UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion for Construction of Haines Alaska Ferry Terminal and 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-2017-9661

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

Affected Species and Determinations:

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

Consultation Conducted By: National Marine Fisheries Service, Alaska Region

Issued By: Robert D Mecum for
James W. Balsiger, Ph.D.
Regional Administrator

Date: October 20, 2017

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TERMS AND ABBREVIATIONS

PR1	Protected Resources, NMFS Headquarters Office
PRD	Protected Resources Division, Alaska NMFS
ADOT&PF	Alaska Department of Transportation and Public Facilities
ITS	Incidental Take Statement
SSL	Steller Sea Lion
DPS	Distinct Population Segment
GOA	Gulf of Alaska
WDPS	Western Distinct Population Segment
AMHS	Alaska Marine Highway System
ESA	Endangered Species Act
MMPA	Marine Mammal Protection Act
MMO	Marine Mammal Observer
ZOE	Zone of Exclusion
IHA	Incidental Harassment Authorization
FHWA	Federal Highway Administration
MLLW	Mean Lower Low Water
TTS	Temporary Threshold Shifts
PTS	Permanent Threshold Shifts
PSO	Protected Species Observers
SSV	Sound Source Verification

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 ensure 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, 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 may fulfill this general requirement informally 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 agency's action is likely to affect ESA-listed species and their critical habitat. If incidental take is reasonably certain to occur, 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 to minimize such impact, and sets forth terms and conditions to implement those measures.

For the actions described in this document, the action agencies are the NMFS 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 Level A and Level B take of humpback whales in conjunction with construction activities at the Haines Ferry Terminal, and the Federal Highway Administration (FHWA), which proposes to fund modifications to a ferry terminal in Haines, Alaska. The environmental review, consultation, and other actions required of the FHWA 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 executed by FHWA and ADOT&PF. The consulting agency for this proposal is NMFS's Alaska Region. This document represents NMFS's biological opinion (Opinion) on the effects of these proposed actions on endangered and threatened species and designated critical habitat.

The Opinion and ITS were prepared by NMFS Alaska Region in accordance with section 7(b) of the ESA and implementing regulations at 50 CFR pt. 402.

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

1.1. Background

This Opinion considers the effects of activities associated with ferry terminal construction in Haines, 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*), as well as the designated critical habitat for the Steller sea lion.

This Opinion is based on information provided in the March 16, 2017 Biological Assessment (ADOT&PF 2017a); the March 16, 2017 Request for Incidental Harassment Authorization (ADOT&PF 2017b); emails and telephone conversations between NMFS Alaska Region, 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.

1.2. Consultation History

On January 9, 2017, PR1 received an initial draft Incidental Harassment Authorization (IHA) application from ADOT&PF for non-lethal take of marine mammals incidental to a ferry terminal modification construction project. A revised IHA application followed on March 16, 2017 and a further revised version on June 1, 2017.

On January 11, 2017, NMFS Alaska Region received from ADOT&PF a draft Biological Assessment (BA) and a letter requesting initiation of formal consultation and a revised BA and initiation letter followed on March 16, 2017. NMFS Alaska Region deemed the initiation package complete and initiated consultation with ADOT&PF on March 16, 2017.

On June 30, 2017, NMFS Alaska Region provided PR1 and ADOT&PF with a copy of the draft Opinion on the suite of activities that would be permitted by PR1 and ADOT&PF. On July 10, 2017 ADOT&PF submitted comments on the draft Opinion. NMFS Alaska Region reviewed all comments submitted and revised the Opinion accordingly. On July 20, 2017, ADOT&PF amended the action to include sound source verification and submitted an underwater noise monitoring plan to NMFS Alaska Region. On August 17, 2017, ADOT&PF made NMFS Alaska Region aware, via email, of significant changes to the timing of the proposed action. In light of the revised action, the initiation date was revised to August 17, 2017. On September 13, 2017, PR1 submitted a request to initiate section 7 consultation with the NMFS Alaska Region, and PRD initiated consultation with PR1.

DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

1.3. Proposed Action

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

This Opinion considers the effects of modifying the Haines ferry terminal Lutak dock in the northern end of Lynn Canal, as well as the effects of authorizing an IHA to take marine mammals by harassment under the MMPA incidental to the ferry terminal modifications. The Lutak dock is used by the Alaska Marine Highway System (AMHS) for both mainline ships and fast ferries, and for tug and barges (operated by Alaska Marine Lines and Delta Western). The ferry terminal is located approximately four miles north of the city of Haines, Alaska (Figure 1) and serves as an important link for the Haines community and continental road system vehicle traffic to marine transportation and shipping.

The purpose of this proposed action is to make necessary modifications to the Haines ferry terminal for it to be capable of accepting a new design of AMHS ship, called the "Alaska class" vessel design. A new Alaska class vessel is currently being constructed in Ketchikan, Alaska and is expected to be operational in 2019. It will be smaller than most other AMHS ships currently in circulation. The proposed action will add capacity to the Haines Ferry Terminal, but the overall frequency of ferry traffic will remain a product of the AMHS operating budget, and passenger and vehicle demand in the Lynn Canal region, and is not expected to increase as a result of this action (per email from J. Taylor and D. Lowell, ADOT&PF, May 2017).

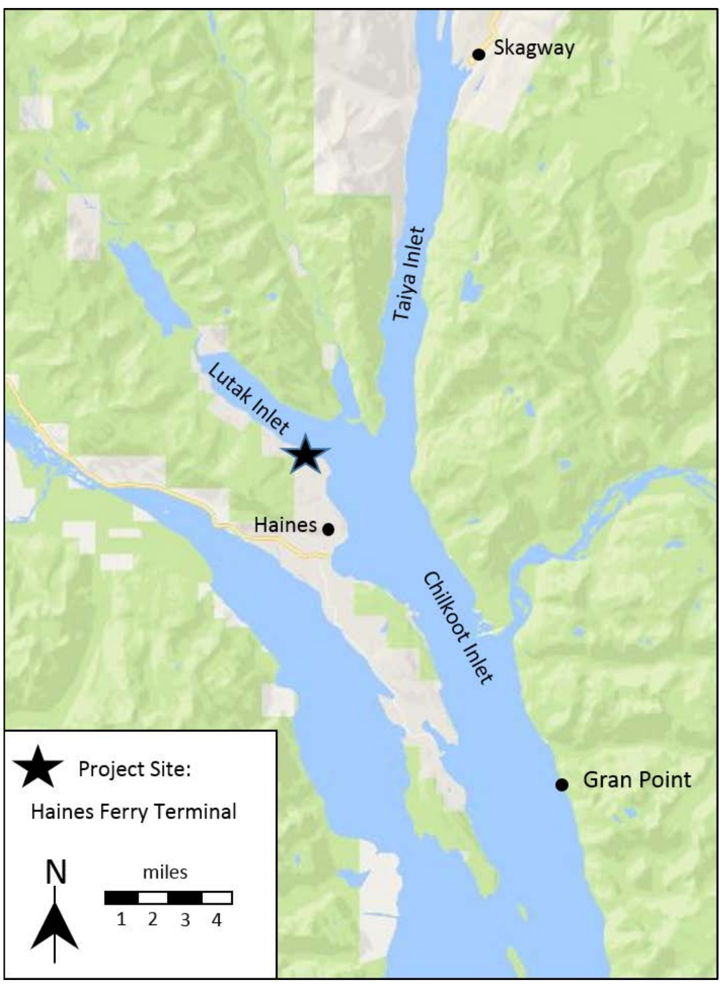

Figure 1. Area map of Haines Ferry Terminal Improvement Project, including nearby geographic locations referenced in this Opinion.

1.3.1. Proposed Activities

The ferry terminal modifications include the following:

- Demolishing and removing a 4-pile structure;
- Dredging to -30 Mean Lower Low Water (MLLW) to provide sufficient water depth for safe maneuvering;
- Any dredge material will be dumped in deep waters of Lynn Canal;
- Replacing riprap slope protection at proposed dredge slope;
- Installation of:
  - One concrete mooring and vehicle transfer float;
  - Restraint structures (two 4-pile and one 7-pile float);
  - Two steel transfer bridges associated with abutment and bearing structures;
  - Four 4-pile and one 6-pile mooring and berthing structures;
  - Personnel access catwalks and gangways;
  - Passenger waiting shelter;
  - Electrical components for marine and upland areas; and
  - Paving and striping of the staging areas.

In total, four 30-inch piles would be removed and 37 new piles would be installed. Of the newly installed piles, 15 piles will be 36-inch diameter, 1 inch wall thickness and the remaining 22 piles will be 30-inch diameter with ¾ inch wall thickness. Generally, two piles would be removed or installed in a day. Thus, it is anticipated that there will be a total of 21 days of in-water pile removal/driving. Because pile driving and removal produce similar sound profiles and levels (MacGillivray et al. 2015), vibratory pile driving sound estimates will be used as a proxy for vibratory pile removal sound levels. The proposed construction will begin as soon as practicable after October 1, 2018 and be completed within one year. All pile driving/removal will occur either during the window of October 1, 2018 to January 31, 2019, or the window of June 1, 2019 to September 30, 2019 to avoid sensitive eulachon runs that occur in spring. (ADOT&PF 2017b, a).

1.3.2. Mitigation Measures

ADOT&PF worked with NMFS Alaska Region and PR1 to develop the following mitigation measures to minimize the potential impacts to marine mammals from the proposed action.

General Construction Activities

1. The construction contractor will follow the conditions and guidance for erosion, sediment, and pollution control outlined in section 641 of the ADOT&PF construction specifications (2015);
2. For equipment noise, ADOT&PF will comply with the requirements of the FHWA Construction Noise Handbook (2005);
3. General best practices for construction sites will be applied, including:
   a. The dock will be maintained in a manner that does not introduce any pollutants or debris into the harbor or cause a migration barrier for fish;
   b. Fuels, lubricants, and other hazardous substances will not be stored below the ordinary high water mark;
   c. Properly sized equipment will be used to drive piles;

d. Oil booms will be readily available for containment should any releases occur;
e. The contractor will check for leaks regularly on any equipment, hoses, and fuel storage that occur at the project site;
f. All chemicals and petroleum products will be properly stored to prevent spills; and
g. No petroleum products, cement, chemicals, or other hazardous materials will be allowed to enter surface waters.

Pile Installation Activities

The following subsections describe mitigation measures proposed by ADOT&PF during pile driving and removal activities. These measures would reduce impacts on marine mammals to the greatest extent practicable throughout the duration of the activities authorized by the IHA.

1. 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). The use of a quieter noise source (vibratory hammer versus an impact hammer) for approximately two-thirds of the work will minimize the total accumulated sound exposure from the project. Only the minimum hammer energy necessary to install piles will be used.
2. Direct pull methods to remove piles will be used to minimize noise levels as much as possible. Direct pull, as the name implies, is a pile extraction method where a crane applies a direct upward force. This method is quieter than other pile extraction methods and sediment is generally less disturbed. However, if the pile requires more upward force than is available from the crane, it may be necessary to employ the vibratory hammer to fully extract the pile. The use a vibratory hammer for pile extraction will only be used when direct pull methods are insufficient.
3. Marine mammal monitoring will be employed during all pile-driving activities and 90-day reports will be produced and sent to NMFS. See below for details on monitoring and reporting protocols.
4. Pile driving operations will be shut down if listed species are observed in the zones listed in Table 1. For Steller sea lions, where Level A take is not expected at any distance, there are no shutdown zones. For humpback whales, there are shutdown zones for impact pile driving (but not for a vibratory hammer) corresponding to the modeled Level A zone. However, the model assumes cumulative sound exposure over a 24 hour period and brief exposure to sound in these zones does not constitute Level A take. Therefore, project activities will be shut down if a humpback whale persist within the Level A shutdown zone for one hour as a conservative measure to prevent Level A harassment take.

Table 1: Shutdown zones for pile driving and removal activities by species.

Species	Vibratory (both pile sizes)		Impact 30-inch		Impact 36-inch	
	km	miles	km	miles	km	miles
Steller sea lions[1]	0	0	0	0	0	0
Humpback whales[2]	0	0	1.65	1.03	2.04	1.27

5. ADOT&PF will conduct a Sound Source Verification (SSV) study per the submitted underwater noise monitoring plan, dated July, 2017. Once SSV measurements have been completed, ADOT&PF will consult PR1 and NMFS Alaska Region and report on their findings within one week of initiating pile driving/removal, to determine if adjustments to the harassment and mitigation zones are necessary.

6. To minimize disturbance and harm to marine mammals from impact pile driving noise, ADOT&PF would implement a soft-start procedure to allow animals to leave the area prior to full sound exposure. For vibratory pile driving and removal, ADOT&PF will initiate pile driving or removal at reduced power for 15 seconds with a one minute interval. This procedure will then be carried out two additional times before using full energy. For impact pile driving, ADOT&PF will provide an initial set of three strikes from the impact hammer at 40 percent energy, followed by a one minute waiting period, then two subsequent 3-strike sets.

7. To reduce potential take, construction will avoid the seasonal influx of marine mammals near Lutak Inlet correlated with forage fish run times in spring, specifically March 1 through May 31. ADOT&PF will not be driving or removing piles during these sensitive times.

Dredging Activities

In addition to previously mentioned erosion, sediment, and pollution control measures, the following mitigation measures specific to dredging activities will be employed.

1. Efforts to reduce benthic disturbance in the action area will be made. Specifically:
    a. No dredge material will be stockpiled on the seafloor, and
    b. No seafloor leveling by dragging the bucket or other device will occur.

2. Turbidity and other water quality parameters will be visually monitored at the project site to ensure construction activities are in compliance with ADEC standards.

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[1]Sound levels will not reach Level A thresholds for Steller sea lions regardless of hammer type or pile size. Therefore, no shutdown zone is designated for Steller sea lions.

[2]To reduce harassment to humpback whales, the project will shut down if a humpback whale enters the Level A zones for impact pile driving and persists there for one hour. Level A impact zones were calculated based on cumulative exposure from 4 hours of pile driving activity over the course of the day (2 piles at 2 hours each), thus, brief exposure does not constitute a Level A take. Shutdown protocols are a conservative measure in place to prevent potential Level A take of Mexico DPS humpback whales in the remote chance that they are present in the impact area during impact pile driving. Sound levels associated with vibratory pile driving/removal will not reach Level A take thresholds for humpback whales, therefore, no shutdown zone is designated.

3. Dredging activities will be shut down if humpback whales or Steller sea lions are seen within 200 meters (219 yards) to reduce potential acoustic disturbance associated with dredging.

Strike Avoidance

1. Vessels will 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:
    a. 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,
    b. Not place vessel in the path of oncoming humpback whales causing them to surface within 100 yards of vessel,
    c. Not disrupt the normal behavior or prior activity of a whale, and
    d. Operate at a slow, safe speed when near a humpback whale (safe speed is defined in regulation (see 33 CFR § 83.06)).

2. Vessels will also follow the NMFS Marine Mammal Code of Conduct for other species of marine mammals which recommend maintaining a minimum distance of 100 yards; not encircling or trapping marine mammals between boats, or boats and shore; and putting engines in neutral if approached by a whale or other marine mammal to allow the animals(s) to pass.

Monitoring Protocols

1. Monitoring will be conducted before, during, and after pile driving and removal activities. In addition, observers will record all incidents of marine mammal occurrence within and approaching the Level A and Level B zones, regardless of distance from activity, and will document any behavioral reactions in concert with distance from piles being driven or removed. Marine mammal observations made outside the shutdown zone (see above) will not result in shutdown; that pile segment would be completed without cessation.

2. The following additional measures apply to visual monitoring:

    Monitoring will be conducted by a minimum of two qualified Protected Species Observers (PSOs). One will be stationed at the ferry terminal and the other will be stationed at Tanani Point, located approximately 1 mile (1.6 km) southeast of the terminal so that they may observe the entire impact zone during all pile driving and removal activities. If it is determined that the entire Level B harassment area cannot be monitored effectively by two PSOs, another PSO will be added to monitor the area. PSOs shall meet 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) Education, training, or suitable combination thereof in biological science, wildlife management, mammalogy or related fields. Observers should have field experience in identification and behavior of marine mammals and project-specific training.

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) Experience or training in protocols to communicate with contractors and operators, including shut down procedures.

f) 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.

g) Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations.

h) 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.

i) Have no other project-related responsibility other than marine mammal monitoring, documentation, and reporting during observation periods.

3. The following equipment will be available to observers to ensure adequate coverage of the pile driving and extraction monitoring areas:

j) Portable radio to communicate with the contractor;

k) Cellular phone with contact information for NOAA Fisheries, the pile installation contractor, and the Alaska Department of Transportation Engineer;

l) Red and green signal flags to use as a back up to radio communication;

m) Daily tide and current tables for the action area;

n) Stopwatch or timekeeping device;

o) High magnification binoculars;

p) Spotting scopes;

q) Rangefinder;

r) Buoys at specified distances to aid in distance approximation;

s) GPS and compass;

t) NOAA Fisheries approved Marine Mammal Observation Record Form (Appendix A) on nonbleeding, waterproof paper;

u) Copy of the final Haines Ferry Terminal Improvements Marine Mammal Monitoring Plan;

v) Copy of the final Haines Ferry Terminal Improvements Incidental Harassment Authorization;

w) Copy of the final Biological Opinion with Terms and Conditions; and

x) Clipboard and pencils.

4. Briefings between construction supervisors and crews and marine mammal monitoring team should occur prior to the start of all pile driving and removal activity, and when new personnel join the work, in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.

5. A two (or three if necessary) 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 eyes 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 exclusion zone. A second observer will either be also located on land from a vantage point that will be supplementing efforts of the first observer. Observers and ADOT&PF will determine safety protocols and decision points for using vessel-based monitoring.

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

   a) Prior to the start of pile driving and removal activity, the shutdown zone will be monitored for twenty minutes to ensure that it is clear of humpback whales. Pile driving and removal will only commence once observers have declared the shutdown zone clear of humpback whales; 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/removal 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/removal that is already underway, the activity will be halted.

   b) If a humpback whale enters the shutdown zone during the course of pile driving/removal operations and remains for one hour, activity will be halted and delayed until either the animal has voluntarily left and has been visually confirmed beyond the shutdown zone or 30 minutes have passed without re-detection of the animal. Monitoring will be conducted throughout the time required to drive/remove a pile.

   c) 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 (see Pile Installation Activities #6).

   d) When a marine mammal is observed within the impact zone, its location will be determined using a rangefinder to verify distance and a GPS or compass to verify heading and the sighting will be recorded for reporting purposes.

7. If the number of Steller sea lions or humpback whales observed within the impact zones during pile driving or removal activities approaches the corresponding number of authorized

takes for that species and take level in the Incidental Take Statement (ITS), AKDOT&PF will notify NMFS, and reinitiate consultation if necessary.

Reporting

1. ADOT&PF will 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 will be presented in a 90-day report, as required by NMFS under the proposed IHA. Additionally, NOAA Fisheries will be notified (via email to Suzie.Teerlink@noaa.gov).

2. Within 90 days of the expiration of the IHA (if issued), a 90-day report will be provided to NMFS that includes:
    a. Summaries of monitoring effort (e.g., total hours, total distances, and marine mammal distribution in the impact zones through the study period, accounting for sea state and other factors affecting visibility and detectability of marine mammals);
    b. 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;
    c. Analyses of the effects of various factors influencing detectability of marine mammals (e.g., sea state, number of observers, and fog/glare);
    d. 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;

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

1.4. Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR § 402.02). For this reason, the action area is typically larger than the project area and extends out to a point where no measurable effects from the proposed action occur.

We define the action area for this consultation to include: 1) the project area; 2) the area within which pile driving and removal noise levels are expected to dissipate to ≥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); 3) the portion of Taiya inlet where dredge material will be disposed; and 4) transit waters between the shipping lanes and project area and between the project area and the disposal site. The action area covers Lutak Inlet and portions of Chilkoot Inlet in northern Lynn Canal (Figure 2).

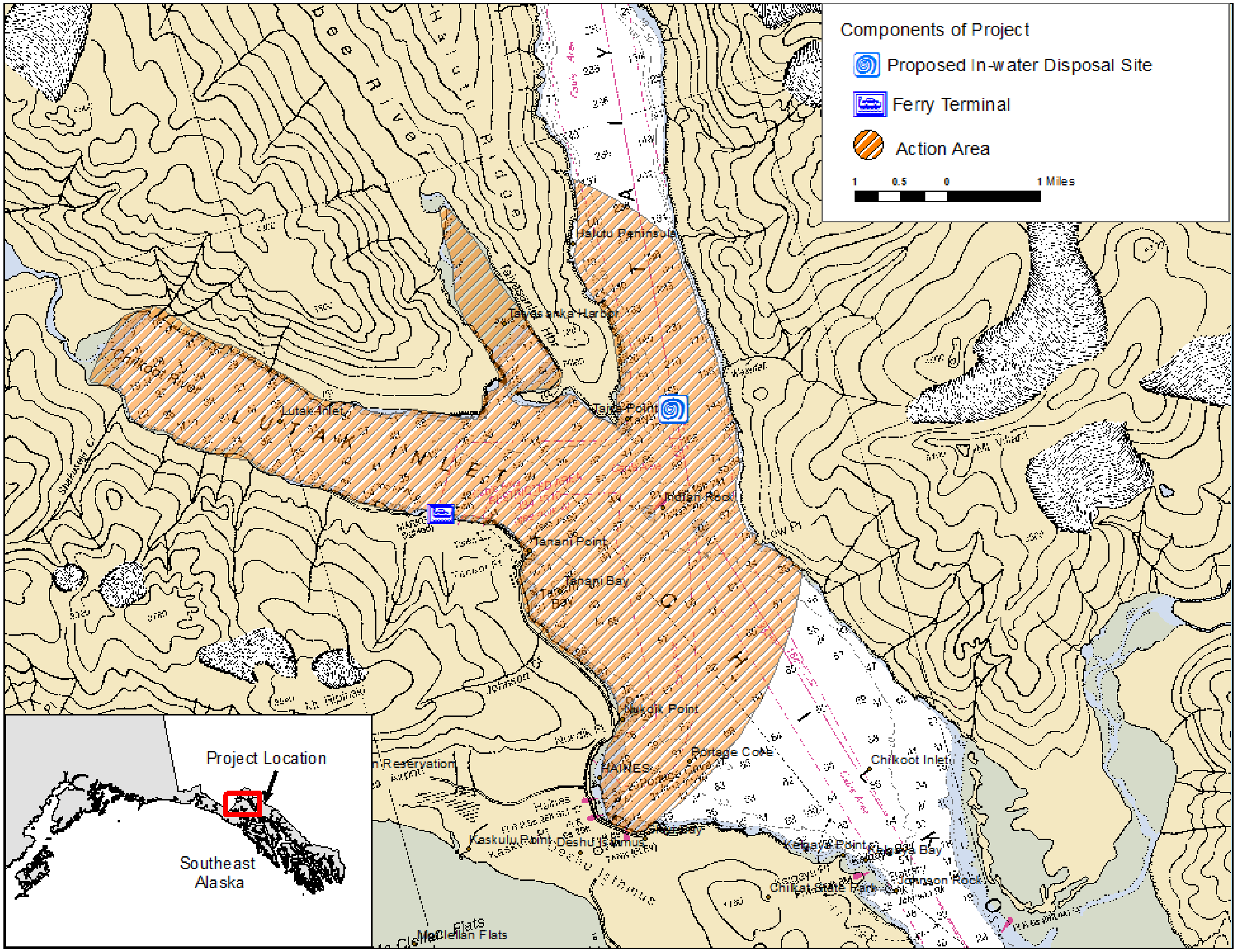

Figure 2. Action Area Map for Haines Ferry Terminal Improvement Project

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 2, 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. 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 of critical habitat for WDPS Steller sea lions uses the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414) 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 Opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

We use the following approach to determine whether the proposed action described in Section 2.1 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 or indirect effects on listed species or critical habitat. As part of this step, we identify the action area – the spatial and temporal extent of these direct and indirect effects.

- Identify the rangewide 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 rangewide status of critical habitat by examining the condition of its PBFs - which were identified when the critical habitat was designated. Species and critical habitat status are discussed in Section 4 of this Opinion.

- 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. The environmental baseline is discussed in Section 5 of this Opinion.

- 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. The effects of the action are described in Section 6 of this Opinion with the exposure analysis described in Section 6.2 of this Opinion.

- 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*). Response analysis is considered in Section 6.3 of this Opinion.

- 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. Cumulative effects are considered in Section 7 of this Opinion.

- 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 (Section 6) to the environmental baseline (Section 5) and the cumulative effects (Section 7) 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 (Section 4). Integration and synthesis with risk analyses occurs in Section 8 of this Opinion.

- Reach jeopardy and adverse modification conclusions. Conclusions regarding jeopardy and the destruction or adverse modification of critical habitat are presented in Section 9. These conclusions flow from the logic and rationale presented in the Integration and Synthesis Section 8 of this Opinion.

- 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

Two species of marine mammals listed under the ESA under NMFS's jurisdiction and may occur in the action area— western Distinct Population Segment (WDPS) Steller sea lions and Mexico DPS humpback whales. No critical habitat occurs within the action area. This Opinion considers the effects of the proposed action on these species (Table 2).

Table 2. 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	May 5, 1997, [62 FR 24345]()	August 27, 1993, [58 FR 45269]()
Humpback Whale, Mexico DPS (*Megaptera novaeangliae*)	Threatened	September 8, 2016, 81 FR 62260	Not designated

1.5. 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 (i.e., less than one year). 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 on WDPS Steller sea lions and Mexico DPS humpback whales would likely include 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.

1.6. Status of Listed Species

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, and discusses the current function of the essential PBFs that help to form that conservation value.

This section consists of narratives for each of the endangered and threatened species that occur in the action area and that may be adversely affected by the proposed action. In each narrative, we present a summary of information on the population structure and distribution of each species 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 or failing to recover.

1.7. Status of WDPS Steller Sea Lions

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 2016) and the recovery plan for Steller sea lions (NMFS 2008). 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*.

1.7.1. Population Structure and Distribution

NMFS reclassified Steller sea lions as two distinct population segments under the ESA in 1997 based on demographic and genetic dissimilarities—the western and eastern stock (62 FR 24345, May 5, 1997). At that time, 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, was listed 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, however, 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, this Opinion does not analyze effects of the proposed action on that DPS.

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

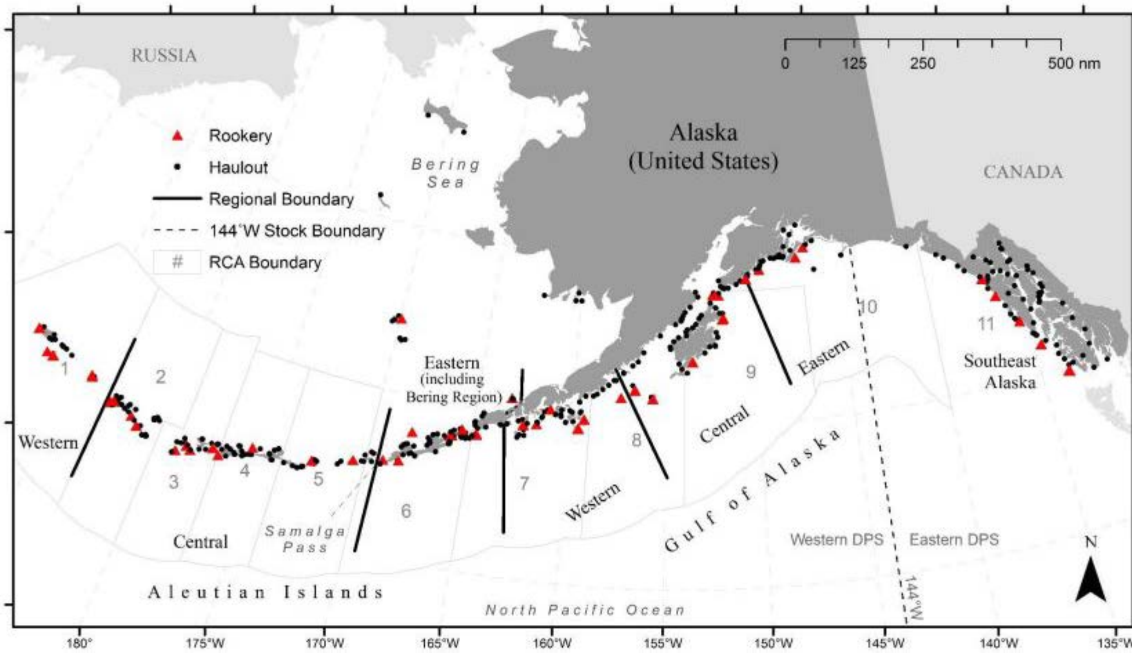

Figure 3. Map of Alaska showing the NMFS Steller sea lion survey regions, rookery, and haulout locations. The line (144°W) separating primary breeding rookeries of the eastern and western distinct population segments (EDPS vs WDPS) is also shown (Fritz et al. 2016).

1.7.2. 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 (DeMaster 2011, Allen and Angliss 2012).

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 (Allen and Angliss 2012). Many studies have 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. Therefore, birth rate, an important parameter driving population trends, is not consistent across the WDPS and is highest in the eastern portion of the WDPS Steller sea lion range (Allen and Angliss 2012).

1.7.3. 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 Steller sea lions may range to find optimal foraging conditions once they are no longer tied to rookeries and haulout sites for nursing and reproduction. Large seasonal differences in foraging ranges have been observed associated with seasonal movements of prey (Merrick et al. 1997).

1.7.4. 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.

1.7.5. 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. NMFS categorizes Steller sea lions in the otariid pinniped functional hearing group, with an applied frequency range between 60 Hz and 39 kHz in water (NMFS 2016c). 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).

1.7.6. 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. The closest designated critical habitat to the action area is the Gran Point haulout, which is approximately 14 miles south of the action area. Therefore, the action will have no effect on critical habitat..

1.7.7. 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, population decline spread and intensified east and west of the eastern Aleutians in the 1980s. Between 1991 and 2000, overall counts of Steller sea lions at trend sites decreased 40%, an average annual decline of 5.4% (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.

More recently, WDPS Steller sea lions have shown an increasing trend in abundance in much of their range. The 2015 Stock Assessment Report for WDPS Steller sea lions indicates a minimum population estimate of 49,497 individuals (Allen and Angliss 2015). The population trend of non-pup WDPS Steller sea lions from 2000-2014 varies regionally, from -7.10 percent per year in the Western Aleutians to +5.22 percent per year in the eastern Gulf of Alaska. Despite incomplete surveys conducted in 2006 and 2007, the available data indicate that overall WDPS Steller sea lions have at least been stable since 2004 (when the last complete assessment was done), although declines continue in the western Aleutian Islands. Overall, the WDPS Steller sea lion population (non-pups only) was estimated to be increasing at about 2.17 percent per year from 2000-2014 (Allen and Angliss 2014).

1.7.8. 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. A small portion of Steller sea lions throughout Alaska are branded as pups, and the brand remains visible in their coat throughout their lives. By surveying haulouts and rookeries and documenting branded animals, it is possible to track branded individuals through space and time. Studies of branded animals have confirmed movement of animals across the EDPS and WDPS 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.

Brand data confirm that WDPS Steller sea lions are sometimes present in northern Lynn Canal, where the project will take place. Although there are no known Steller sea lion haulouts or rookeries directly inside the action area, the Gran Point haulout (~14 miles south of the action area) is likely the predominant haulout used by the Steller sea lions that are found transiting into and out of the action area (personal communication, K. Hastings, ADF&G). From 1995-2016, 253 unique branded individuals were documented at the Gran Point haulout. Of these, four individuals (2%) were from the WDPS and the remaining 249 (98%) were from the EDPS (personal communication, L. Jemison, ADF&G). Therefore, if we assume that branded and unbranded animals follow similar movement patterns, we can conclude that the proportion of WDPS to EDPS are equivalent between the branded and unbranded population. Therefore, for purposes of this analysis, NMFS will consider 2% of the total Steller sea lion density in the action area to be from the endangered WDPS and the remaining 98% to be from the unlisted EDPS.

The seasonal ecology of Steller sea lions in Southeast Alaska has been studied by relating the distribution of sea lions to prey availability (Womble et al. 2005, Womble et al. 2009). Figure 4 depicts a likely seasonal foraging strategy for Steller sea lions in Southeast Alaska. These 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 Status Review of Southeast Alaska Pacific Herring (NMFS 2014b) 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. Herring fishery managers use the presence of sea lions 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 sea lion arrival (Kruse 2000).

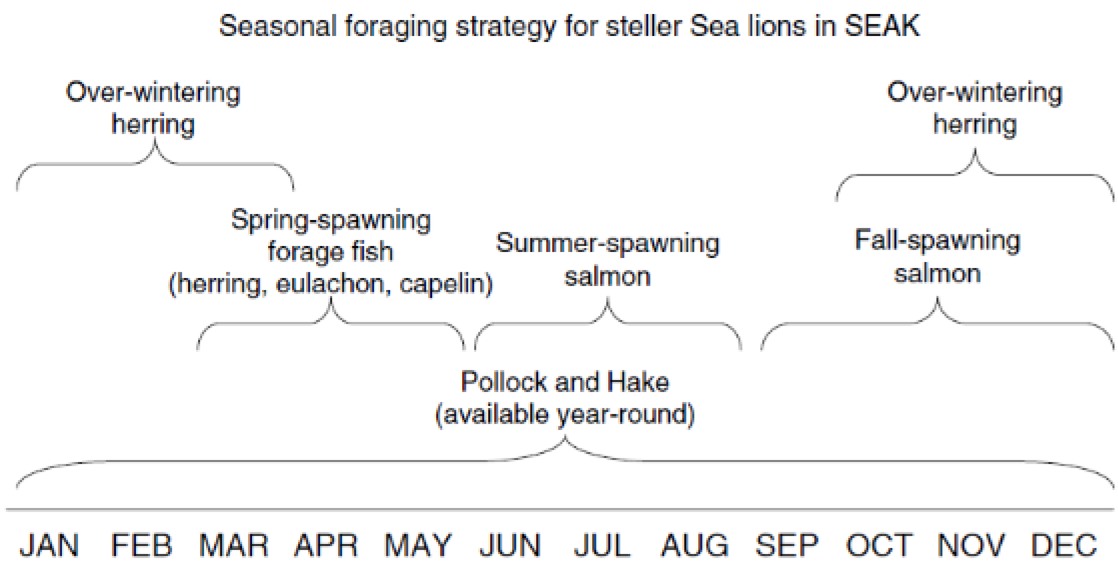

Figure 4. Seasonal foraging ecology of SSL. Reproduced with permission from (Womble et al. 2009).

The action area and surrounding waters contain abundant sources of prey species which draw Steller sea lions in to forage year-round. In particular, the spring spawning of eulachon in Lutak Inlet which occurs in March, April, and early May attracts high numbers of Steller sea lions (Womble et al. 2005). Northern Lynn Canal has fall salmon runs which can also influence Steller sea lion densities, however, these are found outside of the action area and therefore are likely to draw animals away from the action area and reduce potential impacts from pile driving and removal (Womble et al. 2009, ADF&G monthly fishing reports).

1.7.9. 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 2014a).

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, depending on the specific study results. 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 2008). 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).

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 Steller 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.

NMFS Alaska Region 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 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 dropped considerably between 2015 and 2016, and may be a result of increased Office of Law Enforcement (OLE), NMFS Alaska Region, 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, in the form of sea lion research, tourism, and other marine vessel traffic, 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 Opinion (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 Opinion (NMFS 2010) and to the discussion on ocean acidification in Section 7.3 of the Draft Environmental Impact Statement for the Steller sea lion protection measures (NMFS 2013).

1.8. Status of Mexico DPS Humpback Whales

1.8.1. 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 3 below (NMFS 2016a).

Table 3. 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.

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).

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

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 4). 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).

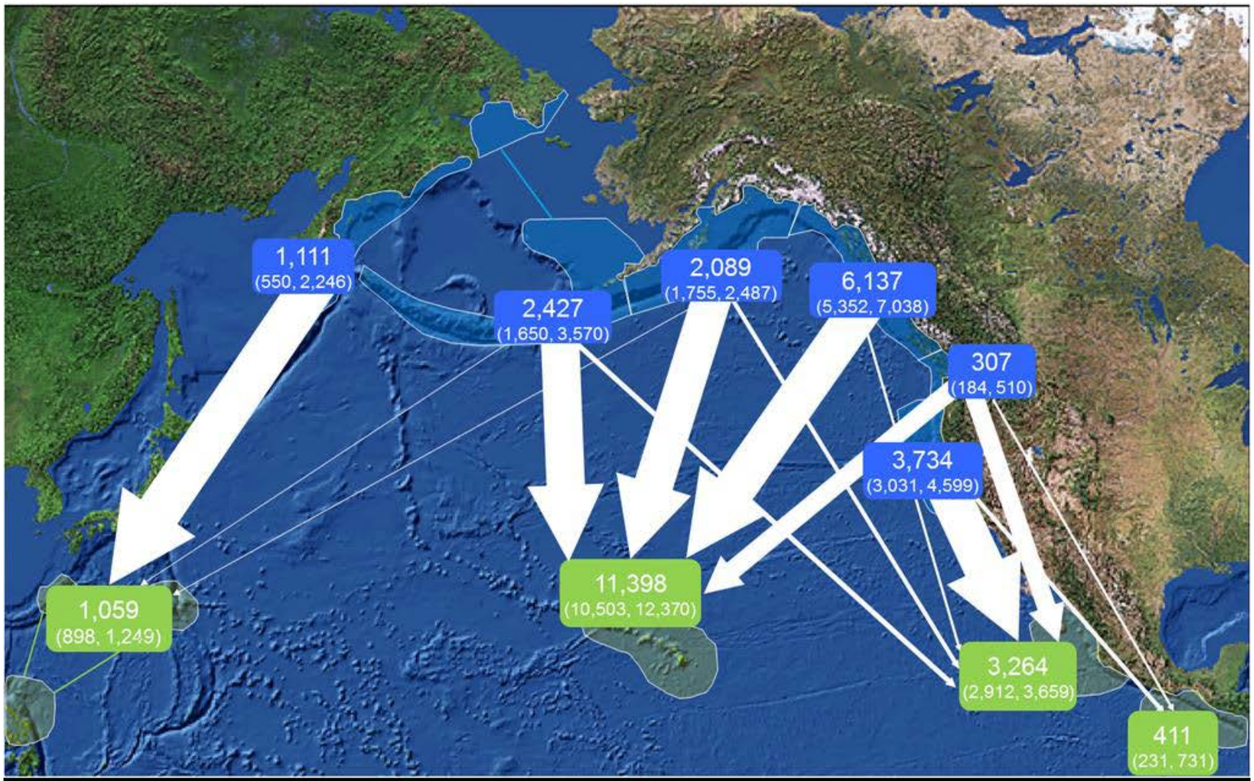

Figure 5. Abundance by summer feeding areas (blue), and winter breeding areas (green), with 95% confidence limits in parentheses. Migratory destinations from feeding area to breeding area are indicated by arrows with width of arrow proportional to the percentage of whales moving into winter breeding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

1.8.2. Humpback Whales in the Action Area

Humpback whale populations in southeast Alaska have been steadily increasing in recent decades. The southeast Alaska-specific rate of increase is approximately 5.6% annually (Calambokidis et al. 2008) and the latest estimate of abundance for Southeast Alaska and northern British Columbia is between 3,005 and 6,137, depending on the modeling approach employed. As previously mentioned, humpback whales in Southeast Alaska are 94% comprised of the Hawaii DPS (not listed) and 6% of the Mexico DPS (threatened; Wade *et al.* 2016). Given Wade *et al.* (2016), we use 6% in this analysis 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 low latitudes, 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) Moran and Straley, in press).

Northern Lynn Canal, where the action area is located, has relatively low humpback whale abundance relative to other areas throughout Southeast Alaska. Humpback whales are infrequently sighted off Haines in northern Lynn Canal, predominantly in the summer months, but generally not seen in the action area (personal communication, K. Hastings and L. Jemison, ADF&G; B. VanBurgh; L. Short-Forrer and W. Carnes, AMHS deck officers).

1.8.3. 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).

1.8.4. Feeding and Prey Selection

Humpback whales tend to feed predominantly 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).

1.8.5. Diving and Social Behavior

In Southeast Alaska waters, humpback whales have been observed diving for an average of 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 1987). 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).

1.8.6. Vocalization and Hearing

Humpback whales may react to and be harassed by in-water noise. NMFS categorizes humpback whales in the low-frequency cetacean functional hearing group, with an applied frequency range between 7 Hz and 35 kHz (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).

1.8.7. Critical Habitat

Critical habitat has not been designated for Mexico DPS humpback whales, and therefore is not analyzed in this Opinion.

1.8.8. 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

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).

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 either most killer whale attacks result in mild scarring, or that those resulting in severe scarring (4 or more rakes, parts of fluke missing) are more often fatal. Most observations of humpback whales under attack from killer whales reported vigorous defensive behavior and tight grouping where more than one humpback whale was present (Ford and Reeves 2008).

Photo-identification data indicate that rake marks are often acquired very early in life, though attacks on adults also occur (Mehta *et al.* 2007, Steiger *et al.* 2008). Killer whale predation may be a factor influencing survival during the first year of life (Mehta *et al.* 2007). There has been some debate as to whether killer whale predation (especially on calves) is a motivating factor for the migratory behavior of humpback whales (Clapham 2001, Corkeron and Connor 1999), however, this remains unsubstantiated.

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 may 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 Hawaii 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 humpback 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.

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.

1.9. Stressors on WDPS Steller Sea Lions

Disturbance from vessel transit, competition for prey, and effects from climate change 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).

1.9.1. Vessel Disturbance and Strike

Vessel-based recreational activities, commercial fishing, shipping, and general transportation occur within the action area regularly. All of which increase ambient in-air and underwater noise and pose risk of vessel-whale collisions. 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.

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.

1.9.2. Competition for Prey

Competition for prey species could exist between Steller sea lions and other marine life and Steller sea lions and commercial fishing. 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.

1.9.3. Climate Change

The indirect effects of climate change would result from changes in the distribution of temperatures suitable for reproduction, the distribution and abundance of prey and abundance of competitors or predators. The effects of climate changes to the marine ecosystems of the Gulf of Alaska, including northern Lynn Canal, and how they may affect Steller sea lions are uncertain. Warmer waters could favor productivity of some species of forage fish, but the impact on recruitment of important prey fish of Steller sea lions is unpredictable. Recruitment of large year-classes of gadids (e.g., pollock) and herring has occurred more often in warm than cool years, but the distribution and recruitment of other fish (e.g., osmerids) could be negatively affected (NMFS 2008).

1.10. Stressors on Mexico DPS Humpback Whales

Disturbance and risk of vessel strike from transiting vessels, competition for prey, and effects from climate change could be sources of stress to humpback whales in the action area. A short description and summary of the effects of this stressor are presented below. More detailed analyses are available in the most recent humpback whale recovery plan (NMFS 1991) and ESA Status Review (Bettridge *et al.* 2015).

1.10.1. 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 increase underwater noise and contribute to the risk of vessel-whale collisions.

Vessel strikes are a leading cause of mortality in large whales. 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

Further, the authors used previous locations of whale strikes to produce this kernel density estimation. The high risk areas shown in red in Figure 6 are also popular whale-watching destinations (Neilson et al. 2012). The action area is not identified as an area of high risk in this analysis.

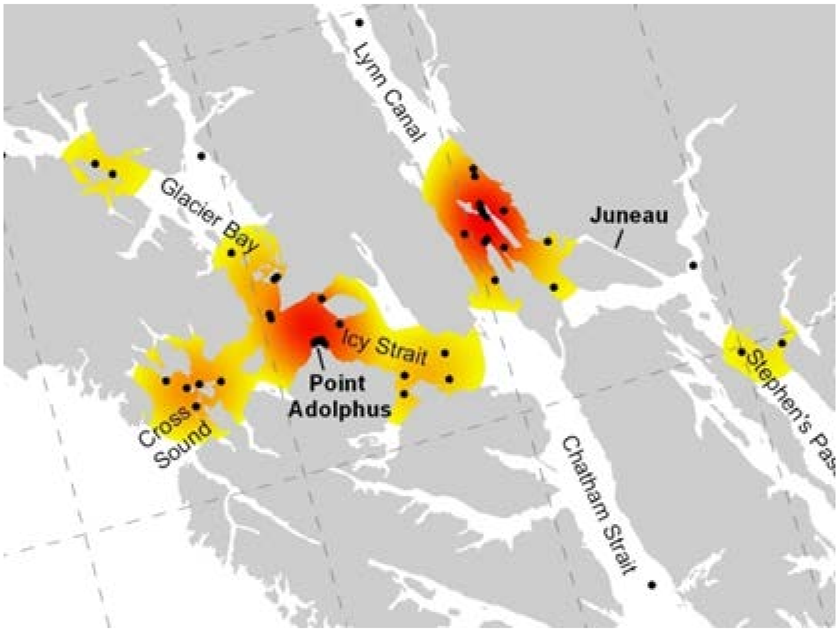

Figure 6. High Risk Areas for Vessel Strike in northern Southeast Alaska. Used with permission from (Neilson et al. 2012).

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:

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

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 to reduce the risk of ship strike and contribute to whale avoidance.

1.10.2. Competition for Prey

Competition for prey between humpback whales other marine life and humpback whales and humans may exist. Humpback whales feed on schooling fish, including species that are harvested by humans commercially or for personal use. Given the recent abundance trends discussed above and the remoteness and small scale of the action area compared to commercial and personal use fishing grounds, NMFS expects any competition for prey in the action area to be insignificant.

1.10.3. Climate Change

The indirect effects of climate change would result from changes in the distribution of temperatures suitable for the distribution and abundance of prey and the distribution and abundance of competitors or predators. For example, variations in the recruitment of krill (*Euphausia superba*) and the reproductive success of krill predators have been linked to variations in sea-surface temperatures and the extent of sea-ice cover during the winter months (which is related to climate change). Because krill are important prey for baleen whales or form a critical component of the food chains on which baleen whales depend, increasing the variability of krill densities or causing those densities to decline dramatically could have adverse effects on populations of baleen whales.

EFFECTS OF THE ACTION

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

This 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* (section 8) that integrates information presented in the *Status of the Species* (section 4) and *Environmental Baseline* (section 5) 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.

1.11. Project Stressors

Based on our review of the Biological Assessment (ADOT&PF 2017a), the IHA application (ADOT&PF 2017b), 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 Haines 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 striking marine mammals;
4. changes in habitat associated with construction and/or dredging, including effects on water quality and turbidity and effects on the habitat of prey.

Most of the analysis and discussion of effects to WDPS Steller sea lions and Mexico DPS humpback whales from this action will focus on exposure to impulsive and continuous noise sources because these stressors will likely have the most direct impacts on listed species. In this analysis, we used sound exposure modeling provided by JASCO Applied Sciences to inform our representation of the sound field produced by these stressors, and the NMFS acoustic thresholds (81 FR 51694, August 4, 2016) to evaluate the effects of those sound fields above the ambient sound levels.

1.11.1. Acoustic Thresholds

As discussed in Section 2, *Description of the Proposed Action*, ADOT&PF intends to conduct construction activities that would introduce acoustic disturbance.

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). NMFS recently developed comprehensive guidance on sound levels likely to cause injury to marine mammals through onset of permanent and temporary thresholds shifts (PTS and TTS; Level A harassment) (81 FR 51693). NMFS is in the process of developing guidance for behavioral disruption (Level B harassment under the MMPA). However, until such guidance is available, NMFS uses the following conservative thresholds of underwater sound pressure levels[3], expressed in root mean square[4] (rms), 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):

- impulsive sound: 160 dB re 1 μPa_{rms}
- continuous sound: 120 dB re 1μPa_{rms}

Under the PTS/TTS Technical Guidance, NMFS uses the following thresholds for underwater sounds that cause injury, referred to as Level A harassment under section 3(18)(A)(i) of the MMPA (NMFS 2016c). 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 4). NMFS categorizes humpback whales in the Low-Frequency Cetaceans functional hearing group and Steller sea lions in the Otariid Pinniped functional hearing group.

[3] 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.
[4] Root mean square (rms) is the square root of the arithmetic average of the squared instantaneous pressure values.

Table 4. PTS Onset Acoustic Thresholds for Level A Harassment (NMFS 2016c).

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

* 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 20µPa$_{rms}$ 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). For the purposes of this consultation, any action that amounts to incidental harassment under the MMPA—whether Level A or Level B—constitutes an incidental "take" under the ESA and must be authorized by the ITS (Section 10).

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 Level A harassment, permanent impairment to hearing, or mortalities are anticipated.

Resulting Impact Zones

JASCO Applied Sciences conducted sound propagation modelling to predict the acoustic footprint of impact and vibratory pile driving associated with this project. Model parameters included pile driving equipment, bathymetry, waters sound speed profiles, and seabed geoacoustic parameters incorporated in two different approaches: 1) Pile Driving Source Model (PDSM); and 2) Full Waveform Range-dependent Acoustic Model (FWRAM) (ADOT&PF 2017b, a). They found that Level B harassment (120dB for continuous sound) was expected at 5,610 meters (limited by land) from the sound source for vibratory pile driving or removal, regardless of pile size. For impact pile driving, Level B harassment levels (160 dB for impulsive sound) extend 1,980 meters when driving 30-inch piles and 2,670 meters for 36-inch piles (ADOT&PF 2017a). Modeled sound propagation distances will be verified by direct sound measurements during this project (ADOT&PF 2017c).

Local Geography of the Action Area

The local geography and topography in Lutak Inlet and northern Lynn Canal 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 thus further refines the resulting impact zones. The project site is at the mouth of Lutak inlet, where the adjacent shoreline (a break in sound propagation) is approximately 1 mile from the project site. The confined nature of the local geography will reduce propagation of sound and is considered in the modeling provided by JASCO Applied Sciences, Inc.

1.11.2. Vessel Strike and Noise

Humpback whales and Steller sea lions are anticipated to occur in the action area and, therefore, to overlap with noise associated with vessels associated with the project. We assume that exposed individuals may potentially respond to this continuous noise source. Further, vessels transiting in to and out of the project area could increase the risk of vessel strike in humpback whales and Steller sea lions in the action area.

1.11.3. 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 species and, therefore, need not be evaluated further in this Opinion. These include changes in habitat and in-air noise. We have briefly analyzed them below.

Changes in Habitat Due to Water Quality and Turbidity

Because of the nature of the project site, ADOT&PF suspect that there will be relatively small amounts of silt 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 and dredging at a moderate to rapid rate depending on tidal stage.

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.

Increased turbidity caused by construction activities has 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 WDPS Steller sea lions, and herring is a primary prey of Mexico DPS humpback whales when they are in southeast Alaska. 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). Estimates of anticipated turbidity levels from the proposed action are unknown, however, are expected to be temporary and highly localized (> 25 feet from the pile or dredge activity; AKDOT 2017b). Therefore, elevated turbidity is unlikely to 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).

ADOT&PF proposed several mitigation measures to ensure water quality standards will be upheld during this project. See the mitigation measures outlined in section 2.1.2.

Based on the data discussed above and the mitigation measures, it is unlikely that the short-term and localized increase in turbidities generated by the proposed actions would measurably 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 WDPS Steller sea lions and Mexico DPS humpback whales will be insignificant.

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

Short-term effects on listed marine mammal species may occur if petroleum or other contaminants accidentally spill into Lutak Inlet or Lynn Canal 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. On-site containment equipment (including a boom) will be readily available prior to any construction activities. Spill prevention and spill response procedures will be maintained throughout construction activities. Therefore, short-term adverse effects on WDPS Steller sea lions and Mexico DPS humpback whales will be small in scale and are considered insignificant. No long-term effects on water quality are expected to occur in the action area as the result of the proposed action.

Changes in Habitat of Prey Species

Proposed ferry improvements will alter existing nearshore habitats by increasing overwater coverage by approximately 20,000 square feet. 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).

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 214 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 action 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 214 square feet with the addition of 37 new piles will be an insignificant decrease in the total benthic habitat within northern Lynn Canal. Therefore, the effects on the prey species of WDPS Steller sea lions and Mexico DPS humpback whales will be insignificant.

In-Air Noise

While WDPS 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 158 feet from the pile, and in-air noise from vibratory driving would fall below 100 db rms threshold altogether (ADOT&PF 2017a). There are no surveyed haulouts within the action area, and any WDPS Steller sea lions exposed to the project sound would do so after swimming into the action area. Any WDPS Steller sea lion close enough to the sound source be considered a 'take' from in-air noise associated with pile driving would already have been accounted for by in-water take, or avoided due to the proposed mitigation measures.

1.11.4. 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 vessels present in the action area are likely to adversely affect WDPS Steller sea lions and Mexico DPS 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.

1.12. 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.

1.12.1. 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 or Level A (injurious) harassment of marine mammals.

Approach to Estimating Exposures to Noise from Pile Driving

Estimates of Steller sea lion and humpback whale densities in northern Lynn Canal are available from Womble et al. 2005, ADOT&PF 2017a, ADOT&PF 2017b, and from personal communication with L. Jemison and K. Hastings who are both marine mammal specialists with the Alaska Department of Fish and Game (ADF&G) who have focused research in the Haines area. Densities of humpback whales used in this analysis are estimates from local experts, as there are no published studies that provide humpback whale densities for this area and no directed surveys for humpback whales in this area. Densities of Steller sea lions come from the most recent survey data conducted by ADF&G. Seasonal count data from the nearest haulout (Gran Point, 14 miles south of Haines) was used to establish densities.

- Approximately 21 days of pile driving and extraction activity will occur over the course of several weeks either between October 2018 and January 2019 or between June 2019 and September 2019. Of these 21 days of in-water construction, 2 days are expected to be dedicated to vibratory pile removal, 11 days for impact and vibratory driving of (22) 30-inch piles, and 8 days of impact and vibratory pile driving of (15) 36-inch piles.
- NMFS used the best available data and the highest estimates of Steller sea lion ($7.55/km^2$) and humpback whales ($0.054/km^2$) densities in this area for the proposed window of time, multiplied by the exposed area and the estimated number of pile-driving days to complete this project for the total number of exposed animals.
- Local brand data from the past 20 years consistently show only low percentages of WDPS Steller sea lions (~2%). NMFS assumes that the proportion of WDPS Steller sea lions is similar between branded and unbranded individuals and considers 2% of all Steller sea lions exposed to level B harassment during this project are WDPS and the remaining 98% are EDPS.
- 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 (Wade et al. 2016).

Individual WDPS Steller sea lions taken are expected to be a mix of solitary adult males and females. NMFS does not anticipate exposure of WDPS Steller sea lion pups, as there are no rookeries within the action area.

Anticipated Densities of Listed Species

Best available seasonal counts for the project area were used to derive densities of Steller sea lions and humpback whales for this area. These numbers are shown in Table 5. The counts for Steller sea lions came from querying the ADF&G Steller sea lion database and the estimate for humpback whales came from local expertise provided through personal communication (K. Hastings, L. Jemison, and B. VanBurgh, ADF&G).

Table 5. Estimated monthly total densities of Steller sea lions and humpback whale (from all DPSs) in the action area (ADOT&PF 2017a); Womble, Hastings, and Jemison, unpublished data.

	Month	Average Count or best available estimate	Density per km^2
Steller Sea Lions	January	188.5	2.06
	February	171.1	1.87
	March-May	NA	NA
	June	698.4	7.55
	July	123.7	1.35
	August	0	0.00
	September	33.0	0.01
	October	168.5	1.85
	November	145.3	1.59
	December	226.2	2.47
Humpback Whales	January	0	0
	February	0	0
	March-May	NA	NA
	June	5	0.054
	July	5	0.054
	August	2	0.022
	September	2	0.022
	October	2	0.022
	November	2	0.022
	December	0	0

The project area is defined by ADOT&PF as the northern Lynn Canal area (north of Gran Point), and covers 91.3 km^2. This is broader than the action area and assumes Steller sea lions and humpback whales counted utilize waters throughout the northern reaches of Lynn Canal. The species-specific densities in this table were calculated by dividing total counts (center column) by this area (91.3 km^2) (ADOT&PF 2017b, a). Densities for March through May are not included as these are months where pile driving and removal is not authorized.

Actual project timing is unknown, however, based on the information provided, June densities were used for estimating exposure to all stressors. June represents the highest potential densities for all listed species, and therefore, are the most conservative estimates. Using maximum monthly density, Table 7 shows the exposure to different sound disturbances that went in to the take estimates.

Noise Propagation

The impact zones for Level A and Level B thresholds were determined by modeling sound propagation specific to the project site and will be verified using SSV during construction. Modelling was done by JASCO Applied Science using their Full Waveform Range-dependent Acoustic Model (FWRAM) to predict sound levels received as a function of bathymetry (depth), range, azimuth direction, sound speed profile, and geoacoustic profiles (composition of benthic material). To be conservative, pile driving was assumed to take place at the deepest water depth at the Haines Ferry Terminal site (where sound propagation would be greatest). Impact pile driving and vibratory pile driving were modeled separately as they are impulsive and continuous sound sources, respectively. The total sound energy in a 24 hour period was computed. Source levels were calculated using JASCO's PDSM, which simulates the sound pressure waves generated at the pile.

Sound energy was accumulated over specified number of hammer strikes, not as a function of time. The number of strikes was assumed to be 700, based on another similar pile driving project in this area. Sound footprints were calculated assuming two piles being installed each day (Table 6).

Table 6 Model inputs used by JASCO Applied Sciences for modeling sound propagation anticipated for the Haines Ferry Terminal project.

Driving Mechanism	Pile Diameter	Pile Driver	Anticipated Sound Pressure Levels at 10 meters	Time to Full Pile Installation
Impact	30	Delmag D30-32	188.5 dB re 1μPa	700 strikes
	36	Delmag D36-32	189.9 dB re 1μPa	
Vibratory	30	ICE-44B	177.6 dB re 1μPa	3600 seconds (1 hour)
	36	ICE-44B	179.8 dB re 1μPa	

Given the above sound propagation modeling, Level A and Level B impact zones were determined given the NMFS Acoustic Guidance (NMFS 2016c) for impact (impulsive) and vibratory (continuous) pile driving and are shown in Table 7. Construction sound will be measured during the first two days of pile driving to verify that the sound models are appropriate. The underwater noise monitoring plan for SSV can be found at *www.nmfs.noaa.gov/pr/permits/incidental/construction.htm*. For more detail on JASCO Applied Sciences modeling process, see (ADOT&PF 2017b, a, c).

We expect that sound levels from this project will remain below the threshold for Level A take for Steller sea lions (otariids), given the results of the sound propagation modeling. Although, cumulative sound exposure from impact pile driving could exceed humpback whale (low frequency cetaceans) Level A thresholds near the source, if an animal were to persist in the Level A zone for an entire day (Table 7). However, Level A exposure to Mexico DPS humpback whales is not expected because of the shutdown mitigation measures in place.

Table 7. Level A and Level B sound exposure to pile driving and removal activities given the hearing range of Steller sea lions and humpback whales and the expected sound propagation for each in-water activity. Not applicable (N/A) indicates that noise will not exceed thresholds for Level A harassment.

	Density (#/km^2)	Level	Pile driving/removal		
			(2) 36-inch/day Impact Zone (km^2)	(2) 30-inch/day Impact Zone (km^2)	Both pile sizes Vibratory Zone (km^2)
Steller sea lion	7.55	A	N/A	N/A	N/A
		B	6.79	4.52	21.1
Humpback whale	0.054	A	4.78	3.17	N/A
		B	2.01	1.35	21.1
Days Proposed			8	11	21*

* Because pile driving and removal produce similar sound profiles and levels (MacGillivray et al. 2015), vibratory pile driving sound estimates will be used as a proxy for vibratory pile removal sound levels. Therefore, we calculate take from vibratory methods with a total of 21 day (19 days pile driving + 2 days pile removal). Note: The area modeled to Level A thresholds is not included in the Level B areas to avoid double counting take in that zone.

From here, the total number of Level A and Level B takes for each construction activity was calculated as:

$$Total\ Takes = Animal\ Density\ \left(\frac{\#}{km^2}\right) * Impact\ Zone\ (km^2) * Days$$

Total take estimates associated with pile driving and removal operations are summarized in Table 8.

Table 8. Number and type of Steller sea lion and humpback whale takes from each in-water activity.

	Level	Pile driving/removal			Total Take (rounded to nearest whole number)
		36-inch Impact	30-inch Impact	Vibratory (all pile sizes)	
Steller sea lion	A	0	0	0	0
	B	410.12	375.39	3,345.41	4,131
Humpback whale	A	2.06	1.88	0	4
	B	0.87	0.80	23.93	26

Of the 26 humpback whales exposed to Level B harassment, we anticipate only 6% to be from the threatened Mexico DPS (~ 2 takes) (Wade *et al.* 2016). The remaining exposures are anticipated to be non-listed Hawaii DPS individuals. Of the 4,131 exposed Steller sea lions, we expect 2% to be from the endangered WDPS (~83 takes) and the remaining to be from the non-listed EDPS (see Table 9).

Table 9. Estimated numbers of listed marine mammals that may be exposed to Level A and Level B take.

Species	Total animals exposed	ESA Listed DPS	% ESA Listed	Total proposed authorized takes from ESA listed DPS
Level A				
Steller sea lion	0	Western DPS	2%	0
Humpback whale	4	Mexico DPS	6%	0
Level B				
Steller sea lion	4,131	Western DPS	2%	83
Humpback whale	26	Mexico DPS	6%	2

No Level A takes are expected or authorized for ESA-listed humpbacks. This is a reasonable assumption because, though our modeling suggests construction could potentially cause 4 Level A takes of humpback whales before mitigation, only 6% of humpbacks in the action area—or 0.24 of the potential Level A takes—are assumed to be from an ESA-listed population. Thus, if construction activities were to cause any Level A takes, it would be far more likely such takes would impact individuals from the unlisted Hawaii DPS. In addition, the 4 Level A takes of humpback whales authorized in the IHA represent a conservative estimate of potential exposures and mitigation measures are in place to shut down pile driving before cumulative sound exposure is expected to rise to Level A thresholds. Therefore, we conclude that Level A takes of ESA-listed humpback whales is extremely unlikely. Further, even if we were to authorized one Level A take by harassment of an ESA-listed humpback in the ITS, that would not change our conclusion regarding the likelihood of the action to jeopardize the continued existence of any ESA-listed humpback DPS.

As discussed in Section 2.1.2 above, the ADOT&PF proposed mitigation measures to avoid or minimize exposure of WDPS Steller sea lions and Mexico DPS humpback whales to acoustic stressors. In particular, measures are meant to reduce overall noise, monitor marine mammals within designated impact zones (Level A and Level B zones), and shut down the project where necessary to prevent project-associated Level A sound exposure to Mexico DPS humpback whales. Take numbers presented are for the peak densities of sea lions and humpback whales in this area; however, if construction occurs in fall or winter months, the take is expected to be considerably lower.

1.12.2. 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 WDPS Steller sea lions and Mexico DPS humpback whales and that some individuals are likely to be exposed to these continuous noise sources.

Broadband source levels for tug and barges 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 in the *Environmental Baseline*, vessel strikes of humpback whales and Steller sea lions in Southeast Alaska have been documented, however, no strikes have been documented in the action area.

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 ferry frequency will continue to rely on the AMHS operational budget and passenger and vehicle demand for the Lynn Canal region as it has in the past, NMFS will assume that ferry traffic is unlikely to increase as a result of this action.

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 (Richardson et al. 1995). Sound from a vessel of that size would attenuate below 120 dB re: 1 µPa (Level B threshold for a continuous noise disturbance) between 86 m and 233 m (282 and 764 feet) from the source. We anticipate low level exposure of short-term duration to listed marine mammals from vessel noise, and do not expect such noise to cause Level B harassment. See Section 6.3.8 for a discussion on potential responses.

Approach to Estimating Exposures to Vessel Strike

Vessel strikes of humpback whales occur in Southeast Alaska, and can result in life-threatening trauma or death for the cetacean.

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 2008). Since 2000, there have been four reported ship strikes of Steller sea lions within Alaska, with three occurring in Southeast Alaska.

Tug towing operations for construction occur at relatively low speed limits (5 knots). However, ferries can operate greater speeds (up to 36 knots) and during periods of limited visibility. All of these factors increase the risk of collisions with marine mammals. However, standard mitigation measures discussed in Section 1.3.2 are designed to help avoid potential vessel strikes.

In Southeast Alaska, there have been 25 reports of humpback whale collisions with vessels and one report of a Steller sea lions collision between 2010 and 2016 (see Figure 6)(NMFS 2016b). Between 2008 and 2012 the mean minimum annual human-caused mortality and serious injury rate for humpback whales based on vessel collisions in Alaska was reported in the NMFS Alaska

Regional Office stranding database as 0.45 (Allen and Angliss 2015). However, these incidences account for a small fraction of the total humpback whale population (Laist et al. 2001). No vessel collisions involving humpback whales or Steller sea lions have been documented in Haines.

Vessels would have a transitory presence in any specific location. NMFS is not able to quantify existing traffic conditions across the entire action area to provide context for the addition of two vessels during construction and potentially one additional Alaska class vessel during operation. However, the rarity of collisions involving vessels and listed marine mammals in Haines despite decades of spatial and temporal overlap suggests that the probability of collision is low. In addition, all vessels will be required to observe the Alaska humpback whale approach regulations, which will further reduce the likelihood of interactions.

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 lack of historic strikes in the action area, the relatively small size of the action area compared to available habitat for both species, mitigation measures to minimize exposure to vessel activity, and the limited duration of operations suggest that juxtaposition in space and time of vessels and these listed marine mammals is unlikely.

1.13. Response Analysis

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

1.13.1. Responses to Noise from Pile Driving

As described in the Section 6.2.1, WDPS Steller sea lions and Mexico DPS humpback whales are anticipated to occur in the action area and are anticipated to overlap with noise associated with pile driving/removal activities. We assume that some individuals are likely to be exposed and respond to these impulsive and continuous noise sources. Out of the 4,131 potential Level B exposures to Steller sea lions, only 83 exposures are anticipated for WDPS animals (2% of total exposures). No level A exposures to Steller sea lions are anticipated. Out of the 4 potential Level A exposures to humpback whales, none are anticipated to be from the Mexico DPS due to the small fraction of the population that are Mexico DPS (6%). Out of the 26 potential Level B exposures to humpback whales, only 2 exposures are anticipated for Mexico DPS animals (6% of total exposures) (see Section 6.2.1, Table 9).

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) 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).

For low-frequency cetaceans, no behavioral or auditory evoked potential (AEP) threshold data exist. Therefore, hearing thresholds were estimated by synthesizing information from anatomical measurements, mathematical models of hearing, and animal vocalization frequencies (NMFS 2016c).

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. For non-impulsive exposures (i.e., vibratory pile driving), a variety of terrestrial and marine mammal data sources indicate that threshold shift up to 40 to 50 dB may be induced without PTS, and that 40 dB is a conservative upper limit for threshold shift to prevent PTS. An exposure causing 40 dB of TTS is therefore considered equivalent to PTS onset (NMFS 2016c).

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 impact 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 the animals utilize, so the frequency range of the potentially masking sound is important in determining any potential behavioral impacts. 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.

Noise from pile driving and removal is relatively short-term. It is possible that pile driving/removal noise resulting from this proposed action may mask acoustic signals important to WDPS Steller sea lions and Mexico DPS humpback whales, but the short-term duration (up to 82 total hours of impact and vibratory pile driving spread over up to 21 days) 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.

1.13.2. 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 from underwater sounds generated from pile driving. Potential takes could occur if individuals of these species are present in the ensonified zone during pile driving activities. 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, and impact hammer driving will be used for final proofing of each pile and as needed in the event that the vibratory hammer is not able to advance the pile. 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 high likelihood of marine mammal detection by trained observers under the required observation protocols 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 2 hours per pile for a total of about 82 hours (37 new piles and 4 pile removals) over the course of 21 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 83 WDPS Steller sea lions and 2 Mexico DPS humpback whales may be exposed to Level B harassment sound levels during the proposed action. While mitigation measures include shut-down zones to prevent Level A exposure, there is no proposed shut-down to avoid level B exposure. If animals approach within the Level B zone during pile removal or driving, harassment may occur. At these distances, a marine mammal that perceived pile driving operations is likely to ignore such a signal and devote its attentional resources to stimuli in its local environment. If animals do respond, some listed species are likely to change their behavioral state – reduce the amount of time they spend at the ocean’s surface, increase their swimming speed, change their swimming direction to avoid pile driving, change their respiration rates, increase dive times, reduce feeding behavior, and/or alter vocalizations and social interactions (Frid and Dill. 2002, Koski et al. 2009, Funk et al. 2010, Melcon et al. 2012). We anticipate that few (if any) exposures would occur at received levels >120 dB or 160 dB respectively for vibratory or impact pile driving due to avoidance of high received levels, and shut-down mitigation measures.

Prey
Noise generated from pile driving can reduce the fitness and survival of fish in areas used by foraging marine mammals; however, given the small area of the project site relative to known feeding areas in Southeast Alaska, and the fact that any physical changes to this habitat would not be likely to reduce the localized availability of fish (Fay and Popper 2012), it is unlikely that marine mammals would be affected. We consider potential impacts to prey resources as insignificant.

1.13.3. Responses to Vessel Traffic

As described in the Sections 6.2.1 humpback whales and Steller sea lions are anticipated to occur in the action area and are anticipated to overlap with noise associated with vessel transit. We assume that some individuals are likely to be exposed and respond to this continuous noise source.

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 2002b, Magalhaes et al. 2002, Ng and Leung 2003, Goodwin and Cotton 2004b, Bain et al. 2006, Bejder et al. 2006, Lusseau 2006, Richter et al. 2006, Lusseau and Bejder 2007, Schaffar et al. 2013), the set of variables that help determine whether marine mammals are likely to be disturbed by surface vessels include:

1. *number of vessels*. The behavioral repertoire marine mammals have used to avoid interactions with surface vessels appears to depend on the number of vessels in their perceptual field (the area within which animals detect acoustic, visual, or other cues) and the animal's assessment of the risks associated with those vessels (the primary index of risk is probably vessel proximity relative to the animal's flight initiation distance). Below a threshold number of vessels (which probably varies from one species to another, although groups of marine mammals probably share sets of patterns), studies have shown that whales will attempt to avoid an interaction using horizontal avoidance behavior. Above that threshold, studies have shown that marine mammals will tend to avoid interactions using vertical avoidance behavior, although some marine mammals will combine horizontal avoidance behavior with vertical avoidance behavior (Lusseau 2003, Christiansen *et al.* 2010);
2. *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 2002a);

3. *vessel's speed and vector* (David 2002a);
4. *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 2002a, Lusseau 2003, Lusseau 2006);
6. *type of vessel* (displacement versus planing), which marine mammals may be interpret as evidence of a vessel's maneuverability (Goodwin and Cotton 2004b);
7. *behavioral state of the marine mammals* (David 2002a, 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). While there are no haulouts in the action area, there is one ~14 miles south of Haines (Gran Point). 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. However, there are no rookeries in the action area, so this response is not expected as a result of this action.

Humpback whale reactions to approaching boats are variable, ranging from approach to avoidance (Payne 1978, Salden 1993). Baker et al. (1983) reported that humpbacks in Hawaii responded to vessels at distances of 2 to 4 km. Bauer and Herman (1986) concluded that reactions to vessels are probably stressful to humpback whales, but that the biological significance of that stress is unknown. Humpback whales seem less likely to react to vessels when actively feeding than when resting or engaged in other activities (Krieger and Wing 1984). Mothers with newborn calves seem most sensitive to vessel disturbance (Clapham and Mattila 1993). Marine mammals that have been disturbed by anthropogenic noise and vessel approaches are commonly reported to shift from resting behavioral states to active behavioral states, which would imply that they incur an energy cost. Morete et al. (2007) reported that undisturbed humpback whale cows that were accompanied by their calves were frequently observed resting while their calves circled them (milling) and rolling interspersed with dives. When vessels approached, the amount of time cows and calves spent resting and milling respectively declined significantly.

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.

1.13.4. Probable Responses to Vessel Traffic

Likely two work barges, 150-250 feet in length, will be staged on-site to support cranes and other construction equipment (per email from J. Taylor and D. Lowell, ADOT&PF, May 2017). 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 and NMFS does not have reason to expect an increase in the risk of vessel strike following completion of this action. Therefore, we consider the impact of vessel strike on Mexico DPS humpback whales and WDPS Steller sea lions to be discountable.

We anticipate low level exposure of short-term duration to listed marine mammals from vessel noise. If animals do respond, they may exhibit slight deflection from the noise source, engage in low-level avoidance behavior, short-term vigilance behavior, or short-term masking behavior, but these behaviors are not likely to result in adverse consequences for the animals. The nature and duration of response is not anticipated to be a significant disruption of important behavioral patterns such as feeding or resting. During the period of construction, the action area is not considered high quality habitat for humpback whales or Steller sea lions so slight avoidance of the area is not likely to adversely affect these species**.**

The small number of vessels involved in the action, the short duration of exposure due to the transitory nature, and vessels following the Alaska Humpback Whale Approach Regulations and marine mammal code of conduct should prevent close approaches and additional harassment of Steller sea lions and humpback whales. The impact of vessel traffic on Mexico DPS humpback whales and WDPS Steller sea lions is not anticipated to reach the level of harassment under the ESA, and is considered insignificant.

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 ESA.

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.

1.14. 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 (Nuka 2012).

Regularly-occurring vessel traffic in the action area can be generally characterized as ferries, cargo vessels, or recreational craft. Cruise ships do not use the Haines ferry terminal or Lutak Inlet, but do utilize nearby waters off of Haines and move through the action area (the section that extends out to Lynn Canal) when transiting to and from the port of Skagway.

Anticipated future use of the Alaska Marine Highway System (AMHS) ferries is of interest in this analysis, since the construction project is at the Haines Ferry Terminal. McDowell Group reports that 36,134 passengers embarked at the Haines Ferry Terminal in 2014, indicating considerable reliance on ferry travel as a connection between Southeast Alaska and the continental road system. 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 (McDowell 2016b).

Although the proposed construction is expected to increase birthing capacity at the Haines Ferry Terminal, it is not expected to increase vessel traffic. Vessel traffic is and will continue to be limited dependent upon the AMHS operating budget and passenger and vehicle demand in the Lynn Canal region, not on birthing capacity (pers. comm. from D. Lowell, ADOT&PF, May 2017). Thus, NMFS assumes that the AMHS use of the facility is unlikely to change as a result of this action.

1.15. Commercial Fishing

Commercial fishing is expected to continue into the future at a level comparable to current effort, and is expected to continue to result in periodic interactions with WDPS Steller sea lions and Mexico DPS humpback whales.

1.16. Tourism

Marine and coastal vessel traffic could contribute to potential cumulative effects through the disturbance of listed marine mammals associated with tourism. Tourism is a large industry in Southeast Alaska, as shown in a recent report on visitor statistics (McDowell 2016a). A summary of these visitor numbers and trends coming to Alaska in recent years is found in Table 10.

Table 10. Trends in Summer Visitor Volume, By Transportation Market, 2008-2015 (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 no directed whale-watching tours out of Haines or Skagway, but there are boat-based tours that view whales opportunistically in northern Lynn Canal. Also, whale-watching is particularly prevalent in the Juneau area, approximately 82 miles to the southeast.

Given the recent trends in numbers of summer visitors reported above and the modest growth projected statewide, NMFS anticipates no increase in tourism-related activities due to the proposed action.

1.17. 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 listed 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.

1.18. Summary of Cumulative Effects

The action area will likely continue to function as a localized water-based transit station for AMHS ferry traffic and tug and barge operations. Restrictions in capacity at the Haines dock, low demand, and low expected population growth in the area will likely limit substantial growth. Tourism and community development activities will continue to occur in northern Lynn Canal, but at a level comparable to present. The current and recent population trends for both WDPS Steller sea lions and Mexico DPS humpback whales indicate that these levels of activity are not hindering population growth.

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 (Section 6) to the environmental baseline (Section 5) and the cumulative effects (Section 7) to formulate the agency's biological 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 (Section 4).

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.

1.19. WDPS Steller Sea Lion Risk Analysis

Based on the results of the *Exposure Analysis* for the proposed activities, we expect a maximum of 4,131 Steller sea lions may be behaviorally harassed by noise from pile driving, and we assume that 2% (83) of those individuals are from the WDPS (see Table 9).

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 few additional vessels introduced by the action and the unlikelihood of these type of interactions.

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.

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 animals' energy budget, time budget, or both (the two are related because foraging requires time). Most adult Steller sea lions occupy rookeries during the pupping and breeding season, which extends from late May to early July (NMFS 2008a). The endangered WDPS Steller sea lion population is increasing 2.17 percent per year. Even if exposure to some WDPS Steller sea lions were to occur from pile driving and removal operations, 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 Steller sea lions. As discussed in the *Description of the Action* section, this action area does not overlap with sea lion breeding rookeries. As a result, the probable responses to pile driving noise are not likely to reduce the current or expected future reproductive success of WDPS Steller sea lions or reduce the rates at which they grow, mature, or become reproductively active.

Coastal development can affect WDPS Steller sea lions, especially where new facilities are built in harbors with fish processing facilities, as sea lions tend to be frequently or continuously present near these sites. Such effects are likely not hindering recovery, however. Commercial fishing likely affects prey availability throughout much of the WDPS's range, and causes a small number of direct mortalities each year. Predation has been considered a potentially high level threat to this DPS, and may remain so. Subsistence hunting occurs at fairly low levels for this DPS. Illegal harvest is also a continuing threat, but it probably does not occur at levels that are preventing recovery. Ship strikes do not seem to be of concern for this species due to its maneuverability and agility in water. Despite exposure to construction activities and ferry and vessel operations for decades, the increase in the number of WDPS Steller sea lions suggests that the stress regime these sea lions are exposed to has not prevented them from increasing their numbers and expanding their range in the action area.

Therefore, exposures associated with the proposed action are not likely to reduce the abundance, reproduction rates, or 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 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 WDPS Steller sea lions 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.

1.20. Mexico DPS Humpback Whale Risk Analysis

Based on the results of the *Exposure Analysis*, we expect a maximum of four humpback whale may be exposed to received levels sufficiently high and distances sufficiently close to result in level A harassment, but this also assumes that these animals persist in the area during 24 hours of cumulative sound exposure. Due to the small fraction of humpback whales that are expected to be from the Mexico DPS and the mitigation measures in place to prevent cumulative sound exposure enough to result in Level A take, no Level A take of Mexico DPS humpback whales will be authorized. Out of the 26 potential Level B exposures to humpback whales, only 2 exposures are anticipated for threatened Mexico DPS animals (6% of total exposures; Table 9).

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 few additional vessels introduced by the action and unlikelihood of these type of interactions.

Our consideration of probable exposures and responses of listed whales to construction activities associated with the proposed action is designed to help us assess whether those activities are likely to increase the extinction risks or jeopardize the continued existence of Mexico DPS humpback whales.

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 animals' energy budget, time budget, or both (the two are related because foraging requires time). Large whales such as humpbacks have an ability to store substantial amounts of energy, which allows them to survive for months on stored energy during migration and while in their wintering areas, and their feeding patterns allow them to acquire energy at high rates. The individual and cumulative energy costs of the behavioral responses we have discussed are not likely to reduce the energy budgets of humpback whales, and their probable exposure to noise sources are not likely to reduce their fitness. 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 and removal 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, or growth rates (or increase variance in one or more of these rates) of the populations those individuals represent. The short duration of 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 strongest evidence supporting the conclusion that pile driving and removal and vessel noise will likely have minimal impact on humpback whales is the estimated growth rate of the humpback whale populations in the North Pacific (5-7%). While there is no accurate estimate of the maximum productivity rate for humpback whales, it is assumed to be 7% (Wade and Angliss 1997, Allen and Angliss 2015). Despite exposure to pile driving and ferry operations for decades, a small number of humpback whale entanglements in fishing gear, and a single subsistence take of one humpback whale in 2006, this increase in the number of listed whales suggests that the stress regime these whales are exposed to has not prevented them from increasing their numbers.

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

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 these species. We estimate 83 WDPS Steller sea lions and 2 Mexico DPS humpback whales may be Level B taken during the term of the MMPA authorization (i.e. construction period) by harassment. This harassment is not likely to result in serious 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 (*Eumetopias jubatus*) or Mexico DPS humpback whales (*Megaptera novaeangliae*).

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA prohibits the take of endangered species unless there is a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity (50 CFR 402.02). Based on recent NMFS guidance, the term "harass" under the ESA 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 "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) and (ii)).

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 incidental take 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 ITS. 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 ITS (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 ITS 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.

1.21. 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)(1); see also 80 FR 26832 (May 11, 2015)). Table 11 lists the amount and timing of authorized take (incidental take by harassment) for this action.

For Mexico DPS humpback whales and WDPS Steller sea lions, based on the best scientific and commercial information available, we would not anticipate responses to impulsive noise at received levels < 160 dB re 1 μPa rms would rise to the level of "take" as defined under the ESA. For this reason, in assessing the total instances of harassment for whales and sea lions from impact pile driving, NMFS only considered exposures at received levels ≥ 160 dB re 1 μPa rms. For continuous noise sources such as vibratory pile driving, we only considered exposures at received levels ≥120 dB re 1 μPa rms.

Table 11. Summary of anticipated instances of exposure to sound from pile driving and pile removal resulting in the incidental take of WDPS Steller sea lions and Mexico DPS humpback whales.

DPS and Species	Total Amount of Take Associated with Proposed Action		Anticipated Temporal Extent of Take
	Level A	Level B	
Western DPS Steller sea lion	0	83	October, 2018 through September, 2019 (take is not authorized for March, April or May)
Mexico DPS humpback whale	0	2	

*These take numbers reflect only these species expected to be from ESA-listed DPSs.

1.22. Effect of the Take

Studies of marine mammals and responses to anthropogenic impacts have shown that Steller sea lions and humpback whales are likely to respond behaviorally upon hearing high levels of acoustic disturbance. 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 whales and pinnipeds to major noise sources and any associated disruptions are not expected to affect the reproduction, survival, or recovery of these species.

In the conclusions section of this 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 WDPS Steller sea lions of Mexico DPS humpback whales.

1.23. 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 WDPS Steller sea lions and Mexico DPS 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 WDPS Steller sea lions and Mexico DPS 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. FHWA 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. FHWA and PR1 shall submit a final report to NMFS AKR that evaluates the mitigation measures and the results of the monitoring program.

1.24. Terms and Conditions

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

In order to be exempt from the prohibitions of section 9 of the ESA, the ADOT&PF and PR1 or any applicant must comply with the following terms and conditions, which implement the RPMs described above and the mitigation measures set forth in Section 2.1.2 of this Opinion. The FHWA and PR1 or any applicant 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).

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, FHWA, NMFS PR1, or their authorization holder must undertake the following:

A. FHWA 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, FHWA, 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.
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, Suzie.Teerlink@noaa.gov, the NMFS Alaska Regional Stranding Coordinator at 907-271-1332 or Mandy.Migura@noaa.gov, and NMFS Permits, Conservation and Education Division at 301-427-8401 or Jaclyn.Daly@noaa.gov.

   Following a prohibited take, ADOT&PF will be required to reinitiate consultation under 50 CFR 402.16, and any subsequent activities causing incidental take will not be exempt from the take prohibitions of ESA section 9. NMFS will work with ADOT&PF to determine what is necessary to minimize the likelihood of further prohibited take and ensure ESA compliance.

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

A. The impact zones must be fully observed by qualified PSOs during all in-water work, in order to document observed incidents of harassment as described in the mitigation measures associated with this action.

B. If take of Steller sea lions or humpback whales approaches the number of takes authorized in the ITS, ADOT&PF will notify NMFS by email, attn: Suzie.Teerlink@noaa.gov and request reinitiation of consultation

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

A. 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 within 90 days of the conclusion of the project that analyzes and summarizes marine mammal interactions during this project to the Protected Resources Division, NMFS by email to Suzie.Teerlink@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 Steller sea lions and/or humpback whales. Note that only 2% of Steller sea lions and 6% of humpback whales are expected to be from the ESA listed DPSs and will count towards the Steller sea lions and/or humpback whales listed in the Incidental Take Statement associated with this Opinion.
- Number of 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.

- 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.

CONSERVATION RECOMMENDATIONS

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

1. ADOT&PF 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 and minimize the risk of vessel strikes. More information is available at https://alaskafisheries.noaa.gov/pr/whale-alert

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.

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.

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.

1.25. Utility

This document records the results of an interagency consultation. The information presented in this document is useful to NMFS, ADOT&PF, 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.

1.26. 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.

1.27. 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 402.01 et seq.

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.

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