**Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion**
Gustavus Ferry Terminal Development in Gustavus, Alaska
Issuance of Incidental Harassment Authorization under 101(a)(5)(D) of the Marine Mammal Protection Act to the Alaska Department of Transportation and Public Facilities (ADOT&PF)

**NMFS Consultation Number:** AKR-2016-9558

**Action Agencies:** National Marine Fisheries Service, Office of Protected Resources, Permits and Conservation Division (PR1)
Federal Highway Administration (FHWA)

**Affected Species and Determinations:**

| ESA-Listed Species | Status | Is Action Likely to Adversely Affect Species or Critical Habitat? | Is Action Likely To Jeopardize the Species? | Is Action Likely To Destroy or Adversely Modify Critical Habitat? |
|---|---|---|---|---|
| Steller Sea Lion, Western Distinct Population Segment (DPS) (*Eumatopias jubatus)* | Endangered | Yes | No | No |
| Humpback Whale, Mexico DPS (*Megaptera novaeangliae*) | Threatened | Yes | No | N/A |

**Consultation Conducted By:** National Marine Fisheries Service, Alaska Region

**Issued By**:

for

James W. Balsiger, Ph.D.
Regional Administrator

**Date**: March 21, 2017

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## TERMS AND ABBREVIATIONS

| | |
|---|---|
| PR1 | Protected Resources, NMFS Headquarters Office |
| PRD | Protected Resources Division, Alaska NMFS |
| FHWA | Federal Highway Administration |
| ITS | Incidental Take Statement |
| | |

# INTRODUCTION

Section 7(a)(2) of the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. § 1536(a)(2)) requires each Federal agency to insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When a Federal agency's action "may affect" a protected species or critical habitat, that agency is required to consult with the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS), depending upon the endangered species, threatened species, or designated critical habitat that may be affected by the action (50 CFR § 402.14(a)). Federal agencies are exempt from this general requirement if they conclude that an action may affect but "is not likely to adversely affect" endangered species, threatened species, or designated critical habitat, and NMFS or the USFWS concurs with that conclusion (50 CFR § 402.14(b)).

Section 7(b)(3) of the ESA requires that at the conclusion of consultation, NMFS and/or USFWS provide an opinion stating how the Federal agencies' actions will affect ESA-listed species and their critical habitat under their jurisdiction (16 U.S.C. § 1536(b)(3)). If incidental take is expected, section 7(b)(4) requires the consulting agency to provide an incidental take statement (ITS) that specifies the impact of any incidental taking, specifies those reasonable and prudent measures necessary or appropriate to minimize such impact, and sets forth terms and conditions that must be complied with to implement those measures (16 U.S.C. § 1536(b)(4)).

For the actions described in this document, the action agencies are the Office of Protected Resources Permits and Conservation Division (PR1), which proposes to permit Marine Mammal Protection Act (MMPA) Level B take of Steller sea lions and humpback whales in conjunction with construction activities at the Gustavus Ferry Terminal, and the Federal Highway Administration (FHWA), which proposes to fund this project. The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being carried out by the Alaska Department of Transportation and Public Facilities (ADOT&PF) pursuant to 23 U.S.C. § 326 and a Memorandum of Understanding dated September 18, 2015 and executed by FHWA and ADOT&PF. The consulting agency for this proposal is NMFS's Alaska Regional Office Protected Resources Division (PRD). This document represents PRD's biological opinion (Opinion) on the effects of this proposal on endangered and threatened species and designated critical habitat for those species.

The opinion and incidental take statement (ITS) were prepared by NMFS in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. §§ 1531-1544), and implementing regulations at 50 CFR Part 402.

The opinion and ITS are in compliance with the Data Quality Act (see 44 U.S.C. § 3504(d)(1)) and underwent pre-dissemination review.

## Background

This opinion considers the effects of activities creating noise sources associated with ferry terminal construction in Gustavus, Alaska. These actions have the potential to affect the endangered western Distinct Population Segment (DPS) Steller sea lion (*Eumetopias jubatus*) and the threatened Mexico DPS humpback whale (*Megaptera novaeangliae*).

This Opinion is based on information provided in the April 15, 2016 Request for Incidental Harassment Authorization by ADOT&PF (Hart Crowser 2016); the June 17, 2015 Biological Assessment (Hart Crowser 2015); the Proposed Notice (RIN 0648-XE603); emails and telephone conversations between PRD, ADOT&PF, and NMFS PR1 staff; and other sources of information. A complete record of this consultation is on file at NMFS's Juneau, Alaska office.

## Consultation History

PR1 received an initial draft of a request from ADOT&PF to take marine mammals incidental to a ferry terminal construction project on March 15, 2015. A revised draft followed on July 1, 2015, and a complete request was received on April 15, 2016. PRD received a request for initiation of consultation dated May 13, 2016 based on a biological assessment submitted June 17, 2015 (Hart Crowser 2015). The BA determined that the project was likely to adversely affect Steller sea lions and humpback whales. Due to their prevalence and abundance within the project area, the BA concluded that Level B harassment would likely occur during pile driving.

The May 13, 2016 request identified an authorization from March 1, 2017 - February 28, 2018 with anticipated work March - May and September - November of 2017. On December 9, 2016, ADOT&PF confirmed changing the project dates to December 15, 2017 – December 14, 2018 with the same expected level of take.

On June 23, 2016, NMFS informed PR1 and ADOT&PF of our use of marine mammal observations that occurred on site March through May of 2016, and our use of 90-day reports from a Fall 2015 Icy Bay monitoring report. These data sources resulted in changes in the proposed take estimates for the project. NMFS also offered several suggestions for increased monitoring of the disturbance and shut down zones. In an email dated June 28, 2016, ADOT&PF and PR1 agreed to the new take estimates and proposed acceptable changes to the marine mammal monitoring plan.

On September 22, 2016, ADOT&PF submitted a memorandum revising the action based on conversations with PR1 and NMFS. Changes included updated sound source levels, observation zones, take estimates using the new NMFS acoustic thresholds, a status change under the ESA for humpback whales, and the inclusion of sound source verification (SSV) at the project site.

On October 21, 2016, NMFS Alaska Region provided PR1 with a copy of the draft Opinion on the suite of activities that would be permitted by PR1 and ADOT&PF.

## DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

### Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR § 402.02). Interrelated actions are those that are part of a larger action and depend on the larger action for their justification (50 CFR § 402.02). Interdependent actions are those that have no independent utility apart from the action under consideration (50 CFR § 402.02).

### Project Purpose, Description, and Timing

The purpose of the project is to improve the vehicle transfer bridge and dock such that damage during heavy storms is prevented, and to improve the safety of vehicle and pedestrian transfer operations. The existing transfer span is supported by a float on the seaward end, making it susceptible to damage from waves during storm events. A small vessel mooring float was significantly damaged during a December 2013 storm event and has been removed. The current dock approach has an obstacle that results in unsafe and difficult turning movements for trucks backing onto the ferry and may be insecure. This Opinion considers the effects of the authorization of an IHA to take marine mammals by harassment under the MMPA incidental to ADOT&PF's construction activities between December 15, 2017 and December 14, 2018.

Pile driving activities are estimated to occur for a total of approximately 171 hours over the course of 16 to 50 days during the following two time periods:

- Spring 2018, with pile driving/removal and in-water work occurring during the period of March 1 through May 31; and
- Fall 2018, with pile driving/removal and in-water work occurring during the period of September 1 through November 30.

#### *Proposed Activities*

The project would remove the existing steel bridge float and restraint structure and replace it with two steel/concrete bridge lift towers capable of elevating the relocated steel transfer bridge above the water when not in use. Each tower would be supported by four 30-inch steel piles. The project would also:

- Expand the dock by approximately 4,100 square feet, requiring 34 new 24-inch steel piles;
- Construct a new steel six-pile (24-inch) bridge abutment;
- Relocate the steel transfer bridge, vehicle apron, and aluminum pedestrian gangway;
- Extract 16 existing 12.75 inch steel piles;
- Relocate the log float to the end of the existing float structure (and install three 12.75-inch steel piles);
- Install a new harbor access float (assembled from a portion of the existing bridge float) and a steel six-pile (30-inch) float restraint structure; and
- Provide access gangways and landing platforms for lift towers and an access catwalk to the existing breasting dolphins (an isolated marine structure that restricts the longitudinal movement of the berthing vessel).

While the exact project specifications are not yet known, contractors on previous ADOT&PF dock projects have typically driven similar-sized piles using the following equipment:

- Air Impact Hammers: Vulcan 512/Max Energy 60,000 foot-pounds (ft-lbs); Vulcan 06/Max Energy 19,000 ft-lbs; ICE/Max Energy 19,500 to 60,000 ft-lbs.
- Diesel Impact Hammer: Delmag D30/Max Energy 75,970 ft-lbs.
- Vibratory Hammers: ICE various models/7,930 to 13,000 pounds static weight.

Similar equipment will likely be used for the proposed project, though each contractor's equipment may vary. ADOT&PF anticipates driving 1 to 3 piles per day, which accounts for setting the pile in place, positioning the barge while working around existing dock and vessel traffic, splicing sections of pile, and driving the piles. Actual pile driving/removal time for nineteen 12.75-inch, forty 24-inch, and fourteen 30-inch-diameter steel piles would be approximately 6 hours per pile for a total of about 114 hours (vibratory hammer) plus 3 hours per day for a total of about 57 hours (impact hammer) over the course of 16 to 50 days in 2018. Table 1 shows the pile-driving schedule.

**Table 1. Pile Driving Schedule**

| | Project Components | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Description** | **Dock Extension** | **Bridge Abutment** | **Lift Towers** | **Access Float** | **Log Float** | **Pile Removal** | **Piles Installed/ Total Piles** | **Installation/ Removal per Day** |
| **# of Piles** | 34 | 6 | 8 | 6 | 3 | 16 | 57/73 | 3 piles/day (maximum) |
| **Pile Size (Diameter)** | 24-inch | 24-inch | 30-inch | 30-inch | 12.75-inch | 12.75-inch | -- | -- |
| **Total Strikes (Impact)** | 20,400 | 3,600 | 4,800 | 3,600 | 1,800 | 0 | 34,200 | 1,800 blows/day |
| **Total Impact Time** | 34 hrs | 6 hrs | 8 hrs | 6 hrs | 3 hrs | 0 | 57 hrs | 3 hrs/day |
| **Total Vibratory Time** | 54 hrs | 9 hrs | 13 hrs | 9 hrs | 5 hrs | 24 hrs | 114 hrs | 6 hrs/day |

## Mitigation Measures

ADOT&PF worked with NMFS and PR1 to develop the following mitigation measures to minimize the potential impacts to marine mammals from the project's activities, by:

1. Minimizing sound levels from project activities;
2. Avoiding work during periods of high Steller sea lion abundance based on temporal and seasonal patterns observed during previous years;
3. Monitoring actual sound produced on site with SSV and adjusting observation and shut-down zones if necessary;

4. Monitoring marine mammals within designated zones of influence corresponding to NMFS's Level A (injury) and Level B (behavioral) harassment thresholds under the MMPA;
5. Installing educational signs about the impacts of feeding Steller sea lions; and
6. Reporting the number of harassed marine mammals to NMFS.

*1. Minimizing sound levels from project activities*

**Type of Pile Driving**

To limit the amount of waterborne noise, a vibratory hammer will be used for initial driving, followed by an impact hammer to proof the pile to load-bearing levels (i.e. to confirm the piles are set). This use of a quieter noise source (vibratory hammer versus an impact hammer) for approximately two-thirds of the work (Table 1) will minimize the total accumulated sound exposure from the project. Direct pull methods to remove piles will be used to minimize noise levels as much as possible. During pile extraction, the vibratory hammer will be used only when direct pull methods are not sufficient.

*2. Avoiding work during periods of high Steller sea lion abundance*

**Temporal and Seasonal Restrictions**

- All work will be between the period of December 15, 2017 and December 14, 2018.
- All in-water construction will be limited to the period between March 1 and May 31, 2018, and September 1 and November 30, 2018. Between May and September, charter fishing vessels come into the dock and Steller sea lions are attracted and habituated to scavenging on their fish waste. While Steller sea lions (SSLs) may haul out in adjacent waters and take advantage of prey resources in the action area during the spring and fall, avoiding construction activities during the peak months of charter boat activity when Steller sea lions are seasonally abundant in the action area will likely provide a conservation benefit in the action area.

- Work may only occur during daylight hours, when visual monitoring of marine mammals can be conducted.

- Starting March 1, 2018 through the end of the charter season in September 2018, all pile driving operations will end as charter fishing vessels return to the dock (4 pm). Steller sea lions are attracted and habituated to coming into the project area to forage on scraps from the charter boats that are returning to the dock and cleaning fish in the late afternoon (C. Gabriele, personal communication, National Park Service, April 2016) (Hart Crowser 2016). Late afternoon is likely to be the period of the day when the highest numbers of sea lions are present in the action area, so stopping operations will limit exposure to concentrated higher numbers of Steller sea lions. Because different numbers of fishing charter vessels may be operating each day and returning at various times, pile driving will stop when either:

- Five or more Steller sea lions are observed following charter fishing vessels to the dock, therefore approaching the 25-meter shutdown zone prior to 4pm; or
- At 4pm during the charter fishing season (May through September) because May through September is anticipated to be the primary months of overlap between construction and charter fishing.

3. *Monitoring sound levels from construction activities*

**Sound Source Verification**
SSV testing of impact and vibratory pile driving will be conducted for this project within 5 days of initiating pile driving. The SSV will be conducted by an acoustical firm with prior experience conducting SSV tests. ADOT&PF will prepare an SSV plan in accordance with the NMFS January 31, 2012 memorandum "Guidance Document: Data Collection Methods to Characterize Impact and Vibratory Pile Driving Source Levels Relevant to Marine Mammals" and submit their plan to PR1 for review and approval prior to implementation of construction activities.

A report on the preliminary results of the SSV measurement including the measured 190, 180, 170, 160, and 120 (rms) radii for each measured source will be submitted within 14 days after the collection of those measurements at the start of the construction season. This report will specify the distances of the shutdown and observation zones that will be adopted for the remainder of construction operations. If necessary, the shutdown and observation zones established in this Opinion will be increased according to the SSV results, in order to meet ESA and MMPA requirements. However, if SSV shows that sound levels and propagation distances measured are less than anticipated, observation and shutdown zones may be minimized if still meeting ESA and MMPA requirements.

4. *Monitoring exposure of marine mammals to acoustic noise and risk of vessel strike*

**Shutdown and Disturbance Zones for Pile Driving**
For all pile driving and removal activities that could cause pinniped and/or cetacean injury (Level A harassment), ADOT&PF will establish a shutdown zone. Shutdown zones are intended to contain the area in which sound pressure levels (SPLs) approach the permanent threshold shift (PTS) Onset Acoustic Thresholds listed in Table 8. The purpose of the shut-down zone is 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. Shut-down zones will be the same size for all sizes of piles (conservatively based on largest 30-inch piles) during driving and extraction, but the size of the shut-down zones varies according to the type of hammer used to install the piles.

ADOT&PF will also establish and monitor disturbance zones that encompass sound levels approaching the Level B harassment thresholds listed below. Disturbance zones enable 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.

ADOT&PF shall establish monitoring locations as described in the Marine Mammal Monitoring Plan (Appendix B of Hart Crowser, 2016). For all pile driving activities, a minimum of two protected species observers (PSOs) will be present during all impact and vibratory pile driving/removal. A description of PSO duties is outlined below.

ADOT&PF's mitigation through shutdown, disturbance, and strike avoidance zones are described below and in Table 2 and shown in Figures 1 and 2.

**Table 2. Impact Zones for Marine Mammals**

| **Activity** | **Distance in Meters** | | | | |
|---|---|---|---|---|---|
| | **Waterborne Noise** | | | | **Strike Avoidance** |
| | **Impact Noise Disturbance (160 dB)** | **Steller Sea Lion Injury** | **Humpback Whale Injury** | **Continuous Noise Disturbance (120 dB)** | **Exclusion Zone** |
| **Impact pile driving** | 2,090 | 25 | 550 | -- | 10 |
| **Vibratory pile driving and extraction** | -- | 10 | 10 | 3,265 | 10 |

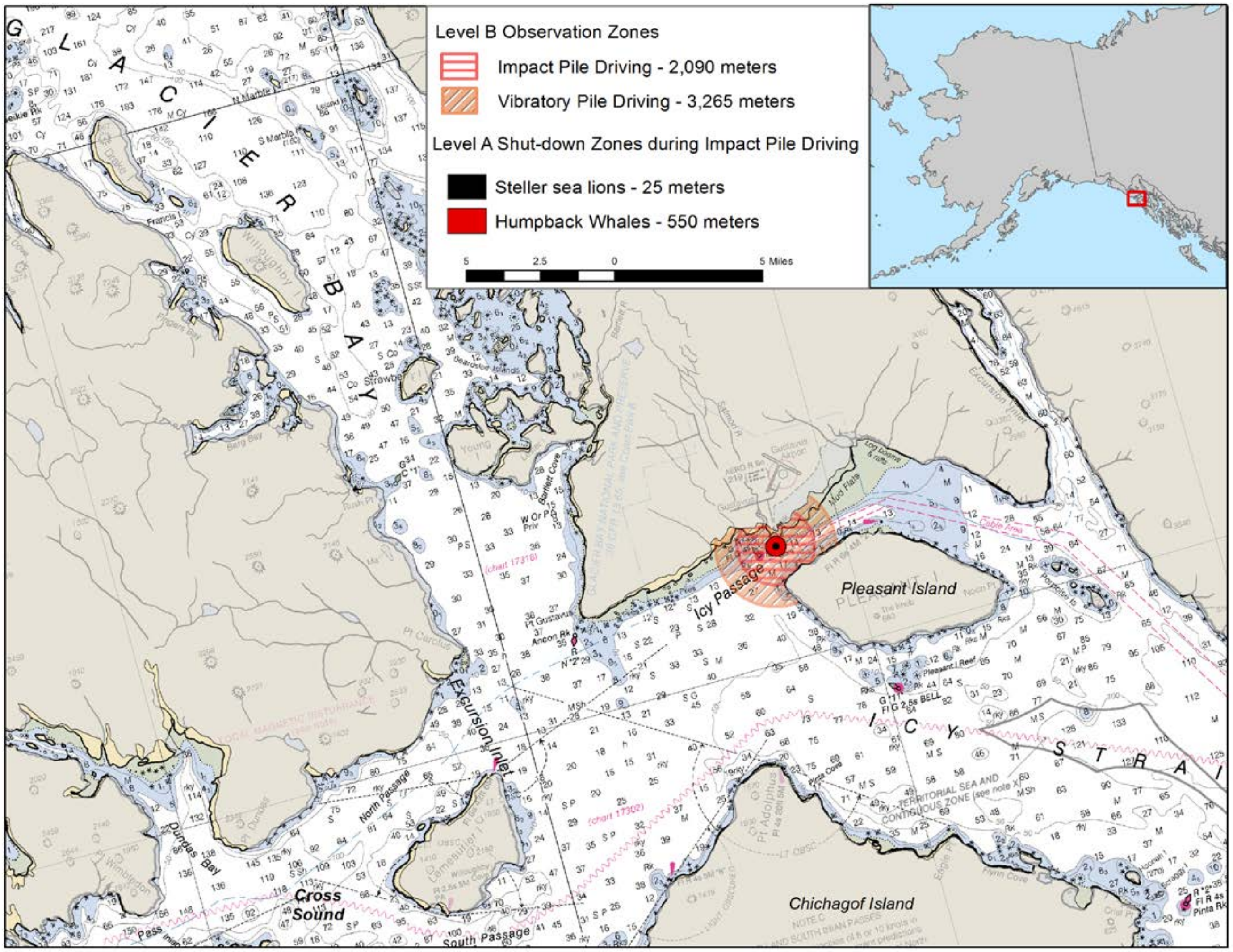


**Figure 1. Action area and surrounding areas, including Icy Strait, Cross Sound, Glacier Bay, and Excursion Inlet.**

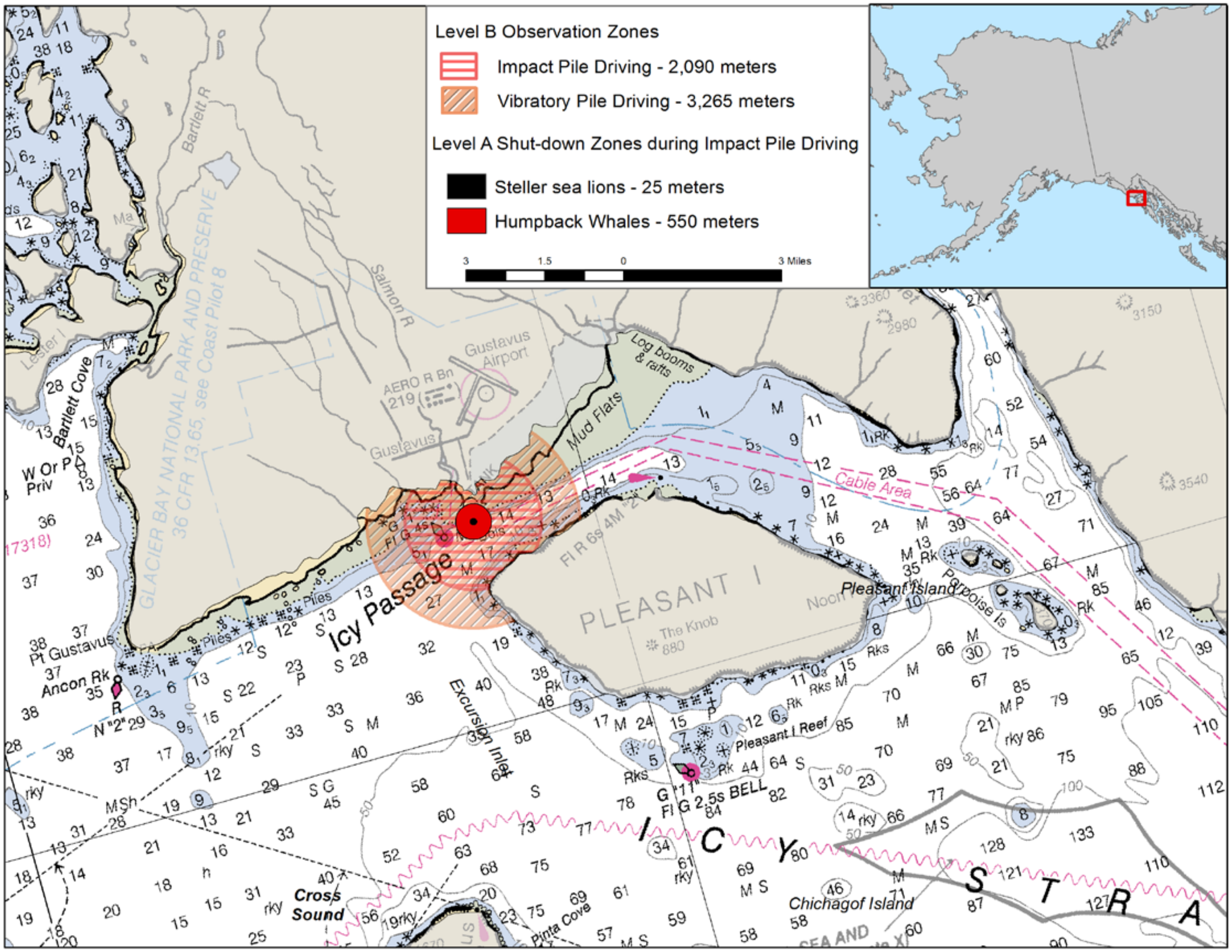


**Figure 2. Local geography, behavioral disturbance observation zones, and shut-down zones.**

## Shutdown Zones

### *Shutdown Zones for Strike Avoidance*

During the in-water operation of vessels and heavy machinery, a 10-meter exclusion zone for all marine mammals will be implemented. This includes movement of construction barges, movement of large vessels (e.g., tug boats), and positioning of piles over water. No movement of this equipment is permitted if a marine mammal is within 10 meters.

### *Shutdown Zones for Impact Pile Driving*

During impact pile driving, ADOT&PF shall implement a shutdown zone of 25 meters for Steller sea lions, and 550 meters for humpback whales (see Table 2).

### *Shutdown Zones for Vibratory Pile Driving and Extraction*

For vibratory driving and extraction, ADOT&PF's activities are not expected to produce sound at or above sounds levels suspected to cause injury. However, ADOTS&PF has agreed to implement a minimum shutdown zone of 10 m radius around piles for all marine mammals. If a marine mammal comes within this zone, all vibratory pile driving and extraction operations will cease.

## Disturbance Zones

Disturbance zones are the areas in which SPLs equal or exceed 120 dB rms (for continuous sound such as vibratory pile driving or extraction) or 160 dB rms (for pulsed sounds such as impact pile driving) for pile driving and removal.

Figure 2 shows 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 Zones for Impact Pile Driving*

The 160 dB rms Level B harassment (behavioral disruption) for underwater noise for pinniped species could be exceeded at a distance of up to approximately 2,090 meters during impact pile driving. Thus, the disturbance zone for impact pile driving includes an area defined with a radius of 2,090 meters from this sound source (Table 2 and Figures 1 and 2).

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. All Steller sea lions 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. All humpback whales documented within the Level B harassment zone during impact driving will be recorded and reported. To then calculate Level B harassment of the Mexico DPS, NMFS will multiply the number of humpback whales recorded in the Level B harassment zone by six percent, which is the proportion of humpback whales from the Mexico DPS expected to be present in the action area (Wade *et al.* 2016). That number will be considered Level B harassment of the Mexico DPS, and will be recorded and reported as such.

### *Disturbance Zones for Vibratory Pile Driving and Extraction*

The assessment of underwater noise attenuation indicates that the 120 dB rms Level B harassment (behavioral disruption) for underwater noise for marine mammals could potentially be exceeded at a distance of up to approximately 3,265 meters during vibratory pile driving and extraction. Thus, the disturbance zone for vibratory pile driving and extraction includes an area defined with a radius of 3,265 meters from this sound source (Table 2 and Figure 1).

Marine mammal presence within this vibratory Level B harassment zone, if any, will be monitored, but vibratory pile driving and extraction activities will not be stopped if marine mammals are found to be present. All Steller sea lions documented within the Level B harassment zone during vibratory driving and extraction would constitute a Level B take (harassment), and will be recorded and reported as such. All humpback whales documented within the Level B harassment zone during vibratory driving and extraction will be recorded and reported. As above, according to the apportionment framework, six percent of that number will be considered Level B harassment of the Mexico DPS, and will be recorded and reported as such.

## Strike Avoidance

The use of a strike avoidance zone during in-water activities and following NMFS's approach regulations are precautionary steps to prevent vessel strike and other detrimental contact with marine mammals located in the area of active construction activities.

During the in-water operation of vessels and heavy machinery, a 10-meter exclusion zone for all marine mammals will be implemented. This includes movement of construction barges, movement of large vessels (e.g., tug boats), and positioning of piles overwater. No movement of this equipment is permitted if a marine mammal is within 10 meters.

In addition, vessels will follow the NMFS Marine Mammal Code of Conduct and adhere to the Alaska Humpback Whale Approach Regulations when transiting to and from the project site (see 50 CFR §§ 216.18, 223.214, and 224.103(b)). These regulations require that all vessels:

- Not approach within 100 yards of a humpback whale, or cause a vessel or other object to approach within 100 yards of a humpback whale,
- Not place vessel in the path of oncoming humpback whales causing them to surface within 100 yards of vessel,
- Not disrupt the normal behavior or prior activity of a whale, and
- Operate vessel at a slow, safe speed when near a humpback whale (safe speed is defined in regulation (see 33 CFR § 83.06)).

## Monitoring Protocols

Monitoring will be conducted before, during, and after pile driving and removal activities. In addition, observers shall record all incidents of marine mammal occurrence within and approaching observation zones, regardless of distance from activity, and shall document any behavioral reactions in concert with distance from piles being driven or removed. 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 the shutdown zone and entry is imminent, at which point all pile driving activities would be halted. 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. The following additional measures apply to visual monitoring:

Monitoring will be conducted by a minimum of two qualified PSOs, who will be placed at the best vantage point(s) practicable to monitor for marine mammals and to 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.

Observers at the project location during March–May 2016 reported that they were able to observe and identify pinnipeds and cetaceans in good weather conditions with binoculars, spotting scopes, and a hand-held rangefinder out to about 2,000 meters from their observation point (N. Drumheller and G.Streveler, personal communication, ADOT&PF observers, May 2016). The following equipment shall be available to observers to ensure adequate coverage of the pile driving and extraction monitoring areas:

- Portable radio to communicate with the contractor;
- Cellular phone with contact information for NOAA Fisheries, the pile installation contractor, and the Alaska Department of Transportation Engineer;
- Red and green signal flags to use as a back up to radio communication;

- Daily tide and current tables for the action area;
- Stopwatch or timekeeping device;
- High magnification binoculars;
- Spotting scopes;
- Rangefinder;
- Buoys at specified distances to aid in distance approximation;
- GPS and compass;
- NOAA Fisheries approved Marine Mammal Observation Record Form (Appendix A) on nonbleeding, waterproof paper;
- Copy of the final Gustavus Ferry Terminal Improvements Marine Mammal Monitoring Plan;
- Copy of the final Gustavus Ferry Terminal Improvements Incidental Harassment Authorization;
- Copy of the final Biological Opinion with Terms and Conditions; and
- Clipboard and pencils.

Briefings between construction supervisors and crews and marine mammal monitoring team should occur 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.

- A total of two observers will be on site and actively observing the shutdown and disturbance zones during all pile driving and extraction activities. Observers will use their naked eye with the aid of high magnification binoculars and a spotting scope to search continuously for marine mammals during all pile driving and extraction activities. One observer will always be positioned on the dock looking out to monitor the zone that is currently in effect.
- A second observer will either be also located on the dock supplementing efforts of the first observer in monitoring from that point, or, when weather and safety conditions permit, on a vessel transiting the observation zones. Observers and ADOT&PF can determine safety protocols and decision points for using vessel-based monitoring.

In addition to the protocol described above, the following additional measures will be used for monitoring during impact pile driving.

- 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, heavy rain, fog, sun glare, etc.). In addition, if such conditions arise during pile driving that is already underway, the activity must 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 has 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.
- Observers will note the return of fishing charter vessels in the afternoon and be sure to watch for Steller sea lions following these vessels into the dock. Observers will communicate with project staff to stop pile-driving activity in the late afternoon if five or more Steller sea lions are approaching the 25-meter shut-down zone.
- 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 impact 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. During construction at the Gustavus Ferry Terminal, ramp-up procedures will be conducted in accordance with Anchorage Fish and Wildlife Field Office (AFWFO; 2012). For impact pile driving, contractors will be required to provide an initial set of three strikes from the hammer at 40 percent energy, followed by a 30-second waiting period after each strike. This procedure will be conducted a total of three times before impact pile driving begins.
- When a marine mammal is observed, its location will be determined using a rangefinder to verify distance and a GPS or compass to verify heading.

*Installing educational signs*

ADOT&PF will install two informational signs designed by NMFS but constructed and supplied by ADOT&PF with a public message about not feeding sea lions. ADOT&PF has already received approval from the City of Gustavus to install the signs near the water where charter vessels dock. NMFS expects this effort will minimize harassment of Steller sea lions by decreasing the free food incentive for Steller sea lions to be in the action area during the project's activities, not only for the duration of this project, but also into the future.

*Reporting*

ADOT&PF must adhere to all monitoring and reporting requirements as detailed in the IHA issued by NMFS under section 101(a)(5) of the MMPA. The results of ADOT&PF monitoring reports would be presented in a 90-day report, as required by NMFS under the proposed IHA. Additionally, NOAA fisheries will be notified (via email to Kristin.Mabry@noaa.gov) if the project has reached 75 percent of the total take limit after the first season of work, and anytime that amount is reached in either of the two construction seasons.

**90-Day Reports**
Within 90-days of the expiration of the IHA (if issued), a 90-day report will be provided to NMFS that includes:

- Summaries of monitoring effort (e.g., total hours, total distances, and marine mammal distribution through the study period, accounting for sea state and other factors affecting visibility and detectability of marine mammals);
- Summaries that represent an initial level of interpretation of the efficacy, measurements, and observations, rather than raw data, fully processed analyses, or a summary of operations and important observations;
- Analyses of the effects of various factors influencing detectability of marine mammals (e.g., sea state, number of observers, and fog/glare);
- Species composition, occurrence, and distribution of marine mammal sightings, including date, water depth, numbers, age/size/gender categories (if determinable), group sizes, and ice cover;
- An estimate of the number (by species) of: (i) pinnipeds (Steller sea lions) that have been exposed to the vibratory and impact pile driving and pile removal operations (extrapolated from visual observation) at received levels greater than or equal to 120dB or 160 dB re 1 µPa (rms) (respectively) with a discussion of any specific behaviors those individuals exhibited; and (ii) cetaceans (humpback whales) that have been exposed to the vibratory and impact pile driving and pile removal operations (extrapolated from visual observation) at received levels greater than or equal to 120 dB or 160 dB re 1 µPa (rms) (respectively) with a discussion of any specific behaviors those individuals exhibited.
- Estimates of uncertainty in all take estimates, with uncertainty expressed by the presentation of confidence limits, a minimum-maximum, posterior probability distribution, or another applicable method, with the exact approach to be selected based on the sampling method and data available;
- A calculation of the final percentage of authorized takes that were taken during the project.

The “90-day” report will be subject to review and comment by NMFS. Any recommendations made by NMFS must be addressed in the final report prior to acceptance by NMFS.

## 5.2 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. We define the action area for this consultation to include the area within which project-related noise levels are ≥120 dB re 1 µPa (rms), and are expected to approach ambient noise levels (i.e., the point where no measureable effect from the project would occur) (see Figure 2).

The project site is located at the Gustavus Ferry Terminal located in Gustavus, Alaska, adjacent to Icy Passage (Figure 1). The action area encompasses approximately 22 square kilometers of marine waters in Icy Passage that contain:

- The project footprint, which includes all proposed project construction activities.
- The extent of temporarily elevated underwater noise levels associated with pile installation.
- The extent of temporarily increased levels of sedimentation and turbidity associated with pile installation and extraction, which will be encompassed within the noise footprint for pile driving.

## APPROACH TO THE ASSESSMENT

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to ensure 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. The adverse modification analysis considers the impacts to the conservation value of the designated critical habitat.

"To 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 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 3, 1986).

Under NMFS's regulations, the destruction or adverse modification of critical habitat "means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species" and such "alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (50 CFR § 402.02).

The designation(s) of critical habitat for Steller sea lions uses the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414, February 11, 2016) replace this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this Oinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

We will use the following approach to determine whether the proposed action described in Section 5.1 is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify those aspects (or stressors) of the 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 and temporal extent of these direct and indirect effects.

- Identify the range-wide status of the species and critical habitat likely to be adversely affected by the proposed action. This section describes the current status of each listed species and its critical habitat relative to the conditions needed for recovery. We determine the range-wide 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 including: past and present impacts of Federal, state, or private actions and other human activities *in the action area*; 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 stressors and the populations or subpopulations those individuals represent. NMFS also evaluates the proposed action's effects on critical habitat features.
- 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: (1) appreciably reduce the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species and critical habitat.
- Reach conclusions in regards to whether the action will result in jeopardy and/or adverse modification of critical habitat. 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.

**RANGEWIDE STATUS OF THE SPECIES AND CRITICAL HABITAT**

The WDPS Steller sea lion and the Mexico DPS humpback whale are both listed under the ESA under NMFS's jurisdiction and may occur in the action area. No critical habitat occurs within the action area (Table 3).

Table 3. Listing status and critical habitat designation for marine mammals considered in this Opinion.

| Species | Status | Listing | Critical Habitat |
|---|---|---|---|
| Steller Sea Lion, WDPS (*Eumetopias jubatus*) | Endangered | NMFS 1997, 62 FR 24345 | NMFS 1993, 58 FR 45269 |
| Humpback Whale, Mexico DPS (*M egaptera nov aeangliae*) | Threatened | 1970, 35 FR 18319; Revised 2016, 81 FR 62260 | N/A |

Climate Change

In accordance with NMFS guidance on analyzing the effects of climate change (Sobeck 2016), NMFS assumes that climate conditions will be similar to the status quo throughout the length of the direct and indirect effects of this short duration project. We present an overview of the potential climate change effects on WDPS Steller sea lions and Mexico DPS humpback whales and their habitat below.

There is widespread consensus within the scientific community that atmospheric temperatures on earth are increasing and that this will continue for at least the next several decades (Watson and Albritton 2001, Oreskes 2004). There is also consensus within the scientific community that this warming trend will alter current weather patterns and patterns associated with climatic phenomena, including the timing and intensity of extreme events such as heat waves, floods, storms, and wet-dry cycles. Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level (Pachauri and Reisinger 2007).

The Intergovernmental Panel on Climate Change (IPCC) estimated that average global land and sea surface temperature has increased by 0.6°C (±0.2) since the mid-1800s, with most of the change occurring since 1976. This temperature increase is greater than what would be expected given the range of natural climatic variability recorded over the past 1,000 years (Crowley 2000). The IPCC reviewed computer simulations of the effect of greenhouse gas emissions on observed climate variations that have been recorded in the past and evaluated the influence of natural phenomena such as solar and volcanic activity. Based on their review, the IPCC concluded that natural phenomena are insufficient to explain the increasing trend in land and sea surface temperature, and that most of the warming observed over the last 50 years is likely to be attributable to human activities (Stocker *et al.* 2013).

Continued greenhouse gas emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century (Watson and Albritton 2001). Climate change is projected to have substantial direct and indirect effects on individuals, populations, species, and the structure and function of marine, coastal, and terrestrial ecosystems in the foreseeable future (Houghton 2001, McCarthy 2001, Parry 2007). Climate change would result in increases in atmospheric temperatures, changes in sea surface temperatures, increased ocean acidity, changes in patterns of precipitation, and changes in sea level (Stocker *et al.* 2013).

The indirect effects of climate change for WDPS Steller sea lions and Mexico DPS humpback whales would result from changes in the distribution of temperatures suitable for many stages of their life history, the distribution and abundance of prey, and the distribution and abundance of competitors or predators.

## Status of WDPS Steller Sea Lions

We present a summary of information on the population structure and distribution of Steller sea lions to provide a foundation for the exposure analyses that appear later in this Opinion. Then we summarize information on the threats to the species and the species' status given those threats to provide points of reference for the jeopardy determinations we make later in this Opinion. That is, we rely on a species' status and trend to determine whether or not an action's direct or indirect effects are likely to increase the species' probability of becoming extinct and the species' probability of failing to recover.

More detailed background information on the status of WDPS Steller sea lions can be found in a stock assessment report on Alaska marine mammals by Allen and Angliss (2015) and the recovery plan for Steller sea lions (NMFS 2008a). 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*.

### 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 24345, May 5, 1997). The WDPS, extending from Japan around the Pacific Rim to Cape Suckling in Alaska (144° W) (Figure 3), was listed as endangered due to its continued decline and lack of recovery. This endangered status listing was supported by a population viability analysis that 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, 24346).

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.

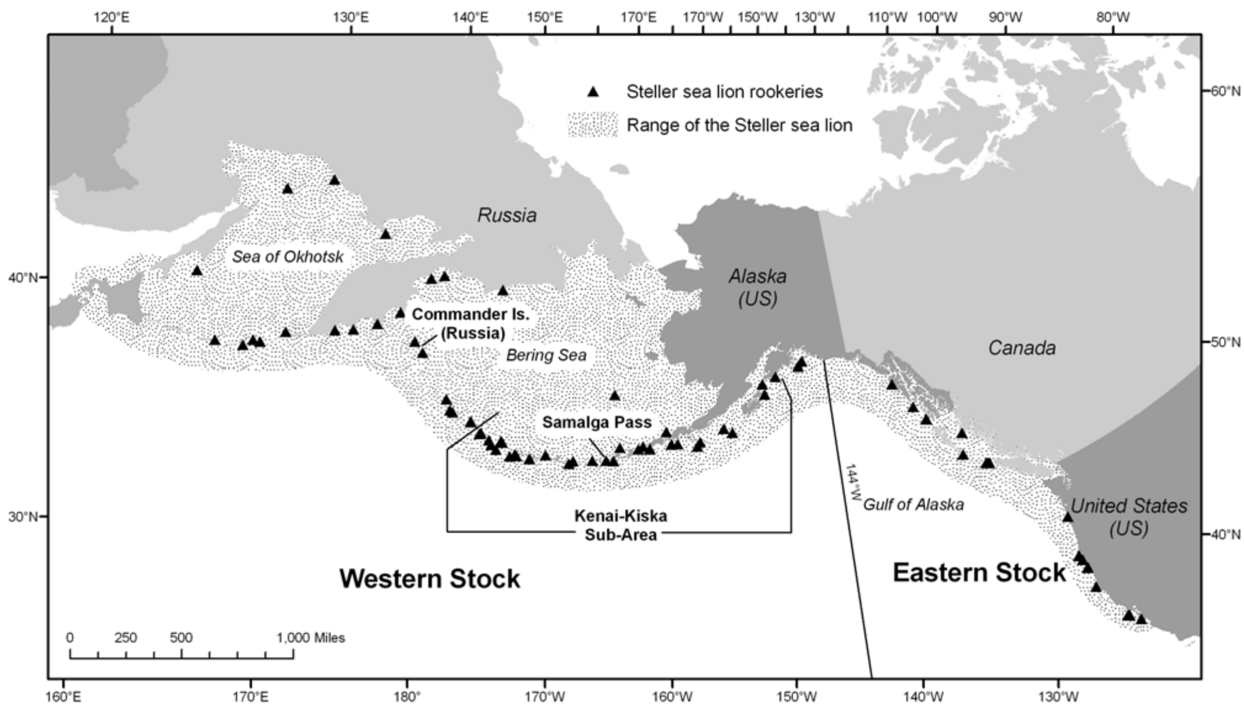


**Figure 3. Steller sea lion range and breeding sites (rookeries) in the North Pacific Ocean.**

### Reproduction and Growth

Detectable changes in a population's birth rate may provide insight into the nature of the factors controlling Steller sea lion population dynamics. While this has been broadly recognized and the focus of many studies, few empirical data exist to directly infer birth rate in wild Steller sea lions. The best data for inferring WDPS Steller sea lion birth rate are available for the central Gulf of Alaska (GOA) where collections from the 1970s and 1980s provide direct measurements and a basis for comparing birth rates in the central GOA over time. The numerous models developed from these historic collections yield generally consistent results: the decline of Steller sea lions in the central GOA in the 1980s was driven by low juvenile survival and the continued decline in the 1990s was likely driven by reduced birth rate.

Several models have demonstrated the relevance of spatial heterogeneity in vital rates (birth rate, death rate, population growth rate) among subpopulations in the WDPS of Steller sea lion. As such, vital rates from one Steller sea lion subpopulation may not be applicable to another, especially where the rate and direction of population growth diverge. Another common conclusion from the age-structured modeling studies is that the fraction of juveniles in the non-pup counts is an important variable for inferring changes in vital rates over time. Many studies concluded that the available count data do not provide insight into the relative contribution of survival and birth rate in current Steller sea lion population trends. However, Holmes *et al.* (2007) included information on changes in the juvenile fraction of the population to help estimate vital rate changes in the central GOA sea lion population. This information improves the ability to estimate vital rate changes in the absence of sightings of known–age individuals.

The best available data from the eastern GOA suggest that birth rate is similar to pre-decline birth rates, while the best available data from the central GOA suggest that the birth rate continues to decline steadily relative to 1976 levels. Thus, while longitudinal studies or population models may provide an insight into the likely birth rate for a particular time and area, the extent to which these estimates apply to areas of the WDPS range lacking age-structured information is unknown.

**Feeding and Prey Selection**

Steller sea lions consume a variety of demersal, semi-demersal, and pelagic prey, indicating a potentially broad spectrum of foraging styles, probably based primarily on availability. Overall, the available data suggest two types of distribution at sea by Steller sea lions: 1) less than 20 km (12 mi) from rookeries and haulout sites for adult females with pups, pups, and juveniles, and 2) much larger areas (greater than 20 km [12 mi]) where these and other animals may range to find optimal foraging conditions once they are no longer tied to rookeries and haulout sites for nursing and reproduction. Loughlin (1993) observed large seasonal differences in foraging ranges that may have been associated with seasonal movements of prey, and Merrick (1995) concluded on the basis of available telemetry data that seasonal changes in home range were related to prey availability.

**Diving and Social Behavior**

Steller sea lions are very vocal marine mammals. Roaring males often bob their heads up and down when vocalizing. Adult males have been observed aggressively defending territories. Steller sea lions gather on haulouts year-round and rookeries during the breeding season and regularly travel as far as 250 miles to forage for seasonal prey. However, females with pups likely forage much closer to their rookery. Diving is generally to depths of 600 feet or less and diving duration is usually 2 minutes or less.

**Vocalization and Hearing**

The ability to detect sound and communicate underwater is important for a variety of Steller sea lion life functions, including reproduction and predator avoidance. Steller sea lions have similar hearing thresholds in-air and underwater to other otariids. In-air hearing ranges from 0.250-30 kHz, with their best hearing sensitivity at 5-14.1 kHz (Muslow and Reichmuth 2010). An underwater audiogram shows the typical mammalian U-shape. Higher hearing thresholds, indicating poorer sensitivity, were observed for signals below 16 kHz and above 25 kHz (Kastelein *et al.* 2005).

**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 of each major rookery and major haulout, 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 rookery and 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 in 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.

**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 4. 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.

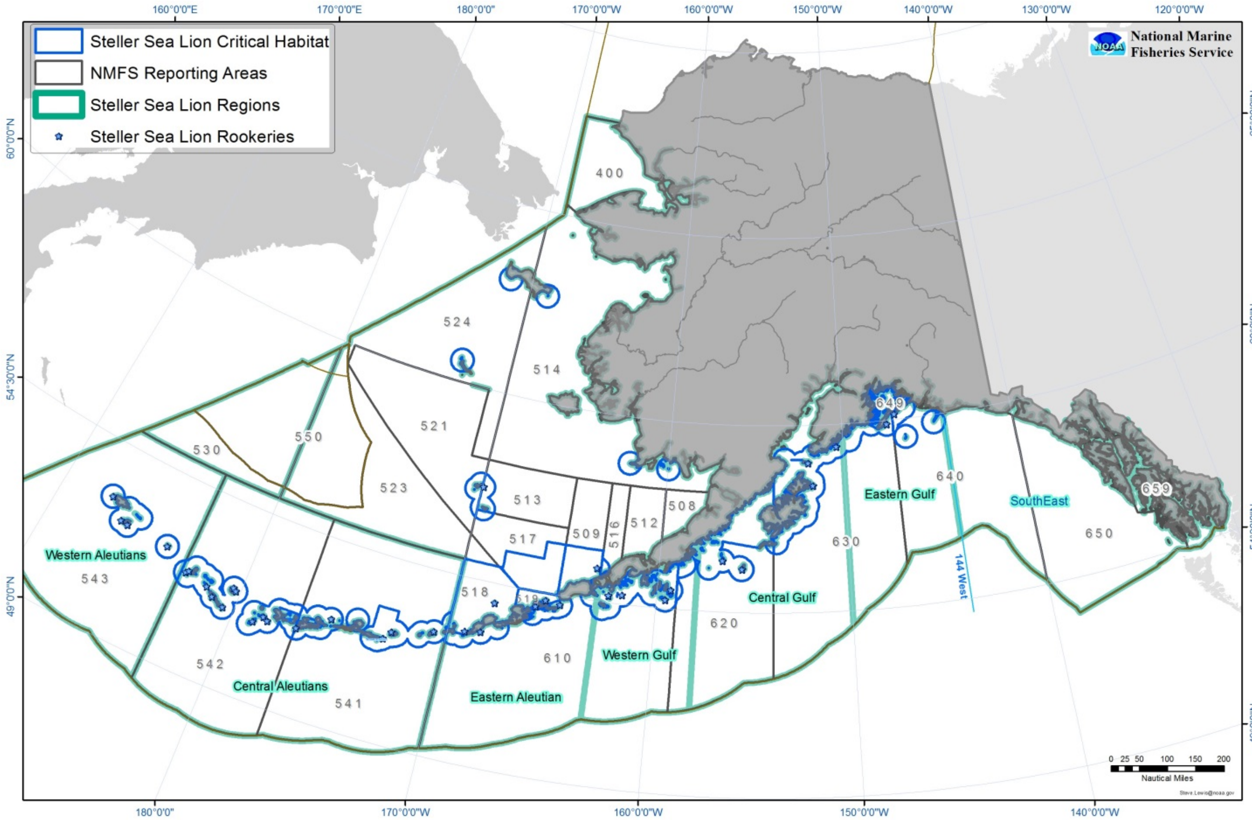


**Figure 4. Sub-regions used by NMFS to monitor status and trends of the WDPS in Alaska.**

**Table 4. 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 calculated 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 a time series of pup and non-pup counts at “trend” sites that have been consistently surveyed 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 since 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 5. 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)

## 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).

*Natural Threats*

**Killer Whale Predation**
The Steller Sea Lion Recovery Plan (NMFS 2008) ranked predation by killer whales as a potentially high threat to the recovery of the WDPS. 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).

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 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 (in the Kenai Fjords area) 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 and Parasites**
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 BiOp for the Fishery Management Plan (FMP) for the Gulf of Alaska (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, and 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 of Steller sea lions 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).

*Anthropogenic Threats*

**Fishing Gear and Marine Debris Entanglement**
The Steller Sea Lion Recovery Plan (NMFS 2008) ranked interactions with fishing gear and marine debris as a low threat to the recovery of the WDPS. Helker *et al.* (2015) report 352 cases of serious injuries to EDPS Steller sea lions from interactions with fishing gear, mostly from troll gear and other marine debris between 2009 and 2013. These interactions occur in fisheries that are not observed. Raum-Suryan *et al.* (2009) found 386 animals either entangled in marine debris or having ingested fishing gear over the period 2000-2007 in Southeast Alaska and northern British Columbia.

Over the same period, the WDPS mostly interacted with observed trawl (66) and some longline (3) groundfish fisheries, typically resulting in death. The minimum estimated mortality rate of western Steller sea lions incidental to all U.S. commercial fisheries is 33.2 sea lions per year, based on observer data (31) and stranding data (2.2) where observer data were not available. Several fisheries that are known to interact with the WDPS have not been observed reaching the minimum estimated mortality rate (Allen and Angliss 2015).

In order to better understand the interactions between salmon fisheries (categorized in the List of Fisheries as having occasional incidental mortality or serious injury of marine mammals) and marine mammals, the Alaska Marine Mammal Observation Program (AMMOP) implemented an observer program to observe the salmon driftnet fishery in Prince William Sound and the Copper River Delta in 1991. The program observed approximately 5% of estimated net retrievals, and extrapolated marine mammal interactions to estimate that 83 marine mammals (95% CI = 7 to 296) were injured or killed in that fishery between May 16 and September 1, 1991 (Wynne *et al.* 1992). Unfortunately that program is no longer funded, and more recent data is not available.

**Competition between Commercial Fishing and Steller Sea Lions for Prey Species**
The Steller Sea Lion Recovery Plan (NMFS 2008) ranked competition with fisheries for prey as a potentially high threat to the 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 commercial fisheries target several important Steller sea lion prey species (NRC 2003) including salmon species, Pacific cod, Atka mackerel, pollock, and others. These fisheries could be reducing sea lion prey biomass and quality at regional and/or local spatial and temporal scales such that sea lion survival and reproduction are reduced. NMFS (2014) analyzes this threat in detail.

**Subsistence/Native Harvest**
The Steller Sea Lion Recovery Plan (NMFS 2008) ranked subsistence harvest as a low threat to the recovery of the WDPS. 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 199 Steller sea lions/year (Allen and Angliss 2015).

**Illegal Shooting**
The Steller Sea Lion Recovery Plan (NMFS 2008) ranked illegal shooting as a low threat to the recovery of the WDPS. 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), although the NMFS Alaska Stranding Program documents 60 Steller sea lions with suspected or confirmed firearm injuries from 2000 – 2016 in Southeast Alaska.

On June 1, 2015, the NMFS AKR Stranding Response Program received reports of at least five dead Steller sea lions on the Copper River Delta. Two NMFS biologists recorded at least 18 pinniped carcasses, most of which were Steller sea lions, on June 2, 2015. A majority of the carcasses had evidence that they had been intentionally killed by humans. Subsequent surveys resulted in locating two additional Steller sea lions, some showing evidence suggestive that they had been intentionally killed.

PRD designed a 2016 survey plan for the Copper River Delta focused on the time period of greatest overlap between the salmon driftnet fishery and marine mammals. The purpose of the surveys was to determine if the intentional killing observed in 2015 continued, and to collect cause of death evidence and samples for health assessments. Intentional killing by humans appears to be continuing and was the leading cause of death of the pinnipeds NMFS AKR assessed on the Copper River Delta from May 10 to August 9, 2016. Without continuous monitoring in past years it is impossible to know if the lack of reported carcasses in the decade prior to 2015 accurately reflects past intentional killings by humans. Numbers of marine mammals found dead with evidence of human interaction did drop considerably between 2015 and 2016, and may be a result of increased OLE, PRD, and USCG presence and activity in the Delta.

**Mortality and Disturbance from Research Activities**
The Steller Sea Lion Recovery Plan (NMFS 2008) ranked effects from research activities as a low threat to the recovery of the WDPS. Mortalities may 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 WDPS of Steller sea lions (Allen and Angliss 2015).

**Vessel 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.

**Risk of Vessel Strike**
NMFS Alaska Region Stranding Program has records of three occurrences of Steller sea lions being struck by vessels in Southeast Alaska; all were near Sitka. Vessel strike is not considered a major threat to Steller sea lions.

**Toxic Substances**
The Steller Sea Lion Recovery Plan ranked the threat of toxic substances as medium (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 WDPS 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).

Status of Mexico DPS Humpback Whales

**Population Structure and Status**
The humpback whale (a mysticete or “baleen” whale) was listed as endangered under the Endangered Species Conservation Act (ESCA) on December 2, 1970 (35 FR 18319). Congress replaced the ESCA with the ESA in 1973, and humpback whales continued to be listed as endangered. NMFS recently conducted a global status review and changed the status of humpback whales under the ESA. The globally listed species was divided into 14 DPSs, four of which are endangered and one is threatened, and the remaining 9 are not listed under the ESA (81 FR 62260; September 8, 2016).

Wade *et al.* (2016) analyzed humpback whale movements throughout the North Pacific Ocean between winter breeding areas and summer feeding areas, using a comprehensive photo-identification study of humpback whales in 2004-2006 during the SPLASH project (Structure of Populations, Levels of Abundance and Status of Humpbacks). A multi-strata mark recapture model was fit to the photo-identification data using a six-month time-step, with the four winter areas and the six summer areas defined to be the sample strata. The four winter areas corresponded to the four North Pacific DPSs: Western North Pacific, Hawaii, Mexico, and Central America. The analysis was used to estimate abundance within all sampled winter and summer areas in the North Pacific, as well as to estimate migration rates between these areas. The migration rates were used to estimate the probability that whales from each winter/breeding area were found in each of the six feeding areas. The probability of encountering whales from each of the four North Pacific DPSs in various feeding areas is summarized in Table 6 below (NMFS 2016a).

**Table 6. Probability of encountering humpback whales from each DPS in the North Pacific Ocean (columns) in various feeding areas (on left). Adapted from Wade *et al.* (2016).**

| **Summer Feeding Areas** | **North Pacific Distinct Population Segments** | | | |
|---|---|---|---|---|
| | Western North Pacific DPS (endangered)[1] | Hawaii DPS (not listed) | Mexico DPS (threatened) | Central America DPS (endangered)[1] |
| Kamchatka | 100% | 0% | 0% | 0% |
| Aleutian I/Bering/Chukchi | 4.4% | 86.5% | 11.3% | 0% |
| Gulf of Alaska | 0.5% | 89% | 10.5% | 0% |
| Southeast Alaska / Northern BC | 0% | 93.9% | 6.1% | 0% |
| Southern BC / WA | 0% | 52.9% | 41.9% | 14.7% |
| OR/CA | 0% | 0% | 89.6% | 19.7% |

[1]For the endangered DPSs, these percentages reflect the 95% confidence interval of the probability of occurrence in order to give the benefit of the doubt to the species and to reduce the chance of underestimating potential takes.

The Mexico DPS is threatened, and is comprised of approximately 3,264 (CV=0.06) animals (Wade *et al.* 2016)[1] with an unknown population trend, though likely to be in decline (81 FR 62260).

[1] Estimates of abundance and migratory destination for north Pacific humpback whales in both summer feeding areas and winter mating and calving areas. Paper SC/66b/IA/21 presented to the International Whaling Commission Scientific Committee. Available at www.iwcoffice.org.

Whales from the Western North Pacific, Mexico, and Hawaii DPSs overlap on feeding grounds off Alaska, and are not visually distinguishable. In the action area, the vast majority of humpback whales (~94%) are likely to be from the recovered Hawaii DPS and about 6% are likely to be from the threatened Mexico DPS. Critical habitat has not been designated for the Western North Pacific or Mexico DPSs (NMFS 2016a).

Humpback whales migrate seasonally between warmer, tropical or sub-tropical waters in winter months (where they reproduce and give birth to calves) and cooler, temperate or sub-Arctic waters in summer months (where they feed) (see Figure 2). In their summer foraging areas and winter calving areas, humpback whales tend to occupy shallower, coastal waters; during their seasonal migrations, however, humpback whales disperse widely in deep, pelagic waters and tend to avoid shallower, coastal waters (Winn and Reichley 1985).

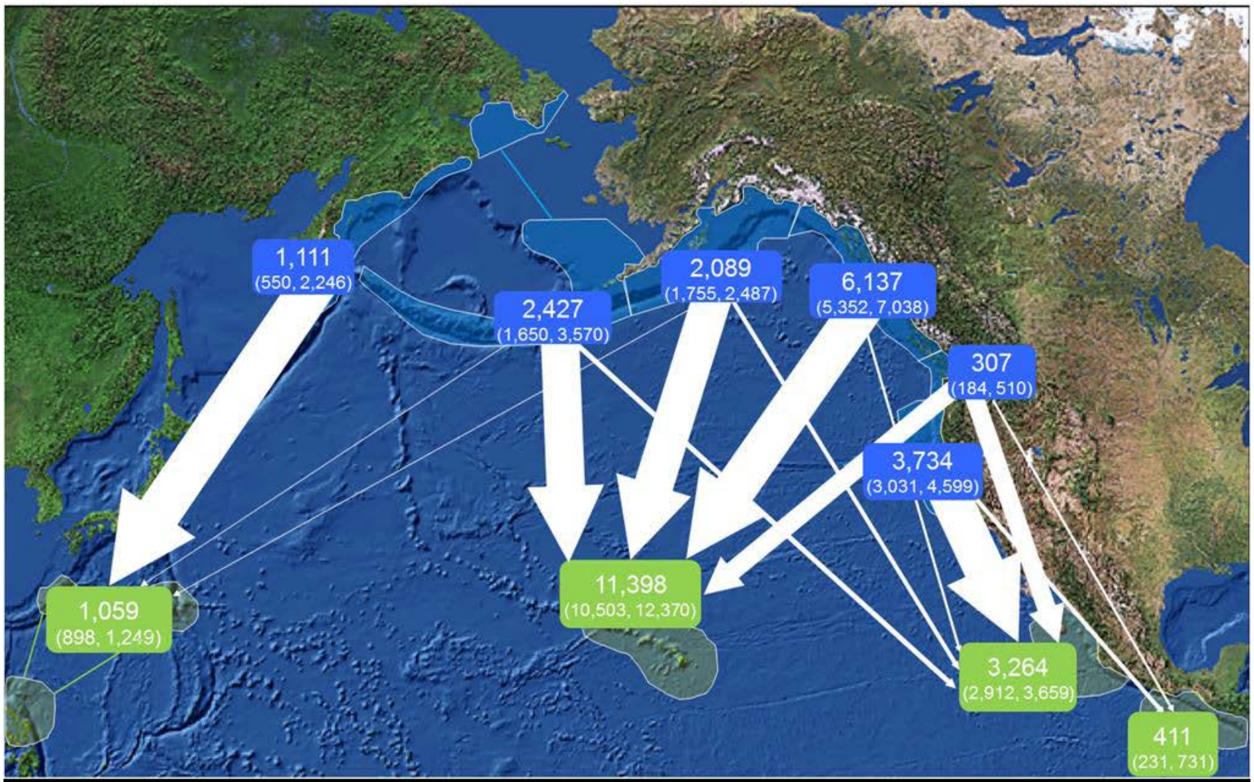


**Figure 5.** **Abundance by summer feeding areas (blue), and winter breeding areas (green), with 95% confidence limits in parentheses. Migratory destinations from feeding area to breeding area are indicated by arrows with width of arrow proportional to the percentage of whales moving into winter breeding area (Wade *et al.* 2016).**

**Reproduction and Growth**

Humpbacks give birth and presumably mate on low-latitude wintering grounds in January to March in the Northern Hemisphere. Females attain sexual maturity at 5 years in some populations and exhibit a mean calving interval of approximately two years (Clapham 1992, Barlow and Clapham 1997). Gestation is about 12 months, and calves probably are weaned by the end of their first year (Perry *et al.* 1999).

Although long-term relationships do not appear to exist between males and females, mature females do pair with other females; those individuals with the longest standing relationships also have the highest reproductive output, possibly as a result of improved feeding cooperation (Ramp *et al.* 2010).

**Feeding and Prey Selection**

Humpback whales tend to feed on summer grounds and not on winter grounds. However, some opportunistic winter feeding has been observed at low latitudes (Perry *et al.* 1999). Humpback whales engulf large volumes of water and then filter small crustaceans and fish through their fringed baleen plates.

Humpback whales are relatively generalized in their feeding compared to some other baleen whales. In the Northern Hemisphere, known prey includes: euphausiids (krill); copepods; juvenile salmonids; Arctic cod; walleye pollock; pteropods; and cephalopods (Johnson and Wolman 1984, Perry *et al.* 1999). Foraging is confined primarily to higher latitudes (Stimpert *et al.* 2007), and the action area is considered a significant locale for foraging humpback whales in Southeast Alaska.

**Diving and Social Behavior**

In Hawaiian waters, humpback whales remain almost exclusively within the 1800 m isobath and usually within water depths less than 182 meters. Maximum diving depths are approximately 170 m (558 ft) (but usually <60 m [197 ft]), with a very deep dive (240 m [787 ft]) recorded off Bermuda (Hamilton *et al.* 1997). They may remain submerged for up to 21 min (Dolphin 1987a). Dives on feeding grounds ranged from 2.1-5.1 min in the north Atlantic (Goodyear unpublished manuscript). In southeast Alaska average dive times were 2.8 min for feeding whales, 3.0 min for non-feeding whales, and 4.3 min for resting whales, with the deepest dives to 148 m (Dolphin 1987a), while whales observed feeding on Stellwagen Bank in the North Atlantic dove <40m (Hain *et al.* 1992). Because most humpback prey is likely found above 300 m depths most humpback dives are probably relatively shallow. Hamilton *et al.* (1997) tracked one whale possibly feeding near Bermuda to 240 m depth.

In a review of the social behavior of humpback whales, Clapham (1996) reported that they form small, unstable social groups during the breeding season. During the feeding season they form small groups that occasionally aggregate on concentrations of food. Feeding groups are sometimes stable for long periods of time. There is good evidence of some territoriality on feeding (Clapham 1994, 1996) and calving areas (Tyack 1981). In calving areas, males sing long complex songs directed towards females, other males, or both. The breeding season can best be described as a floating lek or male dominance polygyny (Clapham 1996). Inter-male competition for proximity to females can be intense as expected by the sex ratio on the breeding grounds, which may be as high as 2.4:1.

Average group size near Kodiak Island is 2-4 individuals, although larger groups are seen near Shuyak and Sitkalidak islands and groups of 20 or more have been documented outside of the project area (Wynne *et al.* 2005). Humpback whales observed in the Alaska Chukchi Sea have been single animals, and one cow calf pair was observed in the U.S. Beaufort Sea (Hashagen *et al.* 2009).

## Vocalization and Hearing

Humpback whales may react to and be harassed by in-water noise. Generally, these whales are sensitive to low-frequency noise. While there is no direct data on hearing in low-frequency cetaceans, the functional hearing range is anticipated to be between 7 Hz to 35 kHz (Watkins 1986, Au *et al.* 2006, Southall *et al.* 2007, Ciminello *et al.* 2012, NMFS 2016c). Baleen whales have inner ears that appear to be specialized for low-frequency hearing. In a study of the morphology of the mysticete auditory apparatus, Ketten (1997) hypothesized that large mysticetes have acute infrasonic hearing.

Humpback whales produce a wide variety of sounds ranging from 20 Hz to 10 kHz. During the breeding season males sing long, complex songs, with frequencies in the 20-5000 Hz range and intensities as high as 181 dB (Payne 1970, Winn *et al.* 1970, Thompson *et al.* 1986). Source levels average 155 dB and range from 144 to 174 dB (Thompson *et al.* 1979). The songs appear to have an effective range of approximately 10 to 20 km. Animals in mating groups produce a variety of sounds (Tyack 1981, Silber 1986b).

Social sounds in breeding areas associated with aggressive behavior in male humpback whales are very different than songs and extend from 50 Hz to 10 kHz (or higher), with most energy in components below 3 kHz (Tyack and Whitehead 1983, Silber 1986a). These sounds appear to have an effective range of up to 9 km (Tyack and Whitehead 1983).

Humpback whales produce sounds less frequently in their summer feeding areas. Feeding groups produce distinctive sounds ranging from 20 Hz to 2 kHz, with median durations of 0.2-0.8 seconds and source levels of 175-192 dB (Thompson *et al.* 1986). These sounds are attractive and appear to rally animals to the feeding activity (D'Vincent *et al.* 1985, Sharpe and Dill 1997).

In summary, humpback whales produce at least three kinds of sounds:

1. Complex songs with components ranging from at least 20 Hz–24 kHz with estimated source levels from 144–174 dB; these are mostly sung by males on the breeding grounds (Winn *et al.* 1970, Richardson *et al.* 1995, Au *et al.* 2000, Frazer and Mercado 2000, Au *et al.* 2006);

2. Social sounds in the breeding areas that extend from 50Hz to more than 10 kHz with most energy below 3kHz (Tyack and Whitehead 1983, Richardson *et al.* 1995); and

3. Feeding area vocalizations that are less frequent, but tend to be 20 Hz–2 kHz with estimated sources levels in excess of 175 dB re 1 Pa at 1m (Thompson *et al.* 1986, Richardson *et al.* 1995).

## Critical Habitat

Critical habitat has not been designated for the Mexico DPS, and therefore will not be analyzed further in this Opinion.

**Threats**

Brief descriptions of threats to humpback whales follow. More detailed information can be found in the Humpback Whale Recovery Plan (NMFS 1991) (available at: http://www.nmfs.noaa.gov/pr/pdfs/recovery/whale_humpback.pdf), the NMFS Stock Assessment Reports (available at: http://www.nmfs.noaa.gov/pr/sars/species.htm), the Global Status Review (Fleming and Jackson, 2011) (available at: http://www.alaskafisheries.noaa.gov/protectedresources/whales/humpback/reports/globalreview0311.pdf), and the ESA Status Review (Bettridge *et al.* 2015) (available at http://www.nmfs.noaa.gov/pr/species/Status%20Reviews/humpback_whale_sr_2015.pdf).

*Natural Threats*

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

**Disease and Parasites**

Humpback whales can carry the giant nematode *Crassicauda boopis* (Bayliss 1920), which appears to increase the potential for kidney failure in humpback whales and may be preventing some populations from recovering (Lambertsen 1992). No information specific to the Mexico DPS is available.

**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) 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).

*Anthropogenic Threats*

Fleming and Jackson (2011), Bettridge *et al.* (2015), and the 1991 Humpback Whale Recovery Plan list the following range-wide anthropogenic threats for the species: vessel strikes, fishery interactions including entanglement in fishing gear, subsistence harvest, illegal whaling or resumed legal whaling, pollution, and acoustic disturbance. Vessel strikes (Fleming and Jackson 2011), and fishing gear entanglement (Bettridge *et al.* 2015 and Fleming and Jackson 2011) are listed as the main threats and sources of anthropogenic impacts to humpback whale DPSs in Alaska.

**Fishery Interactions including Entanglements**

Entanglement in fishing gear is a documented source of injury and mortality to cetaceans. Entanglement may result in only minor injury or may potentially significantly affect individual health, reproduction, or survival (NMFS 2011). Bettridge *et al.* (2015) report that fishing gear entanglements are considered likely to moderately reduce the population size or the growth rate of the Hawaii, Central America, and Mexico DPSs.

Every year, humpback whales are reported entangled in fishing gear in Alaska, particularly pot gear and gill net gear. Other gear interactions with humpback whales in Alaska have occurred with purse seine fisheries, anchoring systems and mooring lines, and marine debris. Between 2009 and 2013, there were two known mortalities of humpback whales in the Bering Sea/Aleutian Islands pollock trawl fishery and one in the Bering Sea/Aleutian Islands flatfish trawl fishery (Allen and Angliss 2015). 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 0.6 humpbacks for the period 2009-2013 (Allen and Angliss). Mean annual mortality to western North Pacific DPS humpbacks caused by entanglement from fishing gear was 1.4 between 2009-2013 (Allen and Angliss 2015).

**Subsistence, Illegal Whaling, or Resumed Legal Whaling**

There are no reported takes of humpback whales from the Mexico DPS by subsistence hunters in Alaska or Russia for the 2008-2012 period (Allen and Angliss 2015).

**Vessel Strikes and Disturbance**

Vessel strikes often result in life-threatening trauma or death for cetaceans. 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 2009 and 2013, mean annual mortality and serious injury due to strikes from charter, recreational, research, and unknown vessels to Central North Pacific humpback whales in Alaska was 1.9 (Allen and Angliss 2015). Most of the vessel collisions were reported in 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 2015).

**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 specifically, is difficult. However, it is clear that the geographic scope of potential impacts is vast, as low-frequency sounds 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 5,000-kg 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.

## 5. ENVIRONMENTAL BASELINE

The "environmental baseline" 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 section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process (50 CFR § 402.02). We also consider natural factors that contribute to the current status of the species, its habitat, and ecosystem in the action area.

Ambient Noise in the Action Area

Ambient background levels at the Gustavus Ferry Terminal have not been collected, but Laughlin (2014) has collected background noise levels at several ferry terminals in Puget Sound, Washington. These levels ranged from 107 to 141 dB rms and were used to predict a waterborne background level of 128 dB rms at the Gustavus facility (Hart Crowser 2016). This level is consistent with waterborne background levels collected at other developed facilities within Puget Sound. Occasional severe weather undoubtedly contributes to the ambient noise levels in Icy Passage, as well as considerable tidal action.

Steller Sea Lions in 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. Fritz *et al.* (2016) estimated an average annual movement of WDPS Steller sea lions to southeast Alaska of 1,039 animals. Studies indicate the females from both stocks have produced pups at both Southeast Alaska rookeries: White Sisters and Graves Rock (Gelatt *et al.* 2007). These rookeries are outside of this project's action area.

The percentage of WDPS versus EDPS of Steller sea lions likely to be in the action area during this project is unknown. Therefore, NMFS conservatively assumes all sea lions in the action area are from the WDPS.

Steller sea lions have increased in the Glacier Bay/Icy Strait area by 8.2 percent per year from the 1970's through 2009, representing the highest rate of growth for this species in Alaska (Mathews 2011). Several data sources contribute to our understanding of Steller sea lion presence in and near the action area. Figure 5 shows opportunistic sightings of Steller sea lions in the Platform of Opportunity database (Lewis, 2011), observations during the Glacier Bay surveys (Neilson 2014), and known Steller sea lion haulouts. Marine Mammal Laboratory (MML) Steller sea lion counts at haulouts include breeding season and winter aerial surveys, boat surveys, cliff counts, and other miscellaneous counts (Fritz 2016). Mathews (2011) summarizes available data from the Alaska Department of Fish and Game, National Park Service, University of Southeast Alaska, United States Geological Survey, and National Marine Fisheries Service. In addition, Womble *et al.* (2005 and 2009) from University of Alaska, Fairbanks provide insights into seasonal ecology of Steller sea lions in Southeast Alaska.

Although there are no known Steller sea lion haulouts or rookeries directly inside the action area (other than the dock itself, which serves as a haulout), there are several in adjacent waters which likely contribute to SSL transit into and out of the action area. The closest rookery is Graves Rock ~40 miles away on the outer coast and has been heavily used in recent years (Fritz 2016). Black Rock is the closest SSL haulout, on the southern coast of Pleasant Island (Figure 5). No Steller sea lions have been counted at the Black Rock haulout during MML summer surveys 2013-2015. Mathews *et al.* (2011) acknowledge Black Rock as a more recently-used haulout, but had too few counts to include in their analysis. Black Rock may be used by small numbers of sea lions ephemerally for several weeks out of the year, corresponding to available prey species in the area (J. Womble, personal communication, National Park Service, May 2016). Point Carolus, at the entrance to Glacier Bay around 8 miles away from the project site, and Inian Islands and Middle Pass further west, are heavily used haulouts in recent years, with peaks numbers of SSL (up to several hundred) observed in late summer and fall, likely associated with salmon returning to spawn in northern Southeast Alaska (L. Jemison, personal communication, Alaska Department of Fish and Game, May 2016). These haulouts are outside of the action area for this project, but may contribute to transit through the action area.

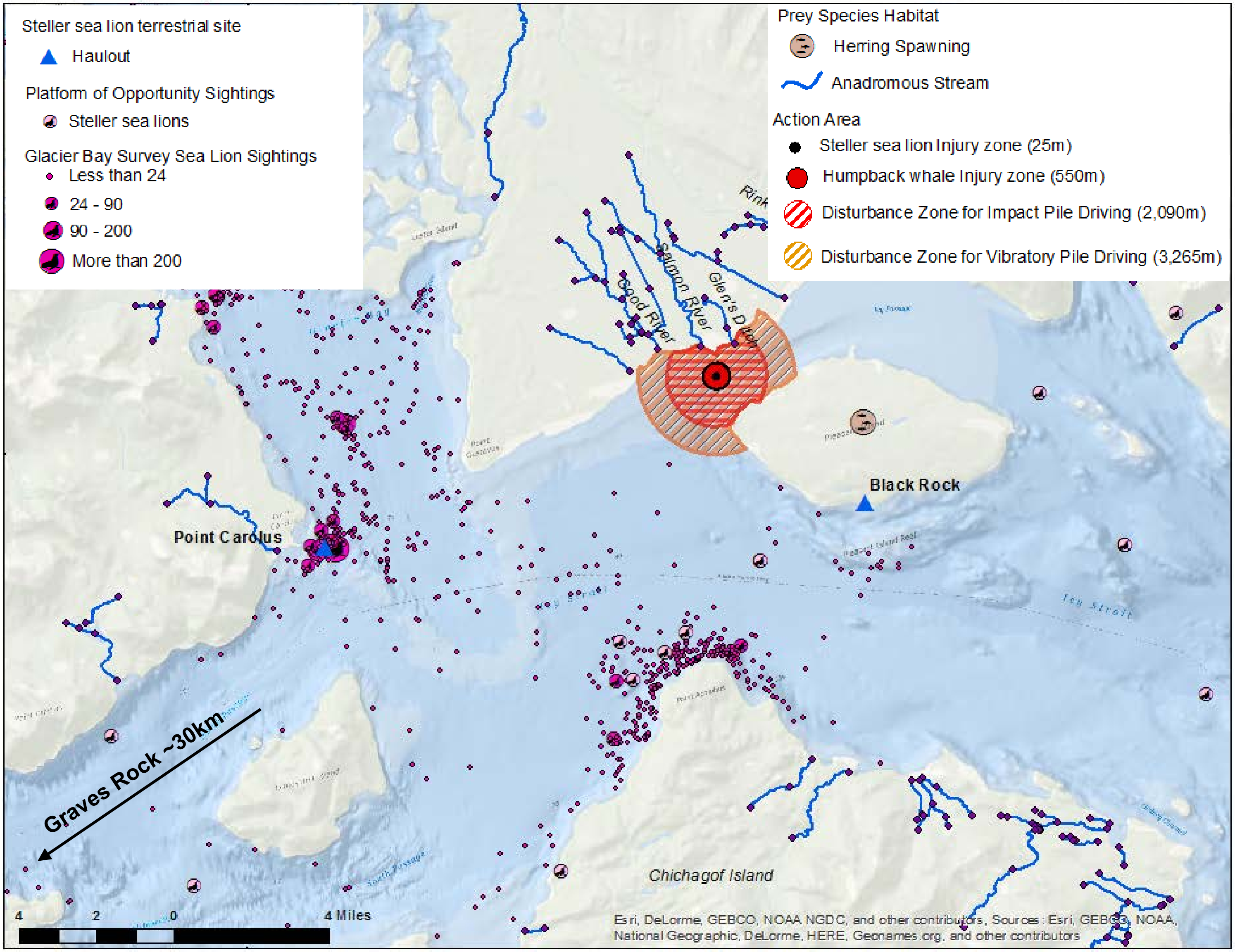


**Figure 5. Steller sea lion haulouts, sightings, and prey resources in and around the action area.**

Womble *et. al.* (2005, 2009) studied the seasonal ecology of Steller sea lions in Southeast Alaska by relating the distribution of sea lions to prey availability. Figure 6 depicts a likely seasonal foraging strategy for Steller sea lions in Southeast Alaska. Their results suggest that seasonally aggregated high-energy prey species, such as eulachon and herring in late spring and salmon in summer and fall, influence the seasonal distribution of Steller sea lions in some areas of Southeast Alaska. Similarly, the NMFS 2014 Status Review of Southeast Alaska Pacific Herring generalizes that sea lions forage on herring aggregations in winter, on spawning herring and eulachon in spring, and on various other species throughout the year. Kruse (2000) report that herring fishery managers use the presence of SSL on the spring spawning grounds as an indicator that spawning is imminent, even though herring have been in deeper adjacent waters for weeks prior to SSL arrival.

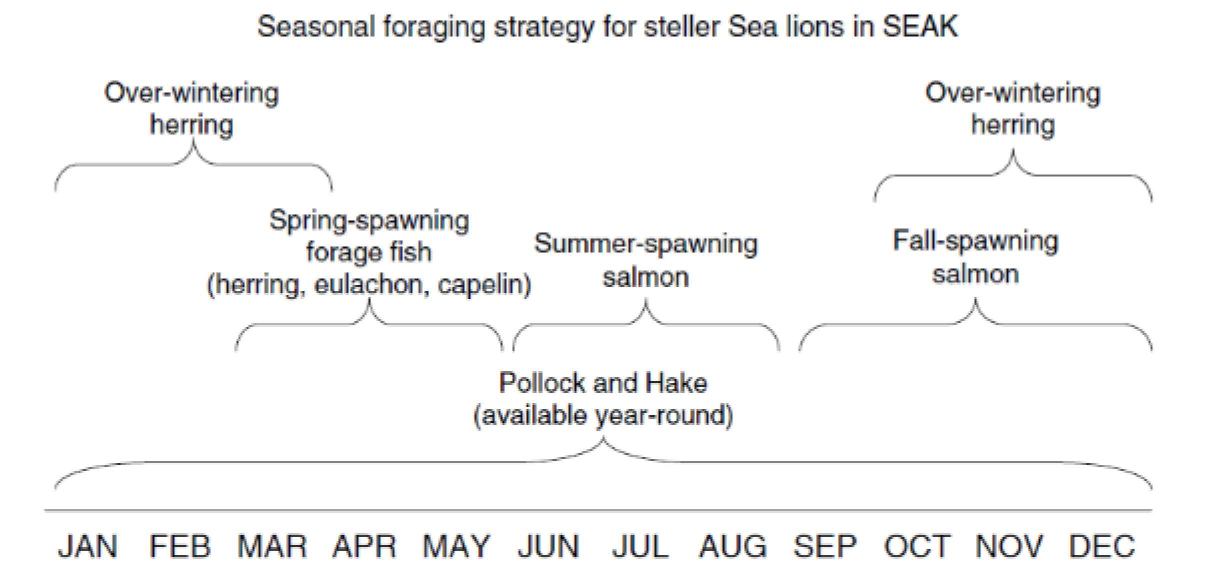


**Figure 6. Seasonal foraging ecology of SSL. Reproduced with permission from Womble *et. al.*, 2009.**

There are several anadromous waters inside and very near the action area as coded in the Alaska Department of Fish and Game's anadromous waters catalog, accessed online at www.adfg.alaska.gov in June 2016. These streams are shown in blue in Figure 5. Salmon River has coho, chum, and pink salmon, as well as Dolly Varden and steelhead trout. Coho salmon rearing occurs in Rink Creek, and coho and chum salmon rearing occurs in Glen's Ditch. Nearby Kahtaheena River supports spawning populations of chum and pink salmon, and Good River has spawning coho and chum salmon, as well as pink and sockeye salmon. Eulachon spawning occurs in nearby Excursion Inlet in April or May (NMFS 2006). Herring spawning also occurs in the spring in Excursion Inlet, as well as in streams on Pleasant Island (Thornton 2010).

Clearly, the action area and surrounding waters contain abundant sources of prey species available to SSL year-round.

## Anthropogenic Stressors

Disturbance from vessel traffic, shipping, and transit; illegal shooting; and competition for prey could be sources of stress to Steller sea lions in the action area. Short descriptions and summaries of the effects of these stressors are presented below. A more detailed analysis is available in a recent biological opinion of the effects of groundfish fisheries (NMFS 2014) and the SSL recovery plan (NMFS 2008).

*Disturbance from Vessel Traffic*

Vessel-based recreational activities, commercial fishing, shipping, and general transportation occur within the action area regularly. NMFS provides a voluntary framework for vessel operators to follow a code of conduct to reduce marine mammal interactions including:

- remain at least 100 yards from marine mammals,
- time spent observing individual(s) should be limited to 30 minutes, and
- vessels should leave the vicinity if they observe Steller sea lion behaviors such as these:
  - Increased movements away from the disturbance, hurried entry into the water by many animals, or herd movement towards the water; or
  - Increased vocalization, aggressive behavior by many animals towards the disturbance, or several individuals raising their heads simultaneously.

These guidelines can be viewed at https://alaskafisheries.noaa.gov/pr/mm-viewing-guide.

*Risk of Vessel Strike*

There are three documented occurrences of Steller sea lions being struck by vessels in Southeast Alaska; all were near Sitka. Vessel strike has not been documented in the action area and is not considered a major threat to Steller sea lions.

*Intentional Killing*

There are no reports of intentional killing in the action area. However, Steller sea lions have been documented following fishing vessels and scavenging on fish waste, which may make them more susceptible to fishery interactions.

*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 a very broad distribution of prey and a lack of seasonal overlap between fisheries and prey preference by sea lions may minimize competition as well. There are no fishery management measures in the action area since there are no haulouts or rookeries. Given the recent abundance trends discussed above and the remoteness and small scale of the action area compared to nearby fishing grounds, NMFS expects any competition for prey in the action area to be insignificant.

Humpback Whales in the Action Area

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). The abundance estimate for humpback whales in Southeast Alaska is estimated to be between 5,352 and 7,038 animals, which are comprised of the Hawaii DPS (93.9%) and the Mexico DPS (6.1%) (Wade *et al.* 2016). As discussed previously, the Hawaii DPS is not listed under the ESA, and the Mexico DPS is listed as threatened. In this analysis, we use the 6.1% figure from Wade *et al.* (2016) to approximate the percentage of observed humpbacks that are from the Mexico DPS.

Humpback whales are present in Southeast Alaska in all months of the year. Most Southeast Alaska humpback whales winter in Hawaii, but some individuals have been documented over-wintering near Sitka and Juneau (NPS Fact Sheet available at http://www.nps.gov/glba). Late fall and winter whale habitat in Southeast Alaska appears to correlate with areas that have over-wintering herring (such as lower Lynn Canal, Tenakee Inlet, Whale Bay, Ketchikan, and Sitka Sound), none of which are in the action area (Baker *et al*. 1985, Straley, 1990, Straley *et al*. 2016, Moran and Straley, in press).

Annual concentrations of humpback whales occur consistently in the waters in and adjacent to Icy Strait. In the spring, Glacier Bay and Icy Strait (adjacent to the action area) appear to be an important feeding area early in the season, having greater densities of humpback whales in April/May (Dahlheim *et al*. 2008) and June/July (Baker *et al.* 1992) with a prey base of euphausiids, while Frederick Sound and Stephens Passage (well outside the action area) showed greater numbers of whales in August and September with a prey base of fish. 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 (NPS Fact Sheet available at http://www.nps.gov/glba). This suggests that whales may be transiting adjacent to the action area (Figure 1).

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 (NPS unpublished data).

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. Sixty-two 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 past years.

The same survey in 2014 had different results. Neilson *et al.* (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). 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.

## Anthropogenic Stressors

Vessel traffic in the action area likely disturbs humpback whales and contributes to the risk of vessel strike.

### *Vessel Disturbance and Strike*

Vessel-based recreational activities, commercial fishing, shipping, whale-watching, and general transportation occur within the action area regularly. All of these sources of vessel traffic contribute to the risk of vessel-whale collisions. Figure 9 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 and near the action area. There is one documented strike inside the action area.

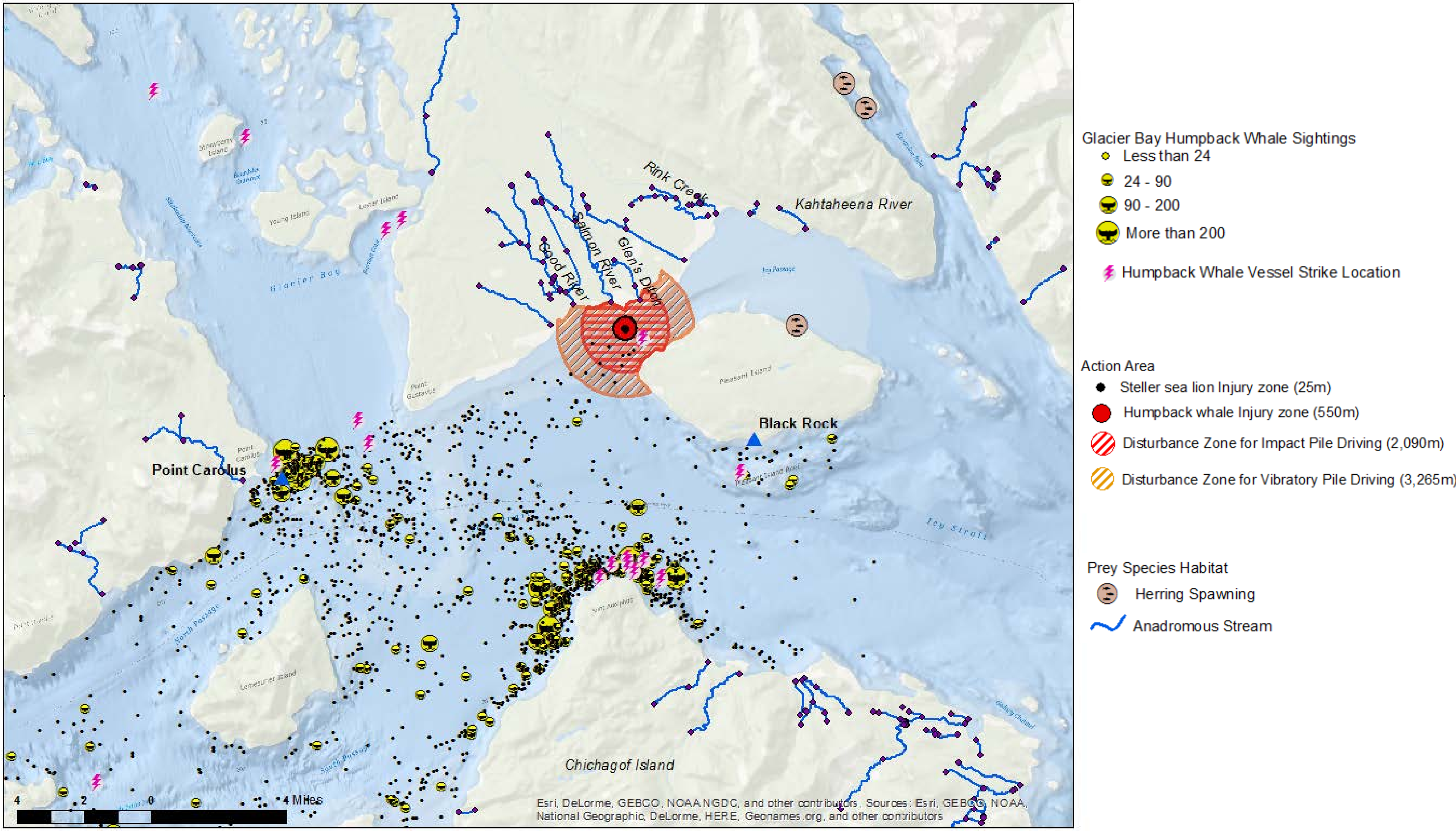


**Figure 7. Opportunistic sightings (Lewis 2011) of humpback whales in and near the action area and known locations of ship strikes (NMFS 2015, GBNP 2015).**

Vessel strikes are a leading cause of mortality in large whales. Reported ship strike locations through 2014 in Southeast Alaska are shown in Figure 7. Neilson *et al.* (2012) reported the following summary statements about humpback whale and vessel collisions in Southeast Alaska.

- Most vessels that strike whales are less than 49 ft long
- Most collisions occur at speeds over 13 knots
- Most collisions occur between May and September
- Calves and juveniles appear to be at higher risk of collisions than adult whales

Neilsen *et al.* (2012) used previous locations of whale strikes to produce this kernel density estimation. The high risk areas shown in red in Figure 10 are also popular whale-watching destinations, including the western part of the action area for this analysis

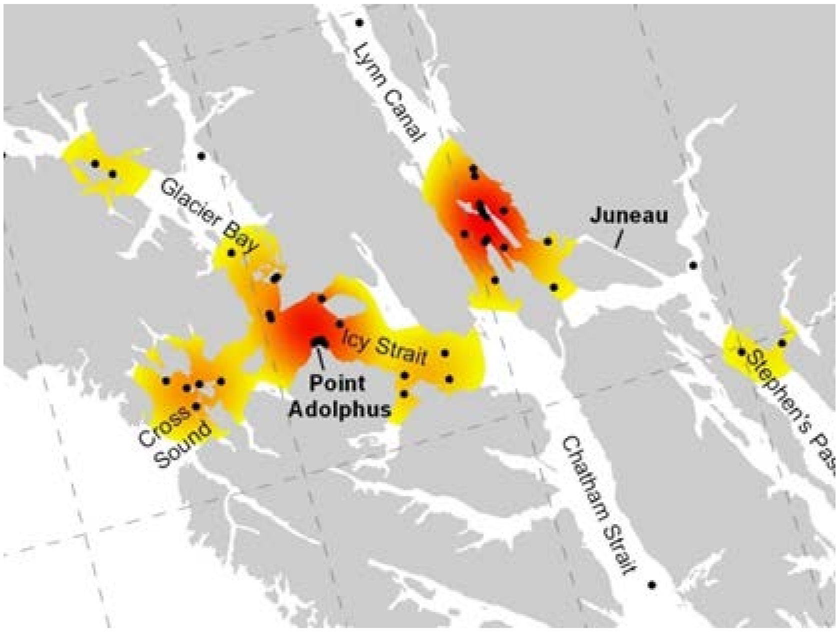


**Figure 8. High Risk Areas for Vessel Strike in and around the Action Area. Used with permission from Neilson *et al.* (2012).**

Whale Strike Avoidance in Southeast Alaska

NMFS implemented regulations to minimize harmful interactions between ships and humpback whales in Alaska (see 50 CFR §§ 216.18, 223.214, and 224.103(b)). These regulations require that all vessels:

- Not approach within 100 yards of a humpback whale, or cause a vessel or other object to approach within 100 yards of a humpback whale,
- Not place vessel in the path of oncoming humpback whales causing them to surface within 100 yards of vessel,
- Not disrupt the normal behavior or prior activity of a whale, and
- Operate vessel at a slow, safe speed when near a humpback whale. Safe speed is defined in regulation (see 33 CFR § 83.06).

In Southeast Alaska, over 1,000 square miles of marine waters inside of Glacier Bay National Park and Preserve are subject to regulations including vessel quotas, wilderness areas, and "whale waters." These include vessel course and speed restrictions to protect the habitat of humpback whales, as well as to reduce the risk of collision and harassment of whales by vessels.

In addition to the voluntary marine mammal viewing guidelines discussed previously, many of the marine mammal viewing tour boats voluntarily subscribe to even stricter approach guidelines by participating in the Whale Sense program. NMFS implemented Whale Sense Alaska in 2015, which is a voluntary program developed in collaboration with the whale-watching industry that recognizes companies who commit to responsible practices. More information is available at https://whalesense.org/ .

Since 2011, cruise lines, pilots, NMFS, and National Park Service (NPS) biologists have worked together to produce weekly whale sightings maps to improve situational awareness for cruise ships and state ferries in Southeast Alaska. In 2016, NMFS and NPS launched Whale Alert, another voluntary program that receives and shares real-time whale sightings with controlled access.

## 6. 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 (50 CFR § 402.02).

This Opinion relies on the best scientific and commercial information available. We try to note 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 analysis using a stressor identification – exposure – response – risk assessment framework for the proposed activities.

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.

### 6.1 Project Stressors

Based on our review of the Biological Assessment (Hart Crowser 2015), the IHA application (Hart Crowser 2016), the proposed notice for issuing the IHA (NMFS 2016), personal communications, and other available literature as referenced in this Opinion, our analysis recognizes that the proposed construction activities at the Gustavus Ferry Terminal may cause these primary stressors:

1. sound fields produced by impulsive noise sources (impact hammers);
2. sound fields produced by continuous noise sources including vessels and vibratory hammers;
3. risk of vessels associated with the construction project striking marine mammals;
4. changes in water quality and turbidity; and
5. changes to habitat.

Most of the analysis and discussion of effects to Steller sea lions and humpback whales from this action will focus on exposure to impulsive and continuous noise sources because NMFS assumes these stressors will have the most direct impacts to Steller sea lions and humpback whales. In this analysis, we used a recent ADOT&PF study conducted at Kake, Alaska (MacGillivray *et al.* 2015) to inform our representation of the sound field produced by these stressors depicted in Figure 1 and the NMFS acoustic thresholds (81 FR 51694, August 4, 2016) to evaluate the effects of those sound fields beyond the ambient sound levels discussed previously in the *Environmental Baseline* section.

**Estimating Sound Fields from Continuous and Impulsive Noise Sources**

Because there was no sound source verification available for this location, ADOT&PF supplied documentation which described their rationale for using the results from the Kake study (MacGillvray *et al.* 2015) to calculate disturbance zones in this analysis (Memorandum from Hart Crowser to ADOT&PF dated September 9, 2016). NMFS (2012) states that pile size and type are probably the most important factors affecting sound levels from pile driving. Hammer energy and the type of bottom substrates likely also play a role. In addition, water depths are not believed to be very predictive of sound levels (NMFS 2012).

NMFS concurs with ADOT&PF and PR1 that the Kake sound source measurements are the best available data to use for this analysis. The pile size and type, substrate, and hammers used at Kake are similar to the proposed action in Icy Passage (Table 7). These data suggest that site-specific acoustic data collected at the Kake Ferry Terminal are appropriate data to inform sound level estimates for this analysis.

**Table 7. A comparison of site and project characteristics at Kake (MacGillvray et. al., 2015) and at the project site in Icy Passage (2/8/16 memo).**

| | **Kake** | **Icy Passage** |
|---|---|---|
| **Date** | September 2015 | September 2017 start date |
| **Pile Size and type** | 30-inch steel | 24- to 30-inch steel |
| **Impact Hammer** | Delmag D19-42 with maximum energy of 29–66 kilonewton meters (kNm), piston weight of 1,820 kilograms (kg), and blow rate of 35–52/minute | Similar |
| **Vibratory hammer** | HPSI 206 with a frequency of 1,600 revolutions per minute (rpm), force of 890 kN, and weight of 4853 kg | Similar |
| **Sediment** | Sediments are largely composed of organic muds between 10 and 15 feet deep over silty sands and gravel (Dames and Moore 1973) | Sediments contain a smaller percentage of fines, but are fine-grained, composed primarily of sand and silty sands (ADOT&PF 2008). Most of the action area is portrayed as mud flats on topographic maps (Figures 1 and 2). |

*Acoustic Thresholds*

Since 1997, NMFS has used generic sound exposure thresholds to determine whether an activity produces underwater and in-air sounds that might result in impacts to marine mammals (70 FR 1871, January 11, 2005). NMFS recently developed comprehensive guidance on sound levels likely to cause injury to marine mammals through the onset of permanent and temporary thresholds shifts (PTS and TTS; Level A harassment) (81 FR 51694, August 4, 2016). NMFS is in the process of developing guidance for behavioral disruption (Level B harassment). However, until such guidance is available, NMFS uses the following conservative thresholds of underwater sound pressure levels,[2] expressed in root mean square (rms),[3] from broadband sounds that cause behavioral disturbance, and referred to as Level B harassment under section 3(18)(A)(ii) of the Marine Mammal Protection Act (MMPA) (16 U.S.C. § 1362(18)(A)(ii)):

- impulsive sound: 160 dB re 1 $\mu Pa_{rms}$
- continuous sound: 120 dB re 1$\mu Pa_{rms}$

Under the PTS/TTS Technical Guidance, NMFS uses the thresholds listed in Table 8 for underwater sounds that cause injury, referred to as Level A harassment under section 3(18)(A)(i) of the MMPA (16 U.S.C. § 1362(18)(A)(i)) (NMFS 2016). These acoustic thresholds are presented using dual metrics of cumulative sound exposure level ($L_E$) and peak sound level (PK) for impulsive sounds and $L_E$ for non-impulsive sounds:

**Table 8. PTS Onset Acoustic Thresholds**

| | PTS Onset Acoustic Thresholds* (Received Level) | |
|---|---|---|
| **Hearing Group** | **Impulsive** | **Non-impulsive** |
| **Low-Frequency (LF) Cetaceans** | $L_{pk,flat}$: 219 dB<br>$L_{E,LF,24h}$: 183 dB | $L_{E,LF,24h}$: 199 dB |
| **Mid-Frequency (MF) Cetaceans** | $L_{pk,flat}$: 230 dB<br>$L_{E,MF,24h}$: 185 dB | $L_{E,MF,24h}$: 198 dB |
| **High-Frequency (HF) Cetaceans** | $L_{pk,flat}$: 202 dB<br>$L_{E,HF,24h}$: 155 dB | $L_{E,HF,24h}$: 173 dB |
| **Phocid Pinnipeds (PW) (Underwater)** | $L_{pk,flat}$: 218 dB<br>$L_{E,PW,24h}$: 185 dB | $L_{E,PW,24h}$: 201 dB |
| **Otariid Pinnipeds (OW) (Underwater)** | $L_{pk,flat}$: 232 dB<br>$L_{E,OW,24h}$: 203 dB | $L_{E,OW,24h}$: 219 dB |

[2] Sound pressure is the sound force per unit micropascals (μPa), where 1 pascal (Pa) is the pressure resulting from a force of one newton exerted over an area of one square meter. Sound pressure level is expressed as the ratio of a measured sound pressure and a reference level. The commonly used reference pressure level in acoustics is 1 μPa, and the units for underwater sound pressure levels are decibels (dB) re 1 μPa.
[3] Root mean square (rms) is the square root of the arithmetic average of the squared instantaneous pressure values.

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.

Note: Peak sound pressure ($L_{pk}$) has a reference value of 1 μPa, and cumulative sound exposure level ($L_E$) has a reference value of 1μPa$^2$s. The subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (i.e., varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

In addition, NMFS uses the following thresholds for in-air sound pressure levels from broadband sounds that cause Level B behavioral disturbance under section 3(18)(A)(ii) of the MMPA:

- 100 dB re 20μ$Pa_{rms}$ for non-harbor seal pinnipeds

The MMPA defines "harassment" as "any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment]" (16 U.S.C. § 1362(18)(A)(i)-(ii)).

While the ESA does not define "harass," NMFS recently issued guidance interpreting the term "harass" under the ESA as to: "create 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" (Wieting 2016).

As described below, we anticipate that exposures to listed marine mammals from noise associated with the proposed action may result in disturbance (Level B harassment). With the addition of mitigation measures including shutdown zones, no mortalities or permanent impairment to hearing are anticipated. No Level A harassment is anticipated nor authorized in the Incidental Take Statement associated with this Opinion.

*Resulting Impact Zones*

Source levels measured at Kake for impact and vibratory driving were estimated to be 194.3dB and 157.7 dB RMS (respectively) for a standardized distance of 10 meters from the pile. Those noise levels and the NMFS acoustic thresholds were used as inputs in the NMFS Practical Spreading Loss Model. The formula is expressed as:

$$RL = SL-15LogR$$

Where RL is the received level of the sound, SL is the source level, 15 is the practical spreading loss coefficient, and R is the radius in meters to the received level. The resulting disturbance and injury zones are presented in Table 2.

*Local Geography of the Action Area*

Note that the local geography and topography in Icy Passage plays a significant role in the transmission loss of sound (i.e., the rate at which sound dissipates in the water) and utility of transit for marine mammals (i.e., whether capable of use as a transit area) in this project, and so, further refines the resulting impact zones. Icy Passage is shallow with mud flats towards the mainland (Figures 1 and 2). It would be unlikely for SSL to be in the very shallow mud flats in the action area unless at high tides when they could be foraging near the river mouths. The shallow depths and geographic orientation result in marine mammal transit as well as sound propagation occurring on a southwest to northeast axis parallel to the coastline. The disturbance zones extend entirely across the passage, so an animal transiting through Icy Passage would swim directly through the ensonified area. Pleasant Island, directly to the south of the project area, serves as a geographic barrier to the propagation of sound. The northern and western coastlines of Pleasant Island truncate the action area because they are less than 2,090 meters from the ferry terminal; thus, those in-water disturbance zones are slightly smaller in area than unobstructed ones would be (without the existence of Pleasant Island).

**Stressors Not Likely to Adversely Affect ESA-listed Species**

Based on a review of available information, we determined which of the possible stressors may affect, but are not likely to adversely affect listed resources and, therefore, need not be evaluated further in this Opinion. These include changes in water quality and turbidity, changes in habitat, and in-air noise. We have briefly analyzed them below.

*Changes in Water Quality and Turbidity*

Because of the relatively silt-free nature of sediments in subtidal areas, relatively little material will be suspended in the water column during pile driving. However, turbidity may be increased above background levels within the immediate vicinity of construction activities and could exceed turbidity criteria for state water quality standards (18 AAC 70). Because of local currents and tidal action, any potential water quality exceedances are expected to be temporary and highly localized. The local currents will disperse suspended sediments from pile-driving operations at a moderate to rapid rate depending on tidal stage. Fish and marine mammals in the Glacier Bay/Icy Strait region are routinely exposed to substantial levels of suspended sediment from glacial sources.

Hollow steel piles used during construction will not introduce or leach contaminants into the sediment, and resuspension will be temporary, highly localized, and minor. Pile removal will be conducted with a vibratory hammer, creating minimal resuspension.

Short-term effects on listed marine mammal species may occur if petroleum or other contaminants accidentally spill into Icy Passage from machinery or vessels during terminal construction activities. Assuming normal construction and vessel activities, discharges of petroleum hydrocarbons are expected to be small and are not expected to result in high concentrations of contamination within the surface waters. Best Management Practices (BMPs) will be implemented to minimize the risk of fuel spills and other potential sources of contamination. An approved Hazardous Materials Control Plan including provisions for on-site containment equipment (including a boom) will be developed prior to any construction activities. Spill prevention and spill response procedures will be maintained throughout construction activities. Therefore, short-term adverse effects on Steller sea lions and humpback whales will be insignificant.

No long-term effects on water quality are expected to occur in the action area as the result of the proposed action.

Construction activities, in the form of increased turbidity, have the potential to adversely affect forage fish and juvenile salmonid migratory routes in the project area. Both herring and salmon form a significant prey base for Steller sea lions, and herring is a primary prey of humpback whales. Increased turbidity is expected to occur in the immediate vicinity of construction activities. However, suspended sediments and particulates are expected to dissipate quickly within a single tidal cycle.

Juvenile salmon have been shown to avoid areas of unacceptably high turbidities (e.g., Servizi 1988), although they may seek out areas of moderate turbidity (10 to 80 nephelometric turbidity units [NTU]), presumably as cover against predation (Cyrus and Blaber 1987a and 1987b). Feeding efficiency of juveniles is also impaired by turbidities in excess of 70 NTU, well below sublethal stress levels (Bisson and Bilby 1982). Reduced preference by adult salmon homing to spawning areas has been demonstrated where turbidities exceed 30 NTU (20 milligrams per liter [mg/L] suspended sediments). However, Chinook salmon exposed to 650 mg/L of suspended volcanic ash were still able to find their natal water (Whitman *et al.* 1982). Based on these data, it is unlikely that the locally elevated turbidities generated by the proposed action would directly affect juvenile or adult salmonids that may be present during pile driving activities.

Similarly, in a feeding study with Pacific herring larvae, fish were exposed to suspensions of estuarine sediment and Mount Saint Helens volcanic ash at concentrations ranging from zero to 8,000 mg/L. In all experiments, maximum feeding incidence and intensity occurred at levels of suspension of either 500 or 1,000 mg/L, with values significantly greater than controls (0 mg/L). Feeding decreased at greater concentrations. The suspensions may have enhanced feeding by providing visual contrast of prey items on the small perceptive scale used by the larvae. Larval residence in turbid environments such as estuaries may also serve to reduce predation from larger, visual planktivores, while searching ability in the small larval perceptive field is not decreased (Boehlert and Morgan 1985).

Based on these data and the mitigation, it is unlikely that the short-term (up to 171 hours over up to 50 days) and localized increase in turbidities generated by the proposed actions would directly affect juvenile or adult salmonids and herring that may be present in the project area. Therefore, the potential indirect effects on the prey species of Steller sea lions and humpback whales will be insignificant.

Furthermore, foraging Steller sea lions and humpback whales within the action area would not be impacted by elevated turbidities, given the highly localized and temporary nature of any project effects. Therefore, the potential direct effects on Steller sea lions and humpback whales will be insignificant.

*Changes to Habitat*

Hollow steel piles will be used for construction of the terminal and will not introduce or leach contaminants into the sediment surrounding the project site. Existing sediment quality in the project area is assumed to be good and relatively free of contaminants, so there will not be any resuspension of contaminants due to pile driving activities. Therefore, no direct effects on habitat and biota associated with Steller sea lions or humpback whales are anticipated from pile driving and other construction activities.

*Changes to Habitat of Prey Species*

Proposed ferry improvements will alter existing nearshore habitats by increasing overwater coverage by approximately 4,100 square feet within the lower intertidal zone between elevations of –5 feet and +2 feet mean lower low water (MLLW). This increase in overwater shading may affect the migration and rearing of juvenile salmon, the adults of which are prey of Steller sea lions. The scientific literature reflects that juvenile salmon migrating along shorelines have consistently shown behavioral responses upon encountering overwater structures. These responses include pausing, school dispersal, and migration directional changes. The significance of these behavioral effects include displacement from optimal habitats or potential increases in predation as fish disperse away from the nearshore. Most of the literature indicates that the change in light intensity between open areas and shading provided by the overwater structure is a primary contributor of behavioral effects. However, there is little empirical evidence to indicate that these behavioral responses result in decreases in fitness or population (Nightingale and Simenstad 2001).

Several salmon-bearing streams and rearing areas are present near the ferry terminal, as discussed in the *Environmental Baseline* section, so it is quite likely that juvenile salmon rear and migrate in the vicinity of the site and would be potentially affected by proposed increases in overwater coverage. Any increases in shading will be minimized by the use of open-grid steel bridge decking for the entire expansion platform (Sheet 4). The grated platform will allow light penetration to the intertidal zone below. The top of the platform is also 25 feet above the intertidal zone (MLLW; Sheet 5) which will also allow for substantial light penetration.

The addition of 37 piles to the intertidal and subtidal zones will eliminate benthic habitats which juvenile salmon use for feeding and rearing in the nearshore. However, piles will only eliminate 130 square feet of bottom and provide a substantially greater area for epibenthic and macrovegetation attachment within the water column on the piles. Total secondary production could actually increase in the area, but it is not clear how much of this increase would be used by juvenile salmon.

The above analyses and the conservation measures built into the design of the proposed new dock extension (grated materials and height above the intertidal zone) and the lack of any other structures within the Icy Passage nearshore make it unlikely that the proposed increase in overwater coverage will have substantial effects on the fitness of outmigrating and rearing juvenile salmon in the project area nearshore. Similarly, the reduction of total benthic habitat by 130 square feet with the addition of 37 new piles will be an insignificant decrease in the total benthic habitat within Icy Passage. Therefore, the effects on the prey species of Steller sea lions and humpback whales will be insignificant.

*In-Air Noise*

While Steller sea lions may be exposed to in-air noise from the pile driving activities, a standard sound attenuation model suggests that sound generated from impact pile driving would attenuate to the 100db rms criterion within 167 feet from the pile, and noise from vibratory driving would fall below 100 db rms. There are no surveyed haulouts within the action area. Though SSL do haulout on the dock itself, mitigation measures included with the action include shut-down zones and times of day that would reduce the likelihood of in-air exposure so that any effects are discountable.

**Summary of Effects**

Stressors Not Likely to Adversely Affect ESA-listed Species

NMFS determined that changes to water quality and turbidity and habitat due to the activities associated with this project may occur, but the associated effects are expected to be too small to detect or measure and therefore insignificant to WDPS Steller sea lions and Mexico DPS humpback whales. These stressors will not be considered further in this Opinion.

Stressors Likely to Adversely Affect ESA-listed Species

NMFS anticipates that increased exposure to sound levels above ambient noise and increased disturbance and risk of vessel strike associated with construction at the ferry terminal are likely to adversely affect Steller sea lions and humpback whales. These two stressors are discussed further in the Exposure Analysis.

Interrelated/Interdependent Effects

NMFS did not identify any interrelated or interdependent effects associated with this project.

## 6.2. 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 these effects in space and time and the nature of that co-occurrence. In this step of our analysis, 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.

**Exposure to Noise from Pile Driving**

WDPS Steller sea lions and Mexico DPS humpback whales may 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 in-air noise levels.

Temporarily elevated underwater noise during vibratory and impact pile driving has the potential to result in Level B (behavioral) harassment of marine mammals. Level A harassment (resulting in injury) is not expected to occur as a result of the proposed action, and the marine mammal monitoring plan will reduce the potential for exposure to levels of underwater noise above the injury threshold established by NMFS.

**Approach to Estimating Exposures to Noise from Pile Driving**

There are no available density estimates of Steller sea lions in the action area. The best available information on the distribution of these marine mammals in the study area comes from a recent on-site monitoring project, and monitoring efforts at nearby Icy Strait during a construction project in 2015.

ADOT&PF hired two observers to visit the Gustavus dock twice every day between March 7, 2016 and May 15, 2016. They scanned for marine mammals within 2000 meters for at least 30 minutes on each visit and recorded observations. Because these data are at the project location at the same time of year as the Spring phase of work for this project, and in the absence of survey data, NMFS considers these data best available for March through May.

Unfortunately, similar data are not available for the September through November work phase, anticipated in 2018. However, a nearby construction project in Icy Strait had marine mammal observers monitoring large zones during this period in 2015 southwest of the project area. Though Icy Passage and Icy Strait are different locations, they share similar timing of SSL use of prey resources. There are nearby late summer/fall salmon runs near Icy Passage similar to those that likely drove the peak September/October SSL observations in the Icy Strait monitoring results (BerberABAM 2016). Because these data were collected near the project location at the same time of year as one of the work phases for this project, and in the absence of survey data, NMFS considers these data best available for September through November.

These sightings are the best available information regarding the presence of Steller sea lions and humpback whales in the action area during the months when the project will occur. Opportunistic sightings are not considered abundance estimates and do no 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 application states that between 16 and 50 days of pile driving and extraction activity will occur. NMFS used 50 days of pile driving in this exposure analysis, as a conservative estimate.
- Fifty days of work across six months yields an average of 8.33 days of work per month. NMFS used the highest number of observed animals on any one day of the month from on-site surveys in the Spring work season and from nearby Icy Strait 90-day reports in the Fall work season, multiplied by the average number of pile-driving days per month to estimate the total number of exposed animals for each month.
- Actual percentage of WDPS versus EDPS of Steller sea lions is unknown, so NMFS conservatively estimates that all individuals are from the endangered WDPS.
- An estimate of the total number of humpback whales exposed is provided. Only 6% of this total is expected to be from the threatened Mexico DPS.

**Table 9. Estimated monthly total number of Steller sea lions exposed to continuous and impact sourced sounds from pile driving.**

| Month/Year | Project Activity Occurring? | Charter Fishing Season? | Number of Days of Pile Driving & Removal | Maximum Number of Animals Observed on a Single Day | Estimated Monthly Total Number of Exposed Animals |
|---|---|---|---|---|---|
| September 2017 | Construction | Yes | 8.33 | 26[2] | 216.58 |
| October 2017 | Construction | No | 8.33 | 33[2] | 274.89 |
| November 2017 | Construction | No | 8.33 | 9[2] | 74.97 |
| December 2017 | None | No | | | 0 |
| January 2018 | None | No | | | 0 |
| February 2018 | None | No | | | 0 |
| March 2018 | Construction | No | 8.33 | 4[1] | 33.32 |
| April 2018 | Construction | No | 8.33 | 7[1] | 58.31 |
| May 2018 | Construction | Yes | 8.33 | 6[1] | 49.98 |
| June 2018 | None | Yes | | | 0 |
| July 2018 | None | Yes | | | 0 |
| August 2018 | None | Yes | | | 0 |
| Total | | | | | 708.25<br>709 (rounded up) |

[1] These estimates come from observations made at the dock during March-May of 2016.
[2] These estimates are from monitoring in nearby Icy Strait in 2015.

Individual Steller sea lions 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 are presented in Tables 9 and 10. NMFS expects that the mitigation measures associated with pile driving 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 10. Estimated monthly total number of humpback whales exposed to continuous and impact sourced sounds from pile driving.**

| Month/Year | Project Activity Occurring? | Charter Fishing Season? | Number of Days of Pile Driving & Removal | Maximum Number of Animals Observed on a Single Day | Estimated Monthly Total Number of Exposed Animals |
|---|---|---|---|---|---|
| September 2017 | Construction | Yes | 8.33 | 15[2] | 124.95 |
| October 2017 | Construction | No | 8.33 | 18[2] | 149.94 |
| November 2017 | Construction | No | 8.33 | 1[2] | 8.33 |
| December 2017 | None | No | | | |
| January 2018 | None | No | | | 0 |
| February 2018 | None | No | | | 0 |
| March 2018 | Construction | No | 8.33 | 6[1] | 49.98 |
| April 2018 | Construction | No | 8.33 | 22[1] | 183.26 |
| May 2018 | Construction | Yes | 8.33 | 10[1] | 83.3 |
| June 2018 | None | Yes | | | |
| July 2018 | None | Yes | | | |
| August 2018 | None | Yes | | | |
| Total | | | | | 599.76<br>600 (rounded) |

[1] These estimates come from observations made at the dock during March-May of 2016.
[2] These estimates are from monitoring in nearby Icy Strait in 2015.

We anticipate 6% of these humpback whales, approximately 36, are part of the Mexico DPS listed as threatened under the ESA (Wade *et al.* 2016).

**Table 11. Estimated numbers of listed marine mammals that may be exposed to Level B harassment.**

| Species | Total proposed authorized takes |
|---|---|
| Steller sea lion (Western DPS) | 709 |
| Humpback whale (Mexico DPS) | 36* |

*While a total of 600 humpback whales may be exposed to level B harassment, only 36 of those 600 are expected to be from the threatened Mexico DPS.

**Exposure to Vessel Strike and Noise**

Vessel noise associated with this action will be transmitted through water and constitutes a continuous noise source. NMFS anticipates that whenever noise is produced from vessel operations, it may overlap with Steller sea lions and humpback whales and that some individuals are likely to be exposed to these continuous noise sources.

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). Also, as previously discussed, vessel strikes of humpback whales and Steller sea lions in the region have been documented.

**Approach to Estimating Exposures to Vessel Noise**

There are two phases of vessel noise and associated disturbance related to the proposed action. The first is vessel noise associated with the construction phase, and the second is vessel noise associated with operation of the ferry terminal. Because there will not be any increased capacity or increased use of the ferry terminal as a results of this action, this Opinion does not analyze vessel noise associated with operation of the ferry terminal.

We based our analysis on vessels associated with construction from measurements that were conducted in Knik Arm for the Knik Arm bridge project on similar types of vessels. 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, which is below the threshold NMFS currently uses to determine Level B harassment from a continuous noise disturbance.

NMFS anticipates that the three vessels used in the proposed action for the construction phase will be of a similar size or smaller and therefore likely producing similar or slightly lower noise levels (J. Taylor, personal communication, ADOT&PF, April 2016). Considering the small ensonified area associated with vessel noise from construction, the implementation of vessel avoidance mitigation including the NMFS humpback whale approach regulations and the NMFS code of conduct whenever possible, and the limited duration of construction activities, we do not anticipate exposure from vessel noise to marine mammals at levels that may cause harassment. The effects from the barge and support vessels for this project therefore are expected to be insignificant.

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.

**Approach to Estimating Exposures to Vessel Strike**

As discussed in the Status of the Species section, vessel strikes of humpback whales occur in Southeast Alaska, and often result in life-threatening trauma or death for the cetacean. Documented ship strikes of humpback whales in and near the action area are shown in Figure 7. One vessel strike has occurred within the action area, and many have occurred in nearby Icy Strait.

Although risk of vessel strike has not been identified as a significant concern for Steller sea lions (Loughlin and York 2000), the Recovery Plan for this species states that Steller sea lions may be more susceptible to ship strike mortality or injury in harbors or in areas where animals are concentrated (e.g., near rookeries or haulouts) (NMFS 2008b). Since 2000, there have been four reported ship strikes of Steller sea lions within Alaska, with three occurring in Southeast Alaska.

NMFS concludes that the risk of vessel strike to WDPS Steller sea lions and Mexico DPS humpback whales associated with this action is discountable for the following reasons. The low historic level of strikes in the action area, the relatively small size of the action area compared to available habitat for both species, and the limited duration of operations suggest that juxtaposition in space and time of vessels and marine mammals is unlikely. Also, only 2-3 additional vessels for project construction will be in the water and will be mostly stationary. They will be required to observe the 10 meter exclusion zone for all in-water activity, humpback whale approach regulations, and the marine mammal codes of conduct for vessels during transit. These mitigation measures will further reduce the likelihood of interactions.

## 6.3 Response Analysis

As described in the Effects of the Action section, Steller sea lions and Humpback whales are susceptible to harm and harassment from in-water noise associated with pile driving and removal and from vessel disturbance and strike during the proposed construction activities. Our response analysis that follows determines how WDPS Steller sea lions and Mexico DPS humpback whales are likely to respond after being exposed to these stressors in their environment and directly to themselves. We 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. Our response analysis considers and weighs evidence of adverse consequences. We do not anticipate any beneficial consequences.

### 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 impulsive sounds on marine mammals. Potential effects from impulsive 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 $\mu Pa^2$-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.

California sea lions experienced TTS-onset from underwater non-pulsed sound at 174 dB re 1 µpa (Kastak *et al.* 2005), but also did not show TTS-onset from pulsed sound at 183 dB re 1 µpa (Finneran *et al.* 2003). It is not clear exactly when Steller sea lions may experience TTS and PTS.

**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 a sound exposure level (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 $\mu Pa^2$-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 haulouts or rookeries). Pinnipeds may increase their haulout 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 (up to 171 total hours of impact and vibratory pile driving spread over up to 50 days as presented in Table 1) 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 sound would only be an issue for SSL 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. The NMFS threshold for SSL for in-air noise is 100 dB rms. Hart Croswer (2015) estimated that impact pile driving sounds would attenuate to below 100 dB rms within 167 feet from the sound source. Vibratory pile driving noise levels are anticipated to fall below this in-air noise criterion. This action includes shutdown zones, observation zones, and further mitigation including time of day closures to limit the likelihood that SSL will be exposed to in-air noise above the NMFS threshold for Level B harassment.

**Probable Responses to Noise from Pile Driving**

Pile driving activities associated with the ferry terminal construction, as outlined previously, have the potential to disturb or displace marine mammals. 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 while 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 Steller sea lions or humpback whales. 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.

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 required observation protocols (e.g., no construction occurring after dark or in low visibility conditions and available gear including high magnification binoculars) further enables the implementation of shutdowns to avoid injury, serious injury, or mortality.

The applicant's proposed activities are spatially and temporally localized. Actual pile driving and extraction would be approximately 3 hours per pile for a total of about 171 hours over the course of up to 50 days. 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.

In summary, up to 709 Western DPS Steller sea lions and 36 Mexico DPS humpback whales may be exposed to sound levels up to 160 dB during the proposed action. While mitigation measures including shut-down zones at 25 meters for Western DPS Steller sea lions and 550 meters for Mexico DPS humpback whales are anticipated to avoid Level A exposure, if animals approach within 2,090 meters during impact pile driving, and 3,265 meters during vibratory pile removal or driving, Level B harassment may occur.

**Responses to Vessel Traffic and Noise**

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. *the 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.

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.

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 altering a population's behavioral budget—time and energy spent foraging versus travelling (Lusseau 2004). These impacts can have biologically significant consequences on the energy budget and reproductive output of individuals and their populations.

**Probable Responses to Vessel Traffic**

A work barge, a service vessel, and intermittently one monitoring vessel will be in the water on site during construction (J. Taylor, personal communication, ADOT&PF, May 2016). Vessel speed, course changes, sounds associated with their engines, and displacement of water along their bowline may be considered stressors to marine mammals.

Although the ferry terminal does create some concentration of vessel traffic in the action area, no documented vessel strikes of either Steller sea lions or humpback whales have occurred in the action area. One humpback whale was struck in the action area between the dock and Pleasant Island by a private recreational vessel in 2009 (Figure 7), but it is unknown if that animal was from the Mexico DPS. There are no Steller sea lion haulouts or rookeries within the action area. They are known to haulout on the dock itself in the late afternoon upon the return of charter fishing vessels, but mitigation measures included in this project require that work stop before this behavior leads to harassment or injury. Because no increase in capacity of the dock is anticipated as a result of this action, NMFS does not anticipate an increase in the risk of vessel strike following completion of this action.

The small number of vessels involved in the action, the 10 meter exclusion zone and mitigation measures for fishing vessels returning to the action area, humpback whale approach guidelines, and vessels following the marine mammal code of conduct should prevent close approaches and additional harassment of Steller sea lions and humpback whales. Temporary changes in behavior could occur, such as changing direction while swimming to avoid contact with vessels, detected either audibly or visually, but these responses are not expected to significantly affect individual fitness and are not likely to rise to the level of take.

## 7. 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 action area over the next two years. Reasonably foreseeable future state, tribal, local, or private actions include activities that relate to different scenarios of disturbance from vessel traffic: transportation, tourism, and community development.

Transportation

Nuka (2012) reports that ferries (28%), passenger vessels with overnight accommodations (20%), and cruise ships (19%) comprise the majority of vessel activity in Southeast Alaska even though most of these vessels only operate 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.

Regularly-occurring vessel traffic in the action area can be generally characterized as ferries, commercial and charter fishing boats, whale watch vessels, recreational vessels, or cargo vessels. Cruise ships do not regularly go into the action area, but are certainly nearby in adjacent waters in Glacier Bay and Icy Strait. In addition, research vessels, including the NPS survey described in this Opinion, may operate in the western-most edge of the action area.

Anticipated future use of the Alaska Marine Highway System (AMHS) ferries is of interest in this analysis, since the construction project is at the Gustavus Ferry Terminal. McDowell Group (2016) reports that 4,165 passengers embarked at the Gustavus Ferry Terminal in 2014, indicating considerable reliance on ferry travel from a community that is not connected via a road network. This same study reports that the total number of visitors using the entire AMHS was down by 17 percent in 2015 (based on the number of non-Alaska residents who purchased at least one ferry ticket anywhere). Ship repair and schedule changes may have contributed to this decline.

In an email dated 6/20/16, the project manager stated that the proposed construction would not increase capacity or result in additional ferry service at the Gustavus terminal. So, NMFS assumes AMHS use of the facility will remain at a constant level.

Commercial Fishing

Salmon and halibut commercial fishing contributes to the local economy and is expected to continue into the future at a level comparable to current efforts since no drastic change to those fish stocks or fishing effort are anticipated.

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 (2016) shows the volume and trends of visitors coming to Alaska in recent years in Table 12.

**Table 12. Trends in Summer Visitor Volume, By Transportation Market, 2008-2015. (From McDowell Group 2016)**

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|
| Cruise ship | 1,033,100 | 1,026,600 | 878,000 | 883,000 | 937,000 | 999,600 | 967,500 | 999,600 |
| Air | 597,200 | 505,200 | 578,400 | 604,500 | 580,500 | 619,400 | 623,600 | 702,400 |
| Highway/ferry | 77,100 | 69,900 | 76,000 | 69,300 | 69,100 | 74,800 | 68,500 | 78,000 |
| **Total** | **1,707,400** | **1,601,700** | **1,532,400** | **1,556,800** | **1,586,600** | **1,693,800** | **1,659,600** | **1,780,000** |
| **% change** | **-0.4%** | **-6.2%** | **-4.3%** | **+1.6%** | **+1.9%** | **+6.8%** | **-2.0%** | **+7.3%** |

McDowell Group (2016) also reports that Alaska's summer 2015 visitor volume of 1.78 million was the highest ever recorded since the Alaska Visitor Statistics Program began tracking visitors in 1985. The vast majority of this volume comes on cruise ships and via airplanes.

Whale-watching 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). There are several companies operating out of Gustavus that take tourists into Glacier Bay National Park, as well as in nearby waters in Icy Strait and near Point Adolphus. Charter (sport) fishing is also popular among visitors in the area. Operators offer single day and multiple-day excursions to waters in and around Glacier Bay, to and from the Gustavus dock. NMFS expects whale-watching and sport-fishing to continue into the foreseeable future at levels comparable to current levels, since no additional capacity is planned at the dock.

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

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 due to small population size and low population growth; however, small development projects are ongoing and likely to continue.

Summary of Cumulative Effects

The action area will likely continue to function as a localized concentration area for fishing, tourism including whale watching, and general water-based transit. Restrictions in capacity at the Gustavus dock and in tourism facilities in general, and well as low expected population growth in the area, will likely limit substantial growth. These types of activities will continue to occur in the action area, but at a level comparable to present. The current and recent population trends for both Western DPS Steller sea lions and humpback whales in Southeast Alaska indicate that these levels of activity are not hindering population growth.

## 8. INTEGRATION AND SYNTHESIS

The Integration and Synthesis section is the final step of NMFS's assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action to the environmental baseline and the cumulative effects to formulate the agency's Opinion as to whether the proposed action is likely to: (1) result in appreciable reductions in the likelihood of the survival or recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) result in the adverse modification or destruction of critical habitat as measured through potential reductions in the value of designated critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species.

As we discussed in the Approach to the Assessment section of this Opinion, we begin our risk analyses by asking whether the probable physical, physiological, behavioral, or social responses of endangered or threatened species are likely to reduce the fitness of endangered or threatened individuals or the growth, annual survival or reproductive success, or lifetime reproductive success of those individuals.

Here we assess the consequences of the responses to the individuals that have been exposed, the populations those individuals represent, and the species those populations comprise.

### WDPS Steller Sea Lion Risk Analysis

The Steller sea lion recovery plan (NMFS 2008) lists recovery criteria that must be accomplished in order to downlist the WDPS from endangered to threatened and to delist the WDPS. More details and exact specifications can be found in the plan, but these criteria generally include an increased population size, requirements that any two adjacent sub regions cannot be declining significantly, reducing the threats to sea lion foraging habitat, reducing intentional killing and overutilization, and others. NMFS concludes that WDPS Steller sea lion response from the proposed activities will not impede progress towards these recovery criteria due to the low anticipated level of harassment, no anticipated injury or mortality, and no significant effects to habitat.

Based on the results of the exposure analysis for the proposed activities, we expect a maximum of 709 Steller sea lions may be behaviorally harassed by noise from pile driving, and we conservatively assume that all of those individuals are from the WDPS. Disturbance from vessels and potential for vessel strike may occur as a result of the proposed activities, but adverse effects to Steller sea lions from vessel disturbance are likely to be insignificant due to the following: small marginal increase in such activities relative to the environmental baseline; mitigation measures in place to reduce approach distances and transitory nature of vessels; adverse effects from vessel strike are considered discountable because sea lions are rarely struck by vessels; implementation of mitigation measures to reduce speed and approach distances; and the limited number of vessels using the action area.

Steller sea lions' probable response to pile driving and removal includes brief startle reactions or short-term behavioral modification. These reactions and behavioral changes are expected to subside quickly when the exposures cease. 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 Steller sea lions. NMFS does not anticipate any effects from this action on the reproductive success of SSL. As discussed in the Description of the Action section, this action does not overlap in space or time with SSL breeding. There are no rookeries in the action area, and there are no construction activities occurring during the SSL breeding season. 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, both the short duration of actual sound generation and the 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. Cumulative effects of future state or private activities in the action area are likely to affect Steller sea lions at a level comparable to present. The current and recent population trends for Western DPS Steller sea lions in Southeast Alaska indicate that these levels of activity are not hindering population growth.

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

**Mexico DPS Humpback Whale Risk Analysis**

Based on the results of the exposure analysis, we expect a maximum of 600 humpback whales may be exposed to noise from pile driving, but only 36 of those humpback whales are anticipated to be from the Mexico DPS. Exposure to vessel noise from transit and potential for vessel strike may occur, but adverse effects from vessel disturbance and noise are likely to be insignificant due to the small marginal increase in such activities relative to the environmental baseline, mitigation measures in place to reduce approach distances, and the transitory nature of vessels. Adverse effects from vessel strike are considered discountable because of the implementation of mitigation measures to reduce speed and approach distances, and that few additional vessels are introduced by the action.

Humpback whales' probable response to pile driving and pile removal includes brief startle reactions or short-term behavioral modification. These reactions and behavioral changes are expected to subside quickly when the exposures cease. 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 discussed in the Description of the Action and Status of the Species sections, this action does not overlap in space or time with humpback whale breeding. Mexico DPS humpback whales feed in Southeast Alaska in the summer months, but migrate to Mexican waters for breeding and calving in winter months. As a result, the probable responses to pile driving noise are not likely to reduce the current or expected future reproductive success of Mexico DPS 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. Cumulative effects of future state or private activities in the action area are likely to affect humpback whales at a level comparable to present. The current and recent population trends for humpback whales in Southeast Alaska indicate that these levels of activity are not hindering population growth.

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

# 9. CONCLUSION

This Biological Opinion has considered the direct, indirect, and cumulative effects of this action on WDPS Steller sea lions and Mexico DPS humpback whales. The proposed action is expected to result in direct and indirect impacts to Steller sea lions and humpback whales. We estimate 709 WDPS Steller sea lions and 36 Mexico DPS humpback whales 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, although individuals 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 WDPS Steller sea lions or Mexico DPS humpback whales.

## 10. 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 (16 U.S.C. § 1532). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity (50 CFR § 402.02). While the ESA does not define harassment, NMFS recently developed guidance on the interpretation of the term "harass" where we interpret it in a manner similar to the USFWS[4] where harass means to: "Create 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"(Wieting 2016). The MMPA defines Level B harassment as: "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)). For this consultation, PR1 anticipates that any take will be by Level B harassment only. No Level A takes are contemplated or authorized.

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 (ITS).

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. PR1 and FHWA have a continuing duty to regulate the activities covered by this incidental take statement. In order to monitor the impact of incidental take, PR1 and FHWA 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 PR1 and FHWA (1) fail to require the authorization holder to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms that are added to the authorization, 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.

[4] See 50 CFR 17.3

15.1 Amount or Extent of Take

Section 7 regulations require NMFS to estimate the number of individuals that may be taken by proposed actions or utilize a surrogate (e.g., other species, habitat, or ecological conditions) 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 80 FR 26832, May 11, 2015). Table 13 lists the amount of authorized take (incidental take by harassment) for the two work periods: (1) March 1 – May 31, 2018, and (2) September 1 – November 30, 2018.

**Table 13. Summary of instances of noise exposure associated with the proposed action's pile driving and removal activities resulting in the incidental take of WDPS Steller sea lions and Mexico DPS humpback whales by behavioral harassment.**

| Species | Estimated Instances of Exposure to ≥120 dB (vibratory) or ≥160 dB (impact) re 1 μPa | | Total Amount of Take Associated with Proposed Action |
|---|---|---|---|
| | March 1 – May 31, 2018 | Sep 1 – Nov 30, 2018 | |
| Steller sea lion, western DPS | 142 | 567 | 709 |
| Humpback Whale, Mexico DPS | 19 | 17 | 36* |

*While a total of 600 humpback whales may be exposed to level B harassment, only 36 of those 600 are expected to be from the threatened Mexico DPS.

15.2 Effect of the Take

Available research on the effects of noise associated with pile driving and removal have suggested that Steller sea lions and humpback whales are likely to respond behaviorally upon hearing this low-frequency noise. The only takes authorized during the proposed action are takes by acoustic harassment. No serious injury or mortalities are anticipated or authorized as part of this proposed action. Although the biological significance of those behavioral responses remains unknown, this consultation has assumed that exposure to major noise sources might disrupt one or more behavioral patterns that are essential to an individual animal's life history. However, any behavioral responses of these marine mammals to major noise sources and any associated disruptions are not expected to affect the reproduction, survival, or recovery of these species.

In Section 9 of the Opinion, NMFS determined that the level of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to Steller sea lions or humpback whales, or destruction or adverse modification of Steller sea lion critical habitat.

## 15.3 Reasonable and Prudent Measures (RPMs)

"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 Steller sea lions and humpback whales resulting from the proposed action.

1. This ITS is valid only for the activities described in this Opinion, and which have been authorized under section 101(a)(5) of the MMPA.
2. The taking of Steller sea lions and humpback whales 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. ADOT&PF and PR1 shall implement a monitoring program that allows NMFS AKR to evaluate the exposure estimates contained in this Opinion and that underlie this incidental take statement.
4. ADOT&PF and PR1 shall submit a final report to NMFS AKR that evaluates the mitigation measures and the results of the monitoring program.

## 15.4 Terms and Conditions

"Terms and conditions" implement the reasonable and prudent measures (50 CFR § 402.14(i)(1)(iv) and (i)(2)). 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, the PR1 must comply with the following non-discretionary terms and conditions, which implement the RPMs described above and the mitigation measures set forth in this Opinion. PR1 has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR § 402.14(3)). If PR1 (1) fails to require the authorization holder to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms that are added to the authorization, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Partial compliance with these terms and conditions may result in more take than anticipated, and may 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, ADOT&PF, NMFS PR1, or their authorization holder must undertake the following:*

A. ADOT&PF 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, ADOT&PF, NMFS PR1, or their authorization holder must undertake the following:*

A. Conduct the action as described in this document including all mitigation measures and observation and shut-down zones unless modified by sound source verification reporting and approved modification by NMFS AKR.
B. 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.
C. 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 NMFS Alaska Regional Stranding Coordinator at 907-271-1332 (Mandy.Migura@noaa.gov), and NMFS PR1 robert.pauline@noaa.gov.

*To carry out RPM #3,* ADOT&PF, *NMFS PR1, or their authorization holder must undertake the following:*

A. The disturbance and shut down zones must be fully observed during daylight hours with good visibility, in order to document observed incidents of harassment as described in the mitigation measures associated with this action.

*To carry out RPM #4,* ADOT&PF, *NMFS PR1, or their authorization holder must undertake the following:*

A. ADOT&PF 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 at the end of the first construction season (by June 30, 2018) and at the end of the project (by December 31, 2018) 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 must contain the following information:

- Dates, times, species, number, location, and behavior of any observed ESA-listed marine mammals, including all observed humpback whales. Note that only 6% of those are expected to be from the threatened Mexico DPS and will count towards the humpback whales listed in the Incidental Take Statement associated with this Opinion.

- 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. If the number of takes approaches 75% of the total amount authorized, PR1 should send that information in a report to Kristin.Mabry@noaa.gov which also contains a description of the amount of project activity remaining at that point, within 5 business days.
- 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.
- Reports of any directly observed instances of humans feeding Steller sea lions or Steller sea lions scavenging on fish waste.

## 11. 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 (16 U.S.C. § 1536(a)(1)). 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. In project action areas where Steller sea lions have been observed feeding on fish waste, including this project and others, PR1 and FHWA should work with applicants, NMFS Alaska Region, and local organizations to provide training to the public on how to avoid "feeding" Steller sea lions, thus decreasing their attraction to the action area and minimizing harassment from the project.
2. Operators should use real-time passive acoustic monitoring to alert vessels to the presence of whales, primarily to reduce the risk of vessel strikes.
3. Ferry bridge crews should participate in the WhaleAlert program to report and view real-time sightings of whales while transiting in the waters of Southeast Alaska. More information is available at https://alaskafisheries.noaa.gov/pr/whale-alert

4. NMFS PR1 and FHWA 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's Protected Resources Division informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, PR1 and FHWA should notify NMFS of any conservation recommendations they implement in their final action.

## 12. REINITIATION OF CONSULTATION

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 incidental take is exceeded, (2) new information reveals effects of the agency action on listed species or designated 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 on 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. In instances where the amount of incidental take is exceeded, section 7 consultation must be reinitiated immediately.

## 13. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) (Data Quality Act (DQA)) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the Opinion addresses these DQA components, documents compliance with the DQA, and certifies that this Opinion has undergone pre-dissemination review.

### 18.1 Utility

This document records the results of an interagency consultation. The information presented in this document is useful to NMFS and the general public. These consultations help to fulfill multiple legal obligations of the named agencies. The information is also useful and of interest to the general public as it describes the manner in which public trust resources are being managed and conserved. The information presented in these documents and used in the underlying consultations represents the best available scientific and commercial information and has been improved through interaction with the consulting agency.

This consultation will be posted on the NMFS Alaska Region website: http://alaskafisheries.noaa.gov/pr/biological-opinions/. The format and name adhere to conventional standards for style.

## 18.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

## 18.3 Objectivity

***Standards:*** This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the ESA Consultation Handbook, ESA Regulations, 50 CFR Part 402.

***Best Available Information:*** This consultation and supporting documents use the best available information, as referenced in the literature cited section. The analyses in this Opinion contain more background on information sources and quality.

***Referencing:*** All supporting materials, information, data, and analyses are properly referenced, consistent with standard scientific referencing style.

***Review Process:*** This consultation was drafted by NMFS staff with training in ESA implementation, and reviewed in accordance with Alaska Region ESA quality control and assurance processes.

## 14. REFERENCES

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