Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion

Icy Strait Point Cruise Ship Terminal development in Hoonah, Alaska and Issuance of Incidental Harassment Authorization under 101(a)(5)(D) of the Marine Mammal Protection Act to the Hoonah Totem Corporation (HTC)

NMFS Consultation Number: *AKR-2015-9440*

Action Agencies: US Army Corps of Engineers, Alaska District
National Marine Fisheries Service, Office of Protected Resources- Permits and Conservation Division (PR1)

Affected Species and Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species	Is Action Likely To Jeopardize the Species?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Humpback Whale (*Megaptera novaeangliae*)	Endangered	Y	N	N/A
Steller Sea Lion, Western US (*Eumetopias jubatus*)	Endangered	Y	N	N

Consultation Conducted By: National Marine Fisheries Service, Alaska Region

Issued By:

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Date: 10.22.15

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3 INTRODUCTION

3.1 Background

The Huna Totem Corporation (HTC) is proposing to re-develop the existing Icy Strait Point tourist facility in Hoonah, Alaska. The proposed improvements include the construction of a new cruise ship berth terminal and associated upland improvements.

The purpose of the project is to construct a permanent cruise ship berth, renovate existing tourist facilities and construct additional tourist facilities to support cruise ship terminal operations at the site and projected increases to tourist traffic. Current cruise ship operations require anchoring the vessel offshore, and lightering of passengers to shore. The new facility would allow passengers to directly access the shore from the cruise ship at berth. The new terminal has been designed as a floating platform to disembark/embark passengers so that there is a fixed elevation between the dock surface and the ships gangways. The proposed action will require work below the mean higher high water mark (MHHW) of Icy Strait and Port Frederick, as well as work within non-tidal waters of the United States, which will require Section 10/404 permits from the U.S. Army Corps of Engineers (USACE). This represents a federal nexus requiring that the USACE evaluate the potential for effects to species or critical habitats listed or proposed for listing under the Endangered Species Act (ESA). The USACE served as the lead agency in this consultation. In addition, the issuance of a permit to Hoonah Totem Corporation (HTC) to incidentally take marine mammals under the MMPA creates a federal nexus requiring that NMFS Office of Protected Resources - Permits and Conservation Division (PR1) evaluate the potential for effects to species or critical habitats listed or proposed for listing under the ESA.

3.2 Consultation History

The applicant coordinated with USACE and NMFS staff between January and August 2014 to discuss permitting and ESA consultation considerations for the project. The applicant also coordinated with US Fish and Wildlife Service (USFWS), Alaska Department of Fish and Game (ADF&G), and National Park Service (NPS) staff between April 2012 and August 2014 regarding ESA-listed species presence in the action area, recommended impact minimization measures and best management practices (BMPs), and the potential for the project to affect ESA-listed species under USFWS and/or NMFS jurisdictions.

A Biological Evaluation was submitted to the USACE and NMFS Alaska region in August 2014. On February 10, 2015, NMFS Alaska region received a request for initiation of a formal consultation under Section 7 from NMFS PR1. On February 26, 2015, the applicant submitted a memorandum to document modifications to the pile installation method and marine mammal monitoring plan, based on guidance from NMFS PR1 during the MMPA application process. Several teleconferences and email exchanges took place February - April of 2015 between NMFS and the applicant regarding clarifications and requests for more information. The original biological opinion was issued on May 21, 2015.

Project work began as scheduled, but the applicant experienced substantial work delays due to weather and the need to frequently replace drill bits due to harder substrate than expected. The applicant sent a memo to NMFS PR1 dated September 25, 2015, requesting an extension of the pile driving work window through

December 31, 2015. NMFS PR1 submitted a reinitiation letter to NMFS Alaska Region on October 20, 2015. The reinitiation did not request any additional take of humpback whales or Steller sea lions and did not include any other changes to the action except for the construction dates. It included the continuation of all mitigation measures and terms and conditions as authorized previously through October 31, 2015. The conclusions of this biological opinion have not changed as a result of reinitiation. The Terms and Conditions of the Incidental Take Statement have not changed except for extending the date for delivery of a final report on marine mammal interactions.

To minimize confusion over which components of this action have already occurred (under the original May 21, 2015, opinion) and which components remain to be completed, this biological opinion supersedes the May 21, 2015 biological opinion, but discusses the full action as though it has not yet commenced.

4 DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

4.1 Project Overview

The existing Icy Strait Point site is located at 108 Cannery Road in Hoonah Alaska, in Township 43S, Range 61E, Section 28 (Sheet 1). The project site is located at the junction of Icy Strait and Port Frederick, on Chichagof Island, Southeast Alaska (Figure 1).

The project would construct a new cruise ship berth terminal and associated upland improvements at the existing facility. The existing facility is served by an approximately 100-foot by 25-foot excursion dock, with an approximately 140-foot walkway connecting to shoreline. There is also an existing 40-foot by 80-foot fishing pier which is connected to the shore by an approximately 120-foot walkway.

The new terminal would consist of a floating pontoon, which would be connected to the shore via a new trestle and transfer span. The new terminal would also include two new mooring dolphins, two new breasting dolphins, and three or more new reaction dolphins. Each of these would be interconnected via pile-supported catwalks.

The upland portions of the project include numerous improvements to the tourist and retail facilities to support the increased cruise passenger traffic that will result from the new cruise ship berth. Construction associated with these upland improvements will have no impact on marine mammals, and are not analyzed further. A detailed list of these structures may be found in the HTC IHA Application.

In-water pile installation would commence around June 1, 2015 and be completed by the end of December 2015. Pile-driving activities will be limited to the period between June 1 and December 31, 2015. The project will require the installation of 104 steel pipe piles of varying diameters below the MHHW. Total impact hammer time would not exceed 5 minutes per pile for 104 piles resulting in less than 10 hours of driving time. Total vibratory hammer time would not exceed 5 hours in any 24-hour period and would not exceed a total of 100 hours. Down hole drilling may take up to 3 hours per pile, for a total of 312 hours. Pile driving (using impact and vibratory hammers) and drilling activities could potentially occur on each day during the authorized period, for less than the maximum times listed above.

The pontoon will arrive at the site in approximately August of 2015, and the remainder of the marine facility will be completed and commissioned in this timeframe as well. Overwater work should be complete by approximately December 2015. The upland project work will be completed between approximately September 2015 and May 2016.

4.2 Construction Elements

4.2.1 In-Water and Over-Water Work

In-water work (work below the MHHW) will be limited to pile installation. Over-water work will include construction and installation of the steel trestle and transfer span, construction of the over-water portions of the mooring, breasting, and reaction dolphins, and construction of the catwalk spans. The floating pontoon will likely be fabricated in a dry dock and floated into position.

In-water and over-water components of the project would be constructed in areas with water depths ranging between MHHW and approximately -60 feet mean lower low water (MLLW). The majority of the in-water and over-water work, including construction of the mooring, breasting, and reaction dolphins; catwalks; a portion of the transfer span; and floating pontoon will be completed between approximately - 25 feet and -60 feet MLLW. Additionally, approximately 1,310 square feet of the transfer span will be constructed above MHHW. HTC has performed a preliminary design of the facility. Detailed design will be completed by the contractor after award.

Table 1 below summarizes the approximate size and dimensions of the new in-water and over-water structures, as well as the approximate size and number of steel pipe piles that will be required for each component.

Table 1. In-Water and Over-Water Project Components

Proposed Structure	Approximate Area (square feet)	Steel Pipe Piles (# and diameter)			
Trestle and Transfer Span*	11,820	Twenty-one 30-inch fifteen 24-inch			
Floating Pontoon	21,500	--			
Mooring Dolphins (2)	1,150 (total)	Fifteen 42-inch			
Breasting Dolphins (2)	1,540 (total)	Twenty 42-inch			
Reaction Dolphins (3)	1,750 (total)	Eighteen42-inch, five 60-inch			
Catwalks (8 spans)	4,150 (total)	Ten 24-inch			
		Total Piles by Size*			
Total	**43,220**	***24-in.***	***30-in.***	***42-in.***	***60-in.***
Total overwater	**41,910**	**25**	**21**	**53**	**5**

* Approximately 1,310 square feet of the trestle and transfer span will be constructed above MHW (upland).

In-water and over-water work will primarily be completed using equipment mounted on barges and/or barge-mounted derricks. It is anticipated that a maximum of three barges, including material barges, will be anchored (four anchors per barge) at the site during offshore construction. The barges may be anchored with spud anchors in shallow water and line anchors in deeper water. The barges will be located close together adjacent to the area where the construction activities are occurring. Small vessels will be used for crew access and miscellaneous construction activities. Limited upland equipment will be used to support in-water construction.

Each element is further described below.

4.2.2 Pile Installation

The trestle and transfer span, dolphins, and catwalks will likely be founded on steel pipe piles of varying diameters. Tension rock anchors (micropiles), consisting of a bundle of pre-stressing tendons grouted into the bedrock and anchored near deck level, will be installed through the inside of steel pipe piles to resolve tension loads to the bedrock. Grout will be placed around these tendons using tremie pipes which will be entirely contained within the steel pipe piles. A vibratory hammer will be used to install and extract all falsework piles. A vibratory hammer will be used to seat structural piles prior to drilling. Pile seating/proofing may be conducted with either a vibratory or an impact hammer.

The modified pile installation approach will conduct no more than 30 minutes of continuous vibratory driving, and no more than 5 hours of vibratory driving in a 24-hour period. Impact proofing will be limited to 3-5 minutes per pile, so total estimated time of proofing would not exceed 10 hours of total impact hammer time. Since vibratory pile driving will likely proceed more quickly than impact driving, it may be possible to install up to 10 piles per day, although some pile driving and/or drilling could occur on every day during the authorized period.

4.2.3 Pile Installation Procedure:

After HTC discussed project plans with NMFS PR1, HTC modified original project plans from 100% impact pile driving to a plan also including vibratory hammers and down hole drilling, to "minimize impacts to marine mammals and species listed under the ESA by reducing the amount of relatively higher energy impact pile driving" (BergerABAM Memo 2/26/15) and associated underwater noise. The site subsurface conditions consist of a 5 to 20 foot thick layer of loose marine sediments overlaying shallow bedrock. The applicant's construction company reports that it has used the system described below in the past with great success in the types of soil to be encountered in this action area.

Pile Driving with impact and vibratory hammers

The applicant proposes to use a D-46 diesel impact hammer, which imparts about 107,000 foot lbs of energy. 350 foot pound eccentric moment vibratory hammer will be used to set the pile in position. After seating the pile, down hole drilling will be used (instead of the vibratory hammer) to advance the pile into or through bedrock, in order to mitigate marine noise generation The following best management practices will be used:

a. The vibratory hammer will comply with soft start operating procedures where the hammer is started and operated at an idle. Only the minimum amount of energy needed to set the pile in location will be used.
b. Protective energy absorbing materials like UHMW or wood will be used to minimize pile chatter caused when a pile is in contact with steel guides. Wood or UHMW guide blocks dampen the energy and reduce noise.
c. The vibratory hammer will be inspected to insure it does not chatter against the pile during driving.
d. Vibratory installation will cease as soon as the pile encounters bedrock. It is anticipated that the actual drive time required to set the piles will be between 10 and 30 minutes per pile. The vibratory hammer will not be used more than 30 minutes continuously or more than 5 hours in a 24 hour period.

Rock excavation

After the piles are set with a vibratory hammer, the piles will be drilled into the bedrock approximately 15 feet. Using a down the hole drilling system with an under reaming bit, the pile will be advanced to its tip elevation in approximately 3 hours per pile.

Proofing/ seating

Once the drilling is complete, the pile will be proofed or seated into the bottom of the drilled socket with either a vibratory or impact hammer. If a vibratory hammer is used, it is expected to take 3-5 minutes of vibrating. If an impact hammer (approximately 107,000 ft.-lbs.) is used, it is expected to take under 50 blows and only 3-5 minutes of impacting. The method of seating will depend on the rock encountered and must be selected in the field based on the actual subsurface conditions. In either case the total proofing effort will not exceed 15 minutes per pile.

4.2.4 Trestle and Transfer Span

A new steel trestle (482 feet by 18 feet) and transfer span (173 feet by 18 feet) with associated steel foundations, measuring 11,100 square feet, will be constructed to allow vehicle and pedestrian access between the pontoon and upland areas. These spans will be supported by approximately fifteen 24-inch and twenty-one 30-inch- diameter steel pipe piles that will be installed per the pile installation methods described above. A portion of the transfer span (approximately 1,065 square feet) and the trestle abutment (240 square feet) will be constructed above MHW (upland). The new trestle and transfer span will create approximately 11,820 square feet of new overwater coverage.

4.2.5 Pontoon

A new floating pontoon (21,500 square feet) with associated components will be constructed to provide a landing surface for cruise ship gangways that is consistently 8 feet above the waterline. The substrate beneath the pontoon consists of fine to coarse gravel and sand with silt. The pontoon will be 400 feet by 50 feet with 1,500 square feet of overhanging components, including pile hoops and the transfer span landing platform. The pontoon will be supported vertically by buoyancy and will be held in place horizontally by the reactions of rubber fender elements (fixed to the pontoon) against steel pipe piles of the nearby reaction dolphins (described below). The pontoon may be ballasted with a combination of gravel and/or seawater. The ballast material will be completely contained within the pontoon. The pontoon will likely be fabricated in a dry dock and floated into position.

The floating pontoon design minimizes the number of pilings needed to support the structure. A pile-supported berth of similar design would require installation of approximately 200 additional pilings.

4.2.6 Mooring Dolphins

Two new mooring dolphins, measuring 1,150 square feet (each approximately 575 square feet), will be constructed to provide mooring points for lines from the cruise ship vessels. The dolphins will be supported by approximately fifteen (total for both) 42-inch-diameter steel pipe piles that will be installed per the pile installation methods described above.

4.2.7 Breasting Dolphins

Two new breasting dolphins, measuring 1,150 square feet (total), will be constructed to provide mooring points for the lines and breasting points for the hulls of cruise ship vessels. Each dolphin will be supported by approximately ten 42-inch-diameter steel pipe piles that will be installed per the pile installation methods described above.

4.2.8 Reaction Dolphins

Approximately three new reaction dolphins, measuring 1,750 square feet (total), will be constructed to maintain the horizontal position of the floating pontoon. The reaction dolphins will be supported by approximately eighteen 42-inch-diameter and five 60-inch-diameter steel pipe piles (total piles used for the three dolphins) that will be installed per the pile installation methods described above.

4.2.9 Catwalks

Eight new catwalk spans, measuring 4,150 square feet total (5 feet wide by 820 feet plus foundations), will be constructed to provide walking access between the pontoon and the mooring and breasting dolphins. The catwalks will be supported by approximately ten 24-inch-diameter steel pipe piles that will be installed per the pile installation methods described above. The decking of the catwalks will be grated and supported by horizontal steel pipes.

4.2.10 Upland Project Components

The upland portions of the project include numerous improvements to the tourist and retail facilities to support the increased cruise passenger traffic that will result from the new cruise ship berth. Construction associated with these improvements will have no impact on marine mammals. A detailed list of these structures may be found in the HTC IHA Application and biological evaluation.

4.3 Mitigation Measures and Best Management Practices

HTC worked with NMFS and proposed the following mitigation measures to minimize the potential impacts to marine mammals in the project vicinity. The primary purposes of these mitigation measures are to minimize sound levels from the activities, and to monitor marine mammals within designated zones of influence corresponding to NMFS's Level A (injury) and Level B (behavioral) harassment thresholds under the MMPA.

4.3.1 Shutdown and Disturbance Zones for Pile Driving

HTC's mitigation through shutdown and disturbance zones are described below and shown in Figure 1 and Figure 2.

4.3.1.1 Shutdown Zones

For all pile driving activities, HTC will establish a shutdown zone. Shutdown zones are intended to contain the area in which sound pressure levels (SPLs) equal or exceed the 180/190 dB rms acoustic injury criteria, with the purpose being to define an area within which shutdown of activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area), thus preventing injury of marine mammals.

Shutdown Zones for Impact Pile Driving

Based on the results of the noise attenuation analysis for this project, the 190 dBRMS Level A harassment (injury) threshold for underwater noise for pinniped species could be exceeded at a distance of up to approximately 22 meters during impact pile driving activities, and the 180 dBRMS Level A harassment (injury) threshold for cetacean species could be exceeded at a distance of up to approximately 100 meters during impact pile driving activities.
In order to avoid injury of marine mammals within the action area, the area within 100 meters of pile driving activity will be monitored and maintained as marine mammal buffer area in which pile installation will not commence or will be suspended temporarily if any marine mammals are observed within the area (Figure 1). This area will be monitored by one qualified field monitor stationed either on the pile driving rig or in the immediate vicinity.

Shutdown Zones for Vibratory Pile Driving

For vibratory driving, HTC's activities are not expected to produce sound at or above the 180 dB rms injury criterion. HTC will, however, implement a minimum shutdown zone of 10 m radius for all marine mammals around all vibratory pile driving and removal activity (Figure 2).

4.3.1.2 Disturbance Zones

Disturbance zones are the areas in which SPLs equal or exceed 120 dB rms (for continuous sound) or 160 dB rms (for pulsed sounds) for pile driving and removal. Figures 1 and 2 show the spatial relationship of the shutdown and disturbance zones. Monitoring of disturbance zones enables observers to be aware of and communicate the presence of marine mammals in the project area outside the shutdown zone, and thus prepare for potential shutdowns if the marine mammals enter the shutdown zones. However, the primary purpose of disturbance zone monitoring is for documenting incidents of Level B harassment; disturbance zone monitoring is discussed in greater detail later.

In order to document observed incidents of harassment, monitors record all marine mammal observations, regardless of location. The observer's location, as well as the location of the pile being driven, is known from a GPS. The location of the animal is estimated as a distance from the observer, which is then compared to the location from the pile and the estimated ZOIs for relevant activities (i.e., pile installation and removal). This information is used to extrapolate observed takes to reach an approximate understanding of actual total takes.

Disturbance Zones for Impact Pile Driving

The 160 dB RMS Level B harassment (behavioral disruption) for underwater noise for pinniped and cetacean species could be exceeded at a distance of up to approximately 2,150 meters during impact pile driving. Thus, the disturbance zone for impact pile driving includes an area that is 2,150 meters from this sound source (Figure 1). This area will be monitored by the field monitor stationed either on the pile driving rig or in the immediate vicinity, and by a second qualified field monitor stationed on or in the vicinity of Halibut Island near the 2,150 meter limit of the Level B harassment zone. A third qualified observer will monitor from a boat that is conducting a transect along the 2,150 meter limit of the Level B harassment zone. Marine mammal presence within this Level B harassment zone, if any, will be monitored, but impact pile driving activity will not be stopped if marine mammals are found to be present. Any marine mammal documented within the Level B harassment zone during impact driving would constitute a Level B take (harassment), and will be recorded and reported as such.

Disturbance Zones for Vibratory Pile Driving

A conservative assessment of underwater noise attenuation indicates that the 120 dB RMS Level B harassment (behavioral disruption) for underwater noise for pinniped and cetacean species could potentially be exceeded throughout the underwater portion of the action area during vibratory pile driving.

The area within the Level B harassment threshold for vibratory driving (Figure 2) will be monitored by three qualified marine mammal observers. One field monitor will be stationed either on the pile driving rig or in the immediate vicinity; a second qualified field monitor will be stationed on or in the vicinity of Halibut Island across Port Frederick; and a third qualified observer will monitor from a boat that is conducting meander transects throughout the Level B harassment zone.

Marine mammal presence within this vibratory Level B harassment zone, if any, will be monitored, but vibratory pile driving activity will not be stopped if marine mammals are found to be present. Any marine mammal documented within the Level B harassment zone depicted in Figure 2 during vibratory driving would constitute a Level B take (harassment), and will be recorded and reported as such.

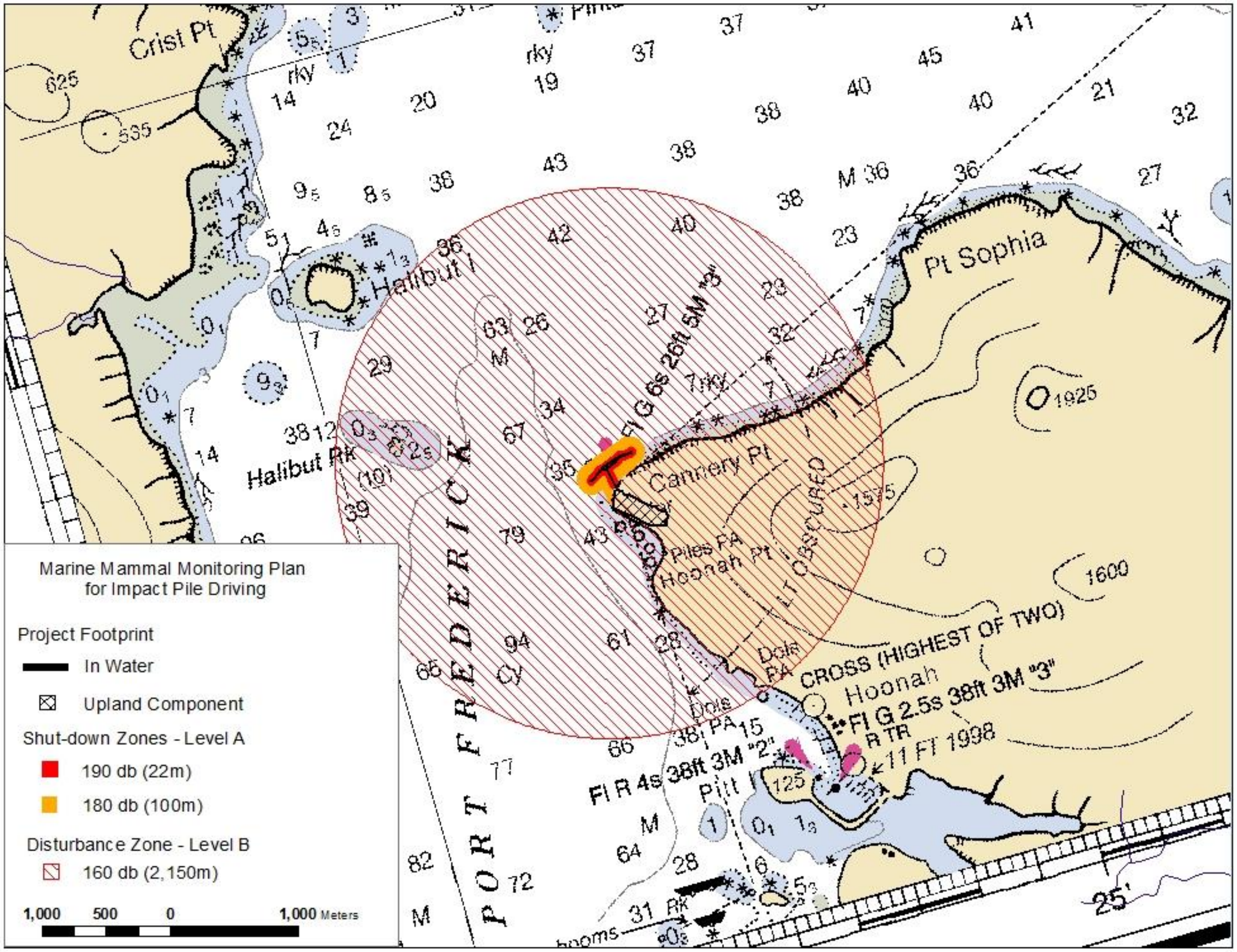

Figure 1. Impact pile driving marine mammal monitoring plan.

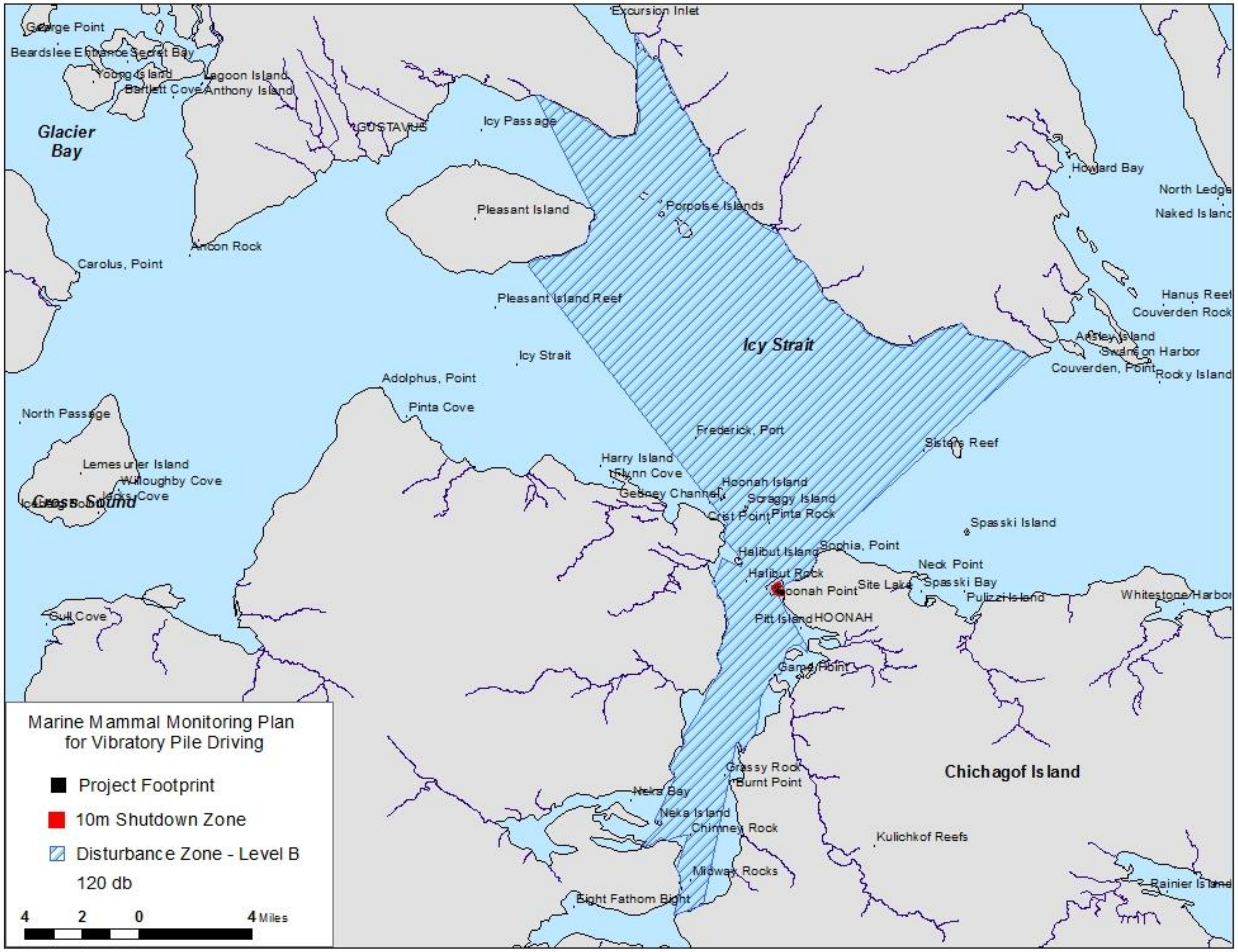

Figure 2. Vibratory pile driving marine mammal monitoring plan.

4.3.2 Monitoring Protocols

Monitoring would be conducted before, during, and after pile driving and removal activities. In addition, observers shall record all incidents of marine mammal occurrence, regardless of distance from activity, and shall document any behavioral reactions in concert with distance from piles being driven. Marine mammal observations made outside the shutdown zone will not result in shutdown; that pile segment would be completed without cessation, unless the animal approaches or enters the shutdown zone, at which point all pile driving activities would be halted. Monitoring will take place from twenty minutes prior to initiation through thirty minutes post-completion of pile driving activities. Pile driving activities include the time to remove a single pile or series of piles, as long as the time elapsed between uses of the pile driving equipment is no more than thirty minutes. Please see the Marine Mammal Monitoring Plan (available at www.nmfs.noaa.gov/pr/permits/incidental/construction.htm), developed by HTC, for full details of the monitoring protocols.

The following additional measures apply to visual monitoring:

(1) Monitoring will be conducted by qualified observers, who will be placed at the best vantage point(s) practicable to monitor for marine mammals and implement shutdown/delay procedures when applicable by calling for the shutdown to the hammer operator. Qualified observers are trained biologists, with the following minimum qualifications:

- (a) Visual acuity in both eyes (correction is permissible) sufficient for discernment of moving targets at the water's surface with ability to estimate target size and distance; use of binoculars may be necessary to correctly identify the target;
- (b) Advanced education in biological science or related field (undergraduate degree or higher required);
- (c) Experience and ability to conduct field observations and collect data according to assigned protocols (this may include academic experience);
- (d) Experience or training in the field identification of marine mammals, including the identification of behaviors;
- (e) Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations;
- (f) Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates and times when in-water construction activities were suspended to avoid potential incidental injury from construction sound of marine mammals observed within a defined shutdown zone; and marine mammal behavior; and
- (g) Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.

(2) Prior to the start of pile driving activity, the shutdown zone will be monitored for twenty minutes to ensure that it is clear of marine mammals. Pile driving will only commence once observers have declared the shutdown zone clear of marine mammals; animals will be allowed to remain in the shutdown zone (i.e., must leave of their own volition) and their behavior will be monitored and documented. The shutdown zone may only be declared clear, and pile driving started, when the entire shutdown zone is visible (i.e., when not obscured by dark, rain, fog, etc.). In addition, if such conditions should arise during impact pile driving that is already underway, the activity would be halted.

If a marine mammal approaches or enters the shutdown zone during the course of pile driving operations, activity will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or fifteen minutes have passed without re-detection of the animal. Monitoring will be conducted throughout the time required to drive a pile.

4.3.3 Soft Start

The use of a soft start procedure is believed to provide additional protection to marine mammals by warning or providing a chance to leave the area prior to the hammer operating at full capacity, and typically involves a requirement to initiate sound from the hammer at reduced energy followed by a waiting period. This procedure is repeated two additional times. It is difficult to specify the reduction in energy for any given hammer because of variation across drivers and, for impact hammers, the actual number of strikes at reduced energy will vary because operating the hammer at less than full power results in "bouncing" of the hammer as it strikes the pile, resulting in multiple "strikes." The project will utilize soft start techniques for both impact and vibratory pile driving. HTC will initiate sound from vibratory hammers for fifteen seconds at reduced energy followed by a thirty-second waiting period, with the procedure repeated two additional times. For impact driving, HTC will initiate an initial set of three strikes from the impact hammer at reduced energy, followed by a thirty-second waiting period, then two subsequent three strike sets. Soft start will be required at the beginning of each day's pile driving work and at any time following a cessation of pile driving of 20 minutes or longer (specific to either vibratory or impact driving).

In addition to the measures described later in this section, HTC would employ the following standard mitigation measures:

(a) Conduct briefings between construction supervisors and crews, marine mammal monitoring team, and HTC staff prior to the start of all pile driving activity, and when new personnel join the work, in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.

(b) For in-water heavy machinery work other than pile driving (using, e.g., standard barges, tug boats, barge-mounted excavators, or clamshell equipment used to place or remove material), if a marine mammal comes within 10 m, operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions. This type of work could include the following activities: (1) movement of the barge to the pile location or (2) positioning of the pile on the substrate via a crane (i.e., stabbing the pile).

4.3.4 Time Restrictions

Work would occur only during daylight hours, when visual monitoring of marine mammals can be conducted. In addition, all in-water construction will be limited to the period between June 1 and December 31, 2015.

4.4 Action Area

The action area is defined as all areas to be affected directly or indirectly by the federal action (50 CFR §402.02). The action area is typically larger than the project area and extends out to a point where no measureable effects from the action are likely to occur. The project site is located at the junction of Icy Strait and Port Frederick on Chicagof Island, Southeast Alaska. For purposes of this Biological Opinion, the action area is defined as all waters of Icy Strait and Port Frederick between Chatham Strait , Cross Sound, and Glacier Bay (Figure 1) based on:

- The project footprint, which includes the limits of all proposed project construction activities.
- The extent of temporarily elevated underwater noise levels associated with pile installation.
- The extent of temporarily elevated above-water noise levels associated with pile installation.
- The extent of temporarily increased levels of sedimentation and turbidity associated with pile installation.
- The extent of additional tourism related activities that are indirect effects of better shore access to cruise ship passengers.

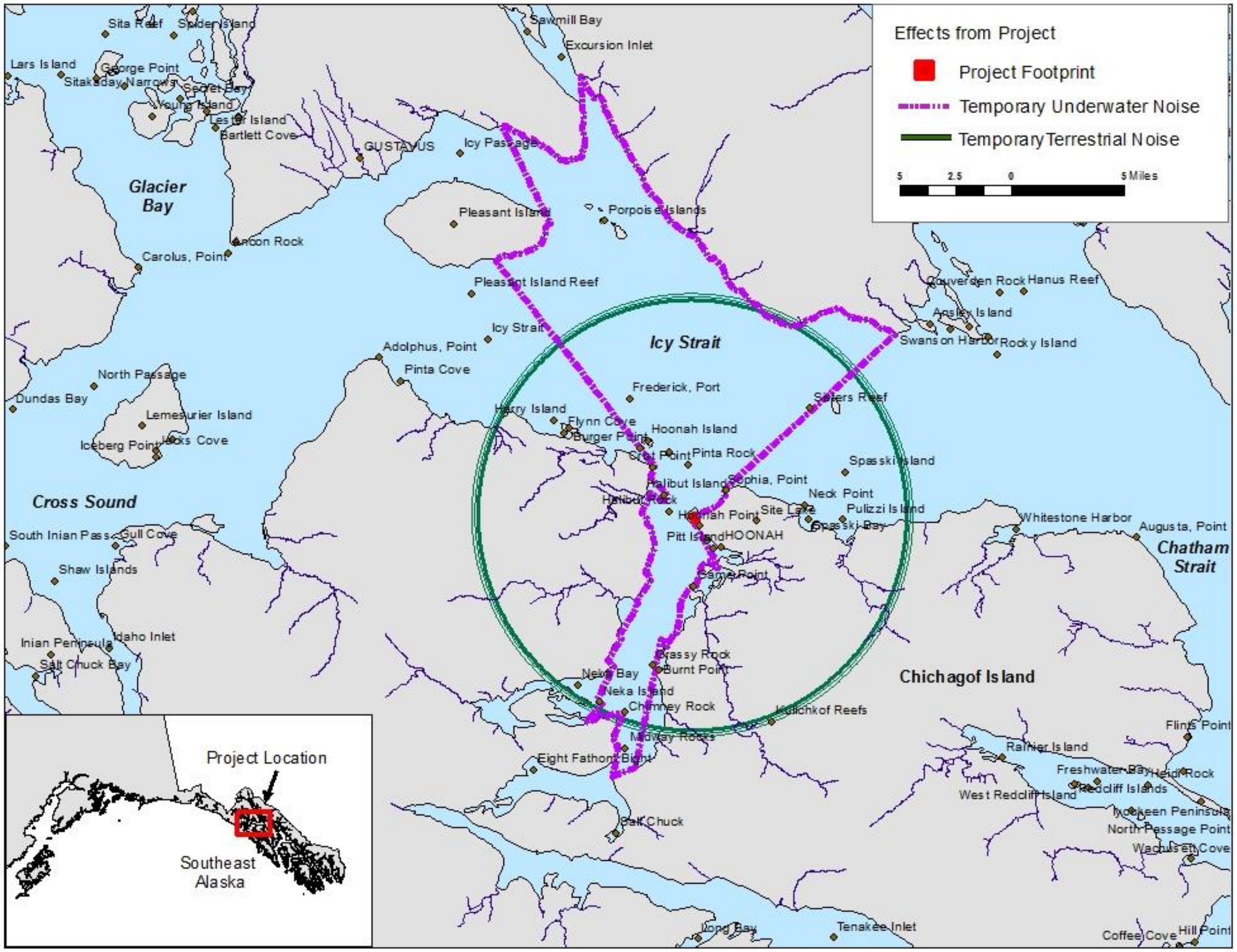

Figure 3. Action Area

5 APPROACH TO THE ASSESSMENT

5.1 Introduction to the Biological Opinion

Section 7(a)(2) of the ESA requires federal agencies, in consultation with NMFS, to insure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. The jeopardy analysis considers both survival and recovery of the species.

"To jeopardize the continued existence of a listed species" means to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). As NMFS explained when it promulgated this definition, NMFS considers the likely impacts to a species' survival as well as likely impacts to its recovery. Further, it is possible that in certain, exceptional circumstances, injury to recovery alone may result in a jeopardy biological opinion (51 FR 19926, 19934; June 2, 1986).

5.1.1 Approach to the Assessment

We will use the following approach to determine whether the proposed action is likely to jeopardize the continued existence of listed species:

- Identify those aspects of proposed action that are likely to have direct and indirect effects on the physical, chemical, and biotic environment of the project area. As part of this step, we identify the action area – the spatial extent of these direct and indirect effects.

- Identify the rangewide status of the species likely to be adversely affected by the proposed action. Section 6 describes the current status of each listed species and its critical habitat relative to the conditions needed for recovery. We determine the rangewide status of critical habitat by examining the condition of its physical or biological features (also called "primary constituent elements" or PCEs in some designations) - which were identified when the critical habitat was designated.

- Describe the environmental baseline for the proposed action. The environmental baseline includes the past and present impacts of federal, state, or private actions and other human activities *in the action area*. It includes the anticipated impacts of proposed federal projects that have already undergone formal or early section 7 consultation and the impacts of state or private actions that are contemporaneous with the consultation in process.

- Analyze the effects of the proposed actions. Identify the listed species that are likely to co-occur with these effects in space and time and the nature of that co-occurrence (these represent our *exposure analyses*). In this step of our analyses, we try to identify the number, age (or life stage), and gender of the individuals that are likely to be exposed to an action's effects and the populations or subpopulations those individuals represent.

- Once we identify which listed species are likely to be exposed to an action's effects and the nature of that exposure, we examine the scientific and commercial data available to determine whether and how those listed species are likely to respond given their exposure (these represent our *response analyses*).

- Describe any cumulative effects. Cumulative effects, as defined in NMFS's implementing regulations (50 CFR 402.02), are the effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area. Future federal actions that are unrelated to the proposed action are not considered because they require separate section 7 consultation.

- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat. In this step, NMFS adds the effects of the action to the environmental baseline and the cumulative effects to assess whether the action could reasonably be expected to reduce appreciably the likelihood of survival or recovery of the species in the wild by reducing its numbers, reproduction, or distribution.

- Reach jeopardy and adverse modification conclusions. These conclusions flow from the logic and rationale presented in the Integration and Synthesis section.

- If necessary, define a reasonable and prudent alternative to the proposed action. If, in completing the last step in the analysis, NMFS determines that the action under consultation is likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat, NMFS must identify a reasonable and prudent alternative (RPA) to the action.

5.1.2 Risk Analysis

Our risk analyses begin by identifying the probable risks actions pose to listed individuals that are likely to be exposed to an action's effects. Our analyses then integrate those individuals' risks to identify consequences to the populations those individuals represent. Our analyses conclude by determining the consequences of those population-level risks to the species those populations comprise.

Our jeopardy determinations must be based on an action's effects on the continued existence of threatened or endangered species as those "species" have been defined by the ESA. Because the continued existence of listed species depends on the fate of the populations that comprise them, the viability (that is, the probability of extinction or probability of persistence) of listed species depends on the viability of the populations that comprise the species. Similarly, the continued existence of populations is determined by the fate of the individuals that comprise them.

5.1.2.1 Jeopardy Standard

Jeopardize the continued existence of [a listed species] means to engage in an action that reasonably would be expected, directly, or indirectly, to reduce appreciably the likelihood of the survival or recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02).[1]

[1] For purposes of this opinion, NMFS interprets this definition consistent with the court's opinion in *National Wildlife Federation v. NMFS*, 524 F.3d 917 (9th Cir. 2008). NMFS's jeopardy analysis considers how the proposed action may affect the likelihood of survival of the species and how it may affect the likelihood of recovery of the species.

The purpose of the analysis is to determine whether appreciable reductions are reasonably expected, but not to precisely quantify the amount of those reductions. Our assessment often focuses on whether a reduction is expected, but need not contain detailed analyses designed to quantify the absolute amount of reduction or the resulting population characteristics (abundance, for example) that could occur as a result of implementing the proposed action.

5.1.2.2 Destruction or Adverse Modification of Critical Habitat Standard

NMFS does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02 because the Ninth Circuit Court of Appeals determined that definition was facially invalid (*Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service*, 378 F.3d 1059, 9th Cir. 2004). Instead, we rely upon the statutory provisions of the ESA to complete the analysis with respect to critical habitat. NMFS will evaluate "destruction or adverse modification" of critical habitat by determining if the action reduces the value of critical habitat for the conservation of the species. Thus, NMFS must determine whether affected designated critical habitat is likely to remain functional (or retain the ability to become functional) to serve the intended conservation role for the species both in the near and long term under the effects of the action, environmental baseline, and any cumulative effects.

6 STATUS OF SPECIES AND CRITICAL HABITAT

6.1 Steller sea lions

The Steller sea lion (*Eumetopias jubatus*) is classified within the Order Carnivora, Suborder Pinnipedia, Family Otariidae, and Subfamily Otariinae. The Steller sea lion is the only extant species of the genus *Eumetopias*.

6.1.1 Population Structure and Distribution

NMFS reclassified Steller sea lions as two distinct population segments under the ESA in 1997 based on demographic and genetic dissimilarities—the western and eastern stock (62 FR 30772, June 5, 2007). The western Distinct Population Segment (WDPS), extending from Japan around the Pacific Rim to Cape Suckling in Alaska (144° W) (Figure 4), was listed as endangered due to its continued decline and lack of recovery. This endangered status listing was supported by a population viability analysis which indicated that a continued decline at the 1985 to 1994 rate would result in extinction of the WDPS in 100 years. The probability of extinction was 65% if the 1989 to 1994 trend continued for 100 years (62 FR 24345).

The eastern Distinct Population Segment (EDPS), extending from Cape Suckling (144° W) east to British Columbia and south to California, remained on the list as threatened because of concern over WDPS animals ranging into the east, the larger decline overall in the U.S. population, human interactions, and the lack of recovery in California (62 FR 24345). The EDPS continued to recover, and NMFS removed the EDPS from the list of threatened species on November 4, 2013 (78 FR 66140), since the recovery criteria in the Steller Sea Lion Recovery Plan (NMFS 2008) were achieved and the stock no longer met the definition of a threatened species under the ESA. Because the EDPS is no longer listed under the ESA, effects from this action on that DPS are not analyzed further.

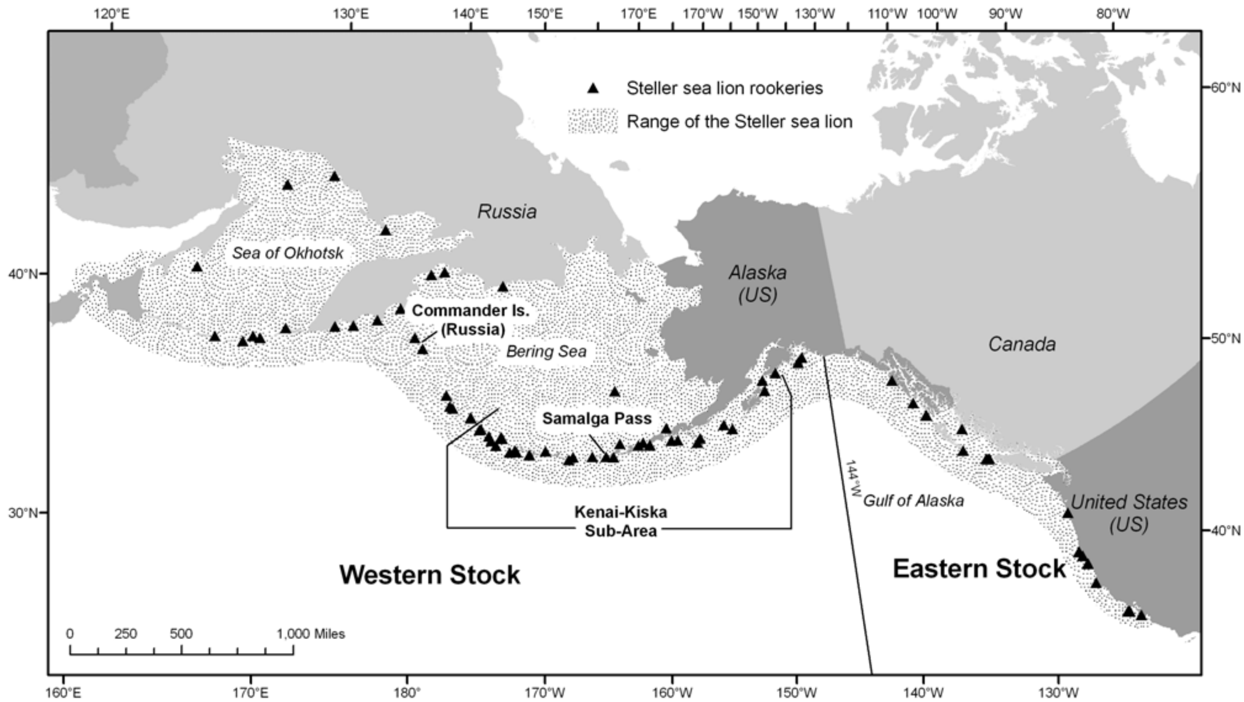

Figure 4. Steller sea lion range and breeding sites (rookeries) in the North Pacific Ocean.

Steller Sea lions in the Action Area

This Opinion analyzes the effects of the action on the WDPS of Steller sea lions, listed as endangered under the ESA. Although the action area is east of the 144W longitude boundary separating the WDPS from the EDPS, individuals from the WDPS do come into the action area.

Movement of animals between the western and eastern stocks of Steller sea lions may affect population dynamics and patterns of underlying genetic variation. Studies have confirmed movement of animals across the eastern and western stock boundary (Fritz et al. 2013, Gelatt et al. 2007, Jemison et al. 2013, Pitcher et al. 2007, Raum-Suryan et al. 2002). Jemison et al (2013) found regularly occurring temporary movements of WDPS Steller sea lions across the 144 W longitude boundary, and some WDPS females have likely emigrated permanently and given birth at White Sisters and Graves rookeries. The vast majority of these sightings have been north of Frederick Sound (the action area is also north of Frederick Sound). Fritz et al (2013) estimated an average annual breeding season movement of WDPS Steller sea lions to southeast Alaska of 917 animals.

Figure 5 shows opportunistic sightings of Steller sea lions in the Platform of Opportunity database (Lewis, 2011) as well as known haulouts and rookeries. None of the haulouts shown in Figure 5 are currently designated as critical habitat for Steller sea lions. One haulout, Graves Rock, is designated critical habitat for Steller sea lions, but is located on the outer coast of Glacier Bay, outside the action area for this project. National Marine Mammal Laboratory (NMML) Steller sea lion counts include breeding season aerial surveys, as well as counts obtained during winter aerial surveys, boat surveys, cliff counts, and other miscellaneous counts. No Steller sea lions have been counted at the ‘The Sisters’ haulout (located within the action area) during NMML surveys from 1982-1996. The site was not included in the counts after that point in time. The Sisters haulout is not designated critical habitat for Steller sea lions.

Habitat Use in Southeast Alaska

Womble et al (2005) studied the seasonal ecology of Steller sea lions in Southeast Alaska by relating the distribution of sea lions to spring herring and eulachon aggregations. Their results suggest that seasonally aggregated high-energy prey species, such as eulachon and herring in late spring and salmon in summer, influence the seasonal distribution of Steller sea lions in some areas of Southeast Alaska. They found peak numbers of sea lions during the spring at Graves Rock (a haulout functioning as a rookery outside of the action area) and peak numbers of sea lions during either summer, fall, or winter at NW Inian, Point Carolus, Rocky Island, and Funter Bay haulouts (outside of action area, Figure 5).

6.1.2 Critical Habitat

On August 27, 1993, NMFS designated critical habitat for Steller sea lions based on the location of terrestrial rookery and haulout sites, spatial extent of foraging trips, and availability of prey items (58 FR 45269). Designated Critical Habitat is listed in 50 CFR 226.202, and includes 1) a terrestrial zone that extends 3,000 ft (0.9 km) landward from the baseline or base point of each major rookery and major haulout; 2) an air zone that extends 3,000 ft (0.9 km) above the terrestrial zone, measured vertically from sea level; 3) an aquatic zone that extends 3,000 ft (0.9 km) seaward in State and federally managed waters from the baseline or basepoint of each major haulout in Alaska that is east of 144° W longitude; 4) an aquatic zone that extends 20 nm (37 km) seaward in State and federally managed waters from the baseline or basepoint of each major rookery and major haulout in Alaska that is west of 144° W longitude; and 5) three special aquatic foraging areas in Alaska; the Shelikof Strait area, the Bogoslof area, and the Seguam Pass area.

There are designated haulouts and rookeries throughout northern Southeast Alaska, but no designated critical habitat exists within the action area and therefore effects to critical habitat from the action will not be analyzed further.

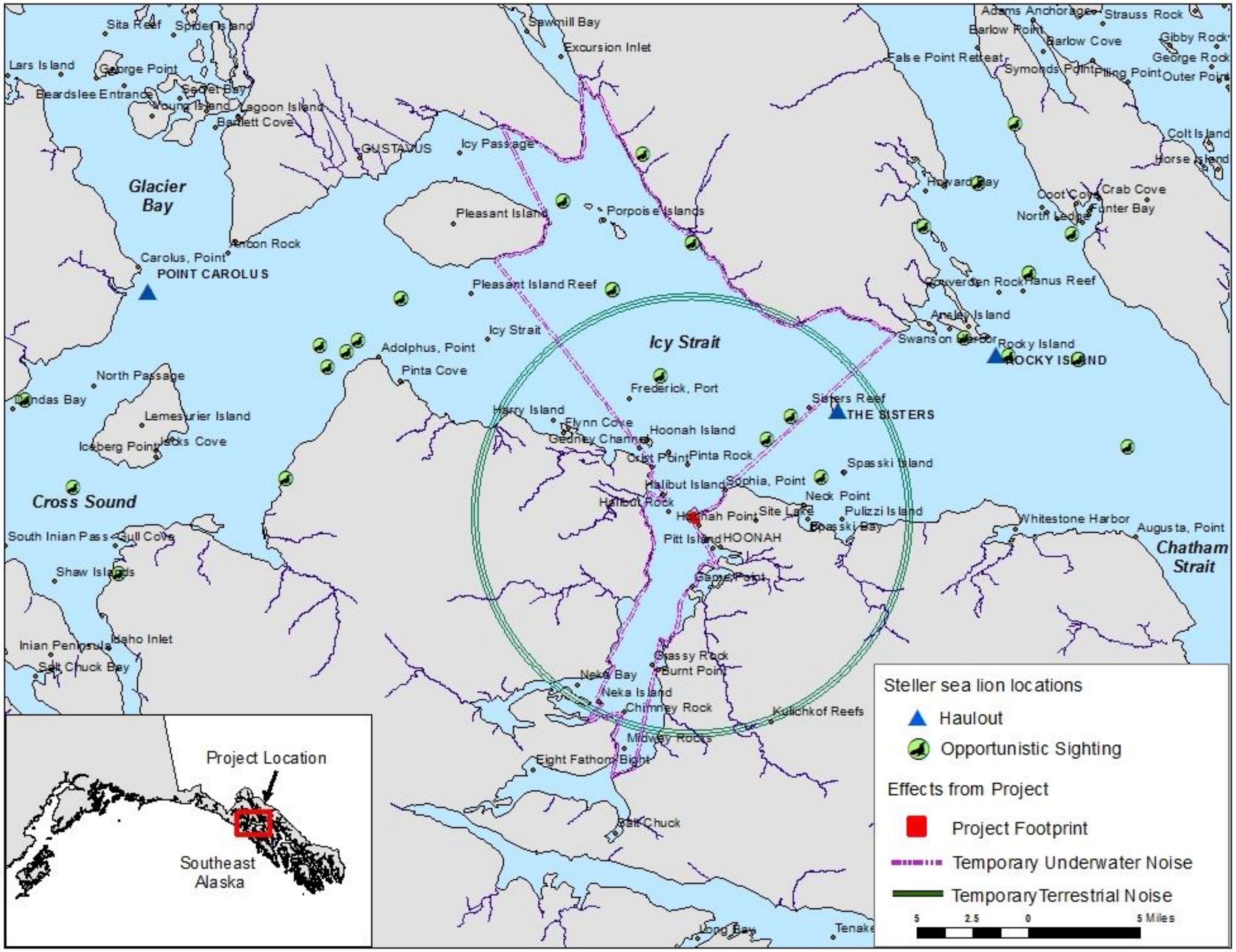

Figure 5. Steller sea lion sightings and haulouts around the project area. Note that The Sisters haulout is not designated critical habitat for Steller sea lions.

6.1.3 WDPS Status and Trends

In the 1950s, the worldwide abundance of Steller sea lions was estimated at 240,000 to 300,000 animals, with a range that stretched across the Pacific Rim from southern California, Canada, Alaska, and into Russia and northern Japan. In the 1980s, annual rates of decline in the range of what is now recognized as the western population were as high as 15 percent. The worldwide Steller sea lion population declined by over 50 percent in the 1980s, to approximately 116,000 animals (Loughlin et al. 1992). By 1990, the U.S. portion of the population had declined by about 80 percent relative to the 1950s. On April 5, 1990, NMFS issued an emergency interim rule to list the Steller sea lion as threatened (55 FR 12645). On November 26, 1990, NMFS issued the final rule to list Steller sea lions as a threatened species under the ESA (55 FR 49204).

In Alaska, the decline spread and intensified east and west of the eastern Aleutians in the 1980s. Steller sea lion regions in Alaska are depicted in Figure 6. Between 1991 and 2000, overall counts of Steller sea lions at trend sites decreased 40 percent, an average annual decline of 5.4 percent (Loughlin and York 2000). In the 1990s, counts decreased more at the western (western Aleutians; -65%) and eastern edges (eastern and central GOA; -56% and -42%, respectively) of the U.S. range than they did in the center (range of -24% to -6% from the central Aleutians through the western Gulf of Alaska) (Fritz et al. 2008). The decline continued in the WDPS until about 2000.

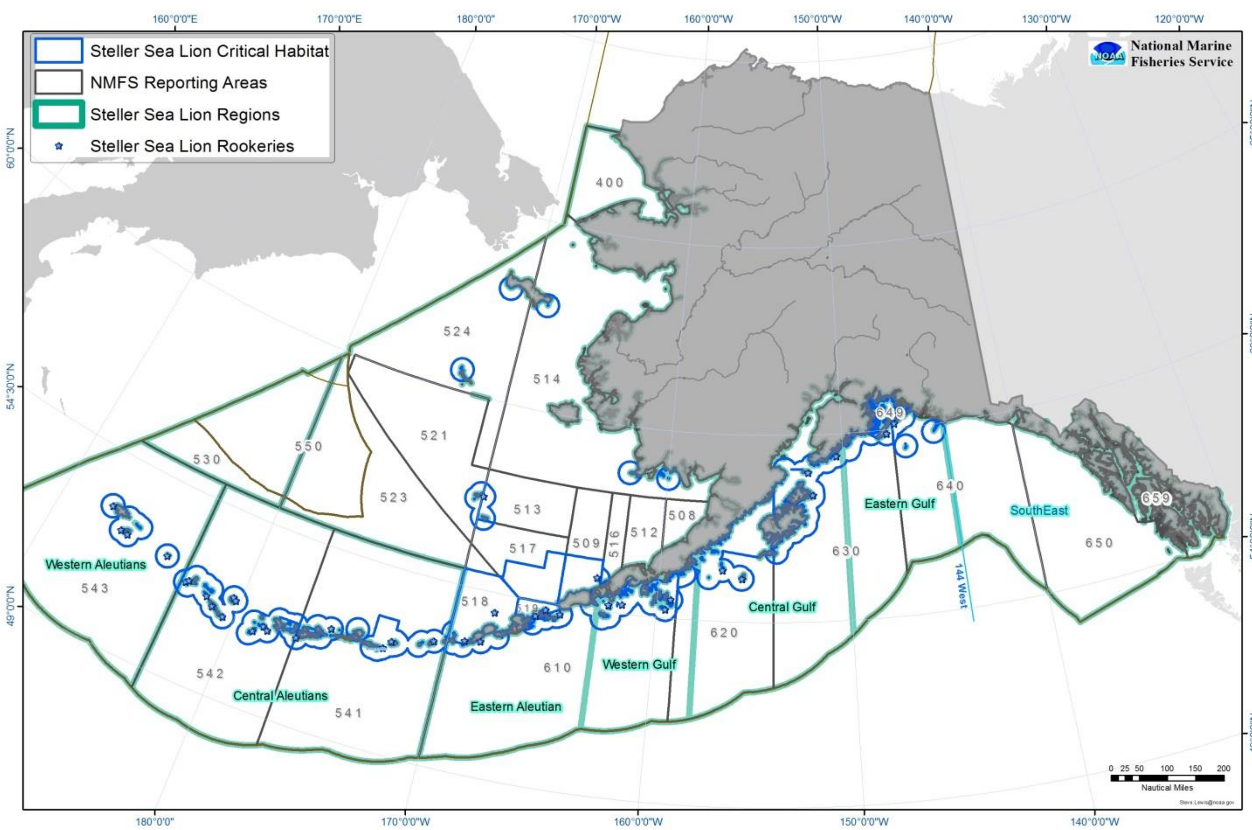

Figure 6. Sub-regions used by NMFS to monitor status and trends of the WDPS in Alaska.

Table 2. Average annual rates of change in non-pup and pup counts of WDPS Steller sea lion non-pups and pups in Alaska, by Recovery Plan sub-region, from 2000 through 2012 (Source:Fritz et al. (2013). Shaded cells denote delineated Recovery Plan sub-regions

Region	Longitude Range	Non-pups			Pups		
		Trend	-95%	+95%	Trend	-95%	+95%
WDPS in Alaska	144°W-172°E	1.67	1.01	2.38	1.45	0.69	2.22
East of Samalga Pass	144-170°W	2.89	2.07	3.8	–	–	–
Eastern Gulf of Alaska	144-150°W	4.51	1.63	7.58	3.97	1.31	6.5
Central Gulf of Alaska	150-158°W	0.87	-0.34	2.18	1.48	-0.56	3.3
E-C Gulf of Alaska	144-158°W	2.4	0.92	3.86	–	–	–
Western Gulf of Alaska	158-163°W	4.01	2.49	5.42	3.03	1.06	5.2
Eastern Aleutian Islands	163-170°W	2.39	0.92	3.94	3.3	1.76	4.83
W Gulf and E Aleutians	158-170°W	3.22	2.19	4.25	–	–	–
West of Samalga Pass	170°W-172°E	-1.53	-2.35	-0.66	–	–	–
Central Aleutian Islands	170°W-177°E	-0.56	-1.45	0.43	-0.46	-1.5	0.72
Western Aleutian Islands	177°E - 172°E	-7.23	-9.04	-5.56	-9.23	-10.93	-7.78

An estimate of the abundance of the entire (U.S. and Russia) WDPS of Steller sea lions (pups and non-pups) in 2012 can be made by adding the most recent U.S. and Russian pups counts, and multiplying by 4.5 (11,603 + 6,021 = 17,624 pups × 4.5), which yields 79,300 sea lions.

WDPS Trend in the U.S. (Alaska)

NMFS monitors the status of the WDPS by conducting aerial surveys of Steller sea lion rookery and haulout sites during the breeding season (June through mid-July), extending the series of surveys that began in Alaska in the mid-1970s (Braham et al. 1980, Calkins and Pitcher 1982, Loughlin et al. 1992, Merrick et al. 1987). Trends in sea lion population abundance have been determined by analyzing time series of pup and non-pup counts at “trend” sites that have been consistently surveyed over time since the 1970s, 1990s, and 2000s (Fritz et al. 2013, NMFS 2008). Trend sites include all rookeries and major haulouts in the WDPS and have included a larger number of sites since Steller sea lions were listed under the ESA and the surveys became more comprehensive. A description of the survey methods and number of sites in each trend site grouping is provided in (Fritz et al. 2013).

Table 3. Aerial survey counts of adult and juvenile (non-pup) Steller sea lions observed at 1970s trend sites (as described in Fritz et al. (2013)) by sub-region in Alaska in June and July from 1976 to 2012.

	Gulf of Alaska			Aleutian Islands				
Year	Eastern	Central	Western	Eastern	Central	Western	Kenai-Kiska	Western
1976-1979	7,053	24,678	8,311	19,743	36,632	14,658	89,364	111,075
1985		19,002	6,275	7,505	21,956	4,526[1]	54,738	
1989								
1990	5,444	7,050	3,915	3,801	7,988		22,754	
1991	4,596	6,270	3,732	4,228	7,496	3,083	21,726	29,405
1992	3,738	5,739	3,716	4,839	6,398	2,869	20,692	27,299
1994	3,365	4,516	3,981	4,419	5,820	2,035	18,736	24,136
1996	2,132	3,913	3,739	4,715	5,524	2,187	17,891	22,210
1998	2,110[2]	3,467	3,360	3,841	5,749	1,911	16,417	20,438
2000	1,975	3,180	2,840	3,840	5,419	1,071	15,279	18,325
2002	2,500	3,366	3,221	3,956	5,480	817	16,023	19,340
2004	2,536	2,944	3,512	4,707	5,936	898	17,099	20,533
2006	2,773			4,721				
2007	2,505		4,114					
2008	3,726	3,176	4,153	5,040	4,932[3]	589	17,301	21,616
2009	3,362	3,683						
2010E	2,951	3,173				516		
2010L	4,716							
2011	4,385[4]		5,014[5]					
2012						455		

[1] Includes 1988 count at Buldir
[2] Includes 1999 counts for those sites not surveyed in 1998
[3] Includes 2006 count at Amchitka/East Cape of 99 animals (adjusted)
[4] Includes 2010L counts at Rugged and Seal Rocks (Kenai) (total of 63 animals adjusted)
Includes 2008 count at Castle Rock of 27 animals (adjusted)

There is little recent data available regarding the population density or abundance of Steller sea lions in Icy Strait or the vicinity other than populations at a number of haulout sites in the area have increased by 8.2% per year between 1970 and 2009. (Matthews et al., 2011).

6.1.4 Threats

Brief descriptions of threats to Steller sea lions follow. More detailed information can be found in the Steller sea lion Recovery Plan (available at: http://alaskafisheries.noaa.gov/protectedresources/stellers/recovery/sslrpfinalrev030408.pdf), the Stock Assessment Reports (available at: http://www.nmfs.noaa.gov/pr/sars/species.htm), and the recent Alaska Groundfish Biological Opinion (NMFS 2014).

6.1.4.1 Natural Threats

Killer Whale Predation

Steller sea lions in both the eastern and western stocks are eaten by killer whales (Dahlheim and White 2010, Ford et al. 1998, Heise et al. 2003, Horning and Mellish 2012, Maniscalco et al. 2007, Matkin et al. 2007, Springer et al. 2008, Williams et al. 2004). The Steller Sea Lion Recovery Plan ranked killer whale predation as a potentially high threat to the recovery of the WDPS (NMFS 2008).

Relative to other WDPS sub-regions, transient killer whale abundance and predation on Steller sea lions has been well studied in the Prince William Sound and Kenai Fjords portion of the eastern Gulf of Alaska (GOA). Steller sea lions represented 33% (Heise et al. 2003) and 5% (NMFS 2013) of the remains found in deceased killer whale stomachs in the GOA. Matkin et al. (2012) estimated the abundance of transient killer whales in the eastern GOA to be 18. Maniscalco et al. (2007) identified 19 transient killer whales in Kenai Fjords from 2000 through 2005 and observed killer whale predation on 6 pup and three juvenile Steller sea lions. Maniscalco et al. (2007) estimated that 11 percent of the Steller sea lion pups born at the Chiswell Island rookery were preyed upon by killer whales from 2000 through 2005 and concluded that GOA transient killer whales were having a minor impact on the recovery of the sea lions in the area. Maniscalco et al. (2008) further studied Steller sea lion pup mortality using remote video at Chiswell Island. Pup mortality up to 2.5 months postpartum averaged 15.4 percent, with causes varying greatly across years (2001–2007). They noted that high surf conditions and killer whale predation accounted for over half the mortalities. Even at this level of pup mortality, the Chiswell Island Steller sea lion population has increased.

Other studies in the Kenai Fjords/Prince William Sound region have also found evidence for high levels of juvenile Steller sea lion mortality, presumably from killer whales. Based on data collected post-mortem from juvenile Steller sea lions implanted with life history tags, 12 of 36 juvenile Steller sea lions were confirmed dead, at least 11 of which were killed by predators (Horning and Mellish 2012). Horning and Mellish (2012) estimated that over half of juvenile Steller sea lions in this region are consumed by predators before age 4 yr. They suggested that low juvenile survival due to predation, rather than low natality, may be the primary impediment to recovery of the WDPS of Steller sea lions in the Kenai Fjords/Prince William Sound region.

Shark Predation

Steller sea lions may also be attacked by sharks, though little evidence exists to indicate that sharks prey on Steller sea lions. The Steller Sea Lion Recovery Plan did not rank shark predation as a threat to the recovery of the WDPS (NMFS 2008). Sleeper shark and sea lion home ranges overlap (Hulbert et al. 2006) and one study suggested that predation on Steller sea lions by sleeper sharks may be occurring (Horning and Mellish 2012). A significant increase in the relative abundance of sleeper sharks occurred during 1989–2000 in the central GOA; however, samples of 198 sleeper shark stomachs found no evidence of Steller sea lion predation (Sigler et al. 2006). Sigler et al. (2006) sampled sleeper shark stomachs collected in the GOA near sea lion rookeries when pups may be most vulnerable to predation (i.e., first water entrance and weaning) and found that fish and cephalopods were the dominant prey. Tissues of marine mammals were found in 15 percent of the shark stomachs, but no Steller sea lion tissues were detected. Overall, Steller sea lions are unlikely prey for sleeper sharks (Sigler et al. 2006).

Disease

The Steller Sea Lion Recovery Plan (NMFS 2008) ranked diseases and parasites as a low threat to the recovery of the WPDS. There is no new information on disease in the WDPS relative to the information in the FMP BiOp (NMFS 2010).

Environmental Variability and Drivers in the Bering Sea and Gulf of Alaska/North Pacific

The Steller Sea Lion Recovery Plan ranks environmental variability as a potentially high threat to recovery of the WDPS (NMFS 2008b). The Bering Sea and Gulf of Alaska are subjected to large-scale forcing mechanisms that can lead to basin-wide shifts in the marine ecosystem resulting in significant changes to physical and biological characteristics, including sea surface temperature, salinity, sea ice extent and amount. Physical forcing affects food availability and can change the structure of trophic relationships by impacting climate conditions that influence reproduction, survival, distribution, and predator-prey relationships at all trophic levels (Wiese et al. 2012). Populations in the GOA and Bering Sea have experienced large fluctuations due to environmental and anthropogenic forcing (Mueter et al. 2009). As we work to understand how these mechanisms affect various trophic levels in the marine ecosystem, we must consider the additional effects of global warming, which are expected to be most significant at northern latitudes (IPCC 2013, Mueter et al. 2009).

6.1.4.2 Anthropogenic Threats

Fisheries interactions including entanglement

The minimum estimated mortality rate of western Steller sea lions incidental to all U.S. commercial fisheries is 33.8 sea lions per year, based on observer data (32.8) and stranding data (1.0) where observer data were not available. Several fisheries that are known to interact with the WDPS have not been observed making the estimated mortality a minimum estimate (Allen and Angliss 2013).

Subsistence/Native harvest

The most recent subsistence harvest data were collected by the Alaska Department of Fish and Game through 2008 and by the Ecosystem Conservation Office of the Aleut Community of St. Paul through 2009. The mean annual subsistence take from the WDPS in Alaska over the 5-year period from 2004 through 2008, combined with the mean take over the 2005–2009 period from St. Paul, was 198 Steller sea lions/year (Allen and Angliss 2013).

Illegal shooting

Illegal shooting of sea lions was thought to be a potentially significant source of mortality prior to the listing of sea lions as threatened under the ESA in 1990. There have been no cases of illegal shooting successfully prosecuted since 1998 (NMFS, Alaska Enforcement Division).

Mortality incidental to research

Mortalities may occasionally occur incidental to marine mammal research activities authorized under ESA and MMPA permits issued to a variety of government, academic, and other research organizations. Between 2006 and 2010, there were no mortalities resulting from research on the western stock of Steller sea lions (Allen and Angliss 2013).

Commercial Fishing for Steller sea lion prey species

The Steller Sea Lion Recovery Plan (NMFS 2008) ranked competition with fisheries for prey as a potentially high threat to recovery of the WDPS. Substantial scientific debate surrounds the question about the impact of potential competition between fisheries and sea lions. It is generally well accepted that fisheries target several important Steller sea lion prey species (NRC 2003). The primary issue of contention is whether fisheries reduce sea lion prey biomass and quality at regional and/or local spatial and temporal scales such that sea lion survival and reproduction are reduced.

Disturbance

Vessel traffic, sea lion research and tourism may disrupt sea lion feeding, breeding, or aspects of sea lion behavior. The Steller Sea Lion Recovery Plan (NMFS 2008) ranked disturbance from these sources as a low threat to the recovery of the WDPS. Disturbance from these sources are not likely affecting population dynamics in the WDPS.

Contaminants

The Steller Sea Lion Recovery Plan ranked the threat of toxic substances as medium (NMFS 2008). Studies published since the completion of the Recovery Plan indicate that contaminants may pose a greater threat to the recovery of the WDPS, particularly for animals in the western portion of the WDPS, than indicated in NMFS (2008).

Climate change and ocean acidification

Marine ecosystems are susceptible to impacts from climate change and ocean acidification linked to increasing CO_2 emissions including increasing global anthropogenic CO_2 emissions. As discussed in the FMP BiOp (NMFS 2010), there is strong evidence that ocean pH is decreasing and that ocean temperatures are increasing and that this warming is accentuated in the Arctic. Scientists are working to understand the impacts of these changes to marine ecosystems, however the extent and timescale over which the WDPS of Steller sea lions may be affected by these changes is unknown. Readers are referred to the discussion on climate change in Section 4.1.6 of the FMP BiOp (NMFS 2010) and to the discussion on ocean acidification in Section 7.3 of the Draft Environmental Impact Statement (NMFS 2013).

6.2 Humpback Whale

Humpback whales were listed as endangered under the ESA in 1973. As a consequence of being listed as endangered under the ESA, the Central North Pacific stock is considered both "depleted" and "strategic" under the MMPA. *See* 16 USC § 1362(1) and (19). NMFS recently conducted a global status review and proposed changing the status of humpback whales under the ESA such that the Central North Pacific stock would no longer be listed (80 FR 22304; April 21, 2015). Final action on that proposal is not expected until after this project occurs.

6.2.1 Population Structure and Distribution

The humpback whale is distributed worldwide in all ocean basins. Figure 5 shows the approximate distribution of humpback whales in the eastern North Pacific. A large-scale study of humpback whales throughout the North Pacific was conducted in 2004-06 (the Structure of Populations, Levels of Abundance, and Status of Humpbacks (SPLASH) project). SPLASH abundance estimates ranged from 9,000 to 19,000 combined for the Aleutian Islands, Bering Sea, and Gulf of Alaska.

During summer and fall, humpback whales in the North Pacific forage over the continental shelf and along the coasts of the Pacific Rim, from Point Conception, California, north to the Gulf of Alaska, Prince William Sound, and Kodiak Island. Within this feeding area there are three relatively separate populations that migrate from these colder, highly productive higher-latitude waters to winter/spring calving and mating areas in warmer, lower-latitude coastal waters. Humpback whales in the waters of southeast Alaska belong to the Central North Pacific stock. This stock forages seasonally in the waters of British Columbia and Alaska and then, during winter, migrates to the Hawaiian Islands for mating and calving; however, a portion of the population remains in southeast Alaska waters year-round. Humpback whales are primarily observed foraging in southeast Alaska from May through December with numbers peaking in late August and September.

In summer the majority of whales from the Central North Pacific stock are found in the Aleutian Islands, Bering Sea, Gulf of Alaska, and Southeast Alaska/northern British Columbia. Relatively high densities of humpback whales occur throughout much of Southeast Alaska and northern British Columbia (Figure 7).

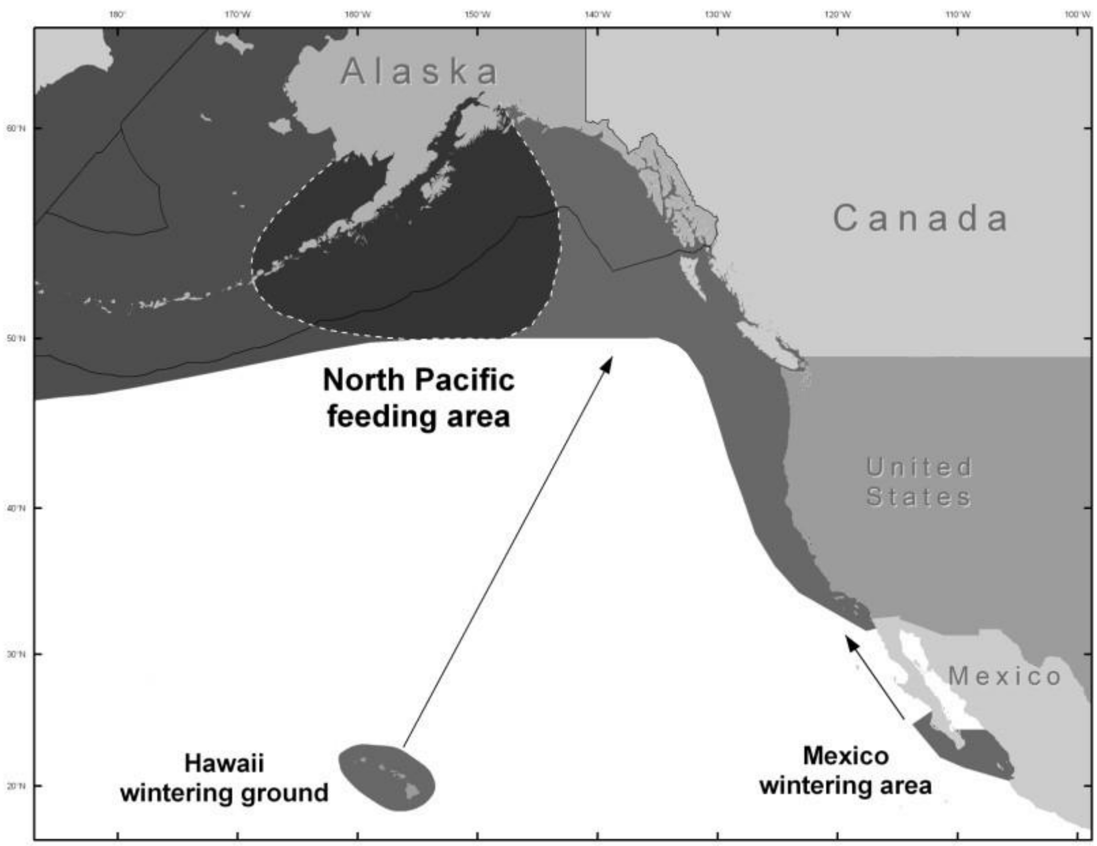

Figure 7. Approximate distribution of humpback whales in the eastern North Pacific (shaded area). Area within the dotted line is known to be an area of overlap with Western North Pacific stock

In the North Pacific, humpback abundance was estimated at fewer than 1,400 whales in 1966, after heavy commercial exploitation. The current abundance estimate for the North Pacific is approximately 21,800 whales (NMFS 2012). The population across Southeast Alaska experienced a 10.6% annual population increase over the 1991-2007 study period (Dahlheim et al., 2008). Humpback whales have been observed within the waters of the action area during all months of the year, with annual concentrations of humpback whales occurring consistently in the waters in and adjacent to Icy Strait in the spring (April/May) (Dahlheim et al., 2008). This is probably when whales are preying on heavily schooled fishes (NMFS 1991). Overall numbers of humpback whales tend to increase during the summer (June/July) and fall (August/September) but are more evenly distributed with fewer identifiable population concentrations (Dahlheim et al. 2008). However, Port Frederick has been identified as being of relatively higher importance during the later summer months, when whales are preying more heavily on swarming euphasiids (NMFS 1991).

Detailed information for the Central North Pacific and Western North Pacific stocks may be found in the 2013 Stock Assessment Report (SAR) (Allen and Angliss 2014), including general species information and the current assessed status of the stocks (population size, trend, and net productivity rate).

Humpback whales in the Action Area

The Southeast Alaska/northern British Columbia feeding aggregation is not formally considered a distinct stock, but the total number of unique individuals seen during a recent study was 1,115 in Southeast Alaska (Allen and Angliss 2014).

Neilson et al (2014) report the highest ever summer count of humpback whales in Glacier Bay/Icy Strait survey area in 2013, at 237 whales. 62 percent of those whales met their definition of resident (20 days or more) highlighting the importance of this area as a summer feeding ground. There were more humpbacks in Icy Strait than in Glacier Bay, and more in Icy Strait in 2013 than in recent years.

The same survey in 2014 had different results. Neilson et al (in press 2015) report a 28% decline in abundance in 2014 compared to 2013, and the largest inter-annual decline in whale numbers since monitoring began (1985-2014 inter-annual range: -28% to +37%). The number of whales in Icy Strait (n = 124) was 39% lower than the record high number of whales there in 2013 (n = 202) and represents the lowest count since 2006 (Neilson et al 2015 in press). Compared to past years, fewer whales met their definition of 'resident' and a high proportion of whales (0.34) were identified on just one day. For the first time since monitoring began in 1985, the survey did not document any "new" whales in the study area in 2014. They offer that oceanographic conditions of increased turbidity and temperature could explain part of this anomaly.

Humpback whale numbers peak in late summer in the project area. There is very little data available on humpback whale presence in Icy Strait in winter months, however late fall and winter habitat in southeast Alaska appears to correlate with areas that have over-wintering herring (Gabriele et al 2015). Dahlheim (2008) evaluated abundance in spring (April/May), summer (June/July) and fall (September/October) based upon surveys conducted over a 17 year period. Dahlheim's report determined that the number of humpback whales increased from spring to late summer to fall, but the number of humpbacks wintering in the waters of Southeast Alaska was greatly reduced as compared with other seasons. Hawaii appears to be the main wintering ground for southeast Alaska humpback whales, although some over-wintering does occur (Gabriele et al 2015).

Figure 8 shows opportunistic sightings of Humpback whales from the Platform of Opportunity database (Lewis 2011) and locations of documented vessel strikes of humpback whales (NMFS 2015, GBNP 2015) in the action area.

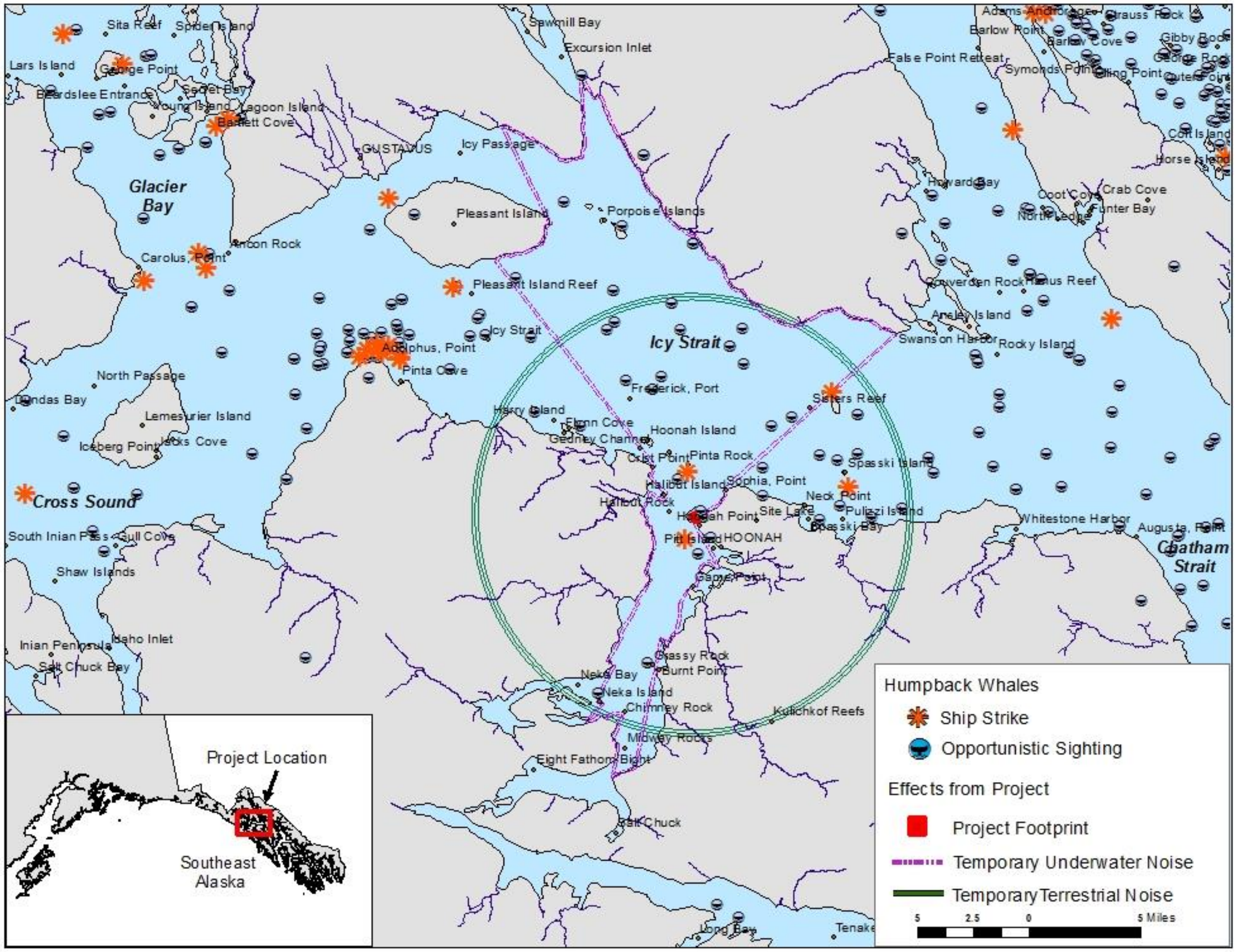

Figure 8. Opportunistic sightings (Lewis 2011) of Humpback Whales in the action area and known locations of ship strikes (NMFS 2015, GBNP 2015)

According to NMFS (1991), Humpback whales are regularly sighted in the Inside Passage and coastal waters of the Southeastern Alaska panhandle from Yakutat Bay south to Queen Charlotte Sound (Rice and Wolman 1982; Morris *et Bl.* 1983).

The Southeastern Alaska feeding aggregation appears to be relatively distinct from others in the North Pacific, since only a few individuals have been observed on more than one feeding ground (Baker *et Bl.* 1985, 1986). Photo-identified individuals have returned to Southeastern Alaska for many years (Baker *et al.* 1986), sometimes to specific summer ranges as small as a few square kilometers in extent (Perry *et al.* 1985). For example, a number of individual whales have returned to the Glacier Bay-Icy Strait area for as many as 16 consecutive summers (Baker *et al.* 1988).

Humpback whales are present in SE Alaska in all months of the year. Most SE Alaska whales winter in Hawaii, but some individuals have been documented over-wintering near Sitka, and NOAA researchers have documented one whale that over-wintered near Juneau (NPS Fact Sheet available at http://www.nps.gov/glba/learn/nature/upload/Whale_Fact_Sheet_2014Dec.pdf). It is unknown how common over-wintering behavior is in most areas because there is minimal or no photographic identification effort in the winter in most parts of SE Alaska. Late fall and winter whale habitat in SE Alaska appears to correlate with areas that have over-wintering herring (lower Lynn Canal, Tenakee Inlet, Whale Bay, Ketchikan, Sitka Sound). In Glacier Bay / Icy Strait, the longest sighting interval recorded was of female whale #1304, who was sighted over a span of 219 days, between April 17 and November 21, 2002, when she was 10 years old.

Whale numbers usually peak in late summer. Some individuals return to very specific areas of Glacier Bay and Icy Strait year after year. Individual whales have preferred feeding partners within and between years. Associations among some whales are stable within and between years. Whales frequently move between Glacier Bay and Icy Strait, treating the area as a single contiguous habitat.

Habitat Use in Southeast Alaska

In feeding areas in the Pacific, there are variable patterns of habitat use from coastal areas to areas quite distant from shore with varying oceanographic characteristics. In southeastern Alaska, habitat use has been observed to change throughout the season. Glacier Bay and Icy Strait appear to be an important feeding area early in the season, having greater densities of humpback whales in June and July with a prey base of euphausiids, while Frederick Sound and Stephens Passage showed greater numbers of whales in August and September with a prey base of fish (Baker et al., 1992). Some individuals were observed to remain in these localized habitats throughout the season, suggesting that for some individual whales, habitat specificity is quite high. This demonstrates that humpback whale prey-choice may vary within a season or across geographic area (NMFS 2011).

Whales in Glacier Bay and Icy Strait typically feed alone or in pairs, primarily on small schooling fishes such as capelin (*Mallotus villosus*), juvenile walleye pollock (*Theragra chalcogramma*), sand lance (*Ammodytes hexapterus*) and Pacific herring (*Clupea pallasi*) (Wing and Krieger 1983). Notable exceptions are the large, stable “core group” that commonly feeds at Point Adolphus in Icy Strait, and less consistent large aggregations of whales that gather to feed at various locations in Glacier Bay and Icy Strait (National Park Service (NPS) unpublished data).

6.2.2 Critical Habitat

Critical habitat has not been designated for this species, and therefore will not be analyzed further.

6.2.3 Status and trends

While the estimated population of the North Pacific stock remains much lower than the population size before whaling, humpback whales are increasing in abundance throughout much of their range. While the species currently remains listed as endangered throughout its range, the State of Alaska, in 2014, filed a petition with NMFS to designate the Central North Pacific stock of humpback whale as a DPS and to delist this DPS under the ESA (ADF&G 2014).

The current population trend for humpback whales in the North Pacific has been estimated in several studies. Mobley et al. (2001) estimated a trend of 7% per year for 1993-2000 for the central North Pacific stock. In the northern Gulf of Alaska, Zerbini et al. (2008) estimated 6.6% per year from 1987-2003, and the SPLASH estimate for the total North Pacific shows an annual increase of 4.9% over a similar period from 1991-1993.

The humpback whale population in Glacier Bay/Icy Strait is growing with an estimated 4.4% annual rate of increase between 1985 and 2009 and an even greater rate of increase from 2002 to 2009 (approximately 7.7% per year) (Saracco et al. 2013).

6.2.4 Vocalization and Hearing

Humpback whales may react to and be harassed by in-water noise. Generally, these whales are sensitive to low-frequency noise. In a study on the mysticete auditory apparatus morphology, Ketten (1997) hypothesized that large mysticetes have acute infrasonic hearing. Southall et al. (2007) assigned humpback whales to the low frequency cetacean functional hearing group. This group has an estimated auditory bandwidth of 7 Hz to 22 kHz. As is the case for all mysticetes, direct data on humpback whale hearing sensitivity is not available but has been estimated based on behavioral responses to sounds at various frequencies, favored vocalization frequencies, body size, ambient noise levels at favored frequencies, and cochlear morphometry.

6.2.5 Threats

Brief descriptions of threats to humpback whales follow. More detailed information can be found in the Humpback Whale Recovery Plan (available at: http://www.nmfs.noaa.gov/pr/pdfs/recovery/whale_humpback.pdf), the Stock Assessment Reports (available at: http://www.nmfs.noaa.gov/pr/sars/species.htm), and the Global Status Review (available at: http://www.alaskafisheries.noaa.gov/protectedresources/whales/humpback/reports/globalreview0311.pdf).

6.2.5.1 Natural Threats

Natural threats to humpback whales include disease and parasites, and predation.

Disease and Parasites

Humpback whales carry a crustacean ectoparasite (the cyamid Cyamus boopis). While the whale is the main source of nutrition for this parasite (Schell et al., 2000), there is little evidence that it contributes to whale mortality. Humpback whales can also carry the giant nematode Crassicauda boopis (Bayliss, 1920), which is known to cause a serious inflammatory response (leading to vascular occlusion and kidney failure) in a few balaenopterid species (Lambertsen, 1992).

Predation

The most common predator of humpback whales is the killer whale (Orcinus orca, Jefferson et al., 1991), although predation by large sharks may also be significant (attacks are mostly undocumented). Rarely, attacks by false killer whales (Pseudorca crassidens) have also been reported or inferred.

Predation by killer whales on humpback calves has been inferred by the presence of distinctive parallel 'rake' marks from killer whale teeth across the flukes (Shevchenko, 1975). While killer whale attacks of humpback whales are rarely observed in the field (Ford and Reeves, 2008), the proportion of photo-identified whales bearing rake scars is between zero and 40%, with the greater proportion of whales showing mild scarring (1-3 rake marks) (Mehta et al., 2007; Steiger et al., 2008). This suggests that attacks by killer whales on humpback whales vary in frequency across regions. It also suggests either that (i) most killer whale attacks result in mild scarring, or (ii) that those resulting in severe scarring (4 or more rakes, parts of fluke missing) are more often fatal. Most observations of humpback whales under attack from killer whales reported vigorous defensive behavior and tight grouping where more than one humpback whale was present (Ford and Reeves, 2008).

Photo-identification data indicate that rake marks are often acquired very early in life, though attacks on adults also occur (Mehta et al., 2007; Steiger et al., 2008). Killer whale predation may be a factor influencing survival during the first year of life (Mehta et al., 2007). There has been some debate as to whether killer whale predation (especially on calves) is a motivating factor for the migratory behavior of humpback whales (Clapham, 2001; Corkeron and Connor, 1999). How significantly motivating this factor is also depends on the importance of humpback whales in the diet of killer whales, another debated topic that remains inconclusive in the published literature (Kuker and Barrett-Lennard, 2010; Springer et al., 2003; Wade et al., 2007). No analyses of killer whale stomach contents have revealed remains of humpback whales (Shevchenko, 1975), suggesting that humpback whales comprise a small part of the diet. However these analyses took place during the height of the whaling period, when humpback whales were at a low density and may therefore have been less available for predation.

There is also evidence of shark predation on calves and entangled whales (Mazzuca et al., 1998). Shark bite marks on stranded whales may often represent post-mortem feeding rather than predation i.e., scavenging on carcasses (Long and Jones, 1996).

6.2.5.2 Anthropogenic Threats

NMFS (2011) global status review and the 1991 recovery plan for Humpback Whales list the following range-wide anthropogenic threats for the species: vessel strikes, fishery interactions including entanglement in fishing gear, subsistence, illegal whaling or resumed legal whaling, pollution, and acoustic disturbance. NMFS 2011 discusses vessel strikes and fishery entanglement as the main threats and anthropogenic impacts to humpback whales in Alaska.

Fishery Interactions including Entanglements

Rarely, humpback whales are caught in fishing nets. Between 2007 and 2011, one humpback whale was brought up in the net on a vessel trawling for flatfish in the Bering Sea/Aleutian Islands and another one was hauled up in the BSAI pollock trawl fishery, both in 2010 (Allen et al 2014). One humpback whale was also injured in the Hawai'i shallow set longline fishery in 2011. Average annual mortality from observed fisheries was calculated as 0.55 humpbacks for the period 2007-2011 (Allen and Angliss 2014).

Entanglement in fishing gear is a documented source of injury and mortality to cetaceans, including humpback whales. Whales have been documented carrying gear by fishery observer programs, opportunistic reports and stranding networks. Fishery entanglements threaten humpback whales in the northern Pacific. Entanglement may result in only minor injury or may potentially significantly affect individual health, reproduction or survival (NMFS 2011). Reports of Central North Pacific humpback whale mortality and serious injury caused by entanglement from gillnet gear, shrimp pot gear, crab gear, longline gear, pot gear, and set net gear occurred between 2007-2011. Mean annual mortality from these sources was 6.9 (Allen and Angliss 2014).

Vessel Strikes and disturbance

Vessel strikes often result in life-threatening trauma or death for the cetacean. Impact is often initiated by forceful contact with the bow or propeller of the vessel. Ship strikes on humpback whales are typically identified by evidence of massive blunt trauma (fractures of heavy bones and/or hemorrhaging) in stranded whales, propeller wounds (deep slashes or cuts into the blubber) and fluke/fin amputations on stranded or live whales (NMFS 2011).

Between 2007 and 2011, mean annual mortality and serious injury due to strikes from charter, recreational, research, and unknown vessels was 6.49 humpbacks (Allen and Angliss 2014). Most of the vessel collisions were reported from Southeast Alaska, but it is unknown whether the difference in ship strike rates between Southeast Alaska and other areas is due to differences in reporting, amount of vessel traffic, densities of whales, or other factors (Allen and Angliss 2014).

Subsistence, Illegal whaling or resumed legal whaling

Small IWC subsistence quotas exist for humpback whales in several oceans (NMFS 2011). Japan pursues whaling for scientific research and Iceland and Norway continue to hunt humpback whales commercially under objection to the international moratorium by the IWC in 1982 (NMFS 2011).

Pollution

Humpback whales can accumulate lipophilic compounds (e.g., halogenated hydrocarbons) and pesticides (e.g. DDT) in their blubber, as a result either of feeding on contaminated prey (bioaccumulation) or inhalation in areas of high contaminant concentrations (e.g. regions of atmospheric deposition) (Barrie et al., 1992; Wania and Mackay, 1993). The health effects of different doses of contaminants are currently unknown for humpback whales (Krahn et al., 2004).

Acoustic disturbance

Anthropogenic sound has increased in all oceans over the last 50 years and is thought to have doubled each decade in some areas of the ocean over the last 30 or so years (Croll et al., 2001; Weilgart, 2007). Low-frequency sound comprises a significant portion of this and stems from a variety of sources including shipping, research, naval activities and oil and gas exploration. Understanding the specific impacts of these sounds on mysticetes, and humpback whales specificall, is difficult. However, it is clear that the geographic scope of potential impacts is vast, as low-frequency sounds, especially, can travel great distances under water.

It does not appear that humpback whales are often involved in strandings related to noise events. There is one record of two whales found dead with extensive damage to the temporal bones near the site of a 5,000kg explosion which likely produced shock waves that were responsible for the injuries (Weilgart, 2007). Other detrimental effects of anthropogenic noise include masking and temporary threshold shifts (TTS). These processes are described in greater detail later in this document.

7 ENVIRONMENTAL BASELINE

By regulation, the environmental baseline for biological opinions includes the past and present impacts of all federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR §402.02).

The occurrence, numbers, and habitat use of Steller sea lion and humpback whale have been described above. This summary of the environmental baseline complements the information provided in the *Status of The Species* section of this opinion, and provides the background necessary to understand information presented in the *Effects of the Action* and *Cumulative Effects* sections. We then evaluate these consequences in combination with the baseline to determine the likelihood of jeopardy.

There are several natural and anthropogenic factors which have affected and may continue to affect humpback whales and Steller sea lions within the action area. Some of those activities, most notably shooting of Steller sea lions, occurred extensively in the past, although the effects of these reductions likely persist today. Other human activities are ongoing and appear to continue to affect populations of humpback whales and Steller sea lions. NMFS is unaware of any other federal projects that have undergone formal or early consultation or contemporaneous state/private actions in the action area.

7.1 Stressors in the Action Area

The following discussion summarizes the principal stressors that affect humpback whales and Steller sea lions in the action area.

7.1.1 Humpback Whales

7.1.1.1 Entanglement in Fishing Gear

As discussed above, entanglement in fishing gear is a geographically wide-spread threat to humpback whales. The mean annual rate of mortality/serious injury is reported as 2.15 humpbacks in Alaska waters and 4.75 in Hawaii waters (Allen and Angliss 2014).

Between 2001 and 2005, 53 incidents of humpback whale entanglement were reported in northern and southeastern Alaska, making the US fishery-related minimum annual mortality and serious injury rate 3.2 humpbacks for the Central Pacific stock (Angliss, 2008).

A recent assessment found that 78% of whales in northern southeastern Alaska had been non-lethally entangled in fishing gear (Neilson et al., 2009). Between 2003 and 2004, 8% of whales in the Glacier Bay and Icy Strait area acquired new entanglement related scars (Neilson et al., 2009). Calves were found to have lower scarring rates but are thought to have more lethal encounters with entanglement. The results of the study also show that males may have a higher rate of entanglement than females, but it is not known why this difference exists or if it is real and will persist over time (Neilson et al., 2009).

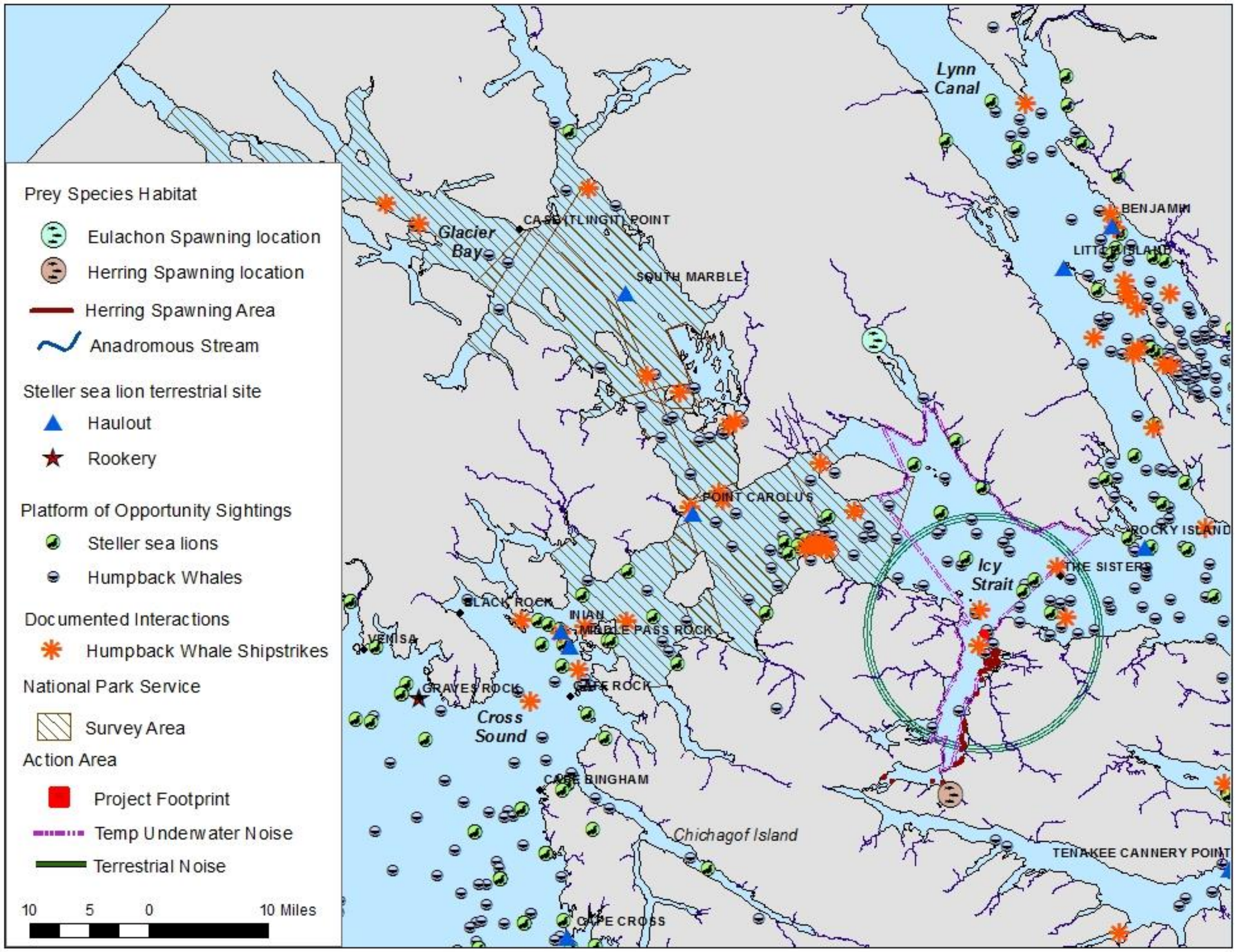

Figure 9. Recorded vessel strikes of humpback whales in the action area and surrounding waters, as well as opportunistic sightings, historical prey aggregations, and the survey area.

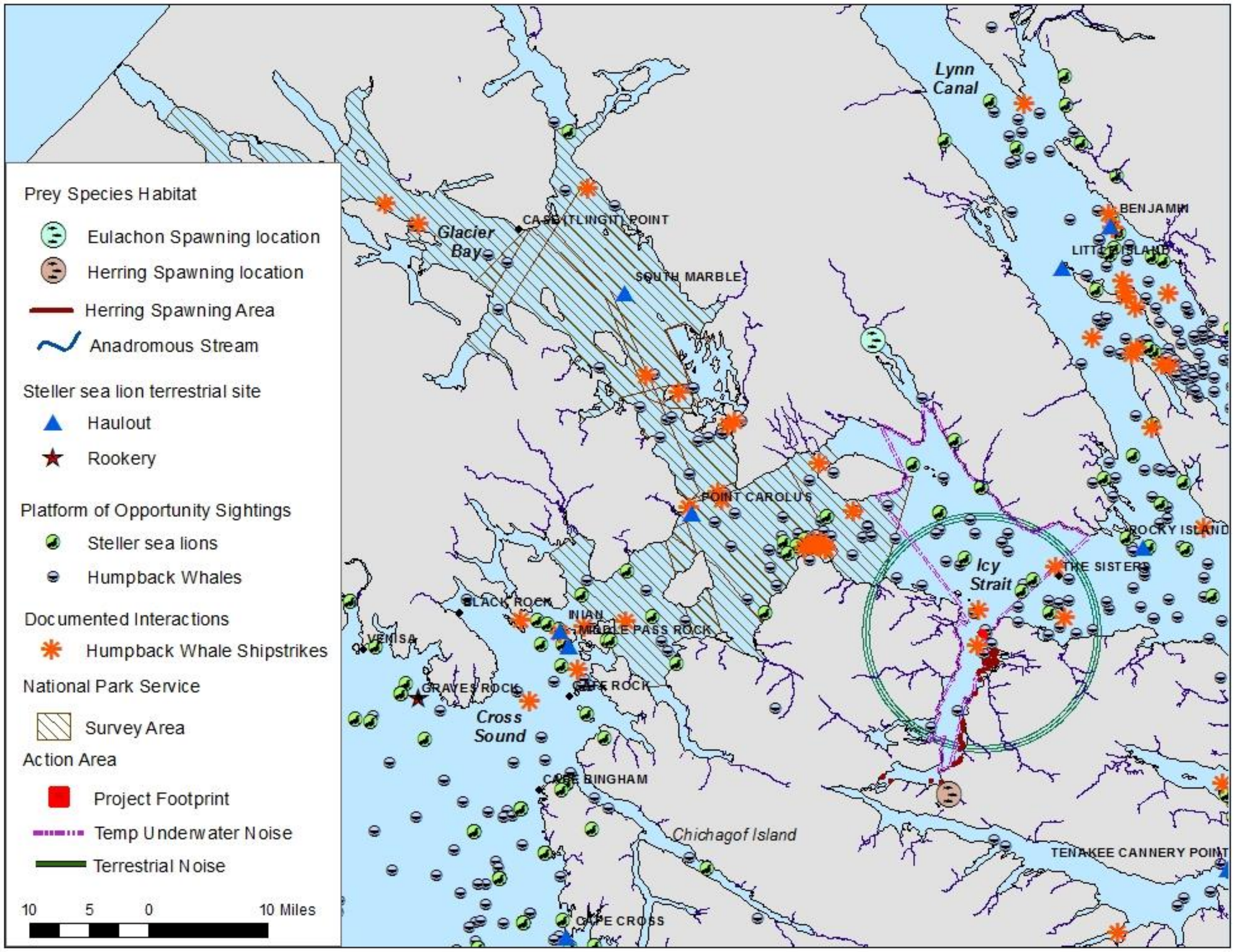

Figure 10. Use of marine habitat in the action area by Steller sea lions, humpback whales, and humans.

7.1.1.2 Vessel Strikes and Disturbance

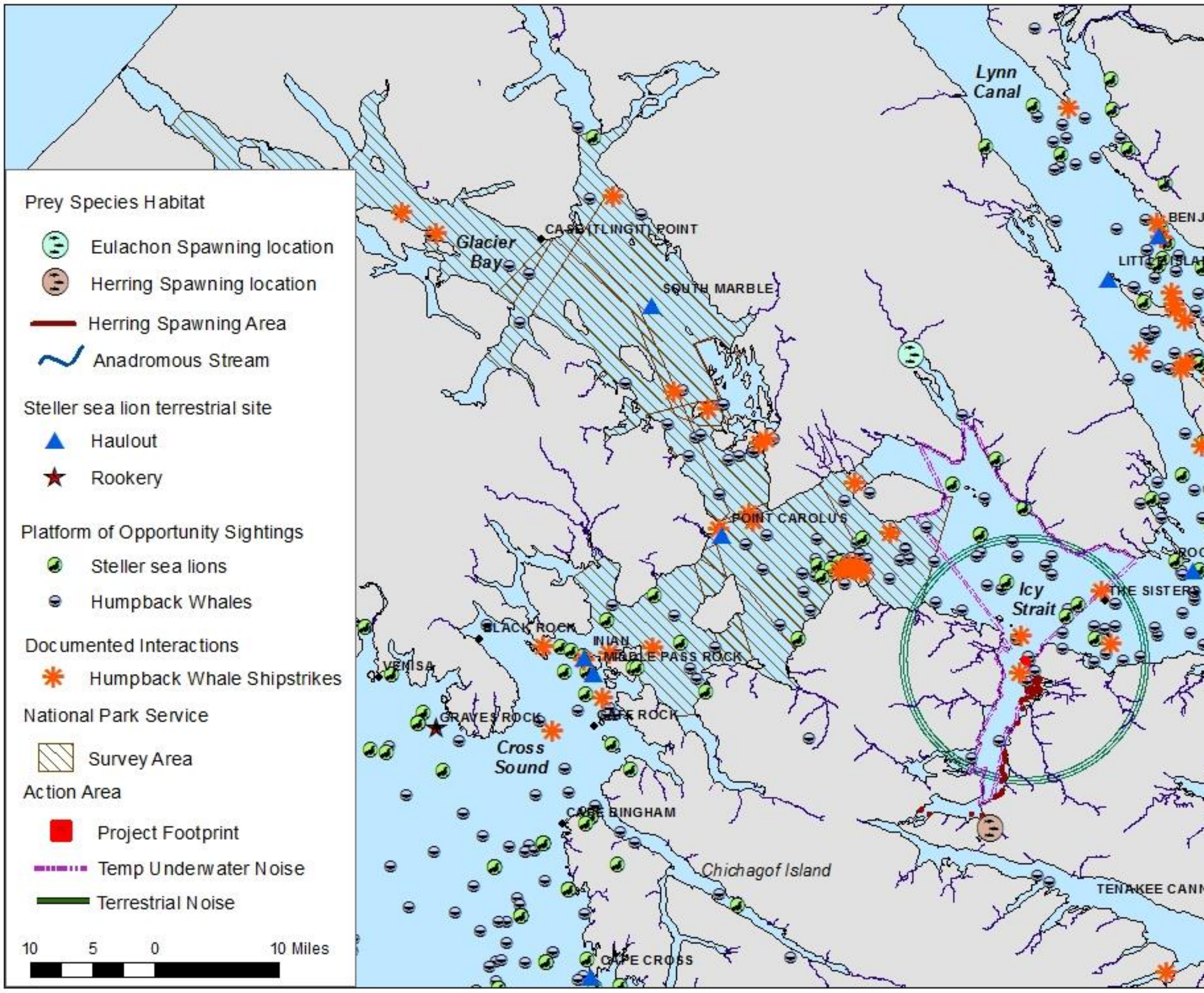

Figure 10*Vessel Strikes*

Available evidence suggests that ship strikes are increasing in Alaska (Gabriele et al., 2007). From 1978-2006, 62 collisions were reported in Alaskan waters, involving a wide range of vessel types and large whale species (Gabriele et al., 2007). The most commonly reported vessel type was small private boats less than 15m in length. However, this trend may be influenced by reporting and not accurately reflect the true frequency of vessel type involved. Of the 62 collisions, 49 had unknown outcomes and 11 collisions resulted in death of the whale. 46 of the 62 reported collisions involved humpback whales (Gabriele et al., 2007). Ship strikes were estimated to account for 1.8 mortality/serious injuries per year in 2013 (Allen and Angliss, 2014).

Neilson et al (2012) summarized 108 reported whale-vessel collisions in Alaska from 1978–2011, of which 25 are known to have resulted in the whale's death. Small vessel strikes were most common (<15 m, 60%), but medium (15–79 m, 27%) and large (≥80 m, 13%) vessels also struck whales. They found a significant increase in the number of reports over time between 1978 and 2011 (regression, r2 =

0.6999, df = 32 , P<0.001). Most strikes (n = 98, 91%) occurred in May through September and there were no reports from December or January. The majority of strikes (n = 82, 76%) were reported in southeastern Alaska, where the number of humpback whale collisions increased 5.8% annually from 1978 to 2011. Vessel strikes recorded in and near the action area are shown in Figure 9.

Disturbance

The current Icy Strait Point facility has been operating as a port of call for cruise ship passengers since 2004. The facility gets about 72 vessel calls per 90-day season each year. Once at Icy Strait Point, passengers partake in a variety of excursions including whale watching tours to Icy Strait and nearby Point Adolphus. Point Adolphus is a very popular area for whale watching, charter fishing and kayak tours in the summer months. The whale watching tours originating at Icy Strait Point have created a noticeable increase in small and medium vessel traffic at Point Adolphus (C. Gabriele, pers. comm).

Systematic whale counts have been undertaken in the area since 1985 by biologists from Glacier Bay National Park and Preserve. In that time, whale counts have been increasing along with whale population growth in Southeast Alaska, but in recent years, there has been a sharp decline in the number of whales near Point Adolphus (Neilson et al. 2014, 2015 in press). There are no published findings on the effects of the increase in whale watching vessel traffic at Point Adolphus although reports of whale harassment and collisions with whales have been documented (Neilson et al. 2013, 2014). Despite the decrease in whale numbers, it appears that the same number of tours still go to Point Adolphus from Icy Strait Point, focusing on a much smaller number of whales, which has the potential to disproportionately affect those individuals via acoustic and behavioral disturbance (C. Gabriele, pers. comm).

7.1.2 Steller Sea lions

7.1.2.1 Illegal shooting

Illegal shooting of sea lions was thought to be a potentially significant source of mortality prior to the listing of sea lions as threatened under the ESA in 1990. There have been no cases of illegal shooting successfully prosecuted since 1998 (NMFS, Alaska Enforcement Division).

7.1.2.2 Competition for Prey

Competition could exist between Steller sea lions and commercial fishing for prey species. NMFS (2008) noted there are commercial fisheries that target key Steller sea lion prey, including Pacific cod, salmon, and herring in the eastern portion of their range. It was recognized that in some regions fishery management measures appear to have reduced this potential competition (e.g., no trawl zones and gear restrictions on various fisheries in southeast Alaska) and in others the very broad distribution of prey and seasonal fisheries that differs from that of sea lions may minimize competition as well.

7.1.2.3 Disturbance

As discussed above for humpback whales, the current Icy Strait Point facility has been operating as a port of call for cruise ship passengers since 2004. The facility gets about 72 vessel calls per 90-day season each year. Icy Strait Point and Point Adolphus are already heavily used tourism areas in the summer months. There is no published information on the effects of this vessel traffic to marine mammals, however NMFS expects that mild behavioral changes could be occurring.

8 EFFECTS OF THE ACTION

"Effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

This biological opinion relies on the best scientific and commercial information available. We try to make note of areas of uncertainty, or situations where data is not available. In analyzing the effects of the action, NMFS gives the benefit of the doubt to the listed species by minimizing the likelihood of false negative conclusions (concluding that adverse effects are not likely when such effects are, in fact, likely to occur).

We organize our effects analyses using a stressor identification – exposure – response – risk assessment framework for the proposed exploration activities. Then we provide a description of the potential effects that could arise from HTC's proposed activity.

We conclude this section with an *Integration and Synthesis of Effects* that integrates information presented in the *Status of the Species* and *Environmental Baseline* sections of this opinion with the results of our exposure and response analyses to estimate the probable risks the proposed action poses to endangered and threatened species.

The ESA does not define "harassment" nor has NMFS defined this term, pursuant to the ESA, through regulation. The MMPA defines "harassment" as "any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild" or "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." The latter portion of these definitions (that is, "...causing disruption of behavioral patterns including…migration, breathing, nursing, breeding, feeding, or sheltering") is almost identical to USFWS's definition of harass[2] for the purposes of the ESA. For the purposes of this consultation, "harassment" is defined such that it corresponds to the MMPA and USFWS's definitions.

8.1 Project Stressors

The primary stressors to humpback whales and Steller sea lions associated with this project are:

1. Exposure to underwater sound from pile driving activities;

2. Risk of vessel strikes and disturbance associated with construction of cruise ship terminal and resulting indirect effects of potentially increased tourism opportunities

[2] An intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding feeding, or sheltering (50 CFR 17.3).

8.2 Exposure Analysis

As discussed in the *Approach to the Assessment* section of this opinion, exposure analyses are designed to identify the listed resources that are likely to co-occur with the stressors associated with an action, and to quantify the and describe that co-occurrence. In this step of our analysis, we try to identify the number, age (or life stage), and gender of the individuals, to the degree possible, that are likely to be exposed to an action's effects and the populations or subpopulations those individuals represent. In this action, we're estimating the numbers of Steller sea lions and humpback whales that would be exposed to Level B harassment from pile driving and vessel strike and disturbance.

8.2.1 Exposure to Noise from Pile Driving

Humpback whale and Western DPS Steller sea lion could potentially be present within the waters of the action area during the time that in-water work is being conducted, and could potentially be exposed to temporarily elevated underwater and/or terrestrial noise levels.

The zone of influence for underwater noise has been estimated using a practical spreading loss model, which assumes a 4.5-dB reduction per doubling of distance. Because no baseline data is available regarding background noise levels in Icy Strait, the baseline underwater noise level within the action area is conservatively assumed to be approximately 120 dBRMS[2] (WSDOT 2013), although actual background underwater noise levels may be higher.

The project will require steel pipe piles of several diameters for various components of the project. Piles that will be used include 24-inch, 30-inch, 42-inch, and 60-inch steel pipe piles. The worst case estimate of underwater noise levels that could be generated during impact pile driving would be those associated with impact installation of 60-inch-diameter steel piles. Information published by the California Department of Transportation (Caltrans 20012) indicate that impact installation of 60-inch steel pipe piles can generate maximum underwater noise levels of approximately 210 dBPEAK, 195 dBRMS, and 185 dBSEL (measured at a distance of 10 meters or 33 feet from the pile) prior to any attenuation.

Given the presumed low level of background sound level (in the absence of site specific data) the geographic extent of temporarily elevated underwater noise has been estimated to extend throughout the water column of Icy Strait, and adjacent waters of Port Frederick, in straight line distances from the proposed pile driving activities, in all directions.

Temporarily elevated underwater and terrestrial noise during impact pile driving has the potential to result in Level B (behavioral) harassment of marine mammals which may be present during construction. Level A harassment (resulting in injury) is not expected to occur as a result of the proposed action, as no Level A harassment threshold has been established for terrestrial noise, and the marine mammal monitoring plan will reduce the potential for exposure to levels of underwater noise above the injury threshold established by NMFS. Table 4 shows the disturbance and injury thresholds that NMFS has established for underwater noise for Level A and B take.

Table 4. Underwater Injury and Disturbance Threshold Decibel Levels for Marine Mammals

Criterion	Criterion Definition	Threshold*
Level A Harassment	PTS (injury) conservatively based on TTS**	190 dB RMS for pinnipeds 180 dB RMS for cetaceans
Level B Harassment	Behavioral disruption for impulsive noise (e.g., impact pile driving)	160 dB RMS
Level B Harassment	Behavioral disruption for non-pulse noise (e.g., vibratory pile driving, drilling)	120*** dB RMS

*All decibel levels referenced to 1 micropascal (re: 1 µPa). Note all thresholds are based on root mean square (RMS) levels

** PTS=Permanent Threshold Shift; TTS=Temporary Threshold Shift

***The 120 dB threshold may be slightly adjusted if background noise levels are at or above this level.

8.2.1.1 Approach to Estimating Exposures to Noise from Pile Driving

There are no density estimates of humpback whales and Steller sea lions available in the action area. The best available information on the distribution of these marine mammals in the study area is data obtained from a National Park Service humpback whale study. The National Park Service has monitored humpback whales in Glacier Bay and Icy Strait every year since 1985 to document the number of individuals, residence times, spatial and temporal distribution, feeding behavior and interactions with vessels (Neilson et. al 2014). This monitoring program covers most of Glacier Bay and Icy Strait (Figure 11). In addition to humpback whales, from 1994 to present, they have also recorded all opportunistic marine mammal sightings during the survey, including sightings of Steller sea lions.

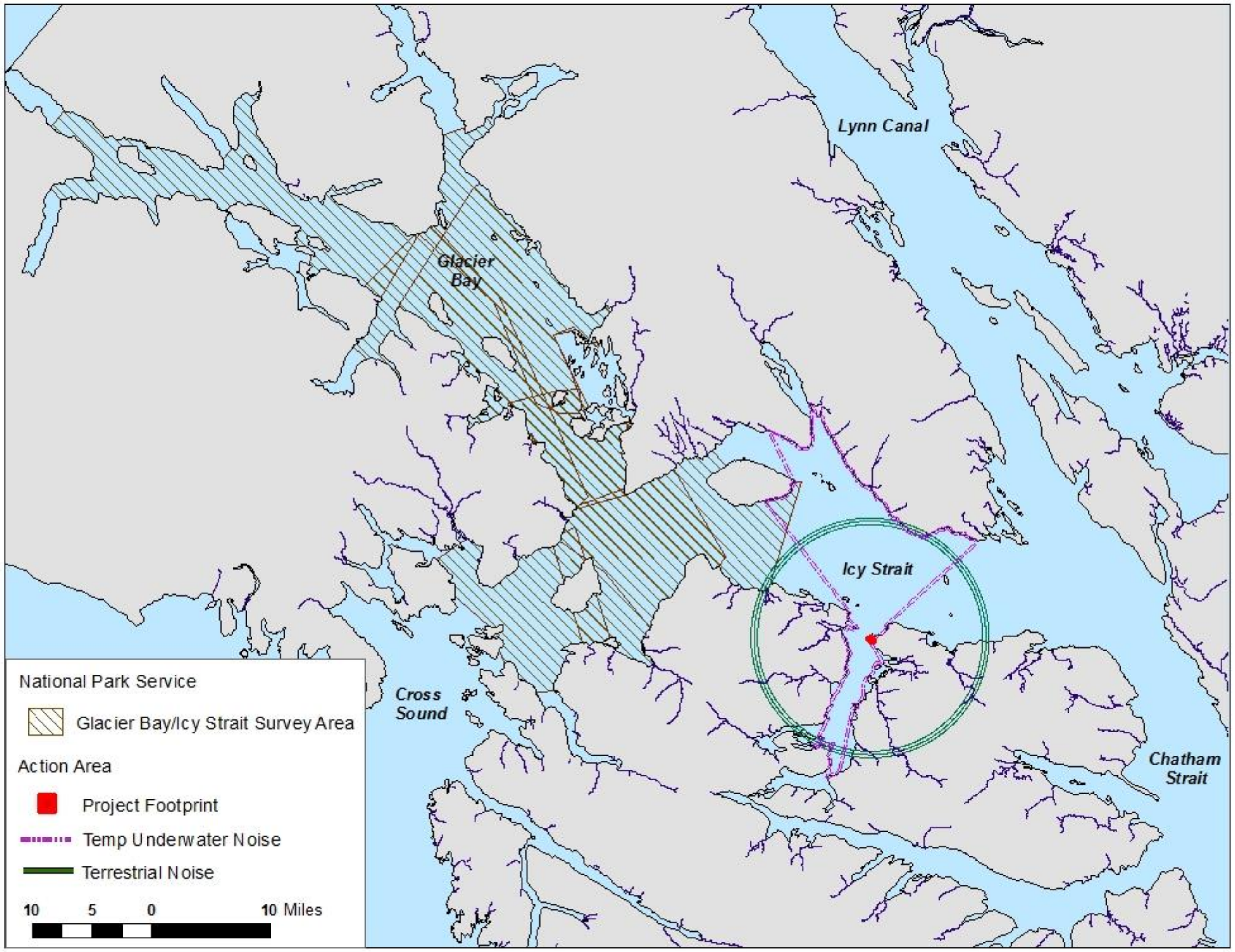

Figure 11. National Park Service Humpback Whale survey area in Glacier Bay and Icy Strait (Neilson 2014).

These sightings are the best available information regarding the presence of humpback whales and Steller sea lions in the action area. Opportunistic sightings are not considered abundance estimates and do not account for unseen animals in the area and in the water. Opportunistic surveys do not have a correction factor for those uncounted animals. However, in the absence of density estimates, NMFS used this data to estimate the numbers of individuals that may be exposed to noise from pile driving Even without a correction factor, NMFS considers these estimates to be conservative for the following reasons:

- The survey area includes Glacier Bay as well as most of Icy Strait. The action area for this project is smaller than the overall survey area and smaller than the portion of the survey conducted in Icy Strait (Figure 11).
- NMFS used the highest yearly count of individual Steller sea lions (395 in 2008) in the survey data and applied a monthly average from that highest count over the four-month project timeline.
- Actual percentage of wDPS versus eDPS of Steller sea lions is unknown in the survey, so NMFS conservatively estimates that all individuals are from the endangered wDPS.
- The project start date of June 1 is after the usual herring spawning window and the eulachon spawning migration when larger numbers of Steller sea lions and humpback whales could be foraging on aggregations of this high-energy prey in the action area.
- NMFS used the highest yearly count of individual humpback whales (237 in 2013) since the survey began) and applied a monthly average from that highest count over the four-month project timeline.
- The superseding biological opinion evaluates extending the project window another two months, to incorporate work in November and December of 2015. According to information given by the applicant to NMFS PR1, there were many project delays during June through October that minimized the number of work days during those months. The total amount of pile driving time included in this project does not change with the extension of work into December 2015, and the density of humpback whales and Steller sea lions in the action area should be no higher in November and December, so we do not expect the amount of take to increase.

8.2.1.1.1 Humpback Whale

Results of 2013 monitoring documented a total of 237 individual humpback whales (including 10 mother-calf pairs) in Glacier Bay and adjacent waters of Icy Strait in the 3-month peak survey period between June and August. Of these 237 whales, 148 were documented as remaining in the vicinity for a period greater than 20 days (Neilson et. al 2013). In the Icy Strait subarea of the survey, 202 humpback whales were counted during the 2014 survey. Because whales move freely back and forth between Glacier Bay and Icy Strait, NMFS used the total survey count of 237, or an average of almost 79 whales per month, to estimate exposure. Given that the period of active pile driving is likely to be spread over four months (June through September), a worst-case estimate would predict that up to 316 (79 * 4) Level B takes of mostly adult male and female humpback whales and a small number of rearing calves could occur as a result of the proposed action.

8.2.1.1.2 Steller Sea Lion

Barlow et al. (in press) report number of sightings, numbers of individuals, and sightings per unit effort data from opportunistic marine mammal surveys conducted in Glacier Bay and Icy Strait between 2005 and 2014. The highest count of observed individuals was 395 sea lions between June and August of 2008, or an average of 132 sightings per month. Since the authorization period is four months, a worst-case estimate would mean that up to 528 (132 * 4) individual Level B takes of Steller sea lions could occur as a result of pile driving activities. Barlow et al. (in press) sightings per unit effort data suggest that Steller sea lions were observed at relatively high densities around Point Adolphus and other locations in Icy Strait and in various places inside Glacier Bay. Individuals taken would be expected to be a mix of solitary adult males and females. NMFS does not anticipate exposure of Steller sea lion pups, as there are no rookeries within the action area.

Estimated amount of takes by harassment due to noise from pile driving is presented in Table 5. NMFS expects that the mitigation measures associated with pile driving (described in detail in Section 4.3) will minimize the potential impacts to marine mammals in the project vicinity. The primary purposes of these mitigation measures are to minimize sound levels from the activities, and to monitor marine mammals within designated zones of influence corresponding to NMFS's Level A (injury) and Level B (behavioral) harassment thresholds under the MMPA.

Table 5. Estimated Numbers of Marine Mammals That May Be Exposed to Level B Harassment

Species	Total proposed authorized takes	Minimum population estimate (Allen and Angliss 2014)
Humpback whale CNP Stock (southeast Alaska aggregation)	316	5,833 (2,251)
Steller sea lion (Western DPS)	528	45,659

8.2.2 Exposure to Noise from down hole drilling

After the piles are set with a vibratory hammer, the piles will be drilled into the bedrock approximately 15 feet. Using a down the hole drilling system with an under reaming bit (See page 8 for a description of this system), the pile will be advanced to its tip elevation in an average of 1.5-2 hours per pile or 3 hours maximum per pile for a total of 312 hours (BergerABAM Memo 2/26/15).

NMFS has not historically included down-hole drilling in its harassment authorizations and section 7 consultations since maximum underwater noise levels are not thought to occur at levels that would result in Level A or B harassment (BergerABAM 4/16/15 Memo). While down-hole drilling is a common pile installation methodology in cases where piles must be seated in difficult geologic substrates, published literature regarding the underwater noise generated specifically during this type of procedure was not avaiable. Down-hole drilling has been reported as analogous to use of a hydraulic hammer (hydro-hammer) (PCTS# AKR-2013-9277), which was estimated to have a maximum underwater noise generation of 165 dB (re: 1 µPa at 200 Hz) (URS 2011). In this action, the site subsurface where the in-water work will occur is at a depth of 65 feet MLLW and is characterized as a 5 to 20 foot thick layer of loose marine sediments overlaying shallow bedrock (Turnagain Memo 2/20/15). As discussed in the response analysis, this type of soft substrate at shallow depths in a complex environment absorbs or attenuates the sound more readily than hard substrates (e.g., rock) which may reflect the acoustic wave. NMFS expects that exposure from down hole drilling in this project will be lower than that estimate from the hydro-hammer based on equipment specifications, mitigation measures, substrate composition, and best management practices, as discussed below.

8.2.2.1 Mitigation Measures to Minimize the Likelihood of Exposure to Noise from Down Hole Drilling

HTC will use a low energy air powered down hole system with the following specifications, mitigation measures, and best management practices that NMFS anticipates could help to attenuate exposure to underwater sound, although no published literature is available.

- The down hole drill is contained inside the pile annulus so at least some of the energy from the drill is captured inside the pile.
- The tip of the pile will be between 5 and 20 feet below the mud line when rock excavation begins. Energy transmitted from the drill has to travel through the pile and through the marine sediments which could dampen the energy before it enters the water column.

- The interior of the pile is filled with air and air bubbles from the drilling process so the pile annulus and exhaust air could work like a bubble curtain inside the pile to mitigate noise transmission.
- Only the minimum amount of compressed air needed to productively power the drill will be used.
- Until the drill is well below the mud line only minimal air flow will be used.
- A soft start startup will be utilized.
- Marine mammal monitoring will be occurring before, during, and after vibratory and impact pile driving as described in Section 4.3. Dependent upon real-time work schedule, marine mammal monitoring could also be occurring during drilling operations.

8.2.2.2 Approach to Estimating Exposures to Noise from Down Hole Drilling

NMFS expects that effects to marine mammals from down hole drilling noise will be minimized due to the mitigation measures described above. Although noise levels associated with down hole drilling are unavailable in the project area, NMFS experts report that noise from down hole drilling would be "significantly lower than pile driving" (John Stadler, pers. comm). Based on the best available information, NMFS concludes that down-hole drilling is not expected to result in underwater noise that would result in Level B harassment of marine mammals and, therefore, is not analyzed further in this consultation. NMFS is aware of in situ studies planned for the future which will include hydroacoustic sound measurement in southeast Alaska. As this data becomes available it will be consistently incorporated into future consultations.

8.2.3 Exposure to Vessel Strikes and Disturbance

Vessel strikes and disturbance could occur as both direct and indirect effects of the action. Icy Strait and Port Frederick are busy thoroughfares for commercial and recreational ship traffic, including existing cruise ship traffic to Icy Strait Point; therefore, humpback whales and Steller sea lions in this area are already exposed to ship noise and general disturbance from vessels, as well as potential strikes.

There will be a temporary and localized increase in vessel traffic during construction. A maximum of three work barges will be present at any time during the in-water and over water work. The barges will be located near each other where construction is occurring. Additionally, the floating pier will be tugged into position prior to installation. After construction, there will be a reduction in small vessel lightering of passengers to/from shore. However, with more passengers on shore, additional small vessel tourism opportunities could be taken. These elements of exposure are analyzed below.

8.2.3.1 Mitigation Measures to Minimize the Likelihood of Exposure to Vessel Strikes and Disturbance

All vessels, before, during, and after construction, need to adhere to established NMFS regulations for approaching humpback whales (66 FR 29502; 50 CFR 224.103)

> NMFS issues a final rule to establish measures to protect humpback whales, *Megaptera novaeangliae*, in waters within 200 nautical miles (370.4 km) of Alaska. Under these regulations it is unlawful for a person subject to the jurisdiction of the United States to approach, by any means, with some exceptions, within 100 yards (91.4 m) of a humpback whale.

Marine mammal viewing guidelines and regulations are available at http://alaskafisheries.noaa.gov/protectedresources/mmv/guide.htm

NMFS anticipates that vessels that follow these guidelines and regulations will be more likely to avoid disturbing marine mammals with vessel noise and more likely to avoid potential strikes.

8.2.3.2 Reduction in Small Vessel Lightering

After construction is complete, the proposed action could also indirectly result in a reduction in the number of small vessel interactions, as the new facility will eliminate the need for passengers to be lightered to shore in small vessels. Ships calling on the new facility will moor directly to the dock, and passengers will have direct access to shore from the dock. This will result in the elimination of over 100 small vessel trips per day when a cruise ship is docked. This will reduce a recurring source of noise, disturbance, and potential strike for marine mammals in the immediate project vicinity.

8.2.3.3 Increased Vessel Traffic

After construction is complete, this action could result in an increase in the number of cruise ships that call on the facility, creating additional vessel traffic in the area. Since lightering passengers to shore will no longer be required upon completion of this project, HTC expects that more cruise ship passengers will come ashore. Once ashore, they could more easily take advantage of tourism opportunities, including whale-watching. Vessel interactions, including collisions and disturbance from increased vessel traffic, could increase.

8.2.3.4 Approach to Estimating Exposures to Vessel Strikes and Disturbance

Vessel noise associated with this action will be transmitted through water and constitutes a continuous noise source (versus an impulse noise). Marine mammal responses to vessels are generally associated with noise and depend on changes in the engine and propeller speed (Richardson 1995). Broadband source levels for tugs have been measured at 145 to 170 dB re: 1 µPa, and 170 to 180 dB re: 1µPa for small ships and supply vessels (Richardson 1995). Based on data for vessels proposed for use during construction of the Knik Arm bridge, the loudest vessel noise associated with that project was produced by ships ranging in length from 180 to 279 feet, with source levels ranging from 170 to 180 dB re: 1 µPa. Sound from a vessel of that size would attenuate below 120 dB re: 1 µPa between 86 m and 233 m (282 and 764 feet) from the source. All of the vessels used in the proposed action (two crane barges (270' x 76'), two support barges, two delivery barges, a small tug, and a few skiffs) will be of a similar size or smaller and therefore likely producing similar or slightly lower noise levels. The amount of noise from the barges and support vessels is expected to be insignificant.

Although vessel strikes of Central North Pacific population of humpback whales are documented at an annual average rate of 6.49 humpbacks (Allen and Angliss 2014) with most of the vessel collisions reported from Southeast Alaska, NMFS expects that effects to marine mammals from vessel strikes will be minimized in this action due to the mitigation measures described above. Construction-related vessel interactions are not expected to result in measurable or significant effects due to the small number of vessels, their localized work activities, and short timeframe of the project. A marine mammal monitoring plan will be implemented during pile installation, and work barges would be stationary during most construction operations. There is a small potential for vessel interactions during movement of the floating pier to the site, but this transport would occur during a single event and would also adhere to established NMFS regulations for approaching humpback whales (66 FR 29502, codified at 50 CFR 224.103).

Based on the best available information, NMFS concludes that vessel noise is not expected to result in Level B harassment of marine mammals and, therefore, is not analyzed further in this consultation. Also, NMFS concludes that the risk of vessel strike associated this action to humpback whales and Steller sea lions is discountable.

8.3 Response Analysis

As discussed in the *Approach to the Assessment* section of this opinion, response analyses determine how listed species are likely to respond after being exposed to an action's effects on the environment or directly on listed species themselves. Our assessments try to detect the probability of lethal responses, physical damage, physiological responses (particular stress responses), behavioral responses, and social responses that might result in reducing the fitness of listed individuals. Ideally, our response analyses consider and weigh evidence of adverse consequences, beneficial consequences, or the absence of such consequences.

8.3.1 Responses to Noise from Pile Driving

The effects of sounds from pile driving might result in one or more of the following: temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, and masking (Richardson *et al.,* 1995; Gordon *et al.,* 2004; Nowacek *et al.,* 2007; Southall *et al.,* 2007). The effects of pile driving on marine mammals are dependent on several factors, including the size, type, and depth of the animal; the depth, intensity, and duration of the pile driving sound; the depth of the water column; the substrate of the habitat; the standoff distance between the pile and the animal; and the sound propagation properties of the environment. Impacts to marine mammals from pile driving activities are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the received level and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The further away from the source, the less intense the exposure should be. The substrate and depth of the habitat affect the sound propagation properties of the environment. Shallow environments are typically more structurally complex, which leads to rapid sound attenuation. In addition, substrates that are soft (e.g., sand) would absorb or attenuate the sound more readily than hard substrates (e.g., rock) which may reflect the acoustic wave. Soft porous substrates would also likely require less time to drive the pile, and possibly less forceful equipment, which would ultimately decrease the intensity of the acoustic source.

In the absence of mitigation, impacts to marine species would be expected to result from physiological and behavioral responses to both the type and strength of the acoustic signature (Viada *et al.,* 2008). The type and severity of behavioral impacts are more difficult to define due to limited studies addressing the behavioral effects of impulse sounds on marine mammals. Potential effects from impulse sound sources can range in severity from effects such as behavioral disturbance or tactile perception to physical discomfort, slight injury of the internal organs and the auditory system, or mortality (Yelverton *et al.,* 1973).

Marine mammals exposed to high intensity sound repeatedly or for prolonged periods can experience hearing threshold shift (TS), which is the loss of hearing sensitivity at certain frequency ranges (Kastak *et al.,* 1999; Schlundt *et al.,* 2000; Finneran *et al.,* 2002, 2005). TS can be permanent (PTS), in which case the loss of hearing sensitivity is not recoverable, or temporary (TTS), in which case the animal's hearing threshold would recover over time (Southall *et al.,* 2007). Marine mammals depend on acoustic cues for vital biological functions, (e.g., orientation, communication, finding prey, avoiding predators); thus, TTS may result in reduced fitness in survival and reproduction. However, this depends on the frequency and duration of TTS, as well as the biological context in which it occurs. TTS of limited duration, occurring in a frequency range that does not coincide with that used for recognition of important acoustic cues, would have little to no effect on an animal's fitness. Repeated sound exposure that leads to TTS could cause PTS. PTS constitutes injury, but TTS does not (Southall *et al.*, 2007). The following subsections discuss in somewhat more detail the possibilities of TTS, PTS, and non-auditory physical effects.

Temporary Threshold Shift

TTS is the mildest form of hearing impairment that can occur during exposure to a strong sound (Kryter, 1985). While experiencing TTS, the hearing threshold rises, and a sound must be stronger in order to be heard. In terrestrial mammals, TTS can last from minutes or hours to days (in cases of strong TTS). For sound exposures at or somewhat above the TTS threshold, hearing sensitivity in both terrestrial and marine mammals recovers rapidly after exposure to the sound ends. Few data on sound levels and durations necessary to elicit mild TTS have been obtained for marine mammals, and none of the published data concern TTS elicited by exposure to multiple pulses of sound. Available data on TTS in marine mammals are summarized in Southall *et al.* (2007).

The received level of a single pulse might need to be approximately 186 dB re 1 μPa^2-s in order to produce brief, mild TTS. Exposure to several strong pulses that each have received levels near 190 dB rms might result in cumulative exposure and TTS in a small odontocete.

The above TTS information for odontocetes is derived from studies on the bottlenose dolphin (Tursiops truncatus) and beluga whale (Delphinapterus leucas). There is no published TTS information for other species of cetaceans. However, preliminary evidence from a harbor porpoise exposed to pulsed sound suggests that its TTS threshold may have been lower (Lucke *et al.*, 2009). As summarized above, data that are now available imply that TTS is unlikely to occur unless odontocetes are exposed to pile driving pulses stronger than 180 dB re 1 μPa rms.

Permanent Threshold Shift

When PTS occurs, there is physical damage to the sound receptors in the ear. In severe cases, there can be total or partial deafness, while in other cases the animal has an impaired ability to hear sounds in specific frequency ranges (Kryter, 1985). There is no specific evidence that exposure to pulses of sound can cause PTS in any marine mammal. However, given the possibility that mammals close to a sound source can incur TTS, it is possible that some individuals might incur PTS. Single or occasional occurrences of mild TTS are not indicative of permanent auditory damage, but repeated or (in some cases) single exposures to a level well above that causing TTS onset might elicit PTS.

Relationships between TTS and PTS thresholds have not been studied in marine mammals but are assumed to be similar to those in humans and other terrestrial mammals, based on anatomical similarities. PTS might occur at a received sound level at least several decibels above that inducing mild TTS if the animal were exposed to strong sound pulses with rapid rise time. Based on data from terrestrial mammals, a precautionary assumption is that the PTS threshold for impulse sounds (such as pile driving pulses as received close to the source) is at least 6 dB higher than the TTS threshold on a peak-pressure basis and probably greater than 6 dB (Southall *et al.*, 2007). On an SEL basis, Southall *et al.* (2007) estimated that received levels would need to exceed the TTS threshold by at least 15 dB for there to be risk of PTS. Thus, for cetaceans, Southall *et al.* (2007) estimate that the PTS threshold might be an M-weighted SEL (for the sequence of received pulses) of approximately 198 dB re 1 μPa^2-s (15 dB higher than the TTS threshold for an impulse). Given the higher level of sound necessary to cause PTS as compared with TTS, it is considerably less likely that PTS could occur.

Non-auditory Physiological Effects

Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to strong underwater sound include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage (Cox *et al.*, 2006; Southall *et al.*, 2007). Studies examining such effects are limited. In general, little is known about the potential for pile driving to cause auditory

impairment or other physical effects in marine mammals. Available data suggest that such effects, if they occur at all, would presumably be limited to short distances from the sound source and to activities that extend over a prolonged period. The available data do not allow identification of a specific exposure level above which non-auditory effects can be expected (Southall *et al.*, 2007) or any meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in those ways. Marine mammals that show behavioral avoidance of pile driving, including some odontocetes and some pinnipeds, are especially unlikely to incur auditory impairment or non-auditory physical effects.

Disturbance Reactions

Disturbance includes a variety of effects, including subtle changes in behavior, more conspicuous changes in activities, and displacement. Behavioral responses to sound are highly variable and context-specific and reactions, if any, depend on species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day, and many other factors (Richardson *et al.*, 1995; Wartzok *et al.*, 2003; Southall *et al.*, 2007).

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok *et al.*, 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure. Behavioral state may affect the type of response as well. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson *et al.*, 1995; NRC, 2003; Wartzok *et al.*, 2003).

Controlled experiments with captive marine mammals showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway *et al.*, 1997; Finneran *et al.*, 2003). Observed responses of wild marine mammals to loud pulsed sound sources (typically seismic guns or acoustic harassment devices, but also including pile driving) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds, 2002; Thorson and Reyff, 2006; see also Gordon *et al.*, 2004; Wartzok *et al.*, 2003; Nowacek *et al.*, 2007). Responses to continuous sound, such as vibratory pile installation, have not been documented as well as responses to pulsed sounds.

With both types of pile driving, it is likely that the onset of pile driving could result in temporary, short term changes in an animal's typical behavior and/or avoidance of the affected area. These behavioral changes may include (Richardson *et al.*, 1995): changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where sound sources are located; and/or flight responses (e.g., pinnipeds flushing into water from haul-outs or rookeries). Pinnipeds may increase their haul-out time, possibly to avoid in-water disturbance (Thorson and Reyff, 2006).

The biological significance of many of these behavioral disturbances is difficult to predict, especially if the detected disturbances appear minor. However, the consequences of behavioral modification could be expected to be biologically significant if the change affects growth, survival, or reproduction. Significant behavioral modifications that could potentially lead to effects on growth, survival, or reproduction include:

- Drastic changes in diving/surfacing patterns (such as those thought to cause beaked whale stranding due to exposure to military mid-frequency tactical sonar);
- Habitat abandonment due to loss of desirable acoustic environment; and
- Cessation of feeding or social interaction.

The onset of behavioral disturbance from anthropogenic sound depends on both external factors (characteristics of sound sources and their paths) and the specific characteristics of the receiving animals (hearing, motivation, experience, demography) and is difficult to predict (Southall *et al.,* 2007).

Auditory Masking

Natural and artificial sounds can disrupt behavior by masking, or interfering with, a marine mammal's ability to hear other sounds. Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher levels. Chronic exposure to excessive, though not high-intensity, sound could cause masking at particular frequencies for marine mammals that utilize sound for vital biological functions. Masking can interfere with detection of acoustic signals such as communication calls, echolocation sounds, and environmental sounds important to marine mammals. Therefore, under certain circumstances, marine mammals whose acoustical sensors or environment are being severely masked could also be impaired from maximizing their performance fitness in survival and reproduction. If the coincident (masking) sound were anthropogenic, it could be potentially harassing if it disrupted hearing-related behavior. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs only during the sound exposure. Because masking (without resulting in TS) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

Masking occurs at the frequency band which the animals utilize so the frequency range of the potentially masking sound is important in determining any potential behavioral impacts. Because sound generated from in-water vibratory pile driving is mostly concentrated at low frequency ranges, it may have less effect on high frequency echolocation sounds made by porpoises. However, lower frequency man-made sounds are more likely to affect detection of communication calls and other potentially important natural sounds such as surf and prey sound. It may also affect communication signals when they occur near the sound band and thus reduce the communication space of animals (e.g., Clark *et al.,* 2009) and cause increased stress levels (e.g., Foote *et al.,* 2004; Holt *et al.,* 2009).

Masking has the potential to impact species at the population or community levels as well as at individual levels. Masking affects both senders and receivers of the signals and can potentially have long-term chronic effects on marine mammal species and populations. Recent research suggests that low frequency ambient sound levels have increased by as much as 20 dB (more than three times in terms of SPL) in the world's ocean from pre-industrial periods, and that most of these increases are from distant shipping (Hildebrand, 2009). All anthropogenic sound sources, such as those from vessel traffic, pile driving, and dredging activities, contribute to the elevated ambient sound levels, thus intensifying masking.

Vibratory pile driving is relatively short-term, with rapid oscillations occurring for 10 to 30 minutes per installed pile. It is possible that vibratory pile driving resulting from this proposed action may mask acoustic signals important to the behavior and survival of marine mammal species, but the short-term duration and limited affected area would result in insignificant impacts from masking. Any masking event that could possibly rise to Level B harassment under the MMPA would occur concurrently within the zones of behavioral harassment already estimated for vibratory pile driving, and which have already been taken into account in the exposure analysis.

Airborne Acoustic Effects

Marine mammals that occur in the project area could be exposed to airborne sounds associated with pile driving that have the potential to cause harassment, depending on their distance from pile driving activities. Airborne pile driving sound would have less impact on cetaceans than pinnipeds because sound from atmospheric sources does not transmit well underwater (Richardson *et al.*, 1995); thus, airborne sound would only be an issue for pinnipeds either hauled-out or looking with heads above water in the project area. Most likely, airborne sound would cause behavioral responses similar to those discussed above in relation to underwater sound. For instance, anthropogenic sound could cause hauled-out pinnipeds to exhibit changes in their normal behavior, such as reduction in vocalizations, or cause them to temporarily abandon their habitat and move further from the source. Studies by Blackwell *et al.* (2004) and Moulton *et al.* (2005) indicate a tolerance or lack of response to unweighted airborne sounds as high as 112 dB peak and 96 dB rms.

8.3.2 Probable Responses to Noise from Pile Driving for Humpback whales and Steller sea lions

Pile driving activities associated with the cruise ship terminal re-development, as outlined previously, have the potential to disturb or displace marine mammals. Specifically, the specified activities may result in take, in the form of Level B harassment (behavioral disturbance), from underwater sounds generated from pile driving. Potential takes could occur if individuals of these species are present in the ensonified zone when pile driving is happening.

NMFS does not anticipate any injury, serious injury, or mortality (Level A take) given the nature of the activity and measures designed to minimize the possibility of injury to marine mammals. The potential for these outcomes is minimized through the construction method and the implementation of the planned mitigation measures. Specifically, vibratory hammers will be the primary method of installation, though impact driving may be used for brief, irregular periods. Vibratory driving is not likely to cause injury to marine mammals due to the relatively low source levels produced (site-specific acoustic monitoring data show no source level measurements above 180 dB rms).

Impact pile driving produces short, sharp pulses with higher peak levels and much sharper rise time to reach those peaks. When impact driving is necessary, required measures (implementation of shutdown zones) reduce the potential for injury. Given sufficient “notice” through use of soft start (for impact driving), marine mammals are expected to move away from a sound source that is annoying prior to the noise becoming potentially injurious. The likelihood that marine mammal detection ability by trained observers is high under the environmental conditions described for Icy Strait Point (e.g., no construction occurring after dark or in low visibility conditions) further enables the implementation of shutdowns to avoid injury, serious injury, or mortality.

HTC’s proposed activities are spatially and temporally localized. Total impact hammer time would not exceed 5 minutes per pile for 104 piles resulting in less than 10 hours of driving time. Total vibratory hammer time would not exceed 5 hours per day over a 24-hour period for up to 100 hours over a four-month period. These localized and short-term noise exposures may cause brief startle reactions or short-term behavioral modification by the animals. These reactions and behavioral changes are expected to subside quickly when the exposures cease. Moreover, the proposed mitigation and monitoring measures are expected to reduce potential exposures and behavioral modifications even further.

8.3.3 Responses to Vessel Traffic and Disturbance

Numerous studies of interactions between surface vessels and marine mammals have demonstrated that free-ranging marine mammals engage in avoidance behavior when surface vessels move toward them. It is not clear whether these responses are caused by the physical presence of a surface vessel, the underwater noise generated by the vessel, or an interaction between the two (Goodwin and Cotton 2004a, Lusseau 2006). However, several authors suggest that the noise generated during motion is probably an important factor (Evans et al. 1992, Blane and Jaakson 1994, Evans et al. 1994a). These studies suggest that the behavioral responses of marine mammals to surface vessels are similar to their behavioral responses to predators.

As we discussed previously, based on the suite of studies of cetacean behavior to vessel approaches (Au and Perryman 1982, Hewitt 1985, Bauer and Herman 1986, Corkeron 1995, Bejder et al. 1999, Au and Green 2000, Nowacek et al. 2001, David 2002a, Magalhaes et al. 2002, Ng and Leung 2003, Goodwin and Cotton 2004b, Bain et al. 2006, Bejder et al. 2006, Lusseau 2006, Richter et al. 2006, Lusseau and Bejder 2007, Schaffar et al. 2013), the set of variables that help determine whether marine mammals are likely to be disturbed by surface vessels include:

1. *Number of vessels*. The behavioral repertoire marine mammals have used to avoid interactions with surface vessels appears to depend on the number of vessels in their perceptual field (the area within which animals detect acoustic, visual, or other cues) and the animal‘s assessment of the risks associated with those vessels (the primary index of risk is probably vessel proximity relative to the animal’s flight initiation distance).

   Below a threshold number of vessels (which probably varies from one species to another, although groups of marine mammals probably share sets of patterns), studies have shown that whales will attempt to avoid an interaction using horizontal avoidance behavior. Above that threshold, studies have shown that marine mammals will tend to avoid interactions using vertical avoidance behavior, although some marine mammals will combine horizontal avoidance behavior with vertical avoidance behavior (Lusseau 2003, Christiansen et al. 2010);

2. *the distance between vessel and marine mammals* when the animal perceives that an approach has started and during the course of the interaction (Au and Perryman 1982, Kruse 1991, David 2002b);

3. *the vessel’s speed and vector* (David 2002b);

4. *the predictability of the vessel’s path*. That is, cetaceans are more likely to respond to approaching vessels when vessels stay on a single or predictable path (Williams et al. 2002, Lusseau 2003) than when it engages in frequent course changes (Evans et al. 1994b, Williams et al. 2002, Lusseau 2006);

5. *noise associated with the vessel* (particularly engine noise) and the rate at which the engine noise increases (which the animal may treat as evidence of the vessel‘s speed; (David 2002b, Lusseau 2003, Lusseau 2006);

6. *the type of vessel* (displacement versus planing), which marine mammals may be interpret as evidence of a vessel‘s maneuverability (Goodwin and Cotton 2004b);

7. *the behavioral state of the marine mammals* (David 2002b, Lusseau 2003, Lusseau 2006). For example, Würsig *et al.* (1998) concluded that whales were more likely to engage in avoidance responses when the whales were 'milling' or 'resting' than during other behavioral states.

Most of the investigations cited earlier reported that animals tended to reduce their visibility at the water's surface and move horizontally away from the source of disturbance or adopt erratic swimming strategies (Williams et al. 2002, Lusseau 2003, Lusseau 2006). In the process, their dive times increased, vocalizations and jumping were reduced (with the exception of beaked whales), individuals in groups move closer together, swimming speeds increased, and their direction of travel took them away from the source of disturbance (Kruse 1991, Evans et al. 1994b). Some individuals also dove and remained motionless, waiting until the vessel moved past their location. Most animals finding themselves in confined spaces, such as shallow bays, during vessel approaches tended to move towards more open, deeper waters (Kruse 1991). We assume that this movement would give them greater opportunities to avoid or evade vessels as conditions warranted. Although most of these studies focused on small cetaceans (for example, bottlenose dolphins, spinner dolphins, spotted dolphins, harbor porpoises, beluga whales, and killer whales), studies of large whales have reported similar results for bowhead, fin and humpback whales.

Three work barges will be on site during construction. While we do not know the number of vessels that may be involved in increased whale watching activities, we do know that their speed, their use of course changes, and sounds associated with their engines and displacement of water along their bowline may be considered stressors to marine mammals. Animals that perceive an approaching potential predator, predatory stimulus, or disturbance stimulus have four behavioral options (*see* (Nonacs and Dill 1990, Blumstein 2003):

a. ignore the disturbance stimulus entirely and continue behaving as if a risk of predation did not exist;

b. alter their behavior in ways that minimize their perceived risk of predation, which generally involves fleeing immediately;

c. change their behavior proportional to increases in their perceived risk of predation which requires them to monitor the behavior of the predator or predatory stimulus while they continue their current activity, or

d. take proportionally greater risks of predation in situations in which they perceive a high gain and proportionally lower risks where gain is lower, which also requires them to monitor the behavior of the predator or disturbance stimulus while they continue their current activity.

The latter two options are energetically costly and reduce benefits associated with the animal's current behavioral state. As a result, animals that detect a predator or predatory stimulus at a greater distance are more likely to flee at a greater distance (Lord et al. 2001). Some investigators have argued that short-term avoidance reactions can lead to longer term impacts such as causing marine mammals to avoid an area (Salden 1988) or alter a population's behavioral budget – time and energy spent foraging versus travelling - (Lusseau 2004) which could have biologically significant consequences on the energetic budget and reproductive output of individuals and their populations.

8.3.4 Probable Responses to Vessel Traffic

Continuous Noise Sources

NMFS anticipates that whenever noise is produced from vessel operations, it may overlap with humpback whales and Steller sea lions. NMFS assumes that some individuals are likely to be exposed to these continuous noise sources.

Vessel Noise and Disturbance

Reactions of marine mammals to vessels often include changes in general activity (e.g. from resting or feeding to active avoidance), changes in surfacing-respiration-dive cycles, and changes in speed and direction of movement (NMFS 2013). Past experiences of the animals with vessels are important in determining the degree and type of response elicited from an animal-vessel encounter. Whale reactions to slow-moving vessels are less dramatic than their reactions to faster and/or erratic vessel movements. Some species have been noted to tolerate slow-moving vessels within several hundred meters, especially when the vessel is not directed toward the animal and when there are no sudden changes in direction or engine speed (Wartzok et al. 1989, Richardson et al. 1995, Heide-Jorgensen et al. 2003).

Humpback whale reactions to approaching boats are variable, ranging from approach to avoidance. On rare occasions humpbacks “charge” towards a boat and “scream” underwater, apparently as a threat (Payne 1978). Baker *et al.* (Baker et al. 1983) reported that humpbacks in Hawai‘i responded to vessels at distances of 2 to 4 km. Bauer and Herman (1986) concluded that reactions to vessels are probably stressful to humpbacks, but that the biological significance of that stress is unknown. Similar to bowhead whales, humpbacks seem less likely to react to vessels when actively feeding than when resting or engaged in other activities (Krieger and Wing 1984). Mothers with newborn calves seem most sensitive to vessel disturbance (Clapham and Mattila 1993). Marine mammals that have been disturbed by anthropogenic noise and vessel approaches are commonly reported to shift from resting behavioral states to active behavioral states, which would imply that the incur an energy cost. Morete *et al.* (2007) reported that undisturbed humpback whale cows that were accompanied by their calves were frequently observed resting while their calves circled them (milling) and rolling interspersed with dives. When vessel approached, the amount of time cows and calves spent resting and milling, respectively declined significantly. Considering 16 mother-calf pairs were observed in Glacier Bay and adjacent waters of Icy Strait in 2012 (Neilson et. al 2013), there is the potential for interactions between vessels and cow calf pairs in the study area.

In general, baleen whales react strongly and rather consistently to approaching vessels of a wide variety of types and sizes. Whales are anticipated to interrupt their normal behavior and swim rapidly away if approached by a vessel. Surfacing, respiration, and diving cycles can be affected. The flight response often subsides by the time the vessel has moved a few kilometers away. After single disturbance incidents, at least some whales are expected to return to their original locations. Vessels moving slowly and in directions not toward the whales usually do not elicit such strong reactions (Richardson and Malme 1993).

Disturbance of Steller sea lion haulouts and rookeries can potentially cause disruption of reproduction, stampeding, or increased exposure to predation by marine predators. Close approach by humans, boats, or aircraft caused hauled out sea lions to go into the water, and caused some animals to move to other haulouts during a study in Southeast Alaska (Kucey 2005). Vessels that approach rookeries and haulouts at slow speed, in a manner that sea lions can observe the approach have less effect than fast approaches and a sudden appearance (NMFS 2011). Sea lions may become accustomed to repeated slow vessel approaches, resulting in minimal response. Although low levels of occasional disturbance may have little long-term effect, areas subjected to repeated disturbance may be permanently abandoned (Kenyon 1962). Repeated disturbances that result in abandonment or reduced use of rookeries by lactating females could negatively affect body condition and survival of pups through interruption of normal nursing cycles.

With mitigation measures in place which specify procedures for changing vessel speed and/or direction to avoid groups of marine mammals and potential for collision, and marine mammal viewing guidelines and regulations that should prevent close approaches and additional harassment of these species, the impact of vessel traffic on humpback whales and Steller sea lions is anticipated to be minor.

9 CUMULATIVE EFFECTS

"Cumulative effects" are those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area (50 CFR 402.02). Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

NMFS reviewed available information to identify actions that were anticipated to occur in the summer of 2015. Reasonably foreseeable future state, tribal, local or private actions include activities that relate to different scenarios of disturbance from vessel traffic - tourism, and transportation, and community development.

9.1 Tourism

Marine and coastal vessel traffic could contribute to potential cumulative effects through the disturbance of marine mammals associated with tourism; tourism is a large industry in Southeast Alaska. McDowell Group (2014) shows the volume and trends of visitors coming to Alaska in recent years in Table 6.

Table 6. Trends in Summer Visitor Volume, By Transportation Market, 2008-2014. (From McDowell Group 2014)

	2008	2009	2010	2011	2012	2013	2014
Cruise ship	1,033,10	1,026,60	878,000	883,000	937,000	999,600	967,500
Air	597,200	505,200	578,400	604,500	580,500	619,400	623,600
Highway/ferr	77,100	69,900	76,000	69,300	69,100	74,800	68,500
Total	**1,707,400**	**1,601,700**	**1,532,400**	**1,556,800**	**1,586,600**	**1,693,800**	**1,659,600**
% change	**-0.4%**	**-6.2%**	**-4.3%**	**+1.6%**	**+1.9%**	**+6.8%**	**-2.0%**

McDowell Group (2014) also reports that Alaska's summer 2014 visitor volume was above average for the last decade: well ahead of the recession-era slumps of 2009-2011, but below the peaks of 2007 and 2008. Twenty-eight cruise ships made 450 voyages through Southeast Alaska in 2012 and 500 voyages in 2013. The summer 2014 drop of 2.0 percent (Table 6) was on the heels of a very strong 2013 summer, which was up 6.8 percent from the previous year. With cruise traffic projected to increase next year by 3 percent, it is likely that summer 2015 will show an overall increase, if not reaching the volume of 2013. The future total maximum capacity is 850 voyages per season (Nuka 2012).

Whale-watch tourism is a global industry with major economic value for many coastal communities. It has been expanding rapidly since the 1980s with an estimated 3.7% global increase in whale watchers per year between 1998-2008 (O'Connor et al., 2009).

Given the recent trends in numbers of summer visitors reported above and the modest growth projected for 2015 statewide, NMFS anticipates that future tourism-related activities may increase in the action area, but not dramatically, due to available facilities, remoteness, and short season length.

9.2 Transportation

Regularly-occurring vessel traffic within the action area in the summer months can be generally characterized as ferries, cruise ships, commercial fishing boats, recreational vessels, or cargo vessels. In addition, research vessels, including the NPS survey described in this opinion, also operate in and around the project area.

Nuka (2012) reports that ferries (28%), passenger vessels with overnight night accommodations (20%), and cruise ships (19%) comprise the majority of vessel activity in Southeast Alaska even though most of these vessels only operated during the five month period from May through September. Dry freight cargo barges and tank barges account for 19% and 11% of total vessel activity, respectively, while freight ships, both log and ore carriers comprise less than 3% of the total.

9.3 Community Development

Community development projects in Southeast Alaska could result in construction noise in coastal areas, and could generate additional amounts of marine traffic to support construction activities. Marine transportation could contribute to potential cumulative effects through the disturbance of marine mammals. No specific major community development projects are expected in the action area or nearby areas during the summer of 2015, however small development projects are ongoing and likely to continue.

10 INTEGRATION AND SYNTHESIS

In this section, NMFS summarizes the effects identified in the preceding sections and details the consequences of the risks posed to Steller sea lions and humpback whales. Finally, this section concludes whether NMFS has insured that the proposed action is not likely to jeopardize the continued existence of any endangered or threatened species, nor result in the destruction or adverse modification of critical habitat.

10.1 Humpback Whale Risk Analysis

Based on the results of the exposure analysis, we expect a maximum of 316 humpback whales may be exposed to noise from pile driving. Exposure to vessel noise from transit, potential for vessel strike and disturbance, and exposure to noise from additional tourism activities may occur, but adverse effects to humpback whales from vessel disturbance and noise are likely to be insignificant due to the small marginal increase in such activities relative to the environmental baseline, and adverse effects from vessel strike from such a slight increase in vessel traffic are considered discountable.

The primary mechanism by which the behavioral changes we have discussed affect the fitness of individual animals is through the animal's energy budget, time budget, or both (the two are related because foraging requires time). The individual and cumulative energy costs of the behavioral responses we have discussed are not likely to reduce the energy budgets of humpback whales. As a result, the whales' probable responses to pile driving noise are not likely to reduce the current or expected future reproductive success of humpback whales or reduce the rates at which they grow, mature, or become reproductively active. Therefore, these exposures are not likely to reduce the abundance, reproduction rates, and growth rates (or increase variance in one or more of these rates) of the populations those individuals represent.

While a single individual may be exposed multiple times during the project, the short duration of actual sound generation and implementation of mitigation measures to reduce exposure to high levels of sound reduce the likelihood that exposure would cause a behavioral response that may affect vital functions, or cause TTS or PTS.

As a result, this project is not likely to appreciably reduce humpback whales' likelihood of surviving or recovering in the wild.

10.2 Steller Sea Lion Risk Analysis

Based on the results of the exposure analysis, we expect a maximum of 528 Steller sea lions may be exposed to noise from pile driving. Exposure to vessel noise from transit, potential for vessel strike, and exposure to noise from additional tourism activities may occur, but adverse effects to Steller sea lions from vessel disturbance and noise are likely to be insignificant due to the small marginal increase in such activities relative to the environmental baseline, and adverse effects from vessel strike are considered discountable because sea lions are rarely struck by vessels.

The primary mechanism by which the behavioral changes we have discussed affect the fitness of individual animals is through the animal's energy budget, time budget, or both (the two are related because foraging requires time). The individual and cumulative energy costs of the behavioral responses we have discussed are not likely to reduce the energy budgets Steller sea lions. As a result, the probable responses to pile driving noise are not likely to reduce the current or expected future reproductive success of Steller sea lions or reduce the rates at which they grow, mature, or become reproductively active.

Therefore, these exposures are not likely to reduce the abundance, reproduction rates, and growth rates (or increase variance in one or more of these rates) of the populations those individuals represent.

While a single individual may be exposed multiple times during the project, the short duration of actual sound generation and implementation of mitigation measures to reduce exposure to high levels of sound, reduce the likelihood that exposure would cause a behavioral response that may affect vital functions, or cause TTS or PTS.

As a result, this project is not likely to appreciably reduce Steller sea lions' likelihood of surviving or recovering in the wild.

11 CONCLUSIONS

This Biological Opinion has considered the direct, indirect, and cumulative effects of this action on Steller sea lions and humpback whales. The proposed action is expected to result in direct and indirect impacts to both species. We estimate 316 humpback whales and 528 Steller sea lions may be taken during the term of the MMPA authorization (i.e. construction period) by harassment. This harassment is not likely to result in injury or death. After construction, some whales and sea lions will be exposed to increased noise due to operation of the cruise ship terminal. Again, it is unlikely this exposure would cause injury or mortality, although individual whales and sea lions may alter their behavior for a brief period of time.

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, NMFS's biological opinion is that the proposed action is not likely to jeopardize the continued existence of the endangered humpback whale or Steller sea lion.

12 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA prohibits the take of endangered species without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. The ESA, however, does not define harassment. USFWS has promulgated a regulation which defines harassment as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." 50 CFR. § 17.3. Under the MMPA, there is a definition of what is referred to as Level B harassment: "any act of pursuit, torment, or annoyance which 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." 16 U.S.C. §1362(18)(A)(ii).

In this opinion and incidental take statement, we have considered potential exposures of listed species to noise from pile driving and vessel strikes and disturbance. For any given exposure, it is impossible to predict the exact impact to the individual marine mammal(s) because an individual's reaction depends on a variety of factors (the individual's sex, reproductive status, age, activity engaged in at the time, etc.). Therefore, as a precautionary measure, we rely on the best available information on the distribution of humpback whales and Steller sea lions in the action area as a proxy for take estimates. We find this approach conservative for evaluating jeopardy under the ESA since the exposure estimates are likely over-estimates, and since an instance of exposure may not actually result in a take by harassment as the USFWS has defined the term. Notwithstanding that fact, the exposure estimates reflect the best scientific and commercial data available.

Under the terms of Section 7(b)(4) and Section 7(o)(2) of the ESA, taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA, provided that such taking is in compliance with the terms and conditions of an Incidental Take Statement.

Section 7(b)(4)(C) of the ESA provides that if an endangered or threatened marine mammal is involved, the taking must first be authorized by Section 101(a)(5) of the MMPA. Accordingly, **the terms of this incidental take statement and the exemption from Section 9 of the ESA become effective only upon the issuance of MMPA authorization to take the marine mammals identified here**. Absent such authorization, this statement is inoperative.

The terms and conditions described below are nondiscretionary. USACE and NMFS PR1 have a continuing duty to regulate the activities covered by this incidental take statement. In order to monitor the impact of incidental take, USACE and NMFS PR1 must monitor the progress of the action and its impact on the species as specified in the incidental take statement (50 CFR 402.14(i)(3)). If USACE and NMFS PR1 (1) fail to require their permittees to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms that are added to the permit or grant document, and/or (2) fail to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

12.1 Amount or Extent of Take

The section 7 regulations require NMFS to estimate the number of individuals that may be taken by proposed actions or the extent of land or marine area that may be affected by an action, if we cannot assign numerical limits for animals that could be incidentally taken during the course of an action (50 CFR § 402.14 (i); see also 51 FR 19926, 19953-54 (June 3, 1986)).

We used the best scientific and commercial information available to determine whether and how listed individuals in the exposed populations might respond given their exposure to the proposed action. To estimate the number of animals that might be "taken" in this opinion, we classified the suite of responses as one or more forms of "take" and estimated the number of animals that might be "taken" by (1) reviewing the best scientific and commercial information available to determine the likely suite of responses given exposure of listed marine mammals to the proposed action at various received levels; (2) classifying particular responses as one or more form of "take" (as that term is defined by the ESA and implementing regulations that further define "harass"); and (3) adding the number of exposure events that could produce responses that we would consider "take."

Table 7 shows the estimated numbers of humpback whales and Steller sea lions that NMFS anticipates could be taken by harassment as a result of this action. The amount of take authorized by this ITS will be exceeded if the number of humpback whales or Steller sea lions taken exceeds the amount in Table 7. The instances of harassment would generally represent changes from foraging, resting, milling, and other behavioral states that require lower energy expenditures shifting to traveling, avoidance, and behavioral states that require higher energy expenditures and, therefore, would represent disruptions of the normal behavioral patterns of the animals that have been exposed.

Table 7. Estimated Numbers of Marine Mammals subject to incidental take as harassment from this action

Species	Total anticipated takes
Humpback whale CNP Stock	316
Steller sea lion (Western DPS)	528

12.2 Reasonable and Prudent Measures (RPM)

"Reasonable and prudent measures" are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02).

The RPMs included below, along with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. NMFS concludes that the following RPMs are necessary and appropriate to minimize or to monitor the incidental take of humpback whales and Steller sea lions resulting from the proposed action.

1. This ITS is valid only for the activities described in this biological opinion, and which have been authorized under section 101(a)(5) of the MMPA.

2. The taking of humpback whales and Steller sea lions shall be by incidental harassment only. The taking by serious injury or death is prohibited and may result in the modification, suspension or revocation of the ITS.

3. USACE and PR1 shall implement a monitoring program that allows NMFS AKR to evaluate the exposure estimates contained in this biological opinion and that underlie this incidental take statement.

4. USACE and PR1 shall submit a report to NMFS AKR that evaluates the mitigation measures and the results of the monitoring program.

12.3 Terms and Conditions

"Terms and conditions" implement the reasonable and prudent measures (50 CFR 402.14). These must be carried out for the exemption in section 7(o)(2) to apply.

In order to be exempt from the prohibitions of section 9 of the ESA, USACE and NMFS PR1 must comply with the following terms and conditions, which implement the reasonable and prudent measures described above, the mitigation measures described as part of this action, and reporting/monitoring requirements.

Partial compliance with these terms and conditions may result in more take than anticipated, and invalidate this take exemption. These terms and conditions constitute no more than a minor change to the proposed action because they are consistent with the basic design of the proposed action.

To carry out RPM #1, USACE, NMFS PR1, or their authorization holder must undertake the following:

A. USACE and NMFS PR1 shall require their permitted operators to possess a current and valid Incidental Harassment Authorization issued by NMFS under section 101(a)(5) of the MMPA, and any take must occur in compliance with all terms, conditions, and requirements included in such authorizations.

To carry out RPM #2, USACE, NMFS PR1, or their authorization holder must undertake the following:

A. The taking of any marine mammal in a manner other than that described in this ITS must be reported immediately to NMFS AKR, Protected Resources Division at 907-586-7638.

B. In the event that the proposed action causes a take of a marine mammal that results in a serious injury or mortality (e.g. ship-strike, stranding, and/or entanglement), immediately cease operations and immediately report the incident to NMFS AKR, Protected Resources Division at 907-586-7638 and/or by email to Jon.Kurland@noaa.gov, Kristin.Mabry@noaa.gov, the Alaska Regional Stranding Coordinator at 907-586-7248 (Aleria.Jensen@noaa.gov), and NMFS PR1 robert.pauline@noaa.gov.

To carry out RPM #3, USACE, NMFS PR1, or their authorization holder must undertake the following:

The disturbance and shut down zones must be fully observed during daylight hours, in order to document observed incidents of harassment as described in section 4.3.1.2.

To carry out RPM #4, USACE, NMFS PR1, or their authorization holder must undertake the following:

A. HTC must adhere to all monitoring and reporting requirements as detailed in the IHA issued by NMFS under section 101(a)(5) of the MMPA.

B. Submit a project specific report that analyzes and summarizes marine mammal interactions during this project to the Protected Resources Division, NMFS by email to kristin.mabry@noaa.gov. This report will be submitted by January 31, 2016. This report must contain the following information:

- Dates, times, species, number, location, and behavior of any observed ESA-listed marine mammals,
- Number of power-downs and shut-downs throughout all monitoring activities;
- An estimate of the instances of exposure (by species) of ESA-listed marine mammals that: (A) are known to have been exposed to noise from pile driving with a discussion of any specific behaviors those individuals exhibited, and (B) may have been exposed to noise from pile driving, with a discussion of the nature of the probable consequences of that exposure on the individuals that were or may have been exposed;
- The report should clearly compare the number of takes (i.e. instances of exposure) authorized in the ITS with those observed during project operations
- A description of the implementation and effectiveness of each Term and Condition, as well as any conservation recommendations, for minimizing the adverse effects of the action on ESA-listed marine mammals.

13 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

1. Operators should use real-time passive acoustic monitoring to alert vessels to the presence of whales, primarily to reduce the risk of vessel strikes.

2. NMFS PR1 should work with other relevant stakeholders (the Marine Mammal Commission, International Whaling Commission, and the marine mammal research community) to develop a method for assessing the cumulative impacts of anthropogenic noise on marine mammals. This analysis includes the cumulative impacts on the distribution, abundance, and the physiological, behavioral and social ecology of these species;

In order to keep NMFS AKR informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, USACE and NMFS PR1 should notify NMFS AKR of any conservation recommendations implemented.

14 REINITIATION OF CONSULTATION

This concludes formal consultation on this action. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of the incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

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