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 Section 7(a)(2) Biological Opinion
Taiya Inlet Railroad Dock Dolphin Project, Skagway, Alaska

NMFS Consultation Number: AKR-2018-9831

Action Agency: U.S. Army Corps of Engineers (Corps), and Permits and Conservation Division, Office of Protected Resources (PR1), National Marine Fisheries Service, NOAA

Affected Species and Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	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?
Humpback Whale, Mexico DPS (*Megaptera novaeangliae*)	Threatened	Yes	N/A	No	N/A
Sperm whale (*Physeter macrocephalus*)	Endangered	No	N/A	No	N/A
Steller Sea Lion, Western DPS (*Eumatopias jubatus)*	Endangered	Yes	No	No	No

Consultation Conducted By: National Marine Fisheries Service, Alaska Region

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

Date: February 11, 2019

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TERMS AND ABBREVIATIONS

BSAI	Bering Sea/Aleutian Islands
CFR	Code of Federal Regulations
CI	Confidence Interval
CWA	Clean Water Act
dB	decibel
DPS	distinct population segment
DTH	down-the-hole
EIS	environmental impact statement
ESA	Endangered Species Act
ESCA	Endangered Species Conservation Act
FR	Federal Register
IHA	incidental harassment authorization
in	inch
ITS	Incidental take statement
kHz	kilohertz
km	kilometer
kts	knots
MMPA	Marine Mammal Protection Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
Opinion	this biological opinion
p-p	peak-to-peak
PAM	passive acoustic monitoring
PBF	physical or biological features
PCE	primary constituent element
PR1	NMFS Office of Protected Resources, Permits and Conservation Division
PSO	protected species observer
PTS	permanent threshold shift
rms	root mean square
SEL	Sound exposure level
SSV	sound source verification
TTS	temporary threshold shift
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
WP&YR	White Pass and Yukon Route
ZOI	zone of influence
μPa	micropascal
0-p	peak

1 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 U.S. Army Corps of Engineers (Corps), which proposes to permit the construction of two railroad dock dolphins within Taiya Inlet in Skagway, Alaska; and NMFS's Office of Protected Resources, Permits and Conservation Division (PR1), which proposes to issue an incidental harassment authorization (IHA) pursuant to section 101(a)(5)(D) of the Marine Mammal Protection Act of 1972, as amended (MMPA) (16 U.S.C. § 1361 *et seq*.), to the White Pass and Yukon Route (WP&YR) for harassment of marine mammals incidental to construction operations (83 FR 64541). The consulting agency is NMFS's Alaska Regional Office.

This document represents NMFS's biological opinion (opinion) on the proposed action and its effects on endangered and threatened species and designated critical habitats.

The opinion and ITS were prepared by NMFS in accordance with section 7(b) of the ESA (16 U.S.C. 1531-1544), and implementing regulations at 50 CFR § 402.

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

1.1 Background

This opinion is based on information provided to us in the October 2018 IHA application and marine mammal monitoring and mitigation plan (PND Engineers 2018), initiation package (Corps 2018a), and the proposed IHA (83 FR 64541). Other sources of information relied upon included updated project proposals, emails and telephone conversations between NMFS Alaska Region, PR1, Corps staff, and Corps' non-Federal representative (PND Engineers, Inc. [PND]). A complete record of this consultation is on file at NMFS's field office in Juneau, Alaska.

The proposed action involves the installation of two new 200-ton pile supported mooring dolphins at the south end of the Railroad Dock in Skagway, AK, to accommodate an increased number of large cruise ships (Figure 1).

Figure 1. Railroad Dock Dolphin Construction Location (PND Engineers 2018).

This opinion considers the effects of construction and operation of the mooring dolphins, and the associated proposed issuance of an IHA. These actions may affect the following species: Mexico distinct population segment (DPS) humpback whales (*Megaptera novaeangliae*), sperm whales (*Physeter macrocephalus*), and western DPS Steller sea lions (*Eumetopias jubatus*). No designated critical habitat is located within the action area. The nearest designated critical habitat, for Steller sea lions, is Gran Point haulout located ~36 km south of the project area.

1.2 Consultation History

Our communication with PR1, the Corps, and PND Engineers regarding this consultation is summarized as follows:

- **May 18, 2018:** NMFS received informal section 7 consultation initiation request from the Corps (Corps 2018b).
- **May 22, 2018:** NMFS submitted an additional information request and suggested the project go through formal consultation.
- **May 25, 2018:** NMFS reiterated that the project needed to go through formal consultation.
- **June 14, 2018:** NMFS received a letter from the Corps designating PND Engineers as their non-federal representative.
- **August 7, 2018:** Corps withdrew request for informal consultation (Corps 2018c).
- **August 21, 2018:** PND Engineers submitted Draft IHA application and Biological Assessment.
- **August 31, 2018:** NMFS received Corps request for initiation of formal consultation (Corps 2018a).
- **September 5, 2018:** NMFS submitted an additional information request on the initiation package.
- **September 21, 2018:** PND Engineers submitted a Revised Draft IHA application.
- **October 4, 2018**: NMFS submitted additional information request on the revised IHA application.
- **October 23, 2018**: PND Engineers submitted a Revised Draft IHA application.
- **November 6, 2018**: PND Engineers submitted a Revised Draft IHA application.
- **November 9, 2018**: PND Engineers submitted a Revised Draft IHA application.
- **November 13, 2018**: NMFS determined that initiation package was sufficient, and initiated consultation with the Corps.
- **November 29, 2018:** NMFS's PR1 submitted a request to initiate formal section 7 consultation.
- NMFS initiated consultation on November 29, 2018, but consultation was held in abeyance for 38 days due to a lapse in appropriations and resulting partial government shutdown. Consultation resumed on January 28, 2019.

2 DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

2.1 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 the WP&YR's construction and operation of a railroad dock dolphin to be permitted by the Corps, as well as NMFS PR1's issuance of an IHA to take marine mammals by harassment under the MMPA incidental to these actions in Taiya Inlet near Skagway, AK between February 1, 2019 and January 31, 2020. However, construction is limited to the months of February through April.

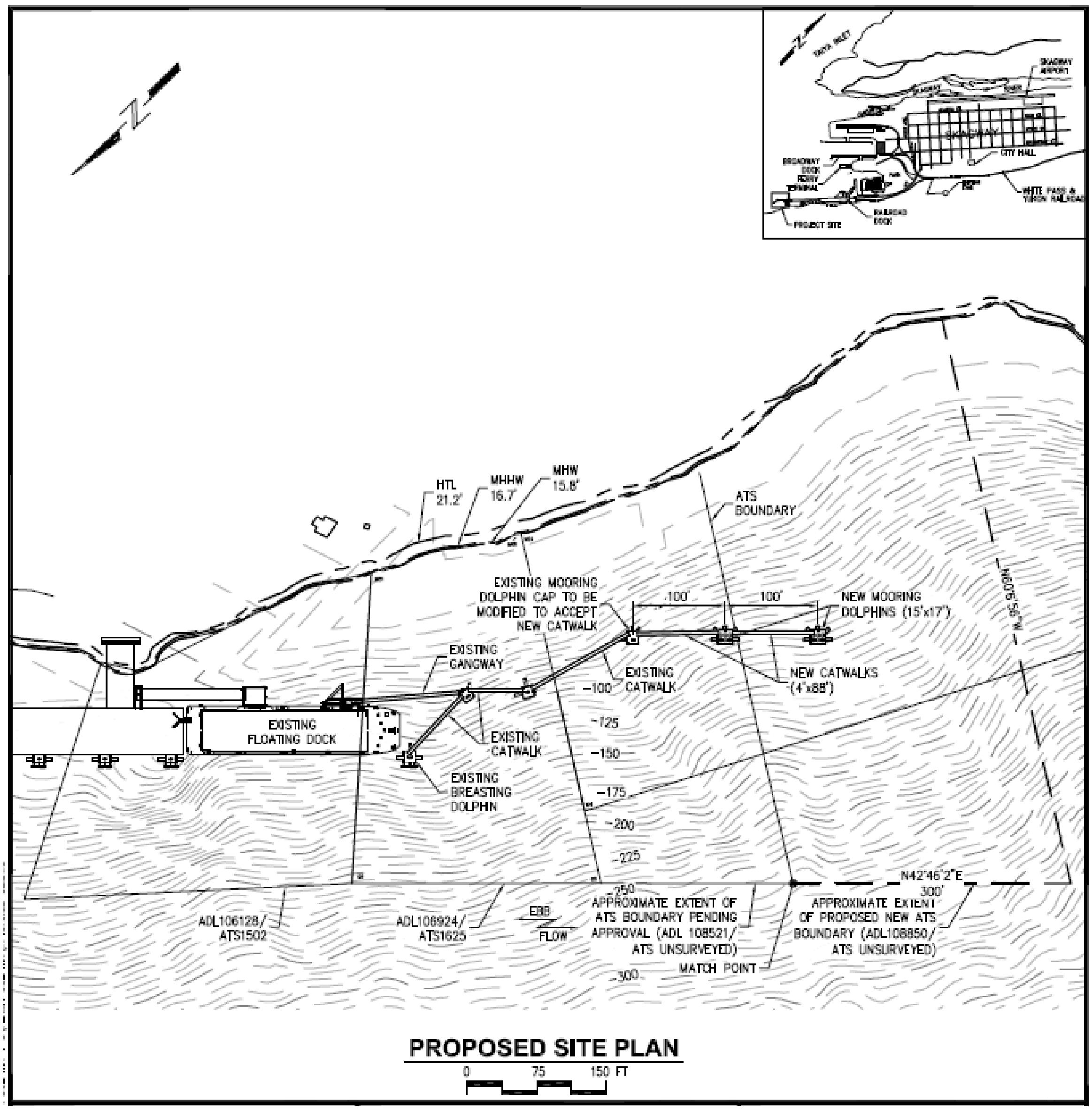


Figure 2. Main structures for the proposed Railroad Dock Dolphin Installation Project (PND Engineers 2018).

2.1.1 Construction of Dock Dolphin

In response to demand from larger cruise ships visiting Skagway, WP&YR proposes to install: (1) template piles consisting of 14 36-in piles that will be installed and removed; (2) two 200-ton mooring dolphins, one at each end section of the new dock with six 42-in. diameter piles; and (3) catwalks between new dolphins and existing southernmost mooring dolphin along the railroad dock south floating dock extension (see Figure 2). Some piles would require internal tension anchors for increased support. Pile counts, sizes, and other details are shown in Table 1.

Table 1. Temporary Template and Permanent Pile Details for New Construction (PND Engineers 2018).

Component	Stage	Type	Quantity	Size
Dock Dolphin	Template[1]	Steel H or Pipe	14	36 in.
	Permanent	Steel Pipe	12	42 in.

[1]Noise from installation and removal of the template piles is considered in the analysis; therefore, template pile count equates to 2 x 14, or 28, but the actual number of piles to be installed is 14. Template piles were assumed to be 36-in. diameter for analysis.

The sequence for installing the dolphin pipe piles will begin with advancement through overlying sediment with a vibratory hammer, followed by use of an impact hammer to drive the piles into bedrock. Finally, down-the-hole (DTH) drilling would be used for socketing the piles into bedrock. As each of the permanent piles is being installed, splicing up to three additional pipes will be required to reach the needed length. Only one installation method will occur at a time, but multiple methods may be used over the course of a day. Throughout the project, one crane will be dedicated to drilling only while the second crane will alternate between the vibratory and impact hammers (PND Engineers 2018).

<u>Temporary Piles</u>

Construction of the new dolphins will begin with the erection of a temporary template. The construction contractor will determine the specific type and size of template piles based on site conditions and availability of materials. For purposes of analysis, the applicant has assumed template piles would be 36-inch diameter pipe piles at the largest (see Table 1). The template piles will be driven into the overburden by vibratory hammer, followed by impact hammering and DTH for bedrock installation, and removed after the permanent piles are installed. A total of 14 template piles will be installed and then removed.

<u>Permanent Piles</u>

All permanent pipe piles will be installed using a combination of vibratory and impact hammering methods to drive the pile into the overburden. Pipe piles will then be drilled and socketed into the underlying bedrock using DTH hammering/drilling techniques. DTH equipment breaks up the rock below the pile while simultaneously installing the pile through rock formation. The pile is then set/confirmed with a few strikes of an impact hammer.

<u>Tension Anchors</u>

Certain piles will require internal tension anchors. Up to 12 of the permanent dock dolphin piles will require these internal tension anchors. Each pile with a tension anchor will first be drilled, socketed into bedrock, and proof driven with an impact hammer as described above for permanent piles. Then a separate smaller drill will be used to complete an approximately 8-inch diameter hole extending about 50 ft into bedrock below the tip of the pile. A steel bar will be grouted into this hole. Once the grout sets, a jack will be applied to the top of the bar and the tensioned rod will be locked off to plates at the top of the pile.

2.1.2 Transport of Material and Equipment

WP&YR will employ the following number and types of vessels for construction operations (PND Engineers 2018):

- 1 material barge;
- 2 crane barges; and
- 3 small work boats

Materials and equipment would be transported to the project site by barge. While work is conducted in the water, anchored barges will be used to stage construction materials and equipment. Vessels are anticipated to transit from Southeast Alaska, but may come from other communities following standard transit routes (PND Engineers 2018).

2.1.3 Dates and Duration of Activities

Construction will occur from approximately February through April 2019. Different installation methods may occur on the same day and the total construction period is expected to last no more than 89 days.

Based on the sequence of pile driving activities and the duration per method required to install piles, we anticipate the following scenario per installation method (Table 2). These construction scenarios are described in detail in the IHA application (PND Engineers 2018).

Table 2. Pile Driving and Removal Modeling Scenarios for the WP&YR Dolphin Project (PND Engineers 2018).

<table>
<tr><th colspan="2" rowspan="2">Source</th><th rowspan="2">Number of Piles Installed</th><th colspan="2">Estimated Duration</th></tr>
<tr><th>Hrs or Strikes/Day[2]</th><th>Total Number of Days Activity Would Occur</th></tr>
<tr><td rowspan="3">Template Piles</td><td>Vibratory Installation/Removal</td><td rowspan="3">14</td><td>3 hours</td><td>72</td></tr>
<tr><td>Impact Installation</td><td>2,000 strikes</td><td>59</td></tr>
<tr><td>Drilling Installation</td><td>6 hours</td><td>59</td></tr>
<tr><td rowspan="3">Permanent Piles</td><td>Vibratory Installation</td><td rowspan="3">12</td><td>8 hours</td><td>89</td></tr>
<tr><td>Impact Installation</td><td>2,000 strikes</td><td>89</td></tr>
<tr><td>Drilling Installation</td><td>8 hours</td><td>89</td></tr>
</table>

Pile installation will occur for 89 days over a period of three months. WY&YR anticipates up to 10 hours of activity (i.e., vibratory driving, impact driving, and DTH) during daylight hours would occur per day. The total number of weighted days is not additive and does not represent the total duration of pile driving. There may be more than one pile driving method used over the course of a single construction day.

2.1.4 Acoustic Sources

A number of acoustic sources are associated with installation of dock dolphin structures including: vibratory pile driving, impact pile driving, and DTH hammering. Each of these elements generates in-water and in-air noise.

Three different pieces of pile driving equipment have been proposed for the construction of the WP&YR dock dolphins: the diesel impact hammer Delmag D100 for impact operations, the APE 200 vibratory driver for vibratory, and the MF34 for DTH hydro-hammering. Table 4 lists equipment details. Although DTH hydro-hammering has impulsive source components, the high frequency of 510 blows/minute combined with long continuous operation intervals of several minutes make its signature noise more like a non-impulsive source and therefore we treat it as such in this opinion.

Table 3. Properties of pile driving equipment anticipated for construction activities at Taiya Inlet Dolphin Project (PND Engineers 2018).

Driving mechanism	Pile driver	Properties
Impact	Delmag D100 Diesel	360 kNm rated energy, 45 strikes/minute
Vibratory	APE 200	1,513 kN centrifugal force
DTH hydro-hammering	MF34	510 blows/minute
Tension Anchoring	ICE-HS-27	31 kNm rated energy

Impact Hammer

An impact hammer is a steel device that works like a piston. The pile is first moved into position and set in the proper location using a choker cable or vibratory hammer. The impact hammer is held in place by a guide (lead) that aligns the hammer with the pile. A heavy piston moves up and down, striking the top of the pile and driving it into the substrate. Once the pile is set in place, pile installation with an impact hammer can take less than 15 minutes under good substrate conditions. However, under poor conditions, such as glacial till and bedrock or exceptionally loose material, piles can take longer to set. The proposed action anticipates using an Delmag D100 impact driver (PND Engineers 2018).

Pipe Piles

Impact pile driving is used to confirm that the pile is firmly positioned on the bedrock (i.e., pile near refusal). Source level broadband SPLs for impact hammering 42-inch piles at refusal for the project are based on measurements of driving 48-inch steel piles at the Port of Anchorage in Alaska (Austin M. et al. 2016). Based on this information, the 90^{th} percentile source levels broadband SPL for impact hammering 42-inch piles is anticipated to be SEL 186.7 dB re 1 $uPa^2 \cdot s$ (PND Engineers 2018).

Vibratory Hammer

Vibratory hammering is anticipated to be the predominant installation method. Generally, the pile is placed into position using a choker and crane, and then vibrated at between 1,200 and 2,400 vibrations per minute. The vibrations liquefy the sediment surrounding the pile allowing it to penetrate to the required seating depth, or to be removed.

The pile driving equipment anticipated for vibratory hammering is the APE-200 vibratory driver (PND Engineers 2018).

Pipe Piles
Source level information for vibratory installation of 42-in pipe piles was not available. In order to be conservative, source level was based on measured values for driving a 48-inch pile at the Port of Anchorage, Alaska (Caltrans 2015, Austin M. et al. 2016). Based on this information, the 90^{th} percentile source levels broadband SPL for vibratory hammering 42-inch piles is anticipated to be 166.8 dB_{rms} re 1 uPa (PND Engineers 2018).

DTH Hydro-Hammering

In this project, the DTH hydro-hammer operates in vertical piles that have been partially driven by vibratory means. Before it begins operating, the DTH hydro-hammer is installed within the hollow pipe pile at the bottom of the pile. Piles are advanced by applying a pulsating mechanism to break the underlying bedrock while simultaneously removing broken rock fragments. We have assumed that the interaction between the rock and the DTH hydro-hammer is what generates noise, therefore sound levels do not depend on pile diameter.

There is very limited source level and sound source verification data available for DTH. In May 2016, a Numa Patriot 180 hammer was used to drive 24-inch diameter piles at a ferry terminal at Kodiak, AK (Warner and Austin 2016b). Acoustic signatures for DTH hydro-hammering were recorded at ranges of 10–30 m from the pile. Using the 90^{th} percentile source levels broadband SPL rms measured from Kodiak, we anticipate a source level RMS of 171 dB re 1 uPa at 10 m and SEL of 186 dB re 1 $uPa^2 \cdot s$. This source level was selected because it is the only DTH SSV in Alaska, and although from a smaller sized pile DTH noise generation is anticipated to be independent from pile diameter.

2.1.5 Mitigation Measures

WP&YR Proposed Mitigation Measures

The following measures will be incorporated by WP&YR to minimize potential impacts from project activities:

1) All vessels associated with project construction will avoid the 3,000 ft (914 m) designated aquatic zones surrounding any major Steller sea lion rookery or haulout east of 144° W longitude.
2) Dolphin installation will be performed in a manner that does not introduce any pollutants or debris into the water.
3) Fuels, lubricants, chemicals, and other hazardous substances will be stored above the high tide line to prevent spills.

4) Oil booms will be readily available for containment should any releases occur.

5) Standard spill-prevention measures will be implemented during construction to prevent spills or leakage of hazardous material. The contractor will always provide and maintain a spill clean-up kit on-site.

6) The contractor will regularly monitor equipment and gear storage areas for drips or leaks, including inspection of fuel hoses, oil drums, oil or fuel transfer valves and fittings, and fuel storage that occurs at the project site. Equipment will be maintained and stored properly to prevent spills and mobilization of fuels, lubricants, chemicals, and other hazardous substances.

7) If contaminated or hazardous materials are encountered during construction, all work near the contaminated site will be stopped until a corrective action plan is devised and implemented to minimize impacts on surface waters and organisms in the action area.

NMFS PR1 Proposed Mitigation

PR1 proposes to issue an IHA for non-lethal "takes"[1] of marine mammals by Level A and Level B harassment (as defined by the MMPA) incidental to WP&YR's proposed action (83 FR 64541). When issued, the IHA will be valid from February 2019, to April 2019, and will authorize the incidental harassment of one ESA-listed whale species and one listed sea lion species, as well as five non-ESA-listed whale and pinniped species. Table 5 shows the amount of proposed take for the two ESA-listed species in the proposed IHA.[2]

Table 4. Amount of proposed incidental harassment (takes) of ESA-listed species in the proposed IHA (83 FR 64541).

Species	Proposed Authorized Level A Takes	Proposed Authorized Level B Takes
Western DPS Steller sea lion (*Eumatopias jubatus*)	0	35[3]
Mexico DPS Humpback whale (*Megaptera noviaengliae*)	2	6[4]

[1] The MMPA defines "harassment" as "any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild" (referred to as Level A harassment) or "has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering" (referred to as Level B harassment). 16 U.S.C. 1362(18)(A) and (B). For the purposes of this consultation, NMFS considers that a take by "harassment" occurs when an animal is exposed to certain sound levels described below in Section 6 of this opinion.
[2] Please see proposed IHA (83 FR 64541) for MMPA-authorized takes of marine mammal species not listed under the ESA.
[3] The proposed IHA (83 FR 64541) indicated a requested Level B take of 1,752 Steller sea lions. Of the proposed takes, 2% are anticipated to occur to ESA-listed western DPS animals. Zero Level A takes are anticipated due to a small level A zone that can be effectively monitored and shut down. The basis for this apportionment is described below in Section 4.3.2
[4] The proposed IHA (83 FR 64541) indicated a requested Level A take of 25 humpback whales, and a Level B take of 125 humpback whales. Humpback whales in Southeast Alaska include individuals from two DPSs. Of the 25 Level A exposures, we anticipate two threatened Mexico DPS animals will be taken, and the remaining 23 will occur from the Hawaii DPS, which is not listed under the ESA. The basis for this apportionment is described below in Section 4.3.1.

The mitigation measures described below are required per the NMFS's IHA stipulations, and will be implemented by WP&YR to reduce potential impacts to marine mammals from pile removal and installation activities, DTH hydro-hammering operations, and vessel movements. Unless otherwise noted, these measures apply to all marine mammal species.

Establishing Exclusion and Disturbance Zones

Exclusion Zone (i.e., shutdown zone) – For all pile driving/removal and DTH hammering activities, the WP&YR will establish an exclusion zone intended to contain the area in which SPLs equal or exceed the auditory injury criteria for cetaceans and pinnipeds. The purpose of an exclusion zone is to define an area within which shutdown of activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area), thus preventing injury (Level A harassment) of marine mammals (see Response Analysis Section 6.3, although serious injury or death are unlikely outcomes even in the absence of mitigation measures). Modeled radial distances for exclusion zones are shown in Table 6. However, a minimum shutdown zone of 10 m will be established during all pile driving activities, regardless of the estimated zone.

Disturbance Zone – Disturbance zones are the areas in which SPLs equal or exceed 160 and 120 dB rms (Level B harassment for impulse and continuous sound, respectively). Disturbance zones provide utility for monitoring conducted for mitigation purposes (*i.e.*, exclusion zone monitoring) by establishing monitoring protocols for areas adjacent to the exclusion zones. Monitoring of disturbance zones enables observers to be aware of and communicate the presence of marine mammals in the ensonified area but outside the exclusion zone, and thus prepare for potential shutdowns of activity. However, the primary purpose of disturbance zone monitoring is for documenting instances of Level B harassment. Nominal radial distances for disturbance zones are shown in Table 6.

Given the size of the disturbance zone for vibratory pile driving and DTH drilling (~13 km; see Figure 4), it is impossible to guarantee that all animals would be observed or to make comprehensive observations of fine-scale behavioral reactions to sound, and only a portion of the zone (*e.g.,* what may be reasonably observed by visual observers stationed between Dyea Point and Taiya Inlet) would be observed. However, with the addition of five PSOs located throughout the inlet, the observable zone provides a representative sample and extrapolation of take is reasonable. In order to document observed instances of harassment, observers record all marine mammal observations, regardless of location. The observer's location, as well as the location of the pile being driven, should be recorded, and is known from a GPS device. The location of the animal is estimated as a distance from the observer, which is then compared to the location from the pile. It may then be estimated whether the animal was exposed to sound levels constituting incidental harassment on the basis of predicted distances to relevant thresholds in post-processing of observational and acoustic data, and a precise accounting of observed incidences of harassment created. This information may then be used to extrapolate observed takes to reach an approximate understanding of total takes beyond the observable distance. The total number of exposures will be estimated by dividing the number of observed animals by the percentage of the monitoring zone that was visible.

Table 5. Distances to Level A Shutdown and Level B Exposure Zones (PND Engineers 2018).

Source	Level B Monitoring Zone All species (km)	Level A Safety Zone Humpback whales/ Steller sea lions (m)
Vibratory Installation	13.0	150/80
Drilling Installation	13.0	150/80
Impact Installation	3.7	2,000[1]/150
[1]Taiya Inlet is approximately 2.0 km wide at Skagway so the exclusion zone has been modified to be the width of the Inlet.		

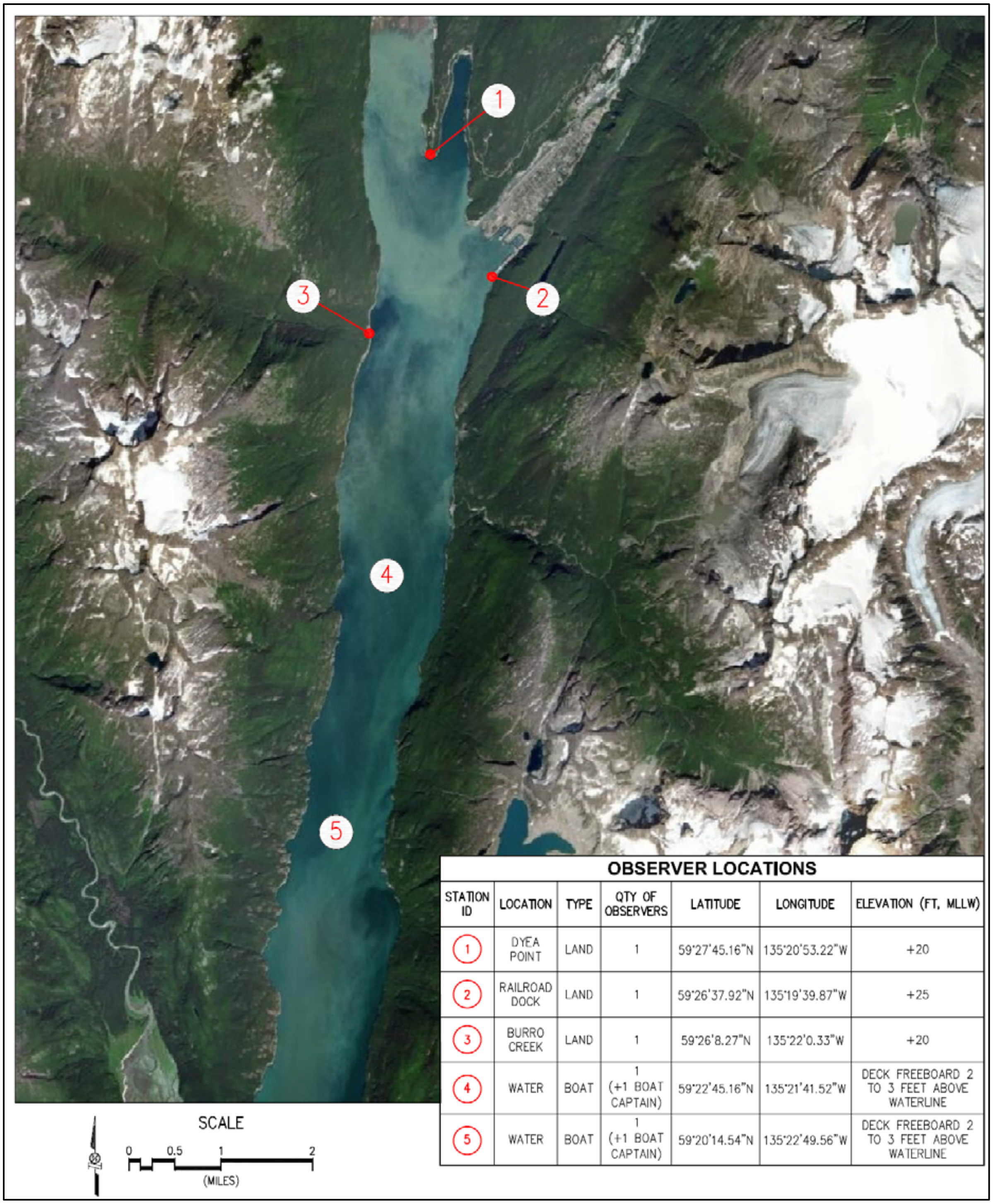
Monitoring Protocols – Monitoring would be conducted before, during, and after pile driving and removal activities. In addition, observers shall record all instances of marine mammal occurrence, regardless of distance from activity, and shall document any behavioral reactions in concert with distance from piles being driven or removed. Observations made outside the exclusion zone will not result in shutdown; that pile segment would be completed without cessation, unless the animal approaches or enters the exclusion zone, at which point all pile driving or removal activities would be halted. Monitoring will take place from 30 minutes prior to initiation through 30 minutes post-completion of pile driving and removal activities. Pile driving activities include the time to install or remove a single pile or series of piles, as long as the time elapsed between uses of the pile driving equipment is no more than 30 minutes.

Protected Species Observers (PSOs)

Monitoring will be conducted by qualified observers, who will be placed at the best vantage point(s) practicable to monitor for marine mammals and implement shutdown/delay procedures when applicable by calling for the shutdown to the hammer operator. During all types of installation an observer will be stationed at the Railroad Dock, Yakutania Point, and Dyea Point. These stations will allow extensive monitoring of the impact hammer Level B zone and the Level A shutdown zones. The vibratory and drilling Level B disturbance zone will be additionally monitored using PSOs stationed on boats anchored near the shoreline, with each team (of two) stationed approximately 2 km apart (see Figure 3).

1. PSO requirements for construction actions are as follows:
    a. Independent observers (*i.e.*, not construction personnel) are required;
    b. At least one observer must have prior experience working as an observer;
    c. Other observers (that do not have prior experience) may substitute education (undergraduate degree in biological science or related field) or training for experience;
    d. Where a team of three or more observers are required, one observer should be designated as lead observer or monitoring coordinator. The lead observer must have prior experience working as an observer; and
    e. NMFS will require submission and approval of observer resumes.
    f. Maximum of 4 consecutive hours on watch per PSO; and
    g. Maximum of ~12 hours of watch time per day per PSO

2. Qualified PSOs are trained biologists, and need the following additional 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;
    b. Ability to conduct field observations and collect data according to assigned protocols;
    c. Experience or training in the field identification of marine mammals, including the identification of behaviors;
    d. PSO training must be provided prior to project start and in accordance with the monitoring measures in the application and biological opinion, and shall include at a minimum:
        i. Species identification (sufficient to distinguish the species listed in Table 12 of the proposed IHA)
    e. Sufficient training, orientation, or experience with the construction operations to provide for personal safety during observations;
    f. Writing skills sufficient to prepare a report of observations; and
    g. Ability to communicate orally, by radio or in person, with each other, and relevant project personnel (*e.g.*, those necessary to effect activity delay or shutdown) to provide real-time information on marine mammals observed in the area as necessary.
3. The five PSOs will be located at the best vantage point(s) in order to properly see the entire exclusion zone and as much of the disturbance zone as possible;
4. The exclusion and disturbance zones around the pile will be monitored for the presence of marine mammals before, during, and after any pile driving or removal activity;
5. During all observation periods, observers will use binoculars and the naked eye to search continuously for marine mammals;
6. Prior to the start of pile driving activity, the exclusion zone will be monitored for 30 minutes to ensure that it is clear of marine mammals. Pile driving will only commence once observers have declared the exclusion zone clear of marine mammals; animals will be allowed to remain in the exclusion zone (*i.e.*, must leave of their own volition) and their behavior will be monitored and documented. The exclusion zone may only be declared clear, and pile driving started, when the entire exclusion zone is visible (*i.e.*, when not obscured by dark, rain, fog, *etc*.). Should such conditions arise while impact, vibratory, or DTH driving is underway, the activity would be halted; and
7. If a marine mammal approaches or enters the exclusion zone during the course of pile driving and removal operations, activity will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the exclusion zone or 15 minutes have passed without re-detection of small cetaceans and pinnipeds, and 30 minutes for humpback whales. Monitoring will be conducted throughout the time required to drive or remove a pile.



OBSERVER LOCATIONS

STATION ID	LOCATION	TYPE	QTY OF OBSERVERS	LATITUDE	LONGITUDE	ELEVATION (FT, MLLW)
1	DYEA POINT	LAND	1	59°27'45.16"N	135°20'53.22"W	+20
2	RAILROAD DOCK	LAND	1	59°26'37.92"N	135°19'39.87"W	+25
3	BURRO CREEK	LAND	1	59°26'8.27"N	135°22'0.33"W	+20
4	WATER	BOAT	1 (+1 BOAT CAPTAIN)	59°22'45.16"N	135°21'41.52"W	DECK FREEBOARD 2 TO 3 FEET ABOVE WATERLINE
5	WATER	BOAT	1 (+1 BOAT CAPTAIN)	59°20'14.54"N	135°22'49.56"W	DECK FREEBOARD 2 TO 3 FEET ABOVE WATERLINE

Figure 3. PSO locations associated with the WP&YR Dock Dolphin Project (PND Engineers 2018).

Soft Start Procedures

The use of a soft start procedure for impact pile driving is believed to provide additional protection to marine mammals by warning or providing a chance for them to leave the area prior to the hammer operating at full capacity, and typically involves a requirement to initiate sound from the hammer at reduced energy followed by a waiting period. This procedure is repeated two additional times. It is difficult to specify the reduction in energy for any given hammer because of variation across drivers and, for impact hammers, the actual number of strikes at reduced energy will vary because operating the hammer at less than full power results in "bouncing" of the hammer as it strikes the pile, resulting in multiple "strikes." For impact driving, we require an initial set of three strikes from the impact hammer at reduced energy, followed by a 30-second waiting period, then two subsequent 3-strike sets. Soft start will be required at the beginning of each day's impact pile driving work and at any time following a cessation of impact pile driving of 30 minutes or longer. Soft start procedures will not be required for vibratory hammering operations.

If work ceases for more than 30 minutes, zone clearance and soft start procedures must recommence prior to performing additional work.

In-Water Work

For in-water heavy machinery work other than pile driving (*e.g.*, standard barges, tug boats, barge-mounted excavators, or clamshell equipment used to place or remove material), if a marine mammal approaches the 10 meters, operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions.

Timing Restrictions

The WP&YR will only conduct construction activities during daytime hours. Construction will also be restricted to the months of February through April.

Sound Source Verification

Acoustic monitoring must be conducted in accordance with the Acoustic Monitoring Plan, dated January 28, 2019. WP&YR will conduct in-situ sound source verification tests for at least one 42-inch permanent pile for vibratory, impact, and DTH hammering methods. WP&YR will submit the preliminary results to NMFS within seven days after completing measurements, followed by a final report submitted within 60 days after the completion of the measures.

The SSV is based on dual metric criteria that will establish source levels for impact pile driving, vibratory pile driving, and DTH drilling. The WP&YR will provide all monitoring data to NMFS. The reports would include the following information:

1. Size and type of piles;
2. The impact hammer energy rating used to drive the piles, and the make and model of the hammer and the output energy;
3. The physical characteristics of the bottom substrate into which the piles were driven;

4. The depth of water in which the pile was driven;
5. The depth into the substrate that the pile was driven;
6. A description of the sound monitoring equipment;
7. The distance between hydrophones and pile;
8. The depth of the hydrophones and depth of water at hydrophone locations;
9. The distance from the pile to the water's edge;
10. The total number of strikes to drive each pile and for all piles driven during a 24-hour period;
11. The results of the hydroacoustic monitoring;
12. Source levels for peak and RMS SPLs and single strike SEL at 10 m from the pile, and RMS pulse duration that contains 90% of pulse energy.
13. The distance at which peak, cumulative SEL, and RMS values exceed the respective threshold values;
14. For vibratory pile driving, SEL based on 30 second averaging of sound intensity;
15. The spectra graphs for each pile type; and
16. A description of any observable marine mammal behavior in the immediate area and, if possible, correlation to underwater sound levels occurring at that time.

A minimum of one 42-in pile for each construction type (i.e. impact and vibratory pile driving and DTH drilling) will be monitored. Piles chosen to be monitored will be representative of the different sizes and range of typical water depths at the project location where piles will be driven with an impact or vibratory hammer.

One bottom-mounted hydrophone will be placed at the nearest distance, approximately 10 meters, from each pile being monitored. A second hydrophone may be deployed at a greater distance (*e.g.*, 1-5 km or further) for the purpose of better defining the long-distance sound propagation. Underwater sound levels will be continuously monitored during the entire duration of each pile being driven. Sound levels will be measured in dB re: 1 μPa.

Least Practicable Impact

NMFS PR1 evaluated the WP&YR's proposed mitigation measures and considered their effectiveness in past implementation to preliminarily determine whether they are likely to result in the least practicable impact on the affected marine mammal species and stocks and their habitat.

Any mitigation measure(s) NMFS PR1 prescribes should be able to accomplish, have a reasonable likelihood of accomplishing (based on current science), or contribute to the accomplishment of one or more of the general goals listed below:

1. Avoidance or minimization of injury or death of marine mammals wherever possible (goals 2, 3, and 4 may contribute to this goal);
2. A reduction in the number (total number or number at biologically important time or

location) of individual marine mammals exposed to stimuli expected to result in incidental take (this goal may contribute to 1, above, or to reducing takes by behavioral harassment only);

3. A reduction in the number (total number or number at biologically important time or location) of times any individual marine mammal would be exposed to stimuli expected to result in incidental take (this goal may contribute to 1, above, or to reducing takes by behavioral harassment only);
4. A reduction in the intensity of exposure to stimuli expected to result in incidental take (this goal may contribute to 1, above, or to reducing the severity of behavioral harassment only);
5. Avoidance or minimization of adverse effects to marine mammal habitat, paying particular attention to the prey base, blockage or limitation of passage to or from biologically important areas, permanent destruction of habitat, or temporary disturbance of habitat during a biologically important time; and
6. For monitoring directly related to mitigation, an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

Based on NMFS PR1's evaluation of the WP&YR's proposed measures, as well as any other potential measures considered by NMFS, PR1 preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable impact on marine mammal species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Monitoring and Reporting

PR1 requires that observers use approved data forms. Among other pieces of information, the WP&YR will record detailed information about any implementation of shutdowns, including the distance of animals to the pile, description of specific actions that ensued, and resulting behavior of the animal, if any. In addition, the WP&YR will attempt to distinguish between the number of individual animals taken and the number of incidences of take.

Data Collection

NMFS PR1 requires that, at a minimum, the following information be collected on the sighting forms:

1. Date and time monitoring activity begins or ends;
2. Construction activities occurring during each observation period;
3. Weather parameters (e.g., percent cover, visibility, and sun glare);
4. Water conditions (e.g., sea state, tide state);
5. Species, group size, age/size/sex categories (if determinable);
6. Description of any observable marine mammal behavior patterns, including direction of travel, and if possible, the correlation to SPLs;

7. An estimated total take extrapolated from the number of marine mammals observed during the course of construction activities;
8. Distance from pile driving or removal activities to marine mammals and distance from the marine mammals to the observation point;
9. Description of implementation of mitigation measures (e.g., shutdown or delay);
10. Locations of all marine mammal observations; and
11. Other human activity in the area.

Reporting

Interim Reports
Brief monthly summaries of PSO observations and recorded takes of ESA-listed species will be provided to NMFS AKR during construction. The frequent reports will allow NMFS AKR to track takes (including extrapolated estimated takes) so that authorized take numbers are not exceeded.

End-of –Project Report
A draft report would be submitted to NMFS PR1 within 90 days of the completion of marine mammal monitoring, or 60 days prior to the requested date of issuance of any future IHA for projects at the same location, whichever comes first. The report will include marine mammal observations pre-activity, during-activity, and post-activity during pile driving and removal days; descriptions of any behavioral responses to construction activities by marine mammals; a complete description of all mitigation shutdowns and the results of those actions; and an extrapolated total take estimate based on the number of marine mammals observed during the course of construction. A final report must be submitted within 30 days following resolution of comments on the draft report.

Unauthorized Take: Dead or Injured Marine Mammals

1. In the unanticipated event that survey operations clearly cause the take of a marine mammal in a manner prohibited by this IHA, such as a serious injury or mortality (e.g., ship-strike, gear interaction, and/or entanglement), the WP&YR will immediately cease the specified activities and report the incident to the Office of Protected Resources, Permits Division, and the Alaska Regional Stranding Network hotline (1-877-925-7773). The report must include the following information:

   1.1 Time, date, and location (latitude/longitude) of the incident;

   1.2 Description of the incident;

   1.3 Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, and visibility);

   1.4 Description of marine mammal observations in the 24 hours preceding the incident;

   1.5 Species identification or description of the animal(s) involved;

   1.6 The fate of the animal(s); and

   1.7 Photographs or video footage of the animal (if equipment is available).

Activities will not resume until NMFS is able to review the circumstances of the unauthorized take. NMFS will work with WP&YR to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. WP&YR may not resume their activities until notified by NMFS.

2. In the event that WP&YR discovers an injured or dead marine mammal, the WP&YR will immediately report the incident to the Permits Division and the NMFS Alaska Stranding Hotline (1-877-925-7773). The report must include the same information identified above in Unauthorized Take items 1.1-1.7 of this list. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with WP&YR to determine whether modifications in the activities are appropriate.

2.2 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.

The proposed dock dolphin installation project is located within Taiya Inlet near Skagway, Alaska. The action area includes: (1) the area in which construction activities will take place, (2) an ensonified area around the pile removal and installation activities[5] (see Figure 4), and (3) the transit route from other locations in Southeast Alaska to Skagway.

Within this area, the loudest sound source with the greatest propagation distance is anticipated to be associated with DTH hydro-hammering. Received levels from DTH hydro-hammering with a source level of 171 dB re 1 uPa (rms), may be expected on average to decline to 120 dB re 1 μPa (rms) within ~25 km of the pile using a practical spreading model (15 log R) (PND Engineers 2018). The 120 dB isopleth was chosen because that is where we anticipate DTH hydro-hammering noise levels would approach ambient noise levels (i.e., the point where no measurable effect from the project would occur). However, our ensonified area has been limited to 13 km due to noise hitting surrounding land masses (Figure 4).

The action area includes transit areas for mobilization and demobilization of construction equipment for vessels. Mobilization and demobilization is anticipated to occur in Southeast Alaska. However, considering that a contractor has not been selected at this point in time, staging areas for operations may vary. Regardless of staging area, the applicant has agreed that all vessels associated with project construction will avoid the 3,000 ft (914 m) aquatic zones surrounding any major Steller sea lion rookery or haulout.

[5] See Section 2.1.4 of this opinion for additional details about how this radius was determined.

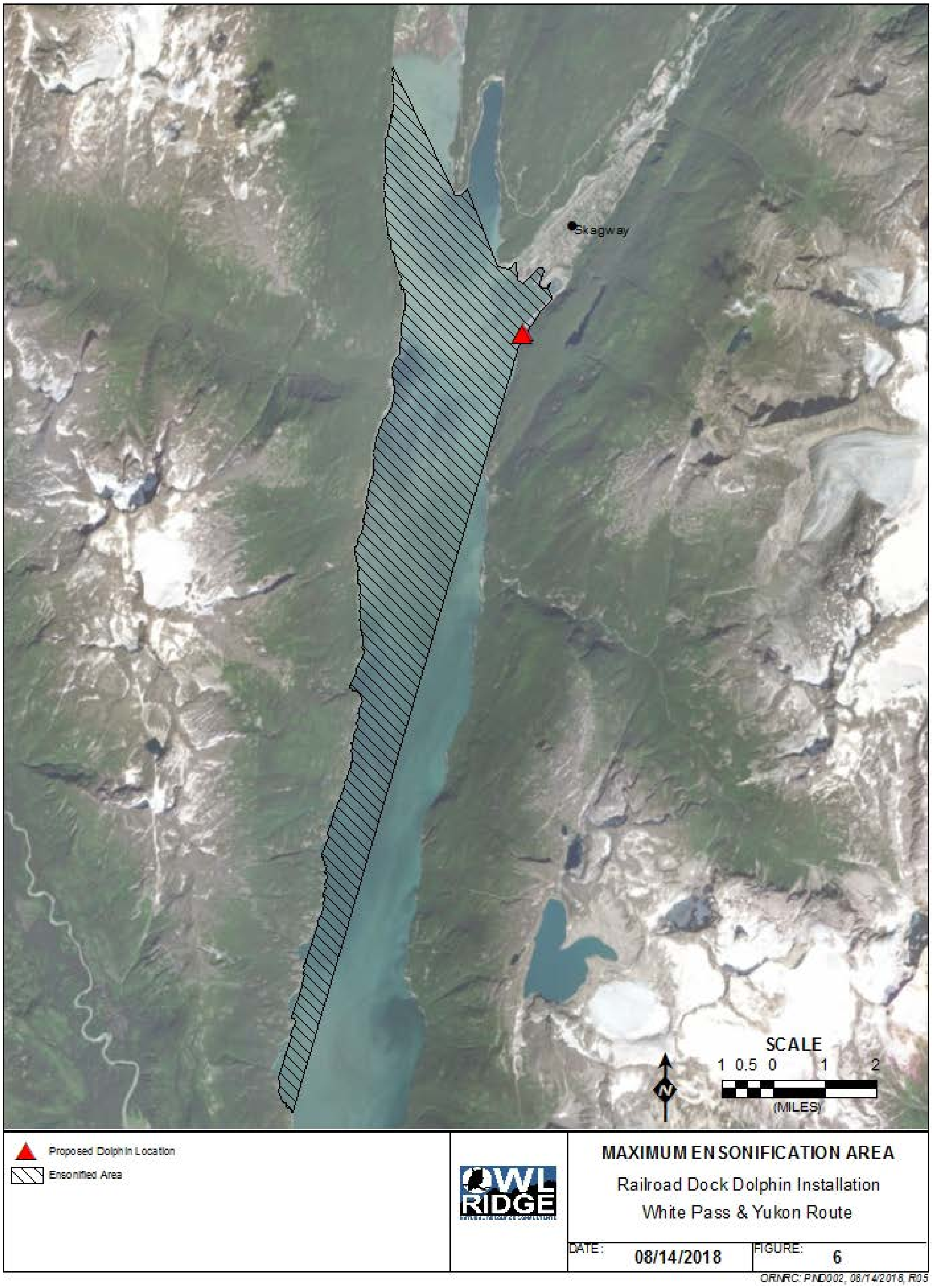


Figure 4. Estimated Level B ensonified area associated with pile installation for the WP&YR dolphin dock project. The 120 dB isopleth extends approximately 13 km from the sound source (PND Engineers 2018).

3 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 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 biological 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 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 range-wide status of the species and critical habitat likely to be adversely affected by the proposed action. This section describes the current status of each listed species and its critical habitat relative to the conditions needed for recovery. We determine the range-wide status of critical habitat by examining the condition of its 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 sex 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.
- 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.

4 RANGEWIDE STATUS OF THE SPECIES AND CRITICAL HABITAT

Three species of marine mammals listed under the ESA under NMFS's jurisdiction may occur in the action area. This opinion considers the effects of the proposed action on these species (Table 7). The nearest designated critical habitat for Steller sea lions is Gran Point located approximately 25 miles south of the construction area.

Table 6. Listing status and critical habitat designation for marine mammals considered in this opinion.

Species	Status	Listing	Critical Habitat
Humpback Whale, Mexico DPS *Megaptera novaeangliae*	Threatened	NMFS 1970, 35 FR 18319 NMFS 2016 81 FR 62260	Not designated
Sperm Whale *Physeter macrocephalus*	Endangered	NMFS 1970 35 FR 18319	Not designated
Steller Sea Lion, Western DPS *Eumetopias jubatus*	Endangered	NMFS 1997, 62 FR 24345	1993 58 FR 45269

4.1 Species and Critical Habitats Not Considered Further in this Opinion

NMFS uses two criteria to identify those endangered or threatened species or critical habitat that are likely to be adversely affected. The first criterion is exposure or some reasonable expectation of a co-occurrence between one or more potential stressors associated with WP&YR's proposed activities and a listed species or designated critical habitat. The second criterion is the probability of a response given exposure.

We applied these criteria to the species and critical habitats listed above and determined that the following species and designated critical habitats are not likely to be adversely affected by the proposed action: sperm whales and Steller sea lion critical habitat.

4.1.1 Sperm Whales

Tagged sperm whales have recently been tracked within the Gulf of Alaska, with one whale tracked up Lynn Canal during October 2014 (SEASWAP 2017). Tagging studies primarily show that sperm whales use the deep water slope habitat extensively for foraging (Mathias et al. 2012). Interaction studies between sperm whales and the longline fishery have been focused along the continental slope of the eastern Gulf of Alaska in water depths between about 1,970 and 3,280 ft (600 and 1,000 m) (Straley et al. 2005, Straley et al. 2014). The shelf-edge/slope waters of the Gulf of Alaska are far outside of the action area.

Though we do not expect sperm whales will occur in the action area where pile driving activities will occur, it is possible these species may be encountered during transit from staging areas to the construction site in Taiya Inlet. Therefore, it is possible the species will be at-risk for vessel strike. However, it is extremely unlikely that vessels will strike sperm whales for the following reasons:

- Few, if any, sperm whales are likely to be encountered because they are generally found in deeper waters than those in which the transit route will occur.
- Project duration is limited to 89 days.
- A limited number of vessels are associated with construction (~6 vessels).
- NMFS's guidelines for approaching marine mammals discourage vessels approaching within 100 yards of marine mammals

For these reasons, we conclude the majority of stressors associated with the proposed action would have no effect on sperm whales because they are not anticipated to overlap in time and space, and the effects of ship strike are discountable because they are extremely unlikely to occur. Therefore, sperm whales are not likely to be adversely affected by this action.

4.1.2 Steller Sea Lion Critical Habitat

NMFS designated critical habitat for Steller sea lions on August 27, 1993 (58 FR 45269). The following PBFs were identified at the time of listing:

1. Alaska rookeries, haulouts, and associated areas identified at 50 CFR 226.202(a), including:
   - 1.1. Terrestrial zones that extend 914 m (3,000 ft) landward
   - 1.2. Air zones that extend 914 m (3,000 ft) above the terrestrial zone
   - 1.3. Aquatic zones that extend 914 m (3,000 ft) seaward from each major rookery and major haulout east of 144° W. longitude
   - 1.4. Aquatic zones that extend 37 km (23 mi) seaward from each major rookery and major haulout west of 144° W. longitude
2. Three special aquatic foraging areas identified at 50 CFR 226.202(c):
   - 2.1. Shelikof Strait
   - 2.2. Bogoslof
   - 2.3. Seguam Pass

The ensonified area associated with the project does not overlap with designated critical habitat. The nearest critical habitat is Gran Point (blue dot near Haines in Figure 5) located 25 miles south of Skagway, and outside of the ensonified area. While transit routes to and from the construction site are currently unknown, mitigation measures require all vessels associated with construction operations to avoid the 3,000 ft (914 m) aquatic zone surrounding any designated critical habitat in Southeast Alaska.

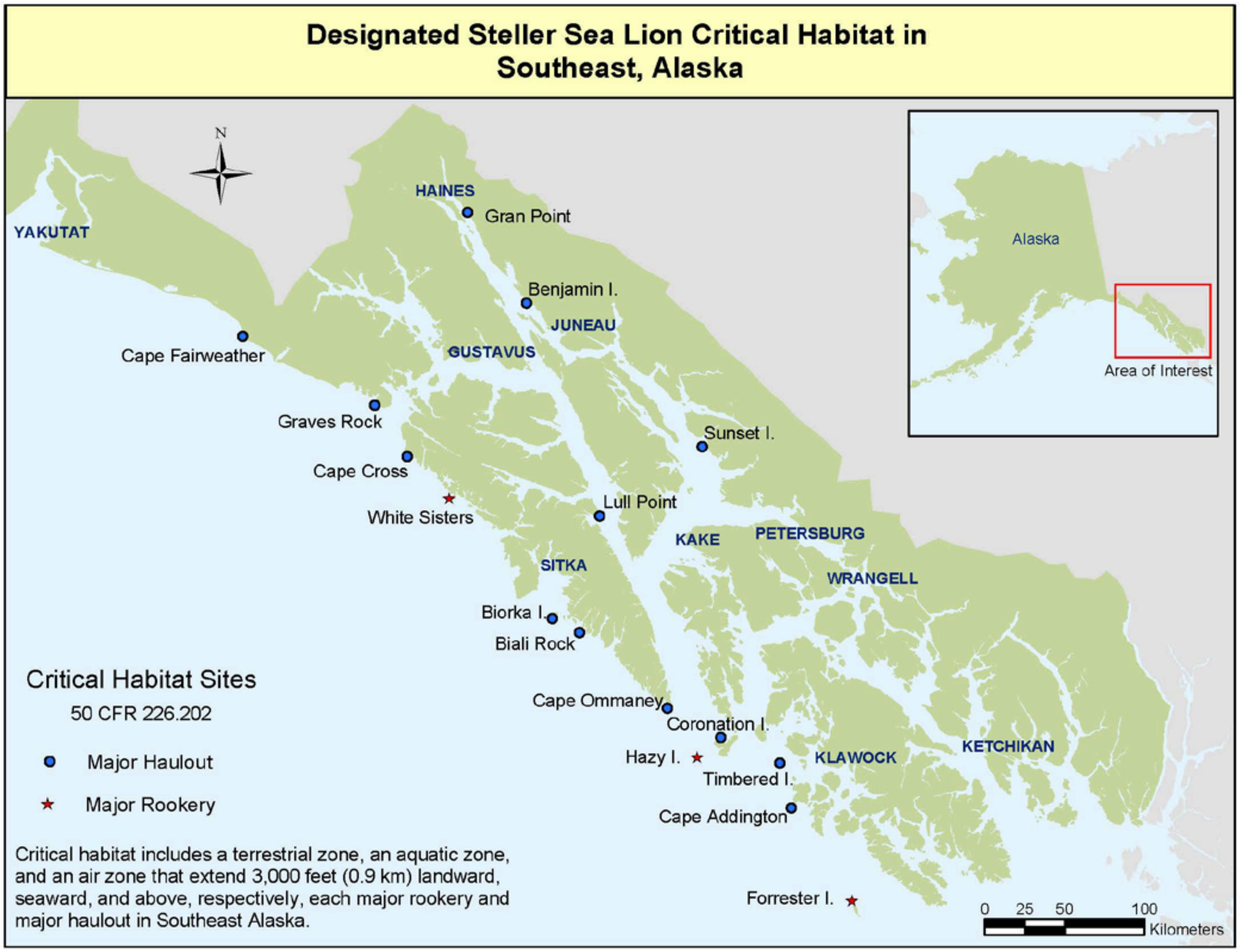


Figure 5. Designated critical habitat for Steller sea lions in Southeast Alaska.

The transit route will not pass near enough to landmasses to encounter hauled-out pinnipeds; however, foraging sea lions may be encountered during vessel transit through critical habitat surrounding haulouts and rookeries. It is unlikely that vessel transit will impact critical habitat surrounding haulouts and rookeries to any measurable degree considering vessels will avoid designated aquatic zones. We conclude any impacts to these PBFs are likely to be insignificant. Therefore, we conclude Steller sea lion critical habitat is not likely to be adversely affected by this action.

4.2 Climate Change

One potential threat common to all of the species we discuss in this opinion is global climate change. Because of this commonality, we present this narrative here rather than in each of the species-specific narratives that follow.

The timeframe for the proposed action is February 1, 2019 through April 30, 2019, which is a relatively short duration to detect any noticeable climate change impacts. We present potential climate change effects on listed species and their habitat below.

The average global surface temperature rose by 0.85º C from 1880 to 2012, and it continues to rise at an accelerating pace (IPCC 2014b). The 15 warmest years on record since 1880 have occurred in the 21st century, with 2015 being the warmest (NCEI 2016). The warmest year on record for average ocean temperature is also 2015 (NCEI 2016). Since 2000, the Arctic (latitudes between 60º and 90º N) has been warming at more than twice the rate of lower latitudes (Jeffries et al. 2014) due to "Arctic amplification," a characteristic of the global climate system influenced by changes in sea ice extent, atmospheric and oceanic heat transports, cloud cover, black carbon, and many other factors (Serreze and Barry 2011).

Direct effects of climate change include increases in atmospheric temperatures, decreases in sea ice, and changes in sea surface temperatures, oceanic pH, patterns of precipitation, and sea level. Indirect effects of climate change have impacted, are impacting, and will continue to impact marine species in the following ways (IPCC 2014b):

- Shifting abundances
- Changes in distribution
- Changes in timing of migration
- Changes in periodic life cycles of species

Further, ocean acidity has increased by 26 percent since the beginning of the industrial era (IPCC 2013) and this rise has been linked to climate change (Foreman and Yamanaka 2011, GAO 2014, Murray et al. 2014, Okey et al. 2014, Secretariat of the Convention on Biological Diversity 2014, Andersson et al. 2015). Climate change is also expected to increase the frequency of extreme weather and climate events including, but not limited to, cyclones, heat waves, and droughts (IPCC 2014a). Climate change has the potential to impact species abundance, geographic distribution, migration patterns, timing of seasonal activities (IPCC 2014a), and species viability into the future. Climate change is also expected to result in the expansion of low oxygen zones in the marine environment (Gilly et al. 2013). Though predicting the precise consequences of climate change on highly mobile marine species, such as many of those considered in this opinion, is difficult (Simmonds and Isaac 2007), recent research has indicated a range of consequences already occurring.

Climate change is likely to have its most pronounced effects on species whose populations are already in tenuous positions (Isaac 2009). Therefore, we expect the extinction risk of at least some ESA-listed species to rise with global warming. Marine species ranges are expected to shift as they align their distributions to match their physiological tolerances under changing environmental conditions (Doney et al. 2012). Cetaceans with restricted distributions linked to water temperature may be particularly exposed to range restriction (Learmonth et al. 2006, Isaac 2009). Hazen et al. (2012) examined top predator distribution and diversity in the Pacific Ocean in light of rising sea surface temperatures using a database of electronic tags and output from a global climate model. He predicted up to a 35 percent change in core habitat area for some key marine predators in the Pacific Ocean, with some species predicted to experience gains in available core habitat and some predicted to experience losses. MacLeod (2009) estimated, based upon expected shifts in water temperature, 88 percent of cetaceans would be affected by climate change, with 47 percent likely to be negatively affected.

For ESA-listed species that undergo long migrations, if either prey availability or habitat suitability is disrupted by changing ocean temperature regimes, the timing of migration can change or negatively impact population sustainability (Simmonds and Eliott. 2009). Low reproductive success and body condition in humpback whales may have resulted from the 1997/1998 El Niño (Cerchio et al. 2005).

The effects of these changes to the marine ecosystems of the Gulf of Alaska, 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 2008b).

As temperatures in the Arctic and subarctic waters are warming and sea ice is diminishing, there is an increased potential for harmful algal blooms that produce toxins to affect marine life (see Figure 6). Biotoxins like domoic acid and saxitoxin may pose a risk to marine mammals in Alaska. In addition, increased temperatures can increase Brucella infections. In the Lefebvre et al. (2016) study of marine mammal tissues across Alaska, 905 individuals from 13 species were sampled including humpback whales, bowhead whales, beluga whales, harbor porpoises, northern fur seals, Steller sea lions, harbor seals, ringed seals, bearded seals, spotted seals, ribbon seals, Pacific walruses, and northern sea otters. Domoic acid was detected in all 13 species examined and had a 38% prevalence in humpback whales, and a 27% prevalence in Steller sea lions. Additionally, fetuses from a beluga whale, a harbor porpoise, and a Steller sea lion contained detectable concentrations of domoic acid documenting maternal toxin transfer in these species. Saxitoxin was detected in 10 of the 13 species, with the highest prevalence in humpback whales (50%) and a 10% prevalence in Steller sea lions (Lefebvre et al. 2016).

Figure 6. Algal toxins detected in 13 species of marine mammals from Southeast Alaska to the Arctic from 2004 to 2013 (Lefebvre et al. 2016).

4.3 Status of Listed Species

This opinion examines the status of each species that is likely to 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.

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.

4.3.1 Mexico DPS Humpback Whale

We used information available in the status review (Bettridge et al. 2015), most recent stock assessment (Muto et al. 2018), NMFS species information (NMFS 2016a), report on estimated abundance and migratory destinations for North Pacific humpback whales (Wade et al. 2016), and recent biological opinions to summarize the status of the species, as follows.

Distribution

Humpback whales are widely distributed in the Atlantic, Indian, Pacific, and Southern Oceans. Individuals generally migrate seasonally between warmer, tropical and sub-tropical waters in winter months (where they reproduce and give birth to calves) and cooler, temperate and sub-Arctic waters in summer months (where they feed). In their summer foraging areas and winter calving areas, they tend to occupy shallower, coastal waters; though during seasonal migrations they disperse widely in deep, pelagic waters and tend to avoid shallower coastal waters (Winn and Reichley 1985).

Humpback whales have been known to occur within the Gulf of Alaska primarily in summer and fall, migrating to southerly breeding grounds in winter and returning to the north in spring (Calambokidis et al. 2008). However, based on recordings from moored hydrophones deployed in six locations in the Gulf of Alaska from October 1999 to May 2002, humpback calls were most commonly detected during the fall and winter (Stafford et al. 2007).

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). Humpback whales occur in relatively low numbers seasonally near Skagway for brief periods. Local observations indicated humpback whales were present in Taiya Inlet infrequently and are most commonly sighted in April and May during the eulachon run. Charter boat captains reported observing four to five whales near Skagway from spring to fall, up to approximately one mile from Skagway, and one whale in June 2018 several miles from Skagway (K. Gross, Never Monday Charters, personal communication cited in PND Engineers 2018). Humpback whale sightings during winter months have not been reported, which is consistent with seasonal migration patterns. Thus, it is anticipated few, if any, will be present in the ensonified area during construction (PND Engineers 2018).

Life History

Humpback whales are large baleen whales that are primarily dark grey in appearance, with variable areas of white on their fins, bellies, and flukes. The coloration of flukes is unique to individual whales. The lifespan of humpback whales is estimated to be 80 to 100 years. Sexual maturity is reached at five to 11 years of age. The gestation period of humpback whales is 11 months, and calves are nursed for 12 months. The average calving interval is two to three years. Birthing occurs in low latitudes during winter months.

Humpback whale feeding occurs in high latitudes during summer months. They exhibit a wide range of foraging behaviors and feed on a range of prey types, such as small schooling fishes, krill, and other large zooplankton.

Humpback whales produce a variety of vocalizations ranging from 20 Hz to 10 kHz (Winn et al. 1970a, Tyack and Whitehead 1983, Payne and Payne 1985, Silber 1986, Thompson et al. 1986, Richardson et al. 1995, Au 2000, Frazer and Mercado III 2000, Erbe 2002b, Au et al. 2006b, Vu et al. 2012). NMFS categorizes humpback whales in the low-frequency cetacean (i.e., baleen whale) functional hearing group. As a group, it is estimated that baleen whales' applied frequency range is between 7 Hz and 35 kHz (NMFS 2018).

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. 1970b, 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).

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 1986). 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–5 kHz with estimated source levels from 144– 174 dB; these are mostly sung by males on the breeding grounds (Winn et al. 1970a, Richardson et al. 1995, Au 2000, Frazer and Mercado 2000, Au et al. 2006a);
2. Social sounds in the breeding areas that extend from 50Hz – 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).

Additional information on humpback whales can be found at: http://www.nmfs.noaa.gov/pr/species/mammals/whales/humpback-whale.html.

Population Dynamics

NMFS recently conducted a global status review and changed the status of humpback whales under the ESA (81 FR 62260; September 8, 2016). Under the final rule, 14 DPSs of humpback whales are recognized worldwide. Humpback whales in the action area may belong to the Mexico or Hawaii DPSs (81 FR 62260).

In the final rule changing the status of humpback whales under the ESA (81 FR 62260; September 8, 2016), the abundances of the Mexico and Hawaii DPSs throughout their range were estimated to be 3,264 (CV = 0.06) and 11,398 (CV = 0.04) whales, respectively. The Mexico DPS has an unknown trend. The growth rate of the Hawaii DPS was estimated to be increasing annually between 5.5 and 6.0 percent.

Within Southeast Alaska and northern British Columbia, the abundance estimate for humpback whales is estimated to be 6,137 (CV= 0.07) animals, which includes whales from the Hawaii DPS (93.9%) and Mexico DPS (6.1%) (NMFS 2016c, Wade et al. 2016).

Table 7. Probability of encountering humpback whales from each DPS in the North Pacific Ocean (columns) in various feeding areas (on left). Gray highlighted area represents the action area 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.

Status

The humpback 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 (81 FR 62260; September 8, 2016). As described in the Population Dynamics Section above, humpback whales in the action area may belong to the Mexico or Hawaii DPSs. The Mexico DPS (a small proportion of the humpback whales found in Southeast Alaska) is listed as threatened, and the Hawaii DPS (most of the humpback whales found in Southeast Alaska) is not listed. Whales from these two DPSs overlap on feeding grounds off Alaska, and are not easily distinguishable. All waters off the coast of Alaska may contain ESA-listed humpbacks.

The humpback whale species was originally listed as endangered because of past commercial whaling. Subsistence hunters in Alaska are not authorized to take humpback whales.

Additional threats to the species include ship strikes, fisheries interactions (including entanglement), and noise. All threats to the species are discussed further in Section 5 of this opinion.

Critical Habitat

There is no critical habitat designated for the Mexico DPS of humpback whale.

4.3.2 Western DPS Steller Sea Lion

We used information available in the recent stock assessment report (Muto et al. 2018), recovery plan (NMFS 2008a), status review (NMFS 1995), listing document (62 FR 24345), NMFS species information, and recent biological opinions to summarize the status of the species, as follows.

Distribution

Steller sea lions are distributed throughout the northern Pacific Ocean, including coastal and inland waters in Russia (Kuril Islands and the Sea of Okhotsk), east to Alaska, and south to central California (Año Nuevo Island) (Figure 7). Animals from the eastern DPS occur primarily east of Cape Suckling, Alaska (144° W), and animals from the endangered western DPS occur primarily west of Cape Suckling. The western DPS includes Steller sea lions that reside primarily in the central and western Gulf of Alaska, Aleutian Islands, and those that inhabit and breed in the coastal waters of Asia (e.g., Japan and Russia). The eastern DPS includes sea lions living primarily in Southeast Alaska, British Columbia, California, and Oregon.

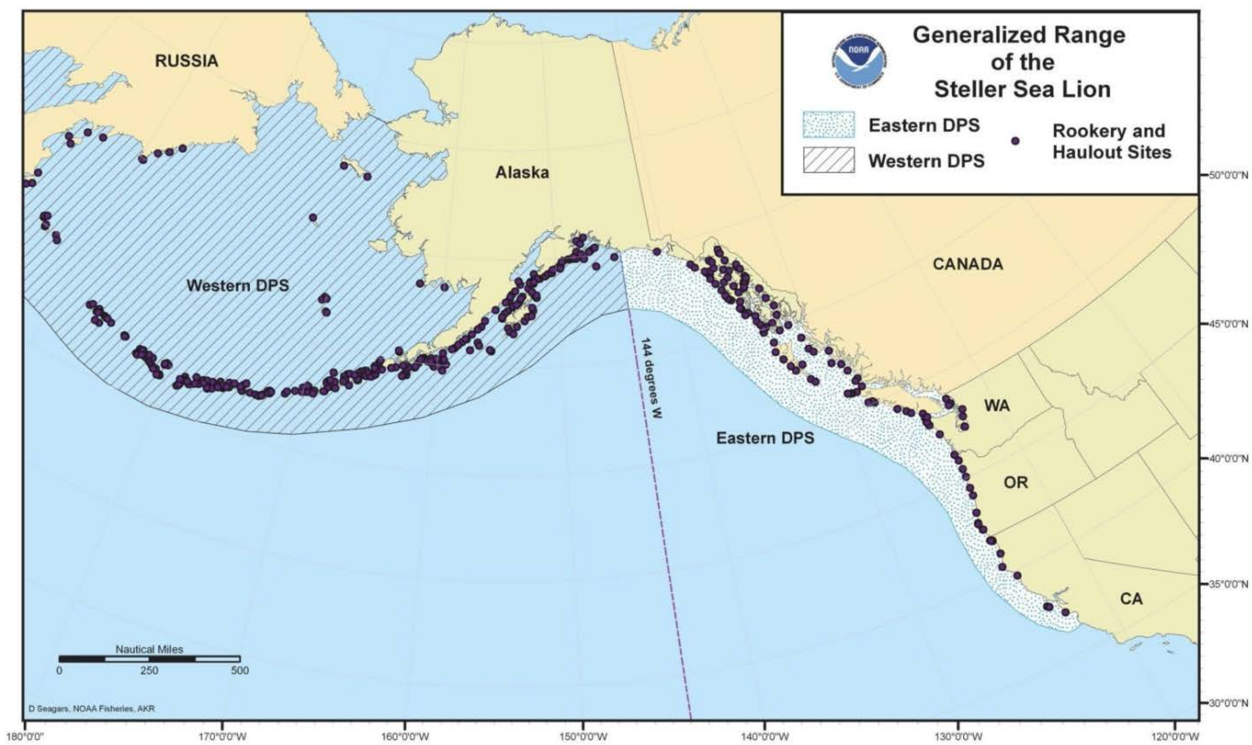


Figure 7. Generalized range of Steller sea lion, including rookery and haulout locations.

<u>Southeast Alaska Distribution</u>

Within the action area, Steller sea lions are anticipated to be predominantly from the eastern DPS. However, studies have confirmed movement of animals across the 144° W longitude 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 western DPS Steller sea lions across the 144° W longitude boundary, and some western DPS females have likely emigrated permanently and given birth at White Sisters and Graves Rock rookeries. The vast majority of these sightings have been in northern Southeast Alaska, north of Frederick Sound (the action area is in northern Southeast Alaska). Fritz et al. (2016) estimated an average annual movement of western DPS 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). However, these rookeries are outside the action area.

Brand data confirm that western DPS Steller sea lions are sometimes present in northern Lynn Canal, near Taiya Inlet. Although there are no known Steller sea lion haulouts or rookeries directly inside the action area, the Gran Point haulout (~25 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 2017). From 1995-2016, 253 unique branded individuals were documented at the Gran Point haulout. Of these, four individuals (2%) were from the western DPS, and the remaining 249 (98%) were from the eastern DPS (personal communication, L. Jemison, ADF&G 2017). If we assume that branded and unbranded animals follow similar movement patterns, we can conclude that the proportion of western DPS to eastern DPS 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 western DPS and the remaining 98% to be from the unlisted eastern DPS.

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. 2009). Figure 8 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 (Womble et al. 2009).

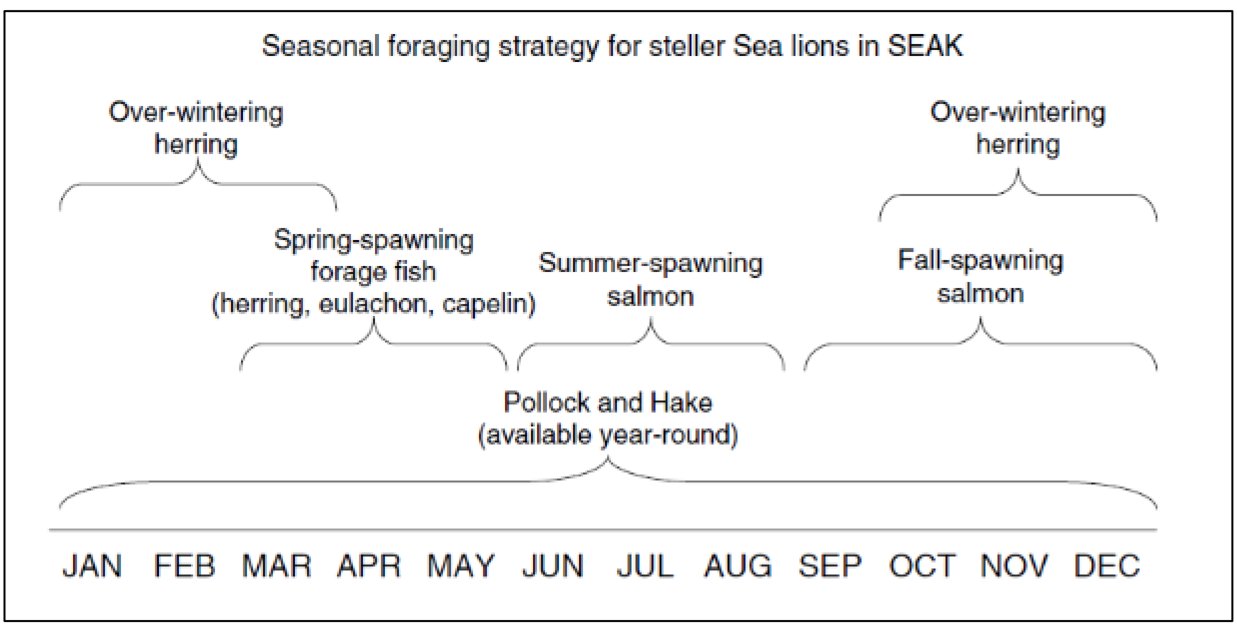


Figure 8. Seasonal foraging ecology of Steller sea lions in Southeast Alaska (Womble et al. 2009).

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. 2005a). The nearest haulout sites to Skagway include a haulout at Taiya Point located 11 mi (18 km) south of construction site, and used only temporarily during the Lutak Inlet eulachon run, and Gran Point located 25 mi (38 km) south of the dock construction.

Observations from local charter boat captains and watershed stewards indicate Steller sea lions can be abundant in the action area, particularly in April and May during the eulachon run (PND Engineers 2018), but are not expected to occur in the action area during the winter.

During multiple sea lion use surveys conducted in 2002 and 2003, Womble et al. (2005) observed a maximum of about 400 sea lions in the water at the mouth of the Taiya River feeding on eulachon in 2003 (but virtually none near Skagway), but very few sea lions at the eulachon site in 2002. They noticed an opposite pattern at Lutak Inlet those years, a feeding site closer to both Taiya Point and Gran Point haulouts. Sea lion use of the upper Taiya Inlet appears to be episodic and related to the timing of the eulachon runs both at Lutak and Taiya (PND Engineers 2018).

Life History

Steller sea lions are the largest of the eared seals (Otariidae), though there is significant difference in size between males and females: males reach lengths of 3.3 m (10.8 ft) and can weigh up to 1,120 kg (2,469 lb) and females reach lengths of 2.9 m (9.5 ft) and can weigh up to 350 kg (772 lb). Their fur is light buff to reddish brown and slightly darker on the chest and abdomen; their skin is black. Sexual maturity is reached and fist breeding occurs between 3 and 8 years of age. Pupping occurs on rookeries between May and June and females breed approximately 11 days after giving birth. Implantation of the fertilized egg is delayed for about 3.5 months, and gestation occurs until the following May or June.

Most adult Steller sea lions occupy rookeries during pupping and breeding season (late May-early July). During the breeding season, most juvenile and non-breeding adults are at haulouts, though some occur at or near rookeries. Adult females and pups continue to stay on rookeries through August beginning a regular routine of alternating foraging trips at sea with nursing their pups on land. During the non-breeding season many Steller sea lions disperse from rookeries and increase their use of haulouts. Steller sea lions do not migrate, but they often disperse widely outside of the breeding season (Loughlin 1997). At sea, Steller sea lions commonly occur near the 200 m (656 ft) depth contour, but have been seen from near shore to well beyond the continental shelf (Kajimura and Loughlin 1988).

The ability to detect sound and communicate underwater and in-air 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 and 39 kHz in water (NMFS 2018).

Additional information on Steller sea lions can be found at: https://alaskafisheries.noaa.gov/pr/steller-sea-lions.

Population Dynamics

The western DPS population declined approximately 75% from 1976 to 1990 (the year of ESA-listing). Since 2000, the abundance of the western DPS has increased, but there has been considerable regional variation in trend (Muto et al. 2018). The minimum population estimate of western DPS Steller sea lions in Alaska is 53,303 individuals. Using data collected through 2016, there is strong evidence that non-pup and pup counts of western DPS Steller sea lions in Alaska increased at ~2% per year between 2000 and 2016 (Muto et al. 2018). Populations in the eastern Gulf of Alaska (closest to the action area) are increasing at an average rate of 5.36% for non-pups and 4.61% for pups annually (Muto et al. 2018).

Status

The Steller sea lion was listed as a threatened species under the ESA on November 26, 1990 (55 FR 49204). In 1997, NMFS reclassified Steller sea lions as two DPSs based on genetic studies and other information (62 FR 24345); at that time the eastern DPS was listed as threatened and the western DPS was listed as endangered. On November 4, 2013, the eastern DPS was removed from the endangered species list (78 FR 66139). Factors affecting the continued existence of the western DPS at the time of its listing included changes in the availability or quality of prey as a result of environmental changes or human activities and removals of Steller sea lions from the wild. Concern about possible adverse effects of contaminants was also noted.

Steller sea lions are hunted for subsistence purposes. As of 2009, data on community subsistence harvest are no longer being consistently collected; therefore, the most recent estimate of annual statewide (excluding St. Paul Island) harvest[6] is 172 individuals from the 5-year period from 2004 to 2008. More recent data from St. Paul and St. George are available; the annual harvest is 30 and 2.4 sea lions respectively from the 5-year period from 2011 to 2015. This results in a total harvest of 204 individuals (172+30+2.4) (Muto et al. 2017, 2018). In addition, data were collected on Alaska Native harvest of Steller sea lions for 7 communities on Kodiak Island for 2011 and 15 communities in Southcentral Alaska in 2014; the Alaska Native Harbor Seal Commission and ADF&G estimated a total of 20 adult sea lions were harvested on Kodiak Island in 2011, and 7.9 sea lions (CI = 6-15.3) were harvested in Southcentral Alaska in 2014, with adults comprising 84% of the harvest (Muto et al. 2017, 2018).

Additional threats to the species include environmental variability, competition with fisheries, predation by killer whales, toxic substances, incidental take due to interactions with active fishing gear, illegal shooting, entanglement in marine debris, disease and parasites, and disturbance from vessel traffic, tourism, and research activities. All threats to the species in the action area are discussed further in Section 5 of this opinion.

Critical Habitat

NMFS designated critical habitat for Steller sea lions on August 27, 1993 (58 FR 45269). More information about critical habitat can be found in Section 4.1.2 of this opinion.

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[6] These numbers included both harvested and struck and lost sea lions.

5 ENVIRONMENTAL BASELINE

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR § 402.02).

Focusing on the impacts of activities specifically within the action area allows us to assess the prior experience and condition of the animals that will be exposed to effects from the actions under consultation. This focus is important because individuals of ESA-listed species may commonly exhibit, or be more susceptible to, adverse responses to stressors in some life history states, stages, or areas within their distributions than in others. These localized stress responses or baseline stress conditions may increase the severity of the adverse effects expected from proposed actions.

5.1 Factors Affecting Species within the Action Area

A number of human activities have contributed to the current status of populations of ESA-listed species in the action area. The factors that have likely had the greatest impact are discussed in the sections below. For more information on all factors affecting the ESA-listed species considered in depth in this opinion, please refer to the following documents:

- "Alaska Marine Mammal Stock Assessments, 2017" (Muto et al. 2018).
    - Available online at https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region
- "Recovery Plan for the Steller Sea Lion, Eastern and Western Distinct Population Segments (*Eumetopias jubatus*)" (NMFS 2008a)
    - Available online at https://alaskafisheries.noaa.gov/sites/default/files/sslrpfinalrev030408.pdf
- "Status Review of the Humpback Whale (*Megaptera novaeangliae*)" (Bettridge et al. 2015)
    - Available online at http://www.nmfs.noaa.gov/pr/species/Status%20Reviews/humpback_whale_sr_2015.pdf

5.1.1 Climate Change

Overwhelming data indicate the planet is warming (IPCC 2014a), which poses a threat to most Arctic and Subarctic marine mammals.

Climate change has the potential to impact species abundance, geographic distribution, migration patterns, timing of seasonal activities (IPCC 2014a), and species viability into the future. Climate change is also expected to result in the expansion of low oxygen zones in the marine environment (Gilly et al. 2013). Though predicting the precise consequences of climate change on highly mobile marine species, such as many of those considered in this opinion, is difficult

(Simmonds and Isaac 2007), recent research has indicated a range of consequences already occurring.

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 localized recruitment of herring in or near the action area caused by climate change could change the distribution and localized abundance of humpback whales. However, we have no information to indicate that this has happened to date. 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 2008a).

The Steller Sea Lion Recovery Plan ranks environmental variability as a potentially high threat to recovery of the western DPS (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. Populations of Steller sea lions in the Gulf of Alaska 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 (Mueter et al. 2009, IPCC 2013).

5.1.2 Fisheries

Worldwide, fisheries interactions have an impact on many marine mammal species. More than 97 percent of whale entanglement is caused by derelict fishing gear (Baulch and Perry 2014). There is also concern that mortality from entanglement may be underreported, as many marine mammals that die from entanglement tend to sink rather than strand ashore. Entanglement may also make marine mammals more vulnerable to additional dangers, such as predation and ship strikes, by restricting agility and swimming speed.

In Alaska, interactions resulting in entanglements, mortality, or serious injury of humpback whales occurred in the following fisheries between 2010-2015: Bering Sea Aleutian Islands (BSAI) flatfish trawl, BSAI pollock trawl, Southeast Alaska salmon drift gillnet, Kodiak Island commercial salmon purse seine gear, Kodiak commercial salmon set gillnet, Pacific cod jig, Bering Sea pot gear, Prince William Sound shrimp pot gear, and Gulf of Alaska Dungeness crab pot gear (Muto et al. 2017, 2018). Pot and trap gear are the most commonly documented source of mortality and serious injury to humpback whales off the U.S. West Coast outside of Alaska (Carretta et al. 2017).

Based on events that have not been attributed to a specific fishery listed on the MMPA List of Fisheries (82 FR 3655; January 12, 2017), the minimum mean annual mortality and serious injury rate from gear entanglements in unknown fisheries is 8.8 humpback whales for the

Central North Pacific stock 2011-2015 (Muto et al. 2018).

The minimum average annual mortality and serious injury rate due to interactions with all fisheries in 2011-2015 is 18 Central North Pacific humpback whales (8.5 in commercial fisheries + 0.7 in recreational fisheries + 0.3 in subsistence fisheries + 8.8 in unknown fisheries), and 1.8 Western North Pacific humpback whales (0.8 in commercial fisheries + 0.4 in recreational fisheries + 0.6 in unknown fisheries) (Muto et al. 2018). All events occurred within the area of known overlap between stocks. Since the stock is unknown, the mortality and serious injury is reflected in the stock assessment reports for both stocks.

Commercial fisheries may indirectly affect whales and pinnipeds by reducing the amount of available prey or affecting prey species composition. In Alaska, commercial fisheries target known prey species of ESA-listed whales and pinnipeds, such as pollock and cod.

The most recent minimum average annual estimated mortality and serious injury rate of western DPS Steller sea lions associated with observed commercial fisheries is 31 individuals (Muto et al. 2018). The minimum average annual mortality and serious injury rate for all fisheries, based on observer data (31 sea lions) for commercial fisheries and stranding data (1.4 sea lions) for unknown (commercial, recreational, or subsistence) fisheries is 32 western DPS Steller sea lions (Muto et al. 2018).

5.1.3 Fishing Gear and Marine Debris Entanglement

Although the Steller Sea Lion Recovery Plan (NMFS 2008c) ranked interactions with fishing gear and marine debris as a low threat to the recovery of the western DPS, it is likely that many entangled sea lions may be unable to swim to shore once entangled, may die at sea, and may not be available to count (Loughlin 1986, Raum-Suryan et al. 2009). Based on data collected by ADF&G and NMFS, Helker *et al.* (2016) reported Steller sea lions to be the most common species of human-caused mortality and serious injury between 2011 and 2015. There were 468 cases of serious injuries to eastern DPS Steller sea lions from interactions with fishing gear and marine debris. While these cases are attributed to the eastern DPS because they occurred east of 144° W, eastern and western DPS animals overlap in Southeast Alaska, and these takes may have been western DPS animals. Raum-Suryan et al. (2009) observed a minimum of 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, there were 241 cases of mortality and serious injury reported for the western DPS: 31 in U.S. commercial fisheries, 1.4 in unknown fisheries (commercial, recreational, or subsistence), 2 in marine debris, 2.6 due to other causes (arrow strike, entangled in hatchery net, illegal shooting, research), and 204 in subsistence harvest. These animals mostly interacted with observed trawl (13) longline (2.8) troll (1), and gillnet (15) fisheries, typically resulting in death (Muto et al. 2018).

The minimum estimated mortality rate of western Steller sea lions incidental to all U.S. commercial fisheries is 32 sea lions per year, based on PSO data (31) and stranding data (1.4) where PSO data were not available. Several fisheries that are known to interact with the western DPS have not been observed reaching the minimum estimated mortality rate (Muto et al. 2018).

5.1.4 Harvest

Commercial whaling in the 19th and 20th centuries removed tens of thousands of whales from the North Pacific Ocean. As discussed in Section 4.3.1 of this opinion, commercial harvest was the primary factor for ESA-listing of humpback whales. This historical exploitation has impacted populations and distributions of humpback whales in the action area, and it is likely these impacts will continue to persist into the future.

Subsistence hunters in Alaska reported one subsistence take of a humpback whale in South Norton Sound in 2006. There had not been any additional reported takes of humpback whales by subsistence hunters in Alaska or Russia until 2016 when hunters illegally harvested one near Toksook Bay in May (DeMarban and Demer 2016).

As of 2009, data on community subsistence harvest are no longer being collected for Steller sea lion; therefore, the most recent estimate of annual statewide (excluding St. Paul Island and St. George) harvest[7] is 172 individuals from the 5-year period from 2004 to 2008. More recent data from the Pribilof Islands are available; the mean annual harvest is 32 sea lions from the 5-year period from 2011 to 2015 for a total of 204 Steller sea lions/year (Muto et al. 2018). More subsistence harvest data are presented above in the Status of the Species section.

5.1.5 Natural and Anthropogenic Noise

ESA-listed species in the action area are exposed to several sources of natural and anthropogenic noise. Natural sources of underwater noise include sea ice, wind, waves, precipitation, and biological noise from marine mammals, fishes, and crustaceans. Anthropogenic sources of noise in the action area include:

- Vessels
  - Shipping
  - Transportation
  - Research
- Construction activities:
  - Drilling
  - Dredging
  - Pile-driving
- Sonar
- Aircraft

The combination of anthropogenic and natural noises contributes to the total noise at any one place and time.

Because responses to anthropogenic noise vary among species and individuals within species, it is difficult to determine long-term effects. Habitat abandonment due to anthropogenic noise exposure has been found in terrestrial species (Francis and Barber 2013). Clark et al. (2009a) identified increasing levels of anthropogenic noise as a habitat concern for whales because of its potential effect on their ability to communicate (i.e., masking). Some research (Parks 2003, McDonald et al. 2006, Parks 2009) suggests marine mammals compensate for masking by

[7] These numbers included both harvested and struck and lost sea lions.

changing the frequency, source level, redundancy, and timing of their calls. However, the long-term implications of these adjustments, if any, are currently unknown.

5.1.5.1 Noise Related to Construction Activities

NMFS has conducted numerous ESA section 7 consultations related to construction activities in Southeast Alaska waters. Many of the consultations have authorized the take (by harassment) of humpback whales and Steller sea lions from sounds produced during pile driving, drilling, and vessel operations.

In 2017, NMFS conducted three consultations with the PR1 on the issuance of IHAs to take marine mammals incidental to dock and ferry terminal construction in Southeast Alaska (Sawmill Cove Dock, Gustavus Ferry Terminal, and Haines Ferry Terminal). The incidental take statements in the three biological opinions estimated 797 western DPS Steller sea lions and 45 Mexico DPS humpback whales, total, would be taken (by Level B harassment) as a result of exposure to continuous sounds at received levels at or above 120 dB re 1 μPa_{rms} and impulsive sounds at received levels at or above 160 dB re 1 μPa_{rms}. Only one Level A harassment of a Mexico DPS humpback whale was authorized.

Anticipated impacts by harassment from noise associated with construction activities generally include changes in behavioral state from low energy states (i.e., foraging, resting, and milling) to high energy states (i.e., traveling and avoidance).

5.1.6 Pollutants and Discharges

Previous development and discharges in portions of the action area are the source of multiple pollutants that may be bioavailable (i.e., may be taken up and absorbed by animals) to ESA-listed species or their prey items (NMFS 2013a).

The Clean Water Act of 1972 (CWA) has several sections or programs applicable to activities in offshore waters. Section 402 of the CWA authorizes the U.S. Environmental Protection Agency (EPA) to administer the National Pollutant Discharge Elimination System (NPDES) permit program to regulate point source discharges into waters of the United States. Section 403 of the CWA requires that EPA conduct an ocean discharge criteria evaluation for discharges to the territorial seas, contiguous zones, and the oceans. The Ocean Discharge Criteria (40 CFR Part 125, Subpart M) sets forth specific determinations of unreasonable degradation that must be made before permits may be issued.

The EPA issued a NPDES vessel general permit that authorizes several types of discharges incidental to the normal operation of vessels, such as grey water, black water, coolant, bilge water, ballast, and deck wash (EPA 2013). The permit is effective from December 19, 2013 to December 19, 2017, and applies to owners and operators of non-recreational vessels that are at least 24 m (79 ft) in length, as well as to owners and operators of commercial vessels less than 24 m that discharge ballast water.

The US Coast Guard has regulations related to pollution prevention and discharges for vessels carrying oil, noxious liquid substances, garbage, municipal or commercial waste, and ballast water (33 CFR Part 151). The State of Alaska regulates water quality standards within three miles of the shore.

5.1.7 Scientific Research

In the following sections, we describe the types of scientific research currently permitted for ESA-listed whales and sea lions in the action area. NMFS issues scientific research permits that are valid for five years for ESA-listed species. When permits expire, researchers often apply for a new permit to continue their research. Additionally, applications for new permits are issued on an on-going basis; therefore, the number of active research permits is subject to change in the period during which this opinion is valid.

Species considered in this opinion also occur in Canada waters. We do not have specific information about any permitted research activities in Canada waters.

5.1.7.1 Whales

Humpback whales are exposed to research activities documenting their distribution and movements throughout their ranges. There are 16 active research permits authorizing takes of humpback whales in Alaska waters (NMFS 2016b). Activities associated with these permits could occur in the action area, possibly at the same time as the proposed project activities. Currently permitted research activities include:

- Counting/surveying
- Opportunistic collection of sloughed skin and remains
- Behavioral and monitoring observations
- Various types of photography and videography
- Skin and blubber biopsy sampling
- Fecal sampling
- Suction-cup, dart/barb, satellite, and dorsal fin/ridge tagging

These research activities require close vessel approach. The permits also include incidental harassment takes to cover such activities as tagging, where the research vessel may come within 91 m (300 ft) of other whales while in pursuit of a target whale. These activities may cause stress to individual whales and cause behavioral responses, but harassment is not expected to rise to the level where injury or mortality is expected to occur.

5.1.7.2 Pinnipeds

Steller sea lions are exposed to research activities documenting their distribution and movements throughout their ranges.

Out of the 16 active research permits, two permits (Permit Nos. 15142 and 15324) include behavioral observations, counting/surveying, photo-identification, and capture and restraint (by hand, net, cage, or board), for the purposes of performing the following procedures:

- Collection of:
  - Blood
  - Clipped hair
  - Urine and feces
  - Nasal and oral swabs
  - Vibrissae (pulled)
  - Skin, blubber, or muscle biopsies
  - Weight and body measurements
- Injection of sedative
- Administration of drugs (intramuscular, subcutaneous, or topical)
- Attachment of instruments to hair or flippers, including flipper tagging
- Ultrasound

Permit Nos. 15142 and 15324 also include incidental harassment of non-target seals during the course of performing the permitted activities. Two additional permits (Permits Nos. 14610 and 18537) include harassment takes of bearded and ringed seals incidental to permitted research activities, and targeting bowhead whales and western DPS Steller sea lions respectively.

Activities may cause stress to individual sea lions, but, in most cases, harassment is not expected to rise to the level where injury or mortality is expected to occur.

5.1.8 Vessel Interactions

Ship strikes and other interactions with vessels unrelated to fisheries occur frequently with humpback whales. Neilson et al. (2012) summarized 108 large whale ship-strike events in Alaska from 1978 to 2011, 25 of which are known to have resulted in the whale's death. Eighty-six percent of these reports involved humpback whales. The minimum mean annual mortality and serious injury rate due to ship strikes reported in Alaska is 2.7 Central North Pacific humpback whales per year between 2010 and 2014. Most vessel collisions with humpbacks are reported from Southeast Alaska (Muto et al. 2017).

Neilson et al. (2012) also 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.

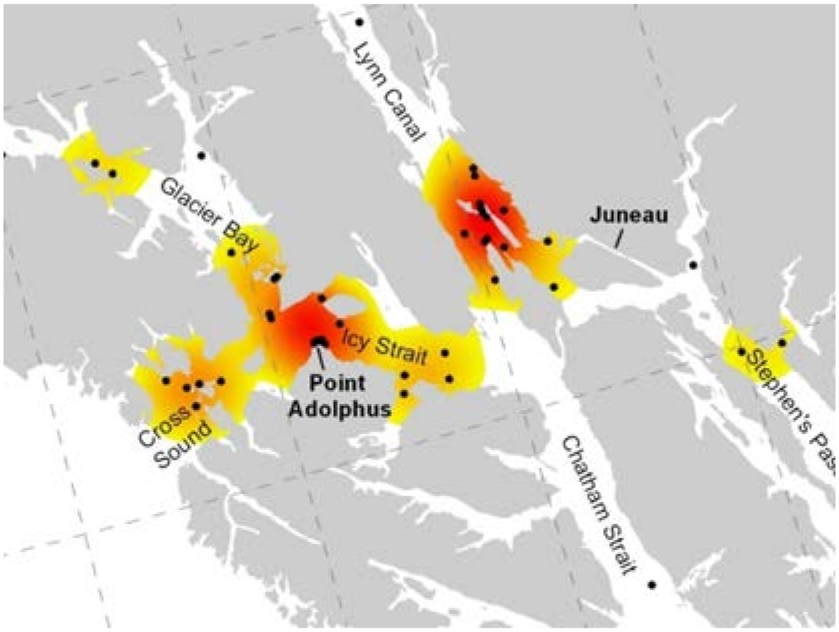

Figure 9. High Risk Areas for Vessel Strike in northern Southeast Alaska. Used with permission from (Neilson et al. 2012).

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:

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 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.

There are at least four documented occurrences of Steller sea lions being struck by vessels in Southeast Alaska; three were near Sitka, and one was south of Juneau. Although risk of ship 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 2008a).

NMFS's guidelines for approaching marine mammals discourage vessels approaching within 100 yards of animals. There is no designated critical habitat for Steller sea lions within the ensonified portion of the action area.

5.1.9 Environmental Baseline Summary

Historically, overexploitation of large whales caused declines in abundance to the point of near-extinction. There is no commercial whaling of humpback whales currently. Mexico DPS humpback whale abundance trend is unknown.

The relationship between sound and marine mammal response to sound is the topic of extensive scientific research and public inquiry. Most observations report only short-term behavioral responses that include cessation of feeding, resting, or social interactions because study design precludes detection of difficult-to-detect long-term effects, if any exist. However, behavioral response could take the form of habitat abandonment, which could have implications at the population level.

Humpback whales and western DPS Steller sea lions in the action area appear to be increasing in population size – or, at least, their population sizes do not appear to be declining – despite their continued exposure to the direct and indirect effects of the activities discussed in the Environmental Baseline. While we do not have trend information for the Mexico DPS of humpback whales, they also do not appear to be declining as a result of the current stress regime.

6 EFFECTS OF THE ACTION

"Effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. NMFS has not identified any interrelated or interdependent activities associated with the proposed action.

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

We organize our effects analysis using a stressor identification – exposure – response – risk assessment framework for the proposed activities.

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

6.1 Stressors

During the course of this consultation, we identified the following potential stressors from the proposed activities:

- Vessel strike
- Disturbance of seafloor
- Underwater sounds from:
  - Vessels
  - Pile Driving and Pile Removal
  - Down-the-Hole Hammering

Below we discuss each stressor's potential to affect ESA-listed species.

6.1.1 Stressors Not Likely to Adversely Affect ESA-listed Species

Based on a review of available information, we determined which of the possible stressors may occur, but for which the likely effects are discountable or insignificant.

6.1.1.1 Vibratory and Impact Pile Driving Airborne Noise

Airborne noises could affect hauled out pinnipeds. However, noise generated during vibratory pile driving would attenuate to the harbor seal in-air threshold (90 dB) at approximately 105 ft (32 m) and attenuate to the threshold for other pinnipeds (e.g., Steller sea lions) (100 dB) at approximately 33 ft (10 m). The in-air sound level for impact driving would decline to the harbor seal threshold (90 dB) at approximately 174 ft (53 m), and the threshold for other pinnipeds (100 dB) at approximately 56 ft (17 m) (PND Engineers 2018).

There are no known Steller sea lion haulout sites within the in-air disturbance zone. Therefore, during pile driving, temporary in-air harassment would be limited to harbor seals and sea lions swimming on the surface through the immediate action area near the dock (approximately 53 m, and 17 m), respectively. At this distance, any animal swimming would already have been exposed to in-water noise levels exceeding the take threshold. Further, proposed mitigation would prevent a take from occurring at these distances (see Section 2.1.5) or cause serious injury due to the implementation of shutdown zones. For these reasons, effects from in-air noise are considered discountable (i.e., no haulouts nearby, so in-air disturbance is extremely unlikely to occur), and insignificant (i.e., shutdown mechanisms in place, so any exposure would occur at levels likely to have immeasurably small effects) for ESA-listed pinnipeds.

6.1.1.2 Tension Anchors

Up to 12 of the dock dolphin piles would require internal tension anchors. Noise associated with drilling an 8-in diameter hole extending about 50 ft into bedrock below the tip of the pile is anticipated to be contained entirely within the piling and is not anticipated to reach or exceed the

120 dB threshold for continuous noise sources (McLean, pers. comm. 2017). Given the small size of the anchoring drill, the installation method within a pile, and the low anticipated sound source level, the effects of tension anchor installation noise are not anticipated to reach the level at which take could occur and are considered insignificant.

6.1.1.3 Vessel Strike

The possibility of vessel strike is extremely unlikely. During construction activities vessel speed will be very low (i.e., 2 km/hr [1 kt] or less), and the maximum transit speed for tug and barge vessels proposed for use is 18.5 km/hr (8-10 kts). Once vessels get to the construction site, they will be anchored. However, operation of the dock dolphin is for cruise ships, which can operate at average speeds of 20 knots and during times of limited visibility.

The proposed dolphin infrastructure will facilitate larger vessels, specifically same day moorage of the Breakaway and Quantum class vessels; both of which are scheduled to visit Skagway during the 2019 cruise ship season. Therefore, this project is not likely to contribute to an increase in vessel traffic, but rather an increase in the size of vessels (PND Engineers 2018).

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 9)(NMFS 2016d). Between 2011 and 2015 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 0.4 (Muto et al. 2018). 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 near Skagway.

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 five vessels during construction and Breakaway and Quantum class vessels during operation. However, the lack of reported collisions involving vessels and listed marine mammals near Skagway 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.

Required mitigation measures described in Section 2.1.5 require all vessels associated with project construction to avoid the 3,000 ft (914 m) designated aquatic zones surrounding major Steller sea lion rookeries or haulout locations east of 144°W longitude. Abundance of humpback whales and Steller sea lions in the action area is anticipated to be lower in the action area during winter months. In addition NMFS's guidelines for approaching marine mammals recommend that vessels not approach within 100 yards of marine mammals. There are approximately five vessels associated with construction, and operations will not increase vessel traffic. Finally, construction will only last ~89 days. All of these factors limit the risk of strike. We conclude the probability of strike occurring is extremely unlikely and therefore effects are discountable.

6.1.1.4 Disturbance of Seafloor

Short-term turbidity increases would likely occur during in-water construction work, including pile driving and pile removal. The physical resuspension of sediments could produce localized turbidity plumes that could last from a few minutes to several hours. In general, turbidity associated with pile installation is expected to be localized to about a 25 ft radius around the pile (Everitt et al. 1980). Contaminated sediments are not expected at the project site but any that do occur would be tightly bound to the sediment matrix. Because of the relatively small work area, any increase in turbidity would be limited to the immediate vicinity of the project site and adjacent portion of the bay. There is little potential for pinnipeds or cetaceans to be exposed to increased turbidity during construction operations. Therefore, exposure to re-suspended contaminants is expected to be negligible since sediments would not be ingested and any contaminants would be tightly bound to them.

Considering local currents, tidal action, and implementation of BMPs, any potential water quality exceedances would likely be temporary and highly localized. The local tides and currents would disperse suspended sediments from pile driving operations at a moderate to rapid rate depending on tidal stage.

Cetaceans are not expected to come close enough to the WP&YR dock dolphin site to encounter increased turbidity from construction activities. Any pinnipeds would avoid the short-term, localized areas of turbidity. Therefore, the impact from increased turbidity levels would be negligible to marine mammals and would not cause a significant disruption of behavioral patterns that would rise to the level of harassment. Therefore, we conclude the effects from this stressor are insignificant.

6.1.1.5 Summary of Stressors Not Likely to Adversely Affect ESA-listed Species

In conclusion, based on review of available information, we determined effects from in-air noise and vessel strike are extremely unlikely to occur. We consider the effects to ESA-listed whales and pinnipeds to be discountable.

We determined tension anchor installation and disturbance of seafloor are not likely to have measurable impact; therefore, we consider the effects to ESA-listed whales and pinnipeds to be insignificant.

Although these four stressors are not likely to adversely affect listed species, the effects of these stressors are considered and addressed in the Integration and Synthesis portion of the opinion.

6.1.2 Stressors Likely to Adversely Affect ESA-listed Species

The following sections analyze the stressors likely to adversely affect ESA-listed species: underwater sounds from pile removal, pile installation, DTH hydro-hammering, and vessel interactions. First, we present a brief explanation of the sound measurements used in the discussions of acoustic effects in this opinion.

6.1.2.1 Sound Measurements Used in this Document

"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 in underwater acoustics is 1 μPa, and the units for sound pressure levels are decibels (dB) re 1 μPa. Sound pressure level (in dB) = 20 log (pressure/reference pressure).

Sound pressure level is an instantaneous measurement and can be expressed as "peak" (PK), "peak-to-peak" (p-p), or "root mean square" (rms). Root mean square, which is the square root of the arithmetic average of the squared instantaneous pressure values, is typically used in discussions of the effects of sounds on vertebrates. All references to sound pressure level in this document are expressed as rms, unless otherwise indicated. Note that sound pressure level does not take the duration of a sound into account.

6.1.2.2 Acoustic Thresholds

As discussed in Section 2, *Description of the Proposed Action*, WP&YR intends to use a wide variety of noise-generating equipment in the action area (see Table 4).

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). However, until such guidance is available, NMFS uses the following conservative thresholds of underwater sound pressure levels, expressed in 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 2018). These acoustic thresholds are presented using dual metrics of cumulative sound exposure level (L_E) and peak sound level (PK) for impulsive sounds[8] and L_E for non-impulsive sounds (see Table 9):

Table 8. PTS Onset Acoustic Thresholds for Level A Harassment (NMFS 2018).

Hearing Group	PTS Onset Acoustic Thresholds* (Received Level)	
	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

[8] For the dual metric associated with impulsive sources, the applicant must consider whichever threshold results in the largest effect distance (isopleth)(NMFS 2018).

Hearing Group	PTS Onset Acoustic Thresholds* (Received Level)	
	Impulsive	Non-impulsive
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].

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 (see Section 10).

As described below, we anticipate that exposures to listed marine mammals from noise associated with the proposed action may result in disturbance and potential injury. However, no mortalities or permanent impairment to hearing are anticipated.

6.2 Exposure

As discussed in the *Approach to the Assessment* section of this opinion, exposure analyses are designed to identify the ESA-listed resources that are likely to co-occur with the action's effects in space and time, as well as the nature of that co-occurrence. In this step of our analysis, we try to identify the number, age (or life stage), and sex of the individuals that are likely to be exposed to the action's effects and the population(s) or subpopulation(s) those individuals represent.

Table 10 provides the modeled distances to Level A and Level B exposure thresholds from vibratory and impulsive noise sources used to estimate potential exposure to ESA-listed species (PND Engineers 2018).

6.2.1 Exposure to Major Noise Sources

The potential for incidental take is estimated for each species by determining the likelihood that a listed marine mammal would be present within a Level A or Level B Zone of Influence (ZOI) during active pile driving/removal or DTH hammering.

Assumptions

The reported radii for 24-hr SEL (Level A) thresholds are based on the assumption that marine mammals remain stationary or at a constant exposure range during the entire 24-hr period, which is an extremely unlikely scenario. These estimated distances for Level A exposure represent an unlikely worst-case scenario.

For the continuous noise sources of vibratory pile driving and DTH, there may be an accumulation of sound caused by both activities during a full 10 hour day when calculating Level A harassment isopleths. Considering that drilling has a higher source level, we used drilling to calculate the Level A harassment isopleths for both drilling and vibratory pile driving activities (83 FR 64554).

Exposure Assumptions

- Animals occurring within the Level A and Level B ensonified zones are considered to be in each zone simultaneously, but would only be counted as one Level A take;
- Exposures are based on total number of days that pile driving could occur and that animals might occur in the ensonified action area;
- One day equates to any length of time that piles are driven whether it is a partial day or a 24-hour period;
- All listed marine mammals occurring in the ensonified area are assumed to be incidentally taken;
- An individual animal can only be counted as taken once during a 24-hour period;
- For animals that may occur in groups, each individual in the group would be considered taken;
- Exposures to sound levels at or above the relevant thresholds equate to take, as defined by the MMPA; and
- Level B take estimates are unmitigated and do not take into account monitoring and mitigation efforts to reduce take as described in Section 2.1.5.

Finally, animals are assumed to be stationary and remain in the area of ensonification. This is unlikely as animals would be expected to move away from the noise source before the exposure would result in a meaningful impact that might affect the individual or populations.

Mitigation Measures to Minimize the Likelihood of Exposure to Major Noise Sources

Mitigation measures are described in detail in Section 2.1.5. The following mitigation measures will be required through the MMPA permitting process to reduce the adverse effects of exposure to major noise sources on marine mammals from the proposed construction activities.

1. PSOs are required on pile driving/removal and DTH hammering activities that may result in incidental take through acoustic exposure.
2. Establishment of radii associated with received sound level thresholds for Level A shutdown for marine mammals under NMFS's authority, including the use of PSOs to monitor for, and take steps to minimize occurrence of, marine mammals within Level A harm and Level B harassment zones for pile removal, pile driving, and DTH hammering activities that may result in incidental take through acoustic exposure.
3. Use of soft start procedures for impact hammering.

Approach to Estimating Exposure to Major Noise Sources

For this analysis we estimated take by considering: 1) acoustic thresholds above which the best available science indicates marine mammals will be behaviorally harassed or incur some degree of temporary or permanent hearing impairment; 2) the area or volume of water that will be ensonified above these levels in a day; 3) the density or occurrence of marine mammals within these ensonified areas; and 4) and the number of days of activities.

Source Level Estimates

Table 10 provides the sound source values and parameters used in calculating zones of influence for each source type. The vibratory and impact hammer source levels are 90th percentile levels measured by Austin et al. (2016) during installation of 48-inch round piles at Port of Anchorage. Denes et al. (2016) measured sound emanating from the DTH of 24-inch piles at Kodiak and calculated a 90th percentile SPL of 171 dB (at 10 m), which is the only drilling source available. Denes et al. (2016) also noted a transmission loss coefficient of 18.9 for drilling suggesting high attenuation when drilling below the seafloor.

Table 9. Parameters for Underwater Noise Harassment Exposure Estimates (83 FR 64541).

Source		Source Type	SPL_{PK} (dB)[1]	SPL_{RMS} (dB)[1]	SEL_{CUM} (dB)[1]	Weighting Factor Adjustment (kHz)	Estimated Duration	
							Hrs or Strikes /Day[2]	Total Number of Days Activity Would Occur
Template Piles	Vibratory Installation /Removal	Non-impulsive, continuous	n/a	166.8	n/a	2.5	3 hours	72
	Impact Installation	Impulsive, intermittent	212.5	197.9	186.7	2	2,000 strikes	59
	Drilling Installation	Non-impulsive, continuous	n/a	171.0	n/a	2	6 hours	59
Permanent Piles	Vibratory Installation	Non-impulsive, continuous	n/a	166.8	n/a	2.5	8 hours	89
	Impact Installation	Impulsive, intermittent	212.5	197.9	186.7	2	2,000 strikes	89
	Drilling Installation	Non-impulsive, continuous	n/a	171.0	n/a	2	8 hours	89

[1.] Sources are referenced at 10 m.
[2] Represents maximum hours per day or maximum number of strikes per day. Estimated strike hours assumed 1 strike/second.

Distances to Level A and Level B Sound Thresholds
PND used the practical spreading model to generate the Level B harassment zones for all pile installation, removal, and drilling activities. Practical spreading, a form of transmission loss, is described in detail below.

Transmission loss (TL) is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. The general formula for underwater TL is:

$$TL = B * \log10(R_1/R_2), \text{ where}$$
R_1 = the distance of the modeled SPL from the driven pile, and
R_2 = the distance from the driven pile of the initial measurement.

This formula neglects loss due to scattering and absorption, which is assumed to be zero here. The degree to which underwater sound propagates away from a sound source is dependent on a variety of factors, most notably the seafloor bathymetry and presence or absence of reflective or absorptive conditions including in-water structures and sediments. Spherical spreading occurs in a perfectly unobstructed (free-field) environment not limited by depth or water surface, resulting in a 6 dB reduction in sound level for each doubling of distance from the source (20*log[range]). Cylindrical spreading occurs in an environment in which sound propagation is bounded by the water surface and sea bottom, resulting in a reduction of 3 dB in sound level for each doubling of distance from the source (10*log[range]). A practical spreading transmission loss value of 15 is often used under conditions where water increases with depth as the receiver moves away from the shoreline, resulting in an expected propagation environment that would lie between spherical and cylindrical spreading loss conditions.

TL coefficients measured at other ports in coastal Alaska ranged from 14.6 to 21.9 (Denes et al. 2016b). However, NMFS typically recommends a default practical spreading loss coefficient of 15 when site-specific empirical data are unavailable. PND used a transmission loss coefficient of 15 to produce conservative estimates of harassment thresholds for the WP&YR dock dolphin project.

Table 11 describes the NMFS User Spreadsheet input parameters used to calculate Level A harassment zones. For stationary sources such as pile driving and drilling, NMFS User Spreadsheet predicts the closest distance at which, if a marine mammal remained at that distance (or greater) the whole duration of the activity, it would not incur PTS. Inputs used in the User Spreadsheet and the resulting isopleths are reported in Tables 11 and 12. Table 11 presents modified input parameters for calculating Level A isopleths than what was provided above in Table 10 by the applicant. The reason for this is that WP&YR plans to employ two continuous sound sources (vibratory pile driving and drilling), and it is necessary to account for accumulation of sound caused by both activities during the full 10 hour work day when calculating Level A harassment isopleths. In addition, as drilling has the higher sound pressure level we propose to use drilling to calculate the Level A harassment isopleths for both drilling and vibratory pile driving activities (Table 11). For impact pile driving, isopleths calculated using the SELCUM metric will be used as it produces larger isopleths than SPLPK. Isopleths for Level B harassment associated with impact pile driving (160 dB) and vibratory pile driving/removal and drilling (120 dB) were also calculated and are can be found in Table 12.

Table 10. User Spreadsheet Input Parameters Used for Calculating Level A Harassment Isopleths (83 FR 64554).

Parameter	Impact Pile Driving	Vibratory Pile Driving/DTH
Spreadsheet Tab Used	E.1 Impact Pile Driving	A.1 Vibratory Pile Driving (Stationary Source: Non-impulsive Continuous)
Source Level	186.7 dB SEL	171 dB rms
Weighting Factor Adjustment (kHz)	2	2
Number of Strikes per Day	2,000	N/A
Activity Duration (h) within 24-hour period	N/A	10 hours

Parameter	Impact Pile Driving	Vibratory Pile Driving/DTH
Propagation (xLogR)	15LogR	15LogR
Distance of source level measurement (m)	11	10

Modeled results are presented in Table 12 with the distances in meters to marine mammal Level A and Level B thresholds for impulsive and continuous sources. The distances are based on NMFS PTS/TTS Technical Guidance (NMFS 2018) for Level A and generic sound exposure thresholds for Level B (70 FR 1871). The reported radii for 24-hr SEL (Level A) thresholds are based on the assumption that marine mammals remain stationary or at a constant exposure range during the entire 24-hr period, which is an extremely unlikely scenario.

Table 11. Calculated distances to Level A and Level B exposure thresholds from vibratory, drilling, impulsive noise sources (PND Engineers 2018).

Source	**PTS Onset Isopleth – Cumulative (m)**					**Behavioral Disturbance Isopleth (km)**	**Behavioral Disturbance Ensonified Area[1] (km^2)**
	LF	**MF**	**HF**	**PW**	**OW**	**Cetaceans & Pinnipeds**	**Cetaceans & Pinnipeds**
Vibratory Installation	148	8.3	129.7	79.2	5.8	13.0[2]	17.9[2]
Drilling Installation	148	8.3	129.7	79.0	5.8	13.0[3]	17.9[3]
Impact Installation	3,077.2	109.4	3,665.4	1,646.8	119.9	3.7	9.9
Source	**PTS Onset Isopleth – Peak (meters)**						
Impact Installation	4.1	n/a	55.1	4.7	n/a		

1. Reflects the area within the maximum ensonified zone shown in Figure 4 ensonified by the three installation types.
2. Based on maximum distance before landfall. Calculated distance was 14.5 km.
3. Based on maximum distance before landfall. Calculated distance was 25.2 km.

Exposure Estimates

At-sea densities have not been determined for marine mammals in Taiya Inlet; therefore, all estimates here are determined by using observational data from biologists, peer-reviewed literature, and information obtained from personal communication with researchers and state and Federal biologists, and from local charter boat operators (PND Engineers 2018).

Western DPS Steller Sea Lion

Observations from local charter boat captains and watershed stewards indicate Steller sea lions can be abundant in the action area, particularly in April and May during the eulachon run, but are not expected to occur in the action area during the winter. MOS (2016) previously estimated that approximately 25 to 40 sea lions haul out at Taiya Rocks during the eulachon run and might be found feeding in Taiya Inlet. Following this estimate, we assume 40 animals may be present during any given day of April pile driving and drilling work. Few sea lions are expected to occur in February (two are assumed) and 16 animals (half of the mean found on Taiya Rocks during the eulachon run) are assumed to occur daily in March (MOS 2016) (Table 13).

Table 12. Anticipated Level B exposures of Steller sea lions per month to project related noise (PND Engineers 2018).

Month	Animals in Inlet per Day	Days in Month	Exposures
February	2	28	56
March	16	31	496
April	40	30	1,200
TOTAL			**1,752**

As described in Section 4.3.2, intermixing of western and eastern DPS Steller sea lions occurs in Southeast Alaska. For this application, we assume that two percent of the animals in the action area could be from the western DPS based on brand recapture information from Gran Point. Therefore, we apportion potential Level B takes accordingly to each DPS. Out of a total 1,752 exposures, 35 animals are anticipated to be from the ESA-listed western DPS (Table 13).

The maximum distance at which a Steller sea lion may be exposed to noise levels that exceed Level A thresholds is ~120 m during impact hammering (see Table 12). Considering that up to five PSOs will be stationed throughout Taiya Inlet during operations, this shutdown zone can be effectively monitored and mitigation implemented. For these reasons, zero Level A takes are anticipated for western DPS Steller sea lions (Table 15).

Mexico DPS Humpback Whale

Due to seasonal migration patterns and the low frequency of humpbacks in the area it is anticipated few, if any, will be present in the action area during the beginning of construction. Humpback whale sightings during winter months have not been reported, which is consistent with seasonal migration patterns. Thus, it is anticipated that no takes will occur for work conducted during February 2019. K. Gross (personal communication 2016) indicated that perhaps four individuals may occur near Skagway during the spring eulachon run, which occurs in April and May. Therefore, for this analysis we conservatively assume that four individuals may be present per day in the action area during April, coinciding with 30 days of project activity. It is unclear whether humpback whales occur in the inlet in March, so we assume that one whale might be found in the inlet during that month for five days, or 0.16 whales per day (Table 13). We use that level of occurrence for March as a conservative value because we do not expect humpback whales to be in the area much before the April-May eulachon run, but we are uncertain.

Table 13. Anticipated harassment exposures of humpback whales per month to project related noise (PND Engineers 2018).

Month	Animals in Inlet per Day	Days in Month	Exposures
February	0	28	0
March	0.16	31	5
April	4	30	120
TOTAL			**125**

Based on previous humpback whales sightings in the action area, and the number of days of project activities, we anticipate 125 animals being exposed to noise levels resulting in take by harassment (Table 14). Of those 125 animals, we estimate 100 Level B exposures and 25 Level A exposures. NMFS estimates 93.9% of humpback whales in Southeast Alaska are from the unlisted Hawaii DPS and 6.1% from the Mexico DPS (NMFS 2016c, Wade et al. 2016). Thus, it is anticipated that this action will result in six Level B and two Level A exposures of Mexico DPS humpbacks (Table 15).

Table 14. Amount of proposed incidental harassment (takes) of ESA-listed species in the proposed IHA (83 FR 64541).

Species	Proposed Authorized Level A Takes	Proposed Authorized Level B Takes
Western DPS Steller sea lion (*Eumatopias jubatus*)	0	35[9]
Mexico DPS Humpback whale (*Megaptera novaeangliae*)	2	6[10]
Note: Take estimates are rounded up to the nearest whole number		

In the *Response Analysis* (Section 6.3) we apply the best scientific and commercial data available to describe the species' expected responses to these exposures.

[9] The proposed IHA (83 FR 64541) indicated a requested Level A take of 0 Steller sea lions, and a Level B take of 1,752 Steller sea lions. Of the proposed takes, 2% are anticipated to be ESA-listed western DPS animals. The basis for this apportionment is described below in Section 4.3.2

[10] The proposed IHA (83 FR 64541) indicated a requested Level A take of 25 humpback whales, and a Level B take of 100 humpback whales. Humpback whales in southeast Alaska include individuals from two DPSs. 6.1% are anticipated to be ESA-listed Mexico DPS animals. The basis for this apportionment is described below in Section 4.3.1.

6.2.2 Exposure to Vessel Interactions

Mitigation Measures to Minimize the Likelihood of Exposure to Vessel Noise
As discussed in Section 2.1.5, the following mitigation measures will be required through the Corps and PR1's permitting process to avoid or minimize exposure of marine mammals to vessel noise:

1. Vessels will not approach within 100 m of marine mammals
2. All vessels associated with project construction will avoid the 3,000 ft (914 m) zones surrounding any major rookery or haulout.
3. If a marine mammal comes within 10 meters, operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions.

Results of Vessel Noise Exposure
There are two phases of vessel noise and associated disturbance related to the proposed action. The first is vessel noise associated with construction, and the second is vessel noise associated with operation of the dock dolphins.

These acoustic impacts will result from moving sources, and for individual marine mammals that are exposed to noise from transiting vessels, the effects from each exposure will be temporary in duration, on the order of minutes. For species such as humpback whales and Steller sea lions that prey upon food items that are not tied to a particular location in the way that salmon are seasonally tied to stream channels and stream mouths, effects of transient and temporary noise are expected to result in low levels of exposure and exposure that the animals can likely avoid without foregoing highly valuable foraging opportunities.

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 western DPS 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 tugs 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 et al. 1995). Sound from vessels within this size range would reach the 120 dB threshold distances between 86 m and 233 m (282 and 764 feet) from the source (Richardson et al. 1995). Listed cetaceans and pinnipeds have the potential to overlap with vessel noise associated with the proposed construction activities. We anticipate low level exposure of short-term duration to listed marine mammals from vessel noise, and do not expect significant behavioral reactions. We will discuss potential responses of listed species to vessel noise in Section 6.3.2.

6.3 Response Analysis

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

Loud underwater noise can result in physical effects on the marine environment that can affect marine organisms. Possible responses by ESA-listed whales and pinnipeds to the impulsive and continuous sound produced by pile installation and removal, DTH hammering, and vessel noise include:

- Physical Response
  - Auditory threshold shifts
  - Non-auditory physiological effects
- Behavioral responses
  - Auditory interference (masking)
  - Tolerance or Habituation
  - Change in dive, respiration, or feeding behavior
  - Change in vocalizations
  - Avoidance or Displacement
  - Vigilance

This analysis also considers information on the potential effects on prey of ESA-listed species in the action area.

6.3.1 Responses to Major Noise Sources (Pile Driving/Removal and DTH Hammering)

As described in the Sections 6.2.1, Mexico DPS humpback whales and western DPS Steller sea lions are anticipated to occur in the action area and are anticipated to overlap with noise associated with impact and vibratory pile driving/removal and DTH hammering activities. We assume that some individuals are likely to be exposed and respond to these impulsive and continuous noise sources.

Between February 1, 2019 and April 30, 2019, we estimate two Mexico DPS humpbacks and zero western DPS Steller sea lions[11] may be exposed at noise levels loud enough, long enough, or at distances close enough to cause Level A harassment (see Section 6.2.1, *Exposure to Major Noise Sources*, Table 15). In addition, 6 Mexico DPS humpback[12], and 35 western DPS Steller sea lions[12] may be exposed to noise levels sufficient to cause Level B harassment. All Level B instances of take are anticipated to occur at received levels ≥ 120 dB or 160 dB for continuous and impulsive noise sources respectively.

The effects of sounds from pile driving/removal and DTH hammering 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, Nowacek et al. 2007, Southall et al. 2007). The effects of pile driving and DTH hammering on marine mammals are dependent on several factors, including the size, type, and depth of the animal; the

[11] The proposed IHA (83 FR 64541) estimated a total of 1,752 Level B takes of Steller sea lions. Of the proposed takes, 2% are anticipated to occur to ESA-listed western DPS animals.

[12] The proposed IHA (83 FR 64541) indicated a requested Level A take of 25 humpback whales, and a Level B take of 100 humpback whales. Humpback whales in southeast Alaska include individuals from two DPSs. Of the proposed takes, 6.1% are anticipated to occur to ESA-listed Mexico DPS animals.

depth, intensity, and duration of the pile driving and hammering sound; the depth of the water column; the substrate of the habitat; the distance between the pile and the animal; and the sound propagation properties of the environment. Impacts to marine mammals from pile driving/removal and DTH hammering 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.

These instances of exposure assume a uniform distribution of animals and do not account for avoidance. The implementation of mitigation measures to reduce exposure to high levels of pile driving sound, the short duration of pile driving operations, and movement of animals reduce the likelihood that exposure to pile driving would cause a behavioral response that may affect vital functions (reproduction or survival), or would result in temporary threshold shift (TTS) or permanent threshold shift (PTS).

Cetacean Responses (Mexico DPS Humpback Whale)
As discussed in the *Status of the Species* section, we have no data on baleen whale hearing so we assume that baleen whale vocalizations are partially representative of their hearing sensitivities. While there is no direct data on hearing in low-frequency cetaceans, the applied frequency range is anticipated to be between 7 Hz to 35 kHz (NMFS 2018).

Humpback whales produce a wide variety of sounds. 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. 1970b, Thompson et al. 1986). Source levels average 155 dB and range from 144 to 174 dB (Thompson et al. 1979). 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 1986). 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).

This information leads us to conclude that humpback whales exposed to sounds produced by pile driving/removal and DTH hammering activities are likely to respond if they are exposed to low-frequency sounds. However, because whales are not likely to communicate at source levels that would damage the tissues of other members of their species, this evidence suggests that received levels of up to 175-192 dB are not likely to damage the tissues of humpback whales (Thompson et al. 1986).

Within the action area, humpback whales are not anticipated during the winter and are seen infrequently during the spring. During the period of pile driving/removal and DTH hammering operations (February-April) lasting approximately 89 days, humpback whales are anticipated to be in low abundance in the action area with a slight increase during the eulachon run in April.

Pile driving/removal and DTH hammering activities would likely impact Mexico DPS humpback whales, although the level of disturbance depends on whether the whales are feeding or traveling, as well as other factors such as the age of the animal, whether it tolerates the sound, etc. In addition to targeted studies in marine mammals indicating that frequency (beyond just differing sensitivities at different frequencies) can affect the likelihood of auditory impairment incurred, there is increasing evidence that contextual factors other than received sound level, including activity states of exposed animals, the nature and newness of the sound, and the relative spatial positions of sound and receiver, can strongly affect the probability of behavioral response (Ellison et al. 2012).

Pinniped Responses (Western DPS Steller Sea Lion)
The ability to detect sound and communicate underwater and in-air 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 and 39 kHz in water (NMFS 2018).

Steller sea lions are anticipated to be attracted to the action area during the spring spawning of eulachon which occurs March, April, and early May (Womble et al. 2005a).

Pile driving/removal and DTH hammering activities would likely impact western DPS Steller sea lions, although the level of disturbance depends on whether the sea lions are feeding or traveling, as well as other factors such as the age of the animal, whether it tolerates the sound, etc. In addition to targeted studies in marine mammals indicating that frequency (beyond just differing sensitivities at different frequencies) can affect the likelihood of auditory impairment incurred, there is increasing evidence that contextual factors other than received sound level, including activity states of exposed animals, the nature and newness of the sound, and the relative spatial positions of sound and receiver, can strongly affect the probability of behavioral response (Ellison et al. 2012).

Physical Responses
Systemic stressors usually elicit direct physical or physiological responses and, therefore do not require high-level cognitive processing of sensory information (Herman and Cullinan 1997, Anisman and Merali 1999, de Kloet et al. 2005, Wright et al. 2007). These physical responses are not influenced by the animal's assessment of whether a potential stressor poses a threat or risk.

Threshold Shifts

Exposure of marine mammals to very loud noise can result in physical effects, such as changes to sensory hairs in the auditory system, which may temporarily or permanently impair hearing. TTS is a temporary hearing change and its severity is dependent upon the duration, frequency, sound pressure, and rise time of a sound (Finneran and Schlundt 2013). TTSs can last minutes to days. Full recovery is expected and this condition is not considered a physical injury. At higher received levels, or in frequency ranges where animals are more sensitive, PTS can occur. When PTS occurs, auditory sensitivity is unrecoverable (i.e., permanent hearing loss). Both TTS and PTS can result from a single pulse or from accumulated effects of multiple pulses from an impulsive sound source (i.e., impact pile driving) or from accumulated effects of non-pulsed sound from a continuous sound source (i.e., vibratory or DTH hammering). In the case of exposure to multiple pulses, each pulse need not be as loud as a single pulse to have the same accumulated effect.

Few data are available to define the hearing range, frequency sensitivities, or sound levels necessary to induce TTS or PTS in whales and pinnipeds. The best available information for whales and pinnipeds comes from captive studies of toothed whales and California sea lions, studies of terrestrial mammal hearing, and extensive modeling (Finneran et al. 2000, Schlundt et al. 2000, Finneran et al. 2002, Finneran et al. 2003, Nachtigall et al. 2003, Nachtigall et al. 2004, Finneran et al. 2005, Finneran et al. 2007, Lucke et al. 2009, Mooney et al. 2009a, Mooney et al. 2009b, Finneran et al. 2010a, Finneran et al. 2010b, Finneran and Schlundt 2010, Popov et al. 2011a, Popov et al. 2011b, Kastelein et al. 2012a, Kastelein et al. 2012b). Finneran et al. (2003) exposed two California sea lions to single underwater pulses up to 183 dB re 1 μPa_{p-p} and found no measurable TTS following exposure. Southall et al. (2007) estimated TTS will occur in pinnipeds exposed to a single pulse of sound at 212 dB re 1 μPa_{0-p} and PTS will occur at 218 dB re 1 μPa_{0-p}. Based on this information, NMFS established the following Level A impulsive sound thresholds for low-frequency cetaceans and otariid pinnipeds in the water as 183 dB re1 $\mu Pa^2 \cdot s$, and 203 dB re1 $\mu Pa^2 \cdot s$ respectively (NMFS 2018).

Both duration and pressure level of a sound are factors in inducement of threshold shift. Exposure to non-pulsed sound (i.e., vibratory or DTH hammering) may induce more threshold shift than exposure to a pulsed sound with the same energy; however, this is dependent on the duty cycle of the pulsed source (because some recovery may occur between exposures) (Kryter et al. 1966, Ward 1997). For example, the impairment caused by exposure to one a high SPL pulse may equal the exposure of a lower SPL continuous sound. The low level continuous sound may also cause more impairment than a series of intermittent lower SPL sounds (Ward 1997). TTS was reported in toothed whales after exposure to relatively short, continuous sounds (ranging from 1 to 64 sec) at relatively high sound pressure levels ranging from 185 to 201 dB re 1 μPa_{rms} (Ridgway et al. 1997, Schlundt et al. 2000, Finneran et al. 2005, Finneran et al. 2007); however, toothed whales experienced TTS at lower sound pressure levels (160 to 179 dB re 1 μPa_{rms}) when exposed to continuous sounds of relatively long duration ranging from 30 to 54 min (Nachtigall et al. 2003, Nachtigall et al. 2004). Kastak et al. (2005) indicated pinnipeds exposed to continuous sounds in water experienced the onset of TTS from 152 to 174 dB re 1 μPa_{rms}.[13] Southall et al. (2007) estimated PTS will occur in pinnipeds exposed to continuous sound pressure levels of 218 dB re 1 μPa_{0-p}.

Based on this information NMFS established Level A continuous sound thresholds for low-frequency cetaceans and otariid pinnipeds in the water as 199 dB re 1 $\mu Pa^2 \cdot s$, and 219 dB re1 $\mu Pa^2 \cdot s$ respectively (NMFS 2018).

[13] Values originally reported as sound exposure level of 183 to 206 dB re 1 μPa^2-s.

To experience TTS from a continuous source, a humpback whale will have to remain in the 148 m radius ZOI for continuous noise sources for an extended period of time, and will need to remain in the ZOI even longer to experience PTS. For Steller sea lions continuous Level A zones were smaller at up to 6 m (see Table 12). The reported radii for 24-hr SEL (Level A) thresholds are based on the assumption that marine mammals remain stationary or at a constant exposure range during the entire 24-hr period, which is an extremely unlikely scenario, though it is possible they may remain in the area if highly motivated by the presence of a food source. In this instance, it is possible that a whale could experience TTS if it chooses to remain in the ensonifed area for an extended period. Though the exact time a whale will need to remain in the ensonified area to experience threshold shift is not known, based on the findings from Nachtigall et al. (2003) and Nachtigall et al. (2004), we estimate a whale will need to remain in the ensonified zone for tens of minutes to experience low-level TTS and likely several to tens of hours to experience PTS, if at all. Considering the applicant has agreed to shut down if marine mammals approach or occur within the Level A zones, TTS and PTS are unlikely to occur.

Non-auditory Physiological Effects

Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to strong underwater sound include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage (Cox et al. 2006, Southall et al. 2007). Studies examining such effects are limited. In general, little is known about the potential for pile driving/removal or DTH hammering 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 cetaceans and some pinnipeds, are especially unlikely to incur auditory impairment or non-auditory physical effects.

An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (Moberg 2000). In many cases, an animal's first and sometimes most economical (in terms of energetic costs) response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

Neuroendocrine stress responses often involve the hypothalamus-pituitary-adrenal system. Virtually all neuroendocrine functions that are affected by stress (including immune competence, reproduction, metabolism, and behavior) are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance (Blecha 2000). Increases in the circulation of glucocorticoids are also equated with stress (Romano et al. 2004).

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and "distress" is the cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other functions. This state of distress will last until the animal replenishes its energetic reserves sufficient to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments and for both laboratory and free-ranging animals (Jessop et al. 2003, Lankford et al. 2005, Crespi et al. 2013). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker 2000, Romano et al. 2002) and, more rarely, studied in wild populations (Romano et al. 2002). For example, Rolland et al. (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. During the time following September 11, 2001, shipping traffic and associated ocean noise decreased along the northeastern U.S. This decrease in ocean noise was associated with a significant decline in fecal stress hormones in North Atlantic right whales, suggesting that chronic exposure to increased noise levels, although not acutely injurious, can produce stress (Rolland et al. 2012). These levels returned to their previous level within 24 hrs after the resumption of shipping traffic. Exposure to loud noise can also adversely affect reproductive and metabolic physiology (Kight and Swaddle 2011). In a variety of situations, including behavioral and physiological responses, females appear to be more sensitive or respond more strongly than males (Kight and Swaddle 2011).

These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as "distress." In addition, any animal experiencing TTS would likely also experience stress responses (NRC 2003).

As discussed throughout the *Response Analysis* of this opinion, we expect individuals may experience TTS (but are not likely to experience PTS), may experience masking, and may exhibit behavioral responses from project activities. Therefore, we expect ESA-listed whales and pinnipeds may experience stress responses. If whales and pinnipeds are not displaced and remain in a stressful environment (i.e., within the ZOI pile driving activities), we expect the stress response will dissipate shortly after the cessation of pile driving. Similarly, if whales or pinnipeds are exposed to sounds from the DTH hammer, we expect a stress response will accompany a brief startle response. However, in any of the above scenarios, we do not expect significant or long-term harm to individuals from a stress response.

Behavioral Responses

Processive stressors require high-level cognitive processing of sensory information (Herman and Cullinan 1997, Anisman and Merali 1999, de Kloet et al. 2005, Wright et al. 2007). Behavioral responses are influenced by an animal's assessment of whether a potential stressor poses a threat or risk. Behavioral responses may include: 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).

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);
- Longer-term habitat abandonment due to loss of desirable acoustic environment; and
- Longer-term 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). Below we describe some of the anticipated behavioral responses to major noise sources associated with the proposed action.

Tolerance, Habituation, and Sensitization

While numerous studies have shown that underwater sounds from industry activities are often readily detectable by marine mammals in the water at distances of many kilometers, few studies have attempted to address habituation, sensitization, or tolerance (Nowacek et al. 2007). Tolerance is defined as 'the intensity of disturbance that an individual tolerates without responding in a defined way' (Nisbet 2000). Tolerance levels can be measured instantaneously and are, therefore, more readily demonstrated than the longer-term processes of habituation or sensitization. In fact, habituation and sensitization are identified, and distinguished from each other, by the direction of change indicated by repeated measures of tolerance taken over time. Thus, over the course of a habituation process, individual tolerance levels will increase, whereas tolerance levels will conversely decrease as individuals become sensitized to specific stimuli (Bejder et al. 2009).

Despite activities occurring at distances of only a few kilometers away, oftentimes marine mammals show no apparent response or tolerance to industry activities of various types (Miller et al. 2005, Bain and Williams 2006). This is often true even in cases when the sounds must be readily audible to the animals based on measured received levels and the hearing sensitivity of that mammal group. Weir (2008) observed marine mammal responses to seismic pulses from a 24 airgun array firing a total volume of either 5,085 in^3 or 3,147 in^3 in Angolan waters between August 2004 and May 2005. Weir recorded a total of 207 sightings of humpback whales (n = 66), sperm whales (n = 124), and Atlantic spotted dolphins (n = 17) and reported that there were no significant differences in encounter rates (sightings/hr) for humpback and sperm whales according to the airgun array's operational status (i.e., active versus silent). Based on the available information on pinnipeds in water exposed to multiple noise pulses, exposures in the ~150-180 dB re 1µ Pa range (rms values over the pulse duration) generally have limited potential to induce avoidance behavior in pinnipeds (Southall et al. 2007). This information indicates marine mammal tolerance of underwater sounds, and we anticipate that some humpback whales and Steller sea lions exposed to low frequency underwater sounds from impulsive construction activities may tolerate pile driving noise and show no apparent response. More information is needed in order to determine if the learned processes of habituation or sensitization are occurring over time as animals experience repeated exposures.

Masking

Masking occurs when anthropogenic sounds and marine mammal signals overlap at both spectral and temporal scales. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs during the sound exposure. Because masking (without resulting in threshold shift) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

For the pile driving/removal sound generated from the proposed construction activities, sound will consist of low frequency impulsive and continuous noise depending on if they are using an impact or vibratory hammer, or DTH hammer. Lower frequency anthropogenic sounds are more likely to affect detection of communication calls and other potentially important natural sounds such as surf and prey noise. This could affect communication signals used by low frequency mysticetes when they occur near the noise band and thus reduce the communication space of animals (Clark et al. 2009b) and cause increased stress levels (Foote et al. 2004, Holt et al. 2009). However, marine mammals are thought to be able to compensate for masking by adjusting their acoustic behavior by shifting call frequencies, and/or increasing call volume and vocalization rates. For example, blue whales are found to increase call rates when exposed to seismic survey noise in the St. Lawrence Estuary (Di Lorio and Clark. 2010). In addition, the sound localization abilities of marine mammals suggest that, if signal and noise come from different directions, masking would not be as severe as the usual types of masking studies might suggest (Richardson et al. 1995).

Noise from pile driving/removal and DTH hammering is relatively short-term. It is possible that pile driving/removal and DTH hammering noise resulting from this proposed action may mask acoustic signals important to western DPS Steller sea lions and Mexico DPS humpback whales, but the short-term duration (up to 89 days) limited affected area, and pauses between operations would limit the 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 DTH hammering, and which have already been taken into account in the exposure analysis.

Changes in Vocalization

Marine mammals vocalize for different purposes and across multiple modes, such as whistling, echolocation click production, calling, and singing. Changes in vocalization behavior in response to anthropogenic noise can occur for any of these modes and may result from a need to compete with an increase in background noise or may reflect increased vigilance or a startle response.

In addition to these behavioral responses, whales alter their vocal communications when exposed to anthropogenic sounds. Communication is an important component of the daily activity of animals and ultimately contributes to their survival and reproductive success. Animals communicate to find food (Marler et al. 1986, Elowson et al. 1991), acquire mates (Ryan 1985), assess other members of their species (Parker 1974, Owings et al. 2002), evade predators (Greig-smith 1980), and defend resources (Zuberbuhler et al. 1997). Human activities that impair an animal's ability to communicate effectively might have significant effects on the survival and reproductive performance of animals experiencing the impairment.

At the same time, most animals that vocalize have evolved with an ability to make adjustments to their vocalizations to increase the signal-to-noise ratio, active space, and recognizability of their vocalizations in the face of temporary changes in background noise (Cody and Brown 1969, Brumm 2004, Patricelli and Blickley 2006). A few studies have demonstrated that marine mammals make the same kind of vocal adjustments in the face of high levels of background noise. For example, two studies reported that some mysticete whales stopped vocalizing – that is, adjusted the temporal delivery of their vocalizations – when exposed to active sonar (Miller et al. 2000, Melcon et al. 2012). Melcón et al. (2012) reported that during 110 of the 395 d-calls (associated with foraging behavior) they recorded during mid-frequency active sonar transmissions, blue whales stopped vocalizing at received levels ranging from 85 to 145 dB, presumably in response to the sonar transmissions. These d-calls are believed to attract other individuals to feeding grounds or maintain cohesion within foraging groups (Oleson et al. 2007).

Humpback whales have been observed to increase the length of their songs in the presence of potentially masking signals (Miller et al. 2000, Fristrup et al. 2003).

Responses While Feeding

The absence of changes in the behavior of foraging humpback whales or Steller sea lions should not be interpreted to mean that the marine mammals were not affected by the noise. Animals that are faced with human disturbance must evaluate the costs and benefits of relocating to alternative locations; those decisions would be influenced by the availability of alternative locations, the distance to the alternative locations, the quality of the resources at the alternative locations, the conditions of the animals faced with the decision, and their ability to cope with or "escape" the disturbance (Lima and Dill 1990, Gill and Sutherland 2001, Frid and Dill. 2002, Beale and Monaghan 2004a, b, Bejder et al. 2006, Bejder et al. 2009). Specifically, animals delay their decision to flee from predatory stimuli they detect until they decide that the benefits of abandoning a location are greater than the costs of remaining at the location or, conversely, until the costs of remaining at a location are greater than the benefits of fleeing (Ydenberg and Dills 1986). Ydenberg and Dill (1986) and Blumstein (2003) presented an economic model that recognized that animals will almost always choose to flee a site over some short distance to a predator; at a greater distance, animals will make an economic decision that weighs the costs and benefits of fleeing or remaining; and at an even greater distance, animals will almost always choose not to flee. For example, in a review of observations of the behavioral responses of 122 minke whales, 2,259 fin whales, 833 right whales, and 603 humpback whales to various sources of human disturbance, Watkins (1986) reported that fin, humpback, minke, and North Atlantic right whales tolerated sounds that occurred at relatively low received levels, had most of their energy at frequencies below or above the hearing capacities of these species, or were from distant human activities and received levels were below ambient levels. Most of the negative reactions that were observed occurred within 100 m of a sound source or when sudden increases in received sound levels were judged to be in excess of 12 dB, relative to previous ambient sounds.

As a result of using this kind of economic model to consider whales' behavioral decisions, we would expect whales to continue foraging in the face of moderate levels of disturbance. For example, humpback whales, which only feed during part of the year and must satisfy their annual energetic needs during the foraging season, may continue foraging in the face of disturbance. Similarly, a humpback cow accompanied by her calf is less likely to flee or abandon an area at the cost of her calf's survival. By extension, we assume that animals that choose to continue their pre-disturbance behavior would have to cope with the costs of doing so, which will usually involve physiological stress responses and the associated energetic costs (Frid and Dill 2002, MMS 2008).

Responses While Migrating and Resting

Migrating whales respond more strongly to noise than do feeding whales. While we do not have information on migrating whale responses to pile driving noise, we do have information on whale responses to other impulsive noise sources such as seismic operations. Avoidance responses of migrating humpback whales to impulsive airgun noise appear consistent with bowhead and gray whale avoidance at received levels between 150-180 dB (Richardson et al. 1995). Migrating humpbacks showed localized avoidance of operating airguns in the range of received levels 157-164 dB. In addition, humpback whales seemed more sensitive to seismic airgun noise while exhibiting resting behavior (McCauley et al. 2000). For resting humpback pods that contained cow-calf pairs, the mean airgun noise level for avoidance was 140 dB re 1 μPa rms, and a startle response was observed at 112 dB re 1μ Pa rms (McCauley et al. 2000). When calves are small, comparatively weak and possibly vulnerable to predation and exhaustion, the potential continual dislocation of these animals in a confined area would interrupt this resting and feeding stage, with potentially more serious consequences than any localized avoidance response to an operating seismic vessel as seen during their migratory swimming behavior (McCauley et al. 2000). For comparison with the proposed action, impact pile driving (also an impulsive source) is anticipated to attenuate to the 160 dB re 1 μPa rms threshold at 4 km from the source.

Avoidance

Avoidance is the displacement of an individual from an area or migration path as a result of the presence of a sound or other stressor(s), and is one of the most obvious manifestations of disturbance in marine mammals (Richardson et al. 1995).

Studies of bowhead, gray, and humpback whales have determined that received levels of pulses in the 160-170 dB re 1 μPa rms range seem to cause obvious avoidance behavior in a substantial fraction of the animals exposed.
Avoidance is one of many behavioral responses whales may exhibit when exposed to pile driving/removal and DTH hammering noise. Other behavioral responses include evasive behavior to escape exposure or continued exposure to a sound that is painful, noxious, or that they perceive as threatening, which we would assume would be accompanied by acute stress physiology; increased vigilance of an acoustic stimulus, which would alter their time budget (that is, during the time they are vigilant, they are not engaged in other behavior); and continued pre-disturbance behavior with the physiological consequences of continued exposure.

Responses of Prey Resources

As described in the *Status of Listed Species*, in Southeast Alaska, marine mammal distributions and seasonal increases in their abundance are strongly influenced by seasonal pre-spawning and spawning aggregations of forage fish, particularly Pacific herring (*Clupea pallasii*), eulachon (*Thaleichthys pacificus*) and Pacific salmon (*Onchorynchus spp.*) (Marston et al. 2002, Sigler et al. 2004, Womble et al. 2005b). Coho, pink, chum, and Chinook salmon are found in the action area and are preyed upon by Steller sea lions. There are three anadromous streams near the project location including Skagway River, Taiya River, and Pullen Creek. Eulachon spawning generally occurs in April and may attract sea lions as well as humpback whales.

Of all known Steller sea lion prey species, only Chinook and coho salmon have been studied for effects of exposure to pile driving noise (Halvorsen et al. 2012). These studies defined very high noise level exposures (SEL_{cum} of 210 dB re 1$\mu Pa^2 \cdot s$) as threshold for onset of injury, and supported the hypothesis that one or two mild injuries resulting from pile driving exposure at these or higher levels are unlikely to affect the survival of the exposed animals, at least in a laboratory environment. Hart Crowser Inc. et al. (2009) studied the effects on juvenile coho salmon from pile driving of sheet piles at the Port of Anchorage in Knik Arm of Cook Inlet. The fish were exposed in-situ (in that location) to noise from vibratory or impact pile driving at distances ranging from less than 1 meter to over 30 meters. The results of this studied showed no mortality of any of the test fish within 48 hours of exposure to the pile driving activities, and for the necropsied fish, no effects or injuries were observed as a result of the noise exposure (NMFS 2016e). 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 pile driving within the action area relative to known feeding areas in Steller sea lions, 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 western DPS Steller sea lion prey would be affected. In general, we expect fish will be capable of moving away from project activities if they experience discomfort. We expect the area in which stress, injury, TTS, or changes in balance, or changes in prey species may occur (if at all) will be limited to a few meters directly around the pile driving and DTH hammering operations. We consider potential adverse impacts to prey resources from pile-driving and DTH hammering in the action area to be unlikely.

Studies on euphausiids and copepods, which are some of the more abundant and biologically important groups of zookplankton, have documented the use of hearing receptors to maintain schooling structures (Wiese 1996) and detection of predators (Chu et al. 1996) respectively, and therefore have some sensitivity to sound; however any effects of pile driving/removal and DTH hammering on zooplankton would be expected to be restricted to the area within a few feet or meters of the project and would likely be sub-lethal.

No appreciable adverse impact on zooplankton populations will occur due in part to large reproductive capacities and naturally high levels of predation and mortality of these populations. Any mortality or impacts on zooplankton as a result of construction operations is immaterial as compared to the naturally-occurring reproductive and mortality rates of these species. This is consistent with previous conclusions that crustaceans (such as zooplankton) are not particularly sensitive to sound produced by even louder impulsive sounds such as seismic operations (Wiese 1996).

6.3.2 Responses to Vessel Noise

As described in the *Exposure to Vessel Interactions* Section 6.2.2, Mexico DPS humpback whales and western DPS Steller sea lions are all 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 these continuous noise sources.

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

Humpback whale reactions to approaching boats are variable, ranging from approach to avoidance (Payne 1978, Salden 1993). On rare occasions humpbacks "charge" towards a boat and "scream" underwater, apparently as a threat (Payne 1978). 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 humpbacks, but that the biological significance of that stress is unknown. Humpbacks seem less likely to react to vessels when actively feeding than when resting or engaged in other activities (Krieger and Wing 1984). Mothers with newborn calves seem most sensitive to vessel disturbance (Clapham and Mattila 1993). Marine mammals that have been disturbed by anthropogenic noise and vessel approaches are commonly reported to shift from resting behavioral states to active behavioral states, which would imply an energetic 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. There is the potential for interactions between vessels and cow calf pairs in Southeast Alaska.

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

Few authors have specifically described the responses of pinnipeds to boats, and most of the available information on reactions to boats concerns pinnipeds hauled out on land or ice. However, the mere presence and movements of ships in the vicinity of seals and sea lions can cause disturbance to their normal behaviors (Calkins and Pitcher 1982, Kucey 2005, Jansen et al. 2006). Disturbances from vessels may motivate seals and sea lions to leave haulout locations and enter the water (Richardson 1998, Kucey 2005). The possible impact of vessel disturbance on Steller sea lions has not been well studied, yet the response by sea lions to disturbance will likely depend on the season and life stage in the reproductive cycle (NMFS 2008a).

The action area does not include Steller sea lion critical habitat, and the WP&YR required all vessels associated with project construction will avoid the 3,000 ft (914 m) designated aquatic zones surrounding any major rookery or haulout as they transit to and from the project site. The limited number of vessels associated with the proposed actions are anticipated to be transiting at speeds of 10 knots or less, and vessels will primarily be anchored at the construction site unless deploying people or supplies.

We anticipate that noise associated with transiting vessels would drop to 120 dB within 233 meters (or less) of most vessels associated with the proposed action (Richardson et al. 1995). Considering that regulations restrict approaching humpback whales within 100 yards, and WP&YR is applying an exclusion zone for vessel transit out to 100 m (~109 yards) around any marine mammal, a Steller sea lion or humpback whale that perceived the vessel noise at that distance is likely to ignore such a signal and devote its attentional resources to stimuli in its local environment. 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 response 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 operational period of the action (Feb-April), the action area is not considered high quality habitat for western DPS Steller sea lions or humpback whales. Temporary avoidance of the action area is not likely to adversely affect these species**.** Therefore, the impact of vessel transit on Mexico DPS humpback whales and western DPS Steller sea lions is not anticipated to reach the level of harassment under the ESA, and is considered insignificant.

6.3.3 Response Summary

No Level A take of western DPS Steller sea lion is anticipated. The maximum distance at which a Steller sea lion may be exposed to noise levels that exceed Level A thresholds is 120 m during impact pile driving (see Table 12). At this distance a PSO can effectively monitor and shutdown operations if a Steller sea lion is observed. No Level A takes are anticipated.

We anticipate up to two Mexico DPS humpback whales may be exposed to Level A harassment from impulsive noise at distances up to 3.1 km (see Table 12).

It is anticipated that for the major noise sources associated with the proposed action (impact pile driving, vibratory pile removal and driving, and DTH hammering), the distances to the Level B isopleth (120 dB for continuous noise sources, and 160 dB for impulsive noise sources) range from 3.7km-13 km depending on the source and threshold of concern (PND Engineers 2018).

Based on this information, we would not anticipate humpback whales or Steller sea lions to devote attention to a noise stimulus beyond the 120 dB isopleth (for continuous noise sources), which may be more than 13 km from the source, and beyond the 160 dB isopleth (for impulsive noise sources) which may reach more than 3.7 km. At these distances, a marine mammal that perceives a signal is likely to ignore such a signal and devote its attention to stimuli in its local environment (that is, they would filter the sound out as background noise or ignore it) (Miller et al. 1999, Richardson 1999). Because of their distance from the noise source, we would also not anticipate humpback whales or Steller sea lions would change their behavior or experience physiological stress responses at received levels < 120 dB or <160 dB for continuous and impulsive sources, respectively; these animals may exhibit slight deflection from the noise source, but this behavior is not likely to result in adverse consequences for the animals exhibiting that behavior.

Feeding humpbacks, however, may cease calling or alter vocalization at significantly lower received levels. The proposed action activities will occur between February and April and will overlap with the eulachon run in April.

Those animals that are closer to the source and not engaged in activities that would compete for their attentional resources (for example, foraging) might engage in low-level avoidance behavior (changing the direction or their movement to take them away from or tangential to the source of the disturbance) possibly accompanied by short-term vigilance behavior, but they are not likely to change their behavioral state (that is, animals that are foraging or migrating would continue to do so). We do not anticipate that low-level avoidance or short-term vigilance would occur until impulsive noise levels are >140 dB for humpback whales (McCauley et al. 2000). Females and females with calves may avoid sound sources ≥ 140 dB. However, we would not anticipate the majority of individuals to show low-level avoidance until impulsive noise levels are ≥ 150 dB (Lien et al. 1993, Richardson et al. 1995, Todd et al. 1996). Again, neither low level avoidance nor short-term vigilance is likely to result in adverse consequences for the animals exhibiting the behavior.

At some distance that is closer still, these species are likely to engage in more active avoidance behavior. Of the humpback whales and Steller sea lions that may be exposed to Level B harassment noise from the proposed action (estimated 41 exposures of listed species), some whales and sea lions are likely to reduce the amount of time they spend at the ocean's surface, increase their swimming speed, change their swimming direction to avoid construction operations, change their respiration rates, increase dive times, increase vigilance, reduce feeding behavior, or alter vocalizations and social interactions (Richardson et al. 1986, Ljungblad et al. 1988, Richardson and Malme 1993, Greene et al. 1999, Frid and Dill. 2002, Christie et al. 2009, Koski et al. 2009, Blackwell et al. 2010, Funk et al. 2010, Melcon et al. 2012). Based on the proposed action, we would expect these kind of responses at maximum distances out to 13 km for vibratory and DTH hammering, and distances out to 3.7 km for impact pile driving (Table 12) (PND Engineers 2018). However, these exposures are anticipated to be separated temporally considering the applicant does not anticipate more than one installation operation occurring simultaneously (PND Engineers 2018).

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (24-hour cycle). Disruption of such functions resulting from reactions to stressors such as sound exposure are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall et al. 2007). Consequently, a behavioral response lasting less than one day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall et al. 2007). Note that there is a difference between multi-day substantive behavioral reactions and multi-day anthropogenic activities.

Some whales or sea lions may be less likely to respond because they are feeding. The whales and sea lions that are exposed to these sounds probably would have prior experience with similar construction stressors resulting from their exposure during previous years; that experience will make some animals more likely to avoid the construction activities while others would be less likely to avoid those activities. In addition, standard mitigation measures (ramp ups and shut downs) will be in place along with monitoring measures. Some Mexico DPS humpback whales and western DPS Steller sea lions might experience physiological stress (but not distress) responses if they attempt to avoid one construction operation and encounter another construction operation while they are engaged in avoidance behavior.

Of the responses considered above, we do not expect PTS will occur. Nor do we consider exposure to vessel noise to rise to the level of take. We expect TTS, masking, behavioral responses, and physical and physiological effects may occur in Mexico DPS humpback whales and western DPS Steller sea lions. Though project activities may cause TTS, interruptions in communications (masking), avoidance of the action area, and stress associated with these disruptions in exposed individual whales and pinnipeds, we expect all effects will be temporary. Prey species may experience stress, injury, TTS, or changes in balance in a small radius directly around the pile driving or DTH hammering activities or startle and disperse when exposed to sounds from project activities. We do not expect effects to prey species will be sufficient to affect ESA-listed whales or pinnipeds.

7 CUMULATIVE EFFECTS

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, which 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, per section 7 of the ESA.

We searched for information on non-Federal actions reasonably certain to occur in the action area. We did not find any information about non-Federal actions other than what has already been described in the Environmental Baseline (Section 5 of this opinion). We expect climate change, fisheries, harvest, noise, pollutants and discharges, scientific research, and ship strike will continue into the future. We expect moratoria on commercial whaling and bans on commercial sealing will remain in place, aiding in the recovery of ESA-listed whales and pinnipeds.

8 INTEGRATION AND SYNTHESIS OF EFFECTS

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, reproductive success, or lifetime reproductive success of those individuals.

Mexico DPS humpback whales and western DPS Steller sea lions in the action area may be affected by:

- Climate change
    - Prey distribution
    - Habitat quality
- Fisheries interactions
- Subsistence harvests
- Natural and anthropogenic noise
- Pollutants and discharges
- Scientific research
- Ship strike

Despite these pressures, available trend information indicates western DPS Steller sea lion populations are increasing. Population trends for Mexico DPS humpbacks are not known; however, Hawaii DPS humpback which are also in the action area are growing at an annual rate of nearly 6 percent (Muto et al. 2018).

We concluded in the *Effects of the Action* (Section 6 of this opinion) that ESA-listed whales and pinnipeds may be harassed by the proposed activities. We expect the following number of whales and sea lions to represent the maximum number of individuals that will be exposed to Level A and Level B harassment associated with the proposed action:

- 0 (Level A) and 35 (Level B) exposures of western DPS Steller sea lions
- 2 (Level A) and 6 (Level B) exposures of Mexico DPS humpback whales

We expect these exposures may cause TTS and interruptions in communication (i.e., masking) and could elicit the following behavioral responses:

- Temporary displacement from feeding areas
- Avoidance of the ensonified area

We expect low-level, brief stress responses will accompany these responses. We do not expect whales or pinnipeds exposed to these sounds will experience a reduction in fitness.

Prey species may experience stress, injury, TTS, changes in balance, or may be displaced when exposed to sounds from project activities. We do not expect these effects will limit the prey available to ESA-listed whales or pinnipeds.

In summary, we do not expect exposure to any of the stressors related to the proposed project to reduce fitness in any individual whale or pinniped. Therefore, we do not expect fitness consequences to ESA-listed whale or pinniped populations or species.

9 CONCLUSION

After reviewing the current status of ESA-listed species, the environmental baseline for the action area, the anticipated effects of the proposed activities, and the possible cumulative effects, it is NMFS's biological opinion that the Corps' permitting of WP&YR's proposed action, and PR1's proposed issuance of an IHA to WP&YR for the proposed Taiya Inlet Dock Dolphin Project near Skagway, Alaska is not likely to jeopardize the continued existence of the following species:

- Mexico DPS Humpback whale
- Western DPS Steller sea lion

In addition, the proposed action is not likely to adversely affect the following species or critical habitat:

- Sperm whale
- Steller sea lion critical habitat

10 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA prohibits the "take" of endangered species without 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)). Both Level A and Level B takes are anticipated and authorized for the proposed action.

Under the terms of sections 7(b)(4) and 7(o)(2), taking that is incidental and not intended as part of the 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 this Incidental Take Statement (ITS).

Section 7(b)(4)(C) of the ESA specifies that in order to provide an Incidental Take Statement for an endangered or threatened species of marine mammal, the taking must first be authorized under 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 ITS is inoperative.

The terms and conditions described below are nondiscretionary. The Corps and NMFS PR1 have a continuing duty to regulate the activities covered by this ITS. In order to monitor the impact of incidental take, the Corps and PR1 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 the Corps or PR1 (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.

10.1 Amount or Extent of Take

Section 7 regulations require NMFS to estimate the number of individuals that may be taken by proposed actions or utilize a surrogate (e.g., other species, habitat, or ecological conditions) if we cannot assign numerical limits for animals that could be incidentally taken during the course of an action (50 CFR § 402.14 (i)(1); see also 80 FR 26832 (May 11, 2015).

NMFS anticipates the proposed Taiya Inlet Dock Dolphin Project, between February 1, 2019 and January 31, 2020, is likely to result in the incidental take of ESA-listed species by Level A and Level B harassment. As discussed in Section 6.2 of this opinion, the proposed action is expected to take the following number of ESA-listed individuals described in Table 16.

Table 15. Summary of instances of exposure associated with the proposed pile driving/removal and DTH hammering resulting in incidental take of ESA-listed species by Level A and Level B harassment.

Species	Proposed Authorized Level A Takes	Proposed Authorized Level B Takes	Anticipated Temporal Extent of Take
Western DPS Steller sea lion (*Eumetopias jubatus*)	0	35[14]	February 1, 2019 through January 31, 2020
Mexico DPS Humpback whale (*Megaptera novaeangliae*)	2	6[15]	

[14] The proposed IHA (83 FR 64541) indicated a requested Level A take of 0 Steller sea lion, and a Level B take of 1,752 Steller sea lion. Of the proposed takes, 2% are anticipated to occur to ESA-listed western DPS animals. The basis for this apportionment is described in Section 4.3.2

[15] The proposed IHA (83 FR 64541) indicated a requested Level A take of 25 humpback whales, and a Level B take of 125 humpback whales. Humpback whales in southeast Alaska include individuals from two DPSs. Of the proposed takes, 6.1% are anticipated to occur to ESA-listed Mexico DPS animals. The basis for this apportionment

While the MMPA authorization is valid for a year, construction is limited to the months of February through April and a maximum extent of 89 days.

Level B harassment of these individuals will occur by exposure to received sound from continuous sound sources with received sound levels of least 120 dB re 1 μPa_{rms} (i.e., vibratory or DTH hammering), or exposure to received sound from impulsive sound sources with received sound levels of least 160 dB re 1 μPa_{rms} (i.e., impact hammering). Level A takes are limited to Mexico DPS humpback whales and will occur by exposure from impulsive sound sources (i.e., impact hammering). The take estimate is based on the best available information of whale and pinniped surveys and sightings in the area that will be ensonified from the proposed activities. Death or injury is not expected or authorized for any individual whales or pinnipeds that are exposed to these sounds.

ESA-listed whales and pinnipeds observed within the ZOI during pile removal/installation or DTH hammering will be considered to be taken, even if they exhibit no overt behavioral reactions due to the potential for unobservable physiological responses.

Any incidental take of ESA-listed whales and pinnipeds considered in this consultation is restricted to the permitted action as proposed. If the actual incidental take exceeds the predicted level or type, the Corps and PR1 must reinitiate consultation. Likewise, if the action deviates from what is described in Section 2 of this opinion, the Corps and PR1 must reinitiate consultation.

10.2 Effect of the Take

In Section 9 of this opinion, NMFS determined that the level of incidental take, coupled with other effects of the proposed action, is not likely to jeopardize the continued existence western DPS Steller sea lions or Mexico DPS humpback whales.

All of the authorized takes from the proposed action are associated with behavioral harassment from acoustic noise (Section 6.2.1). Although the biological significance of 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 individual whales and pinnipeds to major noise sources and any associated disruptions are not expected to affect the reproduction, survival, or recovery of these species.

10.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02). NMFS concludes the reasonable and prudent measures described below, along with implementing terms and conditions, are necessary and appropriate to minimize or to monitor the amount of incidental take of ESA-listed whales and pinnipeds resulting from the proposed actions.

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 western DPS Steller sea lion and Mexico DPS humpback whales shall be

is described in Section 4.3.1.

by incidental harassment only. The taking by serious injury or death is prohibited by and will result in the modification, suspension, or revocation of the ITS.

3. The Corps and PR1 must implement and monitor the effectiveness of mitigation measures incorporated as part of the proposed authorization for the incidental taking of ESA-listed marine mammals pursuant to section 101(a)(5)(D) of the MMPA, as specified below. In addition, they must submit reports to NMFS AKR that evaluate the mitigation measures and report the results of the monitoring program, as specified below.

These Reasonable and Prudent Measures, along with the implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action.

10.4 Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, the Corps and PR1 must require any applicant or contractor to comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline the mitigation, monitoring, and reporting measures required by section 7 regulations (50 CFR 402.14(i)). These terms and conditions are non-discretionary. If the Corps or PR1 fail to ensure compliance with these terms and conditions and their implementing reasonable and prudent measures, the protective coverage of section 7(o)(2) may lapse.

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

To implement the reasonable and prudent measure, the Corps and PR1 must ensure that any applicant or contractor adheres to all portions of the description of the action (Section 2.1 Proposed Action), especially mitigation and monitoring measures described in Section 2.1.5 of this opinion. The Corps and PR1 must also ensure that any applicant or contractor adheres to the following Terms and Conditions:[16]

1. Corps and 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.
2. Monthly PSO reports, a final PSO report, and completed marine mammal observation record forms (developed by applicant) will be provided during the project. Items 2.1 through 2.4, below, provide details about what must be included in the reports.
    - 2.1. The reporting period for each monthly PSO report will be the entire calendar month, and reports will be submitted by close of business on the 5th business day of the month following the end of the reporting period (e.g., the monthly report covering February 1 through 28, 2019, will be submitted to NMFS Alaska Region by close of business [i.e., 5:00 pm, AKDT] on March 7, 2019).

[16] These terms and conditions are in addition to reporting required by PR1.

2.1.1. Completed marine mammal observation record forms, in electronic format, will be provided to NMFS Alaska Region in monthly reports.

2.1.2. Observer report data will include the following for each listed marine mammal observation (or "sighting event" if repeated sightings are made of the same animal[s]):

2.1.2.1. Species, date, and time for each sighting event

2.1.2.2. Number of animals per sighting event and number of adults/juveniles/calves/pups per sighting event

2.1.2.3. Primary, and, if observed, secondary behaviors of the marine mammals in each sighting event

2.1.2.4. Geographic coordinates for the observed animals, with the position recorded by using the most precise coordinates practicable (coordinates must be recorded in decimal degrees, or similar standard and defined coordinate system)

2.1.2.5. Time and description of most recent project activity prior to marine mammal observation

2.1.2.6. Environmental conditions as they existed during each sighting event, including, but not limited to:

2.1.2.6.1. Beaufort Sea State

2.1.2.6.2. Weather conditions

2.1.2.6.3. Visibility (km/mi)

2.1.2.6.4. Lighting conditions

2.1.3. Observer report data will also include the following for each take of a marine mammal that occurs in the manner and extent as described in Section 10 of this opinion:

2.1.3.1. All information listed under Item 2.1.2, above

2.1.3.2. Cause of the take (e.g., humpback within Level B zone during impact pile driving)

2.1.3.3. Time the animal(s) entered the zone, and, if known, the time it exited the zone

2.1.3.4. For takes of humpback whales and Steller sea lions, the observer report will estimate the probability of occurrence of ESA-listed DPSs out of the total estimated takes (e.g., out of a total 1,752 Steller sea lions estimated to be taken by Level B harassment, western DPS 0.02 (1,752) = 35 sea lions may have been taken been taken). See 2.2.4.1 for additional information on anticipated probability of occurrence for each ESA-listed DPS

2.2. A final technical report will be submitted to NMFS Alaska Region within 90 days after the proposed action has completed, and all vessels have left the action area. The report will summarize all project activities and results of marine mammal monitoring conducted during project activities. The final technical report will include all elements from Item 2.1, above, as well as:

2.2.1. Summaries that include monitoring effort (e.g., total hours, total distances, and marine mammal distribution through the study period, accounting for sea state and other factors that affect visibility and detectability of marine mammals)

2.2.2. Analyses on the effects from various factors that influences detectability of marine mammals (e.g., sea state, number of observers, fog, glare, etc.)

2.2.3. Species composition, occurrence, and distribution of marine mammal sightings, including date, water depth, numbers, age/size/sex categories (if determinable), group sizes, and ice cover

2.2.4. Species composition, occurrence, and distribution of marine mammal takes, including date, water depth, numbers, age/size/sex categories (if determinable), group sizes, and ice cover

2.2.4.1. Humpback whale and Steller sea lion take estimates will be broken out by DPS (6.1% of total humpback whales takes for Mexico DPS humpback whale, and 2% of total Steller sea lion takes for western DPS Steller sea lion)

2.2.5. Analyses of effects of project activities on listed marine mammals

2.2.6. Number of marine mammals observed and taken (by DPS) during periods with and without project activities (and other variables that could affect detectability), such as:

2.2.6.1. Initial sighting distances versus project activity at time of sighting

2.2.6.2. Observed behaviors and movement types versus project activity at time of sighting

2.2.6.3. Numbers of sightings/individuals seen versus project activity at time of sighting

2.2.6.4. Distribution around the action area versus project activity at time of sighting

2.3. If unauthorized take occurs, (i.e., take of ESA-listed species not included in Table 16), it must be reported to NMFS Alaska Region within one business day to the contact listed in Item 2.4, below. Observation records for ESA-listed marine mammals taken in a manner or to the extent other than described in Section 10.1 of this opinion must include:

2.3.1. All information listed under Item 2.1, above

2.3.2. Number of listed animals taken

2.3.3. Date and time of each take

2.3.4. Cause of the take (e.g., sperm whale observed within Level B zone or ship-strike of a humpback whale)

2.3.5. Time the animal(s) entered the zone, and, if known, the time it exited the zone, if applicable

2.3.6. Mitigation measures implemented prior to and after the animal entered the zone, if applicable

2.4. NMFS Contact:

Monthly and final reports and reports of unauthorized take will be submitted to:
NMFS Alaska Region, Protected Resources Division
Alicia Bishop
alicia.bishop@noaa.gov
907-586-7224

11 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on ESA-listed species or critical habitat, help implement recovery plans, or develop information (50 CFR 402.02).

We offer the following conservation recommendation, which will provide information for future consultations involving the issuance of permits that may affect ESA-listed whales and pinnipeds:

- **Behavioral responses of marine mammals**: We recommend that PR1 summarize findings from past IHA holders about behavioral responses of ESA-listed species to sounds from DTH hammering. Better understanding of how ESA-listed species have responded to sounds from past projects will inform our exposure and response analyses in the future.

In order for the NMFS Alaska Region to be kept informed of actions minimizing or avoiding adverse effects on, or benefiting, ESA-listed species or their habitats, PR1 should notify the NMFS Alaska Region of any conservation recommendations it implements.

12 Reinitiation Notice

This concludes formal consultation on the Corps' permitting of the proposed Taiya Inlet Railroad Dock Dolphin Project and PR1's issuance of an IHA to WP&YR. 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:

- The amount or extent of taking specified in the ITS is exceeded.
- New information reveals effects of the agency action that may affect ESA-listed species or critical habitat in a manner, or to an extent, not considered in this opinion.
- The agency action is subsequently modified in a manner that causes an effect to the ESA-listed species, or critical habitat not considered in this opinion.
- A new species is ESA-listed or critical habitat designated that may be affected by the action.

In instances where the amount or extent of authorized take is exceeded, the Corps and PR1 must immediately request reinitiation of section 7 consultation.

13 DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

13.1 Utility

This document records the results of an interagency consultation. The information presented in this document is useful to NMFS AKR, PR1, Corps, 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.

13.2 Integrity

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

13.3 Objectivity

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