ENVIRONMENTAL ASSESSMENT

Issuance of an Incidental Harassment Authorization to the Scripps Institution of Oceanography to Take Marine Mammals by Harassment Incidental to a Low-Energy Marine Geophysical Survey in the South-Eastern Pacific Ocean, May, 2012

May 2012

AGENCY: U.S. Department of Commerce,
National Oceanic and Atmospheric Administration
National Marine Fisheries Service,
Office of Protected Resources
1315 East West Highway
Silver Spring, MD 20910

RESPONSIBLE OFFICIAL: Helen M. Golde, Acting Director, Office of Protected Resources

FOR INFORMATION CONTACT: Office of Protected Resources
National Marine Fisheries Service
1315 East West Highway
Silver Spring, MD 20910
301-427-8401

LOCATION: In the Exclusive Economic Zone of Chile, approximately 50 kilometers off the coast, in the area approximately 34° to 35° South, and 72° to 74° West.

ABSTRACT: This Environmental Assessment analyzes the environmental impacts of the National Marine Fisheries Service's proposal to issue an Incidental Harassment Authorization to the Scripps Institution of Oceanography for the taking, by Level B harassment, of small numbers of marine mammals, incidental to conducting a marine geophysical (seismic) survey in the south-eastern Pacific Ocean, May, 2012.

1. CHAPTER 1 – PURPOSE AND NEED FOR ACTION

1.1 DESCRIPTION OF PROPOSED ACTION

NMFS has received an application from Scripps Institution of Oceanography (SIO), a part of the University of California San Diego (UCSD), for an Incidental Harassment Authorization (IHA) to take marine mammals, by Level B harassment, incidental to conducting a marine geophysical (seismic) survey in the south-eastern Pacific Ocean in the Exclusive Economic Zone (EEZ) of Chile, May, 2012. SIO's seismic survey activities, which have the potential to cause marine mammals to be behaviorally disturbed, warrant an incidental take authorization from NMFS under section 101(a)(5)(D) of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1631 *et seq*.).

The proposed action considered in this Environmental Assessment (EA) is the issuance of an IHA, by NMFS, for the incidental taking, by Level B harassment only, of small numbers of marine mammals, incidental to the conduct of SIO's seismic survey in May, 2012 (which includes a six-week buffer for operational delays), pursuant to section 101(a)(5)(D) of the MMPA.

This EA, titled *Issuance of an Incidental Harassment Authorization to the Scripps Institution of Oceanography to Take Marine Mammals by Harassment Incidental to a Low-Energy Marine Geophysical Survey in the South-Eastern Pacific Ocean May, 2012* (hereinafter, EA), addresses the impacts on the human environment that would result from issuance of this IHA for MMPA Level B takes of marine mammals during the SIO survey under the required monitoring and mitigation measures that would be specified in the authorization.

1.1.1 BACKGROUND

The National Science Foundation (NSF) supports basic scientific research in the mathematical, physical, medical, biological, social, and other sciences pursuant to the National Science Foundation Act of 1950, as amended (NSF Act; 42 U.S.C. 1861-75). The NSF considers proposals submitted by organizations and makes contracts and/or other arrangements (i.e., grants, loans, and other forms of assistance) to support research activities.

NSF also invests in research infrastructure, including the Academic Research Fleet (ARF) which allows NSF-funded scientists to conduct marine research in coastal and open waters. These funds support ship operations; shipboard scientific support equipment; oceanographic instrumentation and technical services; and submersible support. The U.S. Navy owns the R/V *Melville*, an 85 m (279 ft) research vessel that SIO, a part of UCSD, operates under a charter agreement with the Office of Naval Research.

In 2011, an NSF-expert panel recommended a collaborative research proposal titled, "*Collaborative Research: Post-seismic response updip of the Chilean megathrust earthquake of February 27, 2010*" (NSF Award # 1130013) for funding and ship time on the *Melville*. As the Federal action agency, the NSF has funded SIO's proposed seismic survey in the south-eastern Pacific Ocean as a part of the NSF Act.

SIO's seismic survey activities, which have the potential to cause marine mammals to be behaviorally disturbed, warrant an incidental take authorization from NMFS under section 101(a)(5)(D) of the MMPA. Accordingly, SIO has submitted a permit application requesting NMFS

to issue an IHA for the take, by Level B harassment only, of small numbers of marine mammals, incidental to conducting a proposed seismic survey in the south-eastern Pacific Ocean from May 4, 2011 to May 18, 2012. Some minor deviation from these dates is possible, depending upon logistics and weather. Therefore, NMFS proposes to issue an authorization that extends to June 29, 2012.

The NSF action of funding Award #1130013 and NMFS's action of issuing an IHA to SIO that authorizes incidental takes, Level B harassment only, of small numbers of marine mammals, incidental to the conduct of the seismic survey are interrelated actions.

1.1.2 Incorporation of NSF's Analysis and Report by Reference

After conducting an independent review of the information and analyses for sufficiency and adequacy, NMFS incorporates by reference the NSF's *National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 et seq.) Analysis Pursuant To Executive Order (E.O.) 12114 Marine Geophysical Survey by the R/V Melville in the South-Eastern Pacific Ocean, May 2012* (NSF, 2012) (hereinafter, the NSF NEPA Analysis) and an associated report prepared by LGL Limited, Environmental Research Associates (LGL) for NSF and SIO, titled *Final Environmental Analysis of a Marine Geophysical Survey by the R/V Melville in the South-Eastern Pacific Ocean off Chile, May 2012*, (LGL, 2011), (hereinafter, the NSF/SIO Report) pursuant to 40 CFR 1502.21 and NOAA Administrative Order (NAO) 216-6 § 5.09(d). In summary, the NSF NEPA Analysis and the NSF/SIO Report concluded that with incorporation of the proposed monitoring and mitigation measures, the potential impacts of the proposed action to marine mammals, sea turtles, seabirds, fish and invertebrates would be limited to short-term, localized changes in behavior and distribution near the seismic vessel.

1.1.3 Purpose and Need

The MMPA and Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq.*) prohibit "takes" of marine mammals and of threatened and endangered species, respectively, with only a few specific exceptions. The applicable exceptions in this case are an exemption for incidental take of marine mammals in sections 101(a)(5)(D) of the MMPA and 7(b)(4) of the ESA.

Section 101(a)(5)(D) of the MMPA directs the Secretary of Commerce to authorize, upon request, the incidental, but not intentional, taking of small numbers of marine mammals of a species or population stock, by United States citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and a notice of a proposed authorization is provided to the public for review. Section 101(a)(5)(D) of the MMPA also establishes a 45-day time limit for NMFS's review of an application for an IHA followed by a 30-day public notice and comment period on any proposed authorizations for the incidental harassment of small numbers of marine mammals. Within 45 days of the close of the public comment period, NMFS must either issue or deny the IHA.

Purpose: The primary purpose of NMFS issuing an IHA to SIO is to provide an exception to SIO from the take prohibitions under the MMPA for the take of marine mammals, incidental to the conduct of SIO's seismic survey in May, 2012. The purpose of issuing an IHA to SIO is to regulate the incidental take of marine mammals associated with the conduct of the seismic survey in May, 2012.

Need: As noted above this section, the MMPA establishes a general moratorium or prohibition on the take of marine mammals, including take by behavioral harassment. The MMPA establishes a

process by which individuals engaged in specified activities within a specified geographic area may request an IHA. NMFS must authorize the take of small numbers of marine mammals if, among other things, it complies with the process described above this section, makes certain determinations, and requires the implementation of mitigation and monitoring to minimize potential adverse impacts and resulting take. Specifically, NMFS shall grant the IHA if it finds that the taking will have a negligible impact on the species or stock(s), and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). The IHA must set forth the permissible methods of taking, other means of effecting the least practicable impact on the species or stock and its habitat, and requirements pertaining to the mitigation, monitoring, and reporting of such takings.

SIO has submitted a complete application demonstrating potential eligibility for issuance of an IHA. NMFS now has a corresponding duty to determine whether and how it can fashion an IHA authorizing take by harassment incidental to the activities described in SIO's application. The need for this action is therefore established and framed by the MMPA and NMFS's responsibilities under section 101(a)(5)(D) of that Act, its implementing regulations, and other applicable requirements which will influence its decision making, such as section 7 of the ESA which is discussed in more detail below this section.

The foregoing purpose and need guide NMFS in developing alternatives for consideration, including alternative means of mitigating potential adverse effects.

1.2 NEPA REQUIREMENTS AND SCOPE OF NEPA ANALYSIS

This EA focuses primarily on the environmental effects of authorizing MMPA Level B incidental takes of marine mammals during seismic surveys in the south-eastern Pacific Ocean. The MMPA and its implementing regulations governing issuance of an IHA (50 CFR § 216.107) require that upon receipt of a valid and complete application for an IHA, NMFS must publish a notice of preliminary determinations and a proposed IHA in the *Federal Register* (FR). The notice published for the SIO action summarizes the purpose of the requested IHA, includes a statement that NMFS would prepare an EA for the proposed action, and invited interested parties to submit written comments concerning the application and NMFS's preliminary analyses and findings including those relevant to consideration in the EA.

NOAA Administrative Order (NAO) 216-6 established agency procedures for complying with NEPA and the implementing NEPA regulations issued by the President's Council on Environmental Quality (CEQ). Consistent with the intent of NEPA and the clear direction in NAO 216-6 to involve the public in NEPA decision-making, NMFS structures the decision-making process for issuance of IHAs to provide for public participation in the NEPA process by requesting comments on potential environmental impacts described in the proposed IHA, and, in this case, the NEPA documents prepared by NSF and LGL.

Under the requirements of NAO 216-6, the proposed issuance of authorization for incidental take of marine mammals is an action that is not categorically excluded from NEPA review. In addition, it is not the type of action normally requiring preparation of an Environmental Impact Statement (EIS). Therefore, NMFS has prepared this EA to assist in determining whether the direct, indirect and cumulative impacts related to its issuance of the authorization for incidental take under the MMPA of 20 marine mammal species are likely to result in significant impacts to the human environment, or whether the analysis, contained herein, including documents referenced and incorporated by reference and public comments received, supports the issuance of a Finding of No Significant

Impact (FONSI). Given the limited scope of the decision for which NMFS is responsible (i.e. whether or not to issue the authorization including prescribed means of take, mitigation measures and monitoring requirements) that this EA is intended to inform, the scope of analysis is limited to evaluating and disclosing the impacts to living marine resources and their habitat likely to be affected by the SIO seismic survey. As described more fully below this section, the EA identifies all marine mammals, and species protected under the ESA, that are likely to occur within the action area.

The primary analysis focuses on the impacts to certain marine mammal and sea turtle species likely to result from the proposed SIO seismic survey in the south-eastern Pacific Ocean in May, 2012; impacts that would result from the alternatives presented; and the consideration of potential cumulative environmental impacts. Impacts to other marine species and habitat located in the action area were considered unlikely, and, thus received less detailed evaluation.

The need for this EA is to provide a NEPA analysis of potential environmental impacts to inform the decision of whether or not to issue the IHA to SIO and to determine whether the SIO proposed action has any potential significant impacts. NMFS has relied on and incorporated the more comprehensive environmental analysis prepared by NSF (LGL, 2012; NSF, 2012) addressing the direct, indirect and cumulative impacts of the underlying activities associated with the seismic cruise described in the application and its supporting documents.

1.2.1 NEPA Scoping Summary

In order to identify environmental issues and impacts to be addressed in this EA, NMFS undertook several scoping steps.

- NMFS independently evaluated and determined the sufficiency of the scope of the NSF/SIO Report and has incorporated those documents by reference (see Section 1.1.2).
- NMFS also made available the NSF/SIO Report to the public at (http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications) concurrently with the release of the *Federal Register* notice requesting comments on the proposed IHA (77 FR 14744, March 13, 2012).

In addition, the NSF also made available the NSF/SIO Report on NSF's website (http://www.nsf.gov/geo/oce/envcomp/index.jsp) for a 30-day public comment period.

On March 13, 2012, NMFS published a notice of proposed IHA and preliminary determinations in the *Federal Register* (77 FR 14744). That notice included a detailed description of the proposed action, environmental issues and impacts of relevance, and potential mitigation and monitoring measures to avoid and minimize potential adverse impacts. This EA incorporates and relies on that notice and its analysis by reference to avoid duplication of analysis and unnecessary length. As noted in Section 1.1.3, the *Federal Register* notice of preliminary determinations, supporting analysis, proposed IHA and corresponding public comment period are instrumental in providing the public with information on relevant environmental issues and offering the public a meaningful opportunity to provide comments to NMFS for consideration in both the MMPA and NEPA decision-making processes.

1.2.2 COMMENTS ON NSF'S NEPA ANALYSIS AND REPORT

The Marine Mammal Commission (Commission) provides comments on all proposed IHAs as part of their established role under the MMPA (§ 202 (a)(2), *humane means of taking marine mammals*). No other organizations or private citizens submitted comments on NSF's NEPA Analysis and Report to date. NMFS has evaluated all comments and did not identify any comments: (1) that raised substantial questions as to whether the project may cause significant degradation to any marine mammal species or its habitat; or (2) that established a substantial dispute concerning the survey's size, nature, or effect.

The Commission's comments are briefly summarized here. Generally, the Commission recommended that NMFS:

- require the applicant to take in-situ measurements at the survey location and environmental parameters to verify, refine, and if needed, recalculate exclusion zones and buffer zones estimates for the airgun array and associated number of marine mammal takes;
- use species-specific maximum densities derived by multiplying the best density estimates using a precautionary correction factor, and re-estimate the anticipated number of takes using that precautionary approach;
- prohibit a 15 minute pause following the sighting of a mysticete or large odontocete in the exclusion zone and extend that pause to cover the maximum dive times of the species likely to be encountered prior to ramp-up procedures; and
- work with NSF to analyze the data collected during ramp-up procedures to help determine the effectiveness of those procedures as a mitigation measure for seismic surveys.

NMFS has considered the comments regarding additional monitoring and mitigation measures within the context of the MMPA requirement to effect the least practicable impact to marine mammals and their habitats. NMFS has developed responses to specific comments and will provide those responses in the *Federal Register* notice announcing the issuance of the IHA. NMFS incorporates those comments by reference and thus does not repeat them here. NMFS notes, however, that it fully considered the Commission's comments, particularly those related to mitigation and monitoring in preparing a final IHA and this EA. Based on those comments, NMFS has re-evaluated the mitigation and monitoring proposed for incorporation in the IHA and has determined, based on the best available data, that the mitigation measures proposed by the applicant, are the most feasible and effective monitoring and mitigation measures to achieve the MMPA requirement of effecting the least practicable impact on each marine mammal species or stock.

1.3 APPLICABLE LAWS AND NECESSARY FEDERAL PERMITS

This section summarizes federal, state, and local permits, licenses, approvals, and consultation requirements necessary to implement the proposed action.

1.3.1 NATIONAL ENVIRONMENTAL POLICY ACT

NEPA compliance is necessary for all "major" Federal actions with the potential to significantly affect the quality of the human environment. Major Federal actions include activities that are fully or partially funded, regulated, conducted, or approved by a Federal agency. NMFS's issuance of an IHA for incidental harassment of marine mammals represents approval and regulation of takes of marine mammals incidental to the applicant's activities and is therefore a major Federal action for

which NEPA review is required. While NEPA does not dictate a substantive outcome for a proposed IHA, it requires consideration of environmental issues in Federal agency planning and decision making, and requires an analysis of alternatives and analysis of direct, indirect, and cumulative environmental effects of the NMFS's proposed action to authorize MMPA Level B incidental take. As noted, since this is a major Federal action which is not categorically excluded and does not normally require preparation of an EIS. NMFS has prepared this EA to analyze environmental impacts and to assist in determining whether an EIS is necessary for the action.

1.3.2 ENDANGERED SPECIES ACT

Section 7 of the ESA requires every Federal agency to insure that any action that it authorizes, funds or carries out is not likely to jeopardize the continued existence of any threatened or endangered species or does not result in the adverse modification or destruction of critical habitat designated for any such species. Section 7 of the ESA also requires an action agency to consult with the appropriate Federal agency (either NMFS or the U.S. Fish and Wildlife Service [USFWS]) for Federal actions that "may affect" a listed species or critical habitat. NMFS's issuance of an IHA is a Federal action, authorized by NMFS, directly or indirectly affecting ESA-listed species or designated critical habitat, and is therefore subject to these section 7 consultation requirements. Regulations specify the requirements for these consultations (50 CFR § 402).

NMFS has determined that issuance of the IHA is likely to result in adverse effects to listed marine mammal species and, therefore, in May, 2012 NMFS completed a formal section 7 consultation and prepared a Biological Opinion (BiOp) to consider whether or not the action is likely to jeopardize such species or result in the adverse modification or destruction of critical habitat designated for such species. The BiOp also includes an Incidental Take Statement (ITS) that includes reasonable and prudent measures (RPMs) and terms and conditions to minimize the level of incidental take. Incidental take is exempted from the ESA's prohibition on take as long as it occurs consistent with the ITS and its RPMs and terms and conditions. The mitigation and monitoring measures set forth in the final IHA related to listed marine mammals have been incorporated into the ITS.

1.3.3 MARINE MAMMAL PROTECTION ACT

Section 101(a)(5)(D) of the MMPA directs the Secretary of Commerce (Secretary) to authorize, upon request, the incidental, but not intentional, taking by harassment of small numbers of marine mammals of a species or population stock, for periods of not more than one year, by United States citizens who engage in a specified activity (other than commercial fishing) within a specific geographic region if certain findings are made and a *Federal Register* notice of a proposed authorization is provided to the public for review.

Section 101(a)(5)(D) of the MMPA established an expedited process by which citizens of the United States can apply for an authorization to incidentally take small numbers of marine mammals by harassment. Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as:

> any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild ["Level A harassment"]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering ["Level B harassment"].

Section 101(a)(5)(D) of the MMPA establishes a 45-day time limit for NMFS's review of an application followed by a 30-day public notice and comment period on any proposed authorizations for the incidental harassment of small numbers of marine mammals. Not later than 45 days after the close of the public comment period, if the Secretary makes the findings set forth in Section 101(a)(5)(D)(i) of the MMPA, the Secretary shall issue the authorization with appropriate conditions to meet the requirements of clause 101(a)(5)(D)(ii) of the MMPA.

NMFS has promulgated regulations to implement the permit provisions of the MMPA (50 CFR Part 216) and has produced Office of Management and Budget (OMB)-approved application instructions (OMB Number 0648-0151) that prescribe the procedures necessary to apply for permits. All applicants must comply with these regulations and application instructions in addition to the provisions of the MMPA. Applications for an IHA must be submitted according to regulations at 50 CFR § 216.104.

1.3.4 EXECUTIVE ORDER 12114 – ENVIRONMENTAL EFFECTS ABROAD OF MAJOR FEDERAL ACTIONS

The requirements for Executive Order (E.O.) 12114, discussed in the NSF/SIO Report (LGL, 2011) are incorporated herein, by reference. Briefly, the provisions of E.O. 12114 apply to major Federal actions that occur or have effects outside of U.S. territories (the United States, its territories, and possessions). Accordingly, NMFS is required to be informed of environmental considerations and take those considerations into account when making decisions on major Federal actions which could have environmental impacts anywhere beyond the borders of the United States.

2. CHAPTER 2 – ALTERNATIVES INCLUDING THE PROPOSED ACTION

The NEPA implementing regulations (40 CFR § 1502.14) and NAO 216-6 provide guidance on the consideration of alternatives to a Federal proposed action and require rigorous exploration and objective evaluation of all reasonable alternatives. Each alternative must be feasible and reasonable in accordance with the President's CEQ regulations (40 CFR §§ 1500-1508) and the purpose and need of the agency proposed action. This chapter describes the range of potential actions (alternatives) determined reasonable with respect to achieving the stated purpose and need, as well as alternatives eliminated from detailed study and also summarizes the expected outputs and any related mitigation of each alternative.

This EA evaluates the alternatives to ensure that they would fulfill the purpose and need, namely: (1) the issuance of an IHA for the take of marine mammals by Level B (behavioral) harassment, incidental to SIO's conduct of a proposed low-energy marine geophysical survey in the south-eastern Pacific Ocean from May 4 to 18, 2012; and (2) compliance with the MMPA, which sets forth specific standards (i.e., unmitigable adverse impact and negligible impact) that must be met in order for NMFS to issue an IHA.

In the present case, NMFS has only included for full consideration one action alternative, the proposed action. In the course of reviewing the IHA, NMFS evaluated several options for mitigation and monitoring, including those suggested during the public comment period on the proposed IHA, and determined that the proposed action includes the monitoring and mitigation measures that would most effectively minimize potential adverse environmental impacts.

Under the requirements of the MMPA, if the proposed action will have no more than a negligible impact on the species or stocks; will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses; and sets forth the appropriate level of mitigation and monitoring measures, then NMFS shall issue the IHA.

2.1 PROJECT OBJECTIVES

SIO's proposed survey will use two dimensional (2D) seismic methodologies to study the seafloor of Maule, Chile to monitor the post-seismic response following a megathrust earthquake which occurred there on February 27, 2010. Study efforts propose to evaluate how the outer accretionary prism, where sediments are accreted onto the non-subducting tectonic plate at the convergent plate boundary, responds to the change in tectonic stress that resulted from slip of the subduction fault during the earthquake. In particular, scientists will monitor for seismic tremor and for low frequency earthquakes as well as for normal earthquakes in the study area and underlying subducting crust and for slow fluid flow out of the seafloor that can be modeled to derive volumetric strain in the underlying sediments. The proposed research activity would complement a NSF-sponsored cruise conducted by SIO to map bathymetry in the area one month after the earthquake and other subsequent international research. The proposed seismic survey will involve one source vessel, the *Melville*, which will deploy a two-airgun array with a total volume of 90 or 210 cubic inches (in^3). The airgun array is towed through the water column along the survey lines, introducing sound into the water column. Airguns function by venting high-pressure air into the water, which creates an air bubble that transmits sounds downward through the seafloor (Figure 1) (NSF, 2010). The sound penetrates the seafloor and returns to a receiver called a hydrophone. The reflected data provides information on sub-sea floor sediment layers.

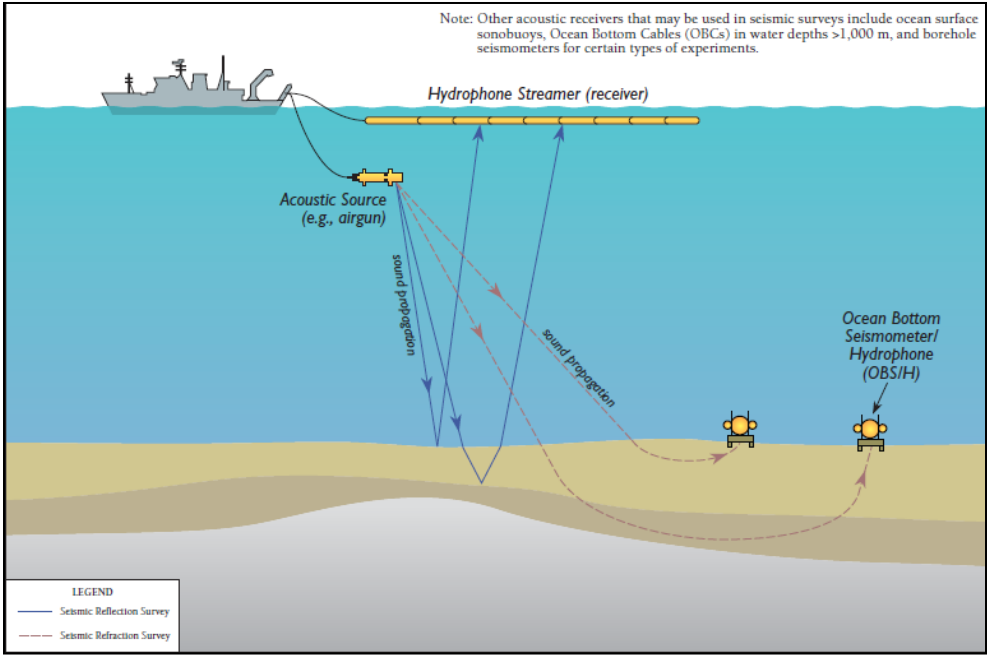

Figure 1. General concept of airgun arrays and hydrophones (NSF, 2010).

2.2 ALTERNATIVE 1 – NO ACTION ALTERNATIVE

Evaluation of the No Action Alternative is required by CEQ NEPA regulations as an environmental baseline against which the impacts of the Proposed Action are compared.

Under the No Action Alternative, NMFS would not issue an IHA to SIO for the taking, by Level B harassment, of small numbers of marine mammals, incidental to conducting a low-energy marine seismic survey in the south-eastern Pacific Ocean from May 4 to 18, 2012. SIO could not legally conduct the seismic survey. The applicant would not receive an exemption from the MMPA and ESA prohibitions against take.

2.3 ALTERNATIVE 2 – ISSUANCE OF AN IHA WITH MITIGATION (PREFERRED)

The Proposed Action is the Preferred Alternative. Under this alternative, NMFS would issue an IHA (valid from May 4, 2012 to June 29, 2012) to SIO allowing the incidental take, by Level B harassment, of 19 species of marine mammals in the south-eastern Pacific Ocean. The project is scheduled to commence on May 4, 2012 and scheduled to end on May 18, 2012, however NMFS is proposing to issue the IHA for a longer period to allow for the possibility of operational delays.

NMFS will incorporate the mitigation and monitoring measures and reporting requirements described in Section II(3) of the NSF/SIO Report (LGL, 2012) into the IHA. Accordingly, this NEPA Preferred Alternative (Issuance of an IHA with Mitigation) would satisfy the purpose and need of the NMFS MMPA action—issuance of an IHA, along with required mitigation measures and monitoring, and would enable NSF and SIO to comply with the statutory and regulatory requirements of the MMPA and ESA.

2.3.1 SEISMIC ACQUISITION OPERATIONS

The NSF/SIO Report (LGL, 2011) describes the survey protocols in detail and this EA briefly summarizes them here.

The proposed study (e.g., equipment testing, startup, line changes, repeat coverage of any areas, and equipment recovery) will take place in the south-eastern Pacific Ocean in water depths ranging from approximately 1,000 to 5,300 meters (m) (3,280.8 to 17,388.5 feet [ft]). The survey will require

approximately 5 to 11 days of airgun operations to complete and consist of approximately 1,145 kilometers (km) (618.3 nautical miles [nmi]) of transect lines.

The *Melville* will conduct additional seismic operations in the survey area associated with turns, airgun testing, and repeat coverage of any areas where the initial data quality is sub-standard.

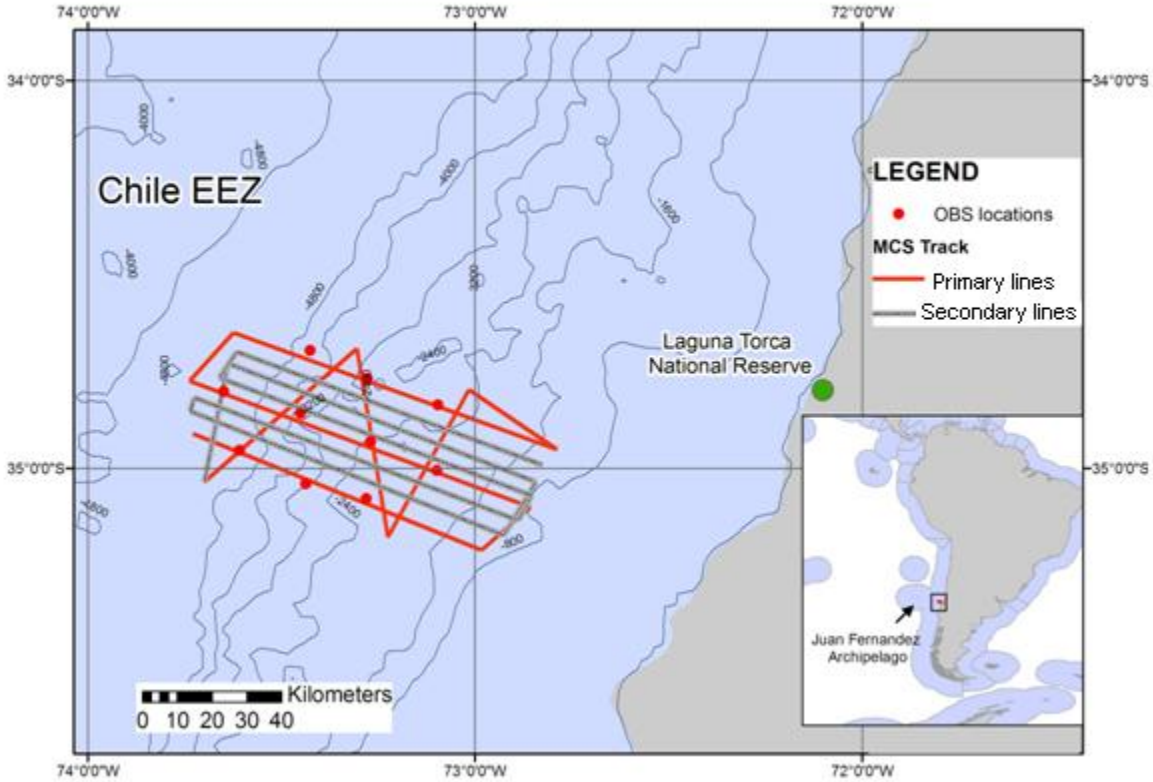

FIGURE 2. PROPOSED STUDY AREAS FOR THE SURVEY IN THE SOUTH-EASTERN PACIFIC OCEAN, MAY, 2012. THE PRIMARY TRACKLINES, APPROXIMATELY 569 KM (NMI), WILL BE SURVEYED FIRST. DEPENDING ON WEATHER DATA QUALITY, AND AT SEA CONDITIONS, EFFORTS WILL BE MADE TO SURVEY SECONDARY TRACKLINES, APPROXIMATELY 576 KM (NMI).

2.3.2 MITIGATION AND MONITORING MEASURES

The NSF/SIO Report (LGL, 2011) describes the required mitigation and monitoring measures in detail and this EA briefly summarizes them here. To reduce the potential for disturbance from acoustic stimuli associated with the activities, SIO and/or its designees have proposed to implement the following monitoring and mitigation measures for marine mammals: (1) proposed exclusion zones; (2) shutdown procedures; (3) ramp-up procedures; (4) visual monitoring by Protected Species Observers (PSOs); and (5) speed or course alteration.

In the IHA, NMFS would include mandatory requirements for NSF/SIO to use these mitigation measures in order to achieve the MMPA requirement of effecting the least practicable impact on each species or stock of marine mammal.

Proposed Exclusion Zones: NMFS has determined that for acoustic effects, using acoustic thresholds in combination with corresponding exclusion zones (EZs) are an effective way to consistently apply measures to avoid or minimize the impacts of an action. SIO uses the thresholds to establish mitigation shut-down or EZ, (i.e., if an animal is about to enter or enters an area calculated to be ensonified above the level of an established threshold a sound source is shut down).

Shut-Down Procedures: SIO would shut-down the operating airgun(s) if a marine mammal is seen within or approaching the EZ for the airgun array. SIO will not resume airgun activity until the marine mammal(s) has cleared the EZ, or until the Protected Species Observer (PSO) is confident that the animal has left the vicinity of the vessel.

Ramp-Up Procedures: SIO would initiate a ramp-up procedure, beginning with a single airgun in the array then adding the second airgun after five minutes when beginning operations, and after a specified period (approximately 15 minutes) of non-active airgun operations when a shut-down has exceeded that period. SIO has used similar periods during previous SIO surveys.

Speed or Course Alteration: If a marine mammal(s) is detected outside the EZ and, based on its position and the relative motion, is likely to enter the EZ, the vessel's speed and/or direct course could be changed. This would be done if operationally practicable while minimizing the effect on the planned science objectives. The activities and movements of the marine mammal(s) (relative to the seismic vessel) will then be closely monitored to determine whether the animal is approaching the applicable EZ. If the marine mammal(s) appears likely to enter the EZ, further mitigative actions will be taken, i.e., either further course alterations or a shut-down of the airguns. Typically, during seismic airgun operations, the source vessel is unable to change speed or course and one or more alternative mitigation measures will need to be implemented.

Visual Monitoring: During seismic operations in the south-eastern Pacific Ocean, at least three PSOs would be based aboard the *Melville* for the duration of the cruise and would watch for marine mammals near the vessel during daytime airgun operations and during any ramp-ups at night. PSOs would record data to estimate the numbers of marine mammals exposed to various received sound levels and to document reactions or lack thereof. PSOs will also observe during daytime periods when the seismic system is not operating for comparison of sighting rates and behavior with versus without airgun operations. They would also provide information needed to order a shut-down of the seismic source when a marine mammal is within or near the EZ. SIO would use the data to estimate numbers of animals potentially 'taken' by harassment (as defined in the MMPA).

2.3.3 REPORTING

The NSF/SIO Report (LGL, 2012) describes the required monitoring and reporting measures in detail and this EA briefly summarizes them here.

SIO will submit a report to NMFS and NSF within 90 days after the end of the cruise. The report will describe the operations that were conducted and sightings of marine mammals near the operations. The report will provide full documentation of methods, results, and interpretation pertaining to all monitoring. The 90-day report will summarize the dates and locations of seismic operations, and all marine mammal sightings (dates, times, locations, activities, associated seismic survey activities). The report will also include estimates of the number and nature of exposures that could result in "takes" of marine mammals by harassment or in other ways.

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by the IHA (if issued), such as an injury (Level A harassment), serious injury or mortality (e.g., ship-strike, gear interaction, and/or entanglement), SIO shall immediately cease the specified activities and immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS. SIO may not resume activities until NMFS is able to review the circumstances of the prohibited take.

2.3.4 ESTIMATED TAKE OF MARINE MAMMALS BY INCIDENTAL HARASSMENT

The NSF/SIO Report (LGL, 2012) describes the estimated take by incidental harassment in detail and this EA briefly summarizes them here.

Only take by Level B harassment is anticipated to be authorized as a result of the marine seismic survey in the south-eastern Pacific Ocean. Acoustic stimuli (i.e., increased underwater sound) generated during the operation of the seismic airgun array may have the potential to cause marine mammals in the survey area to be exposed to sounds at or greater than 160 dB or cause temporary, short-term changes in behavior. There is no evidence that the planned activities could result in injury, serious injury, or mortality within the specified geographic area for which SIO seeks the IHA. Take by injury, serious injury, or mortality is thus neither anticipated nor authorized. NMFS has determined that the required mitigation and monitoring measures will minimize any potential risk for injury, serious injury, or mortality.

SIO's estimates are based on a consideration of the number of marine mammals that could be disturbed appreciably by operations with the two GI airgun array to be used during approximately 1,810.5 km (977.6 nmi) of survey lines (includes primary and secondary lines and an additional 25% contingency) in the south-eastern Pacific Ocean. Density data on the marine mammal species in the survey area were available from five sources: (1) the NMFS Southwest Fishery Science Center (SWFSC) habitat model (Barlow *et al*., 2009); (2) densities from the surveys conducted during summer and fall 1986 to 1996, as summarized by Ferguson and Barlow (2001); (3) for dusky dolphins, mean densities reported for Area A from aerial surveys in North and Central Patagonia (Shiavini *et al*., 1999); (4) for Chilean dolphins, the estimated density of Chilean dolphins in Patagonia from Heinrich (2006); and (5) for blue whales, densities reported by Galletti-Vernazzani and Cabrera (2009) from aerial surveys in Patagonia in March, 2007 and April, 2009 that took place south of the survey site. SIO incorporated the models into a web-based Geographic Information System (GIS) developed by Duke University's Department of Defense Strategic Environmental Research and Development Program (SERDP) team in close collaboration with the SWFSC SERDP team (Read *et al*., 2009). For 11 of the cetacean species in the model, SIO used the GIS to obtain mean densities in the survey area, (i.e., in a rectangle bounded by 4° to 12° South and 75° to 85° West, which was the southeast extent of the model).

The total estimate of the number of individual cetaceans that could be exposed to seismic sounds with received levels greater than or equal to 160 dB re: 1 µPa during the survey is 561 (see Table 3 in the NSF/SIO Report). That total includes: 4 blue whales (endangered under the ESA) or 0.03 percent of the regional population; 1 humpback whale (endangered under the ESA) or less than 0.05 percent of the regional population; and 7 sperm whales (endangered under the ESA) or 0.03 percent of the regional population could be exposed during the survey. In addition, 3 beaked whales (1 Cuvier's, 1 Blainville's beaked whales, and 1 unidentified *Mesoplodon* spp.) could be exposed during the survey. Most (96.4 percent) of the cetaceans that could be potentially exposed are delphinids (e.g., rough-toothed, short-beaked common, striped, spinner, bottlenose, Risso's and

dusky dolphins, and long-finned pilot whales are estimated to be the most common species in the area) with maximum estimates ranging from 1 to 201 (depending on species) exposed to levels greater than or equal to 160 dB re:1 µPa.

NMFS does not expect the activity to impact rates of recruitment or survival of the marine mammals since no mortality (which would remove individuals from the population) or injury is anticipated to occur, nor authorized. Only a temporary modification in behavior and/or low-level physiological effects is anticipated to occur over a very short period of time.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

NMFS considered the alternative where NMFS issues an IHA without the mitigation measures described in Alternative 2–Issuance of an IHA with Mitigation (the Preferred Alternative). However, this alternative failed to meet the statutory and regulatory requirements of the MMPA for an IHA (e.g., negligible impact, effecting the least practicable impact, and monitoring and reporting of such takings). Accordingly, NMFS did not consider this alternative further.

NMFS also considered an alternative whereby NMFS issues the IHA for another time. This alternative, analyzed in the NSF/SIO Report and the NSF NEPA Analysis, is hereby incorporated by reference (LGL, 2012; NSF, 2012). However, this alternative failed to meet the statutory and regulatory requirements of the MMPA for an IHA as SIO did not submit an application (i.e., under the MMPA NMFS shall issue an IHA upon request) to conduct the seismic survey at an alternate time. The proposed dates for the cruise (May, 2012) are the most suitable dates that would best meet the purpose and need, from a logistical perspective, for NSF, SIO, the *Melville*, and its crew. The potential environmental impacts of this alternative would be very similar or identical to the impacts of the proposed action.

3. CHAPTER 3 – AFFECTED ENVIRONMENT

The summary of the physical and biological environment of the study area, as analyzed in the NSF/SIO Report, are hereby incorporated by reference (LGL, 2012). The NSF/SIO Report presents baseline information necessary for consideration of the alternatives and describes the resources that would be affected by the alternatives, as well as environmental components that would affect the alternatives if they were to be implemented. Section 3.1 through 3.3 of this EA briefly summarizes them.

In addition to the marine mammal stocks and species that are the subject of the IHA, an assortment of sea birds, sea turtles, fish, and invertebrates may be found in the action area. Section 3.2.2 – 3.2.5 of this EA briefly summarizes these species. However, potential adverse impacts to these marine species located in the action area were considered unlikely, and, thus received less detailed evaluation than marine mammals.

3.1 PHYSICAL ENVIRONMENT

3.1.1 OCEANOGRAPHY

The survey area located approximately 55 km (29.7 nmi) west of the coast of Chile, occurs within the Chile-Peru current coastal province (Longhurst, 2007). The integrated chlorophyll concentration and the primary productivity in the area of 10° to 55° South are 16 g $Chlm^{-2}$ and 0.74 g $Cm^{-2}d^{-1}$ respectively. The Humboldt Current large region (HC) extends about 7,280 km (3,930.9 nmi) along the west coast of South America from northern Peru (3° 24’ 34” South, 80° 18’ 25” West) to the southern tip of Chile (54° 55’ 39” South, 64° 52’ 12” West). It has a surface area of 2.5 million km^2 (728,883.4 nmi^2), containing 0.42 percent of the world’s seamounts and 24 major estuaries (Miloslavich *et al*., 2011). The HC is one of the major upwelling systems of the world, with moderate to extremely high primary productivity (150 to 300 gC/m^2/year), and highly productive fisheries that account for 16 percent to 20 percent of the global fish captures (Hill *et al*., 1998). This current system is characterized by cold water that flows toward the equator, with offshore Ekman transport and coastal upwelling of cold, nutrient-rich subsurface water. The current system is complex and marked by coastal currents that can export waters up to 1,000 km (540 nmi) offshore, with subsequent effects on the biological populations of species with planktonic dispersal (Miloslavich *et al*., 2011).

3.1.2 PROTECTED AREAS

All territorial waters of Chile have been designated a whale sanctuary, which prohibits all whaling activities. Several marine reserves and parks are established along the coast of Chile, and the parks closest to the proposed survey area are described more in the NSF/SIO Report. Francisco Coloane Marine Park is also described although it is located more than 2,000 km (1,079.9 nmi) from the survey area because of its importance to migrating mysticetes and other resident marine mammals. Protected areas include: Juan Fernandez Archipelago National Park, Laguna Torca National Reserve, Isla Chanaral Marine Reserve, Islas Choros-Damas Marine Reserve, Las Cruces Marine and Coastal Protected Area, and Francisco Coloane Marine Park.

3.2 Social and Economic Environment

Socioeconomics comprise the basic attributes and resources associated with the human environment, particularly population and economic activity. This section addresses the socioeconomic effects of the proposed action on commercial and recreational fishing, tourism, and subsistence use.

3.2.1 Fisheries

Commercial Fisheries

The most important fisheries in the southeast Pacific in terms of catch volume is the tuna fishery, with purse seiners of the international fleet operating in the EEZ waters under a license system. The total catch from purse seine fisheries represents more than half of landings, from commercial fisheries from all reported areas in the EEZ of Chile (see Table 5 of the NSF/SIO Report).

The Chilean fisheries products represent 12 percent of the total national exports. The sector involves 200,000 workers direct and indirectly. Pelagic resources (mainly horse mackerel, anchovy, sardine, and hake) contributes over 73% of the total fish export and are heavily exploited. These species are primarily used as the main raw material for fishmeal (FAO, 1999). Longline fisheries for swordfish occur off the coast of Chile as well, but these do not form a major part of Chile's fisheries export.

The artisanal fisheries (small-scale, decentralized operations) in Chile captured 763,000 tonnes in 2004 using small sea-faring vessels (FAO, 2011). In 2004, 14,000 fishing vessels were registered to artisanal fishers which included 8,905 motor boats and 1,219 row boats (FAO, 2011).

Recreational Fisheries

Sport fishing for billfish and tuna are pursued in most Latin American coastal nations. Sport fishing is popular in both freshwater and marine environments in Chile. Species targeted in the marine recreational fisheries include: sole, tuna, and sea bass among others. Salmon are typically fished in estuaries along the central and southern regions in Chile. The recreational fisheries industry is regulated by the National Fishing Service (SERNAPESCA) that provides fishing licenses to local residents and foreign visitors. SIO's seismic operations in the study area are expected to have a negligible contribution to cumulative impacts on the study area when compared to that of commercial and recreational fisheries activities.

Aquaculture

Chilean aquaculture takes place mainly in coastal marine environments and secondarily in freshwater environments (rivers and lakes). Aquaculture activities are concentrated almost entirely in two administrative areas of the country: Regions III-IV (north of the proposed survey area), and Regions X-XI (south of the survey area) which contributed 5 percent and 92 percent of that national harvest in 2003 respectively (FAO, 2011). In 2007, over 800,000 tonnes of aquaculture products were harvested (FAO, 2011). The breakdown of the harvest was: 80 percent fish (primarily salmon and trout), 13 percent shellfish and 7 percent algae (primarily *Gracilaria*). The total area of aquaculture concessions granted in Chile in 2004 reached 19,600 hectares, and the aquaculture industry is growing steadily in Chile (FAO, 2011).

Most aquaculture production occurs in the intensive cultivation of salmonids in suspended system (floating cages) in marine and estuarine environments, and secondarily in freshwater. Most

production units used are circular in design (10 to 15 m [32.8 to 49.2 ft] in diameter) and approximately 15 to 20 m (49.2 to 65.6 ft) in height. These are arranged in trains of up to 10 units. Culture centers can have up to 3 trains of rafts, depending on the concession area. The second largest aquaculture production is focused on semi-intensive cultures of oyster long-lines and to a lesser extent on field crops of other bivalves (mussels and abalone). Of the 14 species grown commercially in aquaculture facilities, only 6 species are native (FAO, 2011).

The *Melville's* streamer may become entangled with fishing gear. SIO will employ avoidance tactics as necessary to prevent conflict. It is not expected that SIO's operations will have a significant impact on commercial or recreational fisheries in the south-eastern Pacific Ocean. Nonetheless, SIO will minimize the potential to have a negative impact on the fisheries by avoiding areas where fishing is actively underway. More information about impacts on fisheries in Section IV of the NSF/SIO Report (LGL, 2012).

3.2.2 OIL AND GAS ACTIVITIES

In most Latin American countries, hydrocarbons are an asset of the state, and state-owned oil and gas companies are responsible for conducting extraction and development activities. In recent years, however, several countries have introduced regulatory reforms to allow for increased participation of the private sector in oil and gas production activities.

Most of Chile's energy sector is privatized, with Empresa Nacional del Petroleo (ENAP) controlling the oil sector. ENAP is also the sole producer and refiner in the country. Energy policy decisions are the shared responsibility of the National Energy Commission (CNE), the Ministry of Economy and Energy (MME), and the Superintendency of Electricity and Fuels (SEC) (Mbendi, 2011). In 2006, Chile had only 150 million barrels of crude oil reserves. Oil production in Chile is consequently limited, and has been dwindling over the past two decades, from 49,000 barrels per day in 1983 to 15,100 barrels per day in 2006 (production includes crude, natural gas liquids and refinery gain). In contrast, oil consumption in Chile has increased significantly, with Chile consuming an average of 341.72 thousand barrels a day of oil in 200. The country's main source of crude oil imports is Argentina. Other oil import sources include Brazil, Angola, and Nigeria (Mbendi, 2011).

ENAP first started production at its Poseidon project in the CAM 2 A Sur block offshore Tierra del Fuego (south of the survey area) in June, 2003. The Poseidon platform was the first to be installed in the area, 14 km (7.6 nmi) off the northeast coast of Tierra del Fuego in Argentine territorial waters (BNAmericas, 2003).

On April 30, 2008 the Chilean government granted eight blocks (territory portion) for the exploration of oil and natural gas deposits, in Magallanes Region, south of the survey area (see Figure 5 of the NSF/SIO Report). ENAP was one of the forerunning companies in this process. The other blocks granted, and the awarded companies and consortiums were: Tranquilo Block, IPR-Manas; Russfin Block, Apache; Brotula Isla Magdalena and Porvenir Blocks. The awarded companies participate in a 50 percent association with ENAP in the three remaining blocks, el Coiron (Pan American Energy), Caupolican (Greymouth) and Lenga (Apache). In December 2010, international oil companies were invited to become partners with ENAP in hydrocarbon exploration work in five areas located on Tierra del Fuego island in the 12th Region of Magallanes and Chilean Antarctic. In September 2011, ENAP, and the companies Geopark, YPF and Wintershall, presented Special Petroleum Operations Contract (CEOP) requests to the Ministry of Energy, concerning five exploration blocks in Magallanes Region: Isla Norte, Campanario, Flamenco, San Sebastian and

Marazzi-Lago Mercedes. The Chilean Secretary of State will define the awarding of these CEOPs in 2012 (ENAP, 2011).

3.3 BIOLOGICAL ENVIRONMENT

3.3.1 MARINE MAMMALS

Forty-four species of marine mammal, including 32 odontocetes, 8 mysticetes, 4 pinnipeds, and the marine otter are known to occur in the south-eastern Pacific Ocean. Of those, 28 species may occur in the proposed survey area (see Table 2 of NSF/SIO's Report). Five of these species are listed as endangered under the ESA, including the humpback (*Megaptera novaeangliae*), sei (*Balaenoptera borealis*), fin (*Balaenoptera physalus*), blue (*Balaenoptera musculus*), and sperm (*Physeter macrocephalus*) whale. Twelve cetacean species, although present in the survey area, are extralimital, or they are typically found in coastal water. Four species of pinnipeds are known to occur in the south-eastern Pacific Ocean: the Juan Fernandez fur seal (*Arctocephalus philippii*), southern sea lion (*Otaria flavescens*), the South American fur seal (*A. australis*) and the southern elephant seal (*Mirounga leonina*). The typical range of southern elephant seals is far south of the survey area, and the southern sea lion is typically found in coastal waters shallower than the depth of the survey area. The Juan Fernandez fur seal and South American fur seals could be encountered at sea, although they are typically found close to the Juan Fernandez archipelago, approximately 700 km (378 nmi) west of the survey area. The marine otter (*Lontra felina*) is a coastal species and does not occur in offshore waters.

Information on the occurrence, distribution, population size, and conservation status for each of the 28 cetacean species and 4 pinniped species that may occur in the proposed area is presented in Table 2 of the NSF/SIO Report. More information about each stock may be found in the respective Stock Assessment Reports, which are available online at http://www.nmfs.noaa.gov/pr/sars/species.htm.

3.3.2 MARINE TURTLES

Of the world's several species of sea turtles, four species of sea turtles could occur in the proposed study area during the proposed seismic activities. They include the green (*Chelonia mydas*); leatherback (*Dermochelys coriacea*); loggerhead (*Caretta caretta*); and olive ridley (*Lepidochelys olivacea*) sea turtles. At least three species nest north of the survey area in considerable numbers: leatherbacks in Mexico and Costa Rica, green turtles from Mexico and Columbia (mostly in Mexico, nesting in the Galapagos occurs during December to May), and olive ridleys from Mexico to Peru, mostly in southern Mexico and northern Costa Rica. Loggerheads do not next in the eastern Pacific. The proposed survey is scheduled after the peak nesting periods for leatherbacks (October to march), green turtles (October to November), and olive ridleys (September to December).

More information about each species may be found in Section III of the NSF/SIO Report (LGL, 2012).

3.3.3 FISH

Examples of fish present in the south-eastern Pacific Ocean (SAUP, 2012) include species important to commercial and recreational fisheries such as Inca scad (*Trachurus murphyi*), Peruvian anchoveta (*Engraulis ringens*), Patagonian grenadier (*Macrunonus magellanicus*), South American pilchard (*Sardinops sagax*), Normans camote (*Normanichthys crockeri*), South Pacific hake (*Merluccius*

gayi), Araucanian herring (*Clupea bentincki*), Southern hake (*Merluccius australis*), and chub mackerel (*Scomber japonicus*); to name a few.

3.3.4 INVERTEBRATES

Examples of invertebrates present in the south-eastern Pacific Ocean (SAUP, 2012) include mollusks, urchins, shrimp, squids, sharks, rays, and chimaeras.

4. CHAPTER 4 –ENVIRONMENTAL CONSEQUENCES

The NSF/SIO Report and NSF's NEPA Analysis, which address potential direct, indirect, and cumulative impacts of the proposed marine seismic survey on marine mammals, sea turtles, fish, and invertebrates, and impacts to prey species and marine mammal habitats, are hereby incorporated by reference (LGL, 2012; NSF, 2012). NMFS finds that the NSF/SIO Report and NSF's NEPA Analysis facilitate a meaningful analysis of the direct, indirect, and cumulative effects of SIO's proposed action on marine mammals and other marine species, including marine turtles, seabirds, fish, and invertebrates.

Under the MMPA, NMFS has evaluated the potential impacts of SIO's action in order to determine whether to authorize incidental take of marine mammals. Under NEPA, NMFS has determined that an EA is appropriate to evaluate the potential significance of environmental impacts to the marine environment resulting from the proposed SIO action that would occur after issuance of this IHA.

4.1 EFFECTS OF ALTERNATIVE 1 – NO ACTION ALTERNATIVE

Under the No Action Alternative, NMFS would not issue an IHA to SIO for the taking, by Level B harassment, of small numbers of marine mammals, incidental to conducting a low-energy marine seismic survey in the south-eastern Pacific Ocean from May 4 to 18, 2012. SIO could not legally conduct the seismic survey. The applicant would not receive an exemption from the MMPA and ESA prohibitions against take. There are no direct or indirect effects on the environment of not issuing the IHA. The incidental take of marine mammals, including those listed as threatened or endangered, resulting from SIO's survey would not be exempted. It is unlikely the applicant would conduct the research in the absence of a permit, because to do so would risk sanctions and enforcement actions under the MMPA and ESA.

4.2 EFFECTS OF ALTERNATIVE 2 – PREFERRED ALTERNATIVE

The NSF/SIO Report and NSF's NEPA Analysis, incorporated by reference (LGL, 2012; NSF, 2012), describe, in detail, the potential effects of airgun sounds, multibeam echosounder and sub-bottom profiler signals on marine species, particularly marine mammals and marine turtles of particular concern (see Section IV and Appendices B through D of the NSF/SIO Report). The NSF/SIO Report also includes analyses of effects on sea turtles, fish, and invertebrates.

SIO proposed a number of monitoring and mitigation measures for marine mammals as part of the action evaluated in the NSF/SIO Report and NSF's NEPA Analysis. In analyzing the effects of the preferred alternative, NMFS has included the following monitoring and mitigation measures as part of the preferred alternative:

(1) proposed exclusion zones;
(2) power-down procedures;
(3) shut-down procedures;
(4) ramp-up procedures;
(5) visual monitoring by PSOs; and
(6) speed or course alteration.

Inclusion of these monitoring and mitigation measures will minimize and/or avoid impacts to marine resources. With the above mandatory monitoring and mitigation measures, unavoidable impacts to each species of marine mammal and sea turtle that could be encountered are expected to be limited to short-term, localized changes in behavior (such as brief masking of natural sounds) and short-term changes in animal distribution near the seismic vessel. At most, effects on marine mammals may be interpreted as falling within the MMPA definition of Level B (behavioral) harassment for those species managed by NMFS. Under the proposed action, NMFS expects no long-term or substantial adverse effects on marine mammals, marine turtles, fish, invertebrates, or the populations to which they belong or on their habitats.

NMFS does not anticipate that take by injury (Level A harassment), serious injury, or death will occur and expects that harassment takes should be at the lowest level practicable due to the incorporation of the mitigation measures proposed in the application, NSF/SIO Report and NMFS' notice of proposed IHA (77 FR 14744, March 13, 2012), nor is take by injury, serious injury, or mortality authorized by this IHA.

4.2.1 Impacts to the Physical Environment

Based on a review of the data, NMFS expects no significant direct impacts from the action of issuing an IHA for the incidental take, by Level B harassment, of small numbers of marine mammals to SIO during the conduct of the seismic survey. SIO's survey activities are not expected to disturb the geology nor the water surrounding the survey area.

NMFS does not expect the seismic survey to have any substantial impacts to the protected areas near the proposed action area, nor does NMFS expect the authorization to have a significant effect on the living marine resources that may be important resources in the waters off of Chile.

4.2.2 Impacts to marine Mammals and Sea Turtles

The impacts of the seismic survey on marine mammals and sea turtles are specifically related to acoustic activities, and these are expected to be temporary in nature, negligible, and would not result in substantial impact to marine mammals or to their role in the ecosystem. These temporary acoustic activities would not affect physical habitat features, such as substrates and water quality.

Additionally, the effects from vessel transit and routine operation of one seismic source vessel would not result in substantial damage to ocean and coastal habitats that might constitute marine mammal habitats. The potential for striking marine mammals and sea turtles is a concern with vessel traffic. The probability of a ship strike resulting in an injury or mortality of an animal has been associated with ship speed; it is highly unlikely that the proposed seismic survey would result in a serious injury or mortality to any marine mammal or sea turtle as a result of vessel strike given the *Melville*'s slow survey speed (8 to 12 km/hr; 4.3 to 6.5 nmi per hour; 4 to 6 knots [kts]). SIO has not requested authorization for take of marine mammals that might occur incidental to vessel ship strike while transiting to and from the survey site. However, the probability of marine mammal interactions occurring during transit to and from the survey area is unlikely due to the *Melville*'s slow cruising speed which is approximately 11.7 nmi per hour (21.7 km/hr; 11.7 kts) which is generally below the speed at which studies have noted reported increases of marine mammal injury or death (Laist, Knowlton, Mead, Collet, & Podesta, 2001).

NMFS anticipates, and would authorize, the incidental, Level B harassment only, in the form of temporary behavioral disturbance, of several species of cetaceans. NMFS does not anticipate that

take by injury (Level A harassment), serious injury, or death would occur and expects that harassment takes should be at the lowest level practicable due to the incorporation of the monitoring and mitigation measures required by the proposed IHA and analyzed in this EA, the NSF/SIO Report and NSF's NEPA Analysis. The Level B harassment is not expected to affect biodiversity or ecosystem function. As with marine mammals, sea turtles may experience temporary hearing threshold shifts and may exhibit relatively minor and short-term behavioral responses.

4.2.3 POTENTIAL CONSEQUENCES TO OTHER LIVING MARINE RESOURCES

NMFS's evaluation indicates that any direct or indirect effects of the action would not result in a substantial impact to living marine resources (i.e., any fish, or invertebrate species) or their habitats and would not have any adverse impacts on biodiversity or ecosystem function. Most effects of the proposed action are considered to be short-term, temporary in nature, and negligible, and unlikely to affect normal ecosystem function or predator/prey relationships; therefore, there will not be a substantial impact on marine life biodiversity or on the normal function of the high seas marine environment.

SIO proposes to conduct the proposed open-water low-energy marine geophysical survey for a short period of time in deep-water (approximately 1,000 to 5,300 m in depth). As the *Melville* transits the area while conducting the survey, any displacement of marine fish species by the proposed action would be temporary. Many fish species (i.e., those that do not have swim bladders, have rudimentary swim bladders (such as bottom-dwelling species, including flatfish), or well-developed swim bladders that are not directly connected to the ears) tend to have relatively poor auditory sensitivity and are not likely to be affected by exposure to intense noise. The seismic survey may potentially displace prey items of marine mammals, such as fish. However, prey items would return after the *Melville* and the towed airgun array have transited through the area and the ambient sound has returned to baseline levels.

The overall response of fishes and squids is to exhibit startle responses and undergo vertical and horizontal movements away from the sound source. NMFS expects that the seismic survey would have no more than a temporary and minimal adverse effect on any fish or invertebrate species and no cumulative effects on the environment. Although there is a potential for injury to fish or marine life in close proximity to the seismic airguns, the impacts of the seismic survey on fish and other marine life specifically related to acoustic activities are expected to be temporary in nature, negligible, and would not result in substantial impact to these species or to their role in the ecosystem.

NMFS conducted additional literature reviews for purposes of the MMPA analyses, and applicable information is included here to support this finding. Sperm whales regularly feed on squid and some fishes and may be feeding while in the area during the proposed survey. One study investigating behavioral response of southern calamari squid (*Sepioteuthis australis*) exposed to seismic survey sound reported that the squid exhibited both startle and avoidance responses. It is expected that sperm whales remaining in this area would experience indirect effects from airgun activities through temporary behavioral disruptions and reduced feeding opportunities. Like their prey, sperm whales are expected to move out of the survey area temporarily and return to the area once survey activities are complete and prey species return.

Available data suggest that sound energy from the airguns will diminish dramatically by the time it travels more than 1,000 m (3,820 ft) to the ocean floor. The seismic program in the south-eastern

Pacific Ocean is not expected to significantly impact benthic and invertebrate communities in the study area.

The existing body of information on the impacts of seismic survey sound on marine invertebrates and benthic fauna is very limited. Recent controlled field experiments on adult crustaceans exposed to seismic energy found no pathological impacts to the research animals. The study reported that the seismic survey did not: (1) cause any acute or mid-term mortality of the snow crabs (*Chionoecetes opilio*); (2) alter feeding behavior; or (3) affect embryo survival or post-hatch locomotion of larvae.

4.3 COMPLIANCE WITH NECESSARY LAWS – NECESSARY FEDERAL PERMITS

NMFS has determined that the IHA is consistent with the applicable requirements of the MMPA, ESA, and NMFS's regulations. The applicant has secured or applied for necessary permits from NMFS.

Under section 7 of the ESA, NSF initiated formal consultation with the NMFS, Office of Protected Resources, Endangered Species Act Interagency Cooperation Division, on this seismic survey. NMFS's Office of Protected Resources, Permits and Conservation Division, has initiated formal consultation under section 7 of the ESA with NMFS's Office of Protected Resources, Endangered Species Act Interagency Cooperation Division, to obtain a Biological Opinion evaluating the effects of issuing the IHA on threatened and endangered marine mammals and, if appropriate authorizing incidental take. In May, 2012, NMFS issued a BiOp and concluded that the action and issuance of the IHA are not likely to jeopardize the continued existence of humpback, sei, fin, blue, and sperm whales as well as sea turtles. NSF and SIO must comply with the relevant terms and conditions of the ITS corresponding to NMFS's BiOp issued to NSF, SIO, and NMFS's Office of Protected Resources. SIO must comply with the mitigation and monitoring requirements included in the IHA in order to be exempted under the ITA in the BiOp from the prohibition on take of listed endangered marine mammal species otherwise prohibited by section 9 of the ESA.

4.4 UNAVOIDABLE ADVERSE IMPACTS

The summary of unavoidable adverse impacts to marine mammals, marine turtles, seabirds, fish, invertebrates, or the populations to which they belong or on their habitats occurring in the survey area analyzed in the NSF/SIO Report and NSF's NEPA Analysis are hereby incorporated by reference (LGL, 2012; NSF, 2012).

NMFS does not expect SIO's activities to have adverse consequences on the viability of marine mammals in the study area. Further, NMFS does not expect the marine mammal populations in that area to experience reductions in reproduction, numbers, or distribution that might appreciably reduce their likelihood of surviving and recovering in the wild. Numbers of individuals of all species taken by harassment are expected to be small (relative to species or stock abundance), and the low-energy marine seismic survey will have a negligible impact on the affected species or stocks of marine mammals. The MMPA requirement of ensuring the proposed action has no unmitigable adverse impact to subsistence uses does not apply here because of the location of the proposed activity.

4.5 CUMULATIVE EFFECTS

The potential cumulative effects to marine mammals, marine turtles, seabirds, fish, invertebrates, or the populations to which they belong or on their habitats occurring in the survey area analyzed in the NSF/SIO Report and NSF's NEPA Analysis are hereby incorporated by reference (LGL, 2012; NSF, 2012).

The impacts of conducting the seismic survey on marine mammals and sea turtles are specifically related to acoustic activities, and these are expected to be temporary in nature, negligible, and would not result in substantial impacts to marine mammals or to their role in the ecosystem. NMFS believes that the survey would not have any adverse cumulative effect on any fish or invertebrate species or their habitats.

NMFS has issued incidental take authorizations for other seismic research surveys (to SIO, L-DEO, U.S. Geological Survey [USGS], and other parties) that may have resulted in the harassment of marine mammals, but the other research surveys are dispersed both geographically (throughout the world) and temporally, are short-term in nature, and all are required to use mitigation and monitoring measures to minimize impacts to marine mammals and other living marine resources in the activity area. There are no other NSF-sponsored seismic surveys scheduled in the south-eastern Pacific Ocean in May, 2012; therefore, NMFS is unaware of any synergistic impacts to marine resources associated with reasonably foreseeable future actions that may be planned or occur within the same region of influence.

5. LIST OF PREPARERS AND AGENCIES CONSULTED

Agencies Consulted
No other persons or agencies were consulted in preparation of this EA.

Prepared By
Howard Goldstein
Fisheries Biologist
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
National Oceanic and Atmospheric Administration

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