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

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

Sitka Dock North Dolphins Expansion Project

NMFS Consultation Number: AKR0-2019-02310

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

U.S. Army Corps of Engineers (USACE)

Affected Species and Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species or Critical Habitat?	Is Action Likely To Jeopardize the Species?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Humpback whale (*Megaptera novaeangliae*) Mexico Distinct Population Segment (DPS)	Threatened	Yes	No	N/A
Steller sea lion (*Eumetopias jubatus)* Western DPS	Endangered	Yes	No	No
Sperm whale (*Physeter macrocephalus*)	Endangered	No	No	N/A

Consultation Conducted By: National Marine Fisheries Service, Alaska Region

Issued By:

for James W. Balsiger, Ph.D.
Regional Administrator

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LIST OF ABBREVIATIONS

4MP	Marine Mammal Monitoring and Mitigation Plan
ADEC	Alaska Department of Environmental Conservation
AKR	Alaska Region NMFS
BIA	Biologically Important Area (for humpback whale feeding)
BSAI	Bering Sea Aleutian Islands
CFR	Code of Federal Regulations
CV	Coefficient of variation
dB	Decibels
DPS	Distinct Population Segment
DQA	Data Quality Act
DTH	down-the-hole
ESCA	Endangered Species Conservation Act
ESA	Endangered Species Act of 1973
ft	feet
FR	Federal Register
GOA	Gulf of Alaska
GPIP	Gary Paxton Industrial Park
GPS	Global Positioning System
HF	high-frequency
HPMS	Halibut Point Marine Services
hr	hour(s)
Hz	Hertz
IAAAM	International Association for Aquatic Animal Medicine
IHA	Incidental Harassment Authorization
IPCC	Intergovernmental Panel on Climate Change
ITS	Incidental Take Statement
kHz	kilohertz
km	kilometer(s)
lb	pound(s)
L_E	cumulative sound exposure level
LF	low frequency
LOA	length overall
m	meter(s)
MF	mid-frequency
min	minute(s)
MMC	Marine Mammal Commission
MMPA	Marine Mammal Protection Act
μPa	microPascal (measurement of pressure)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service

ONR	Office of Naval Research
Opinion	Biological Opinion under Section 7 of the ESA
OW	Otariid pinnipeds
PBF	Physical or Biological Features (of critical habitat)
PCE	Primary Constituent Element (of critical habitat)
pk	peak sound level
PR1	NMFS Office of Protected Resources, Permits and Conservation Division
PRD	Protected Resources Division, Alaska NMFS
PSO	Protected Species Observers
PTS	Permanent Threshold Shifts
PW	Phocid pinnipeds
rms	root mean square
RPM	Reasonable and Prudent Measures
SAR	marine mammal stock assessment reports
SEL	Sound Exposure Level
SPL	Sound Pressure Level
SSV	Sound Source Verification
T&Cs	Terms and Conditions (of Incidental Take Statement)
TL	Transmission Loss
TMDL	Total maximum daily load
TTS	Temporary Threshold Shifts
UME	Unusual Mortality Event
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service

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 or threatened species, or designated critical habitat that may be affected by the action (50 CFR § 402.14(a)). Federal agencies fulfill this general requirement informally if they conclude that an action "may affect, but is not likely to adversely affect" endangered and 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 or appropriate 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 (USACE) and the NMFS Office of Protected Resources Permits and Conservation Division (NMFS PR1). USACE proposes to authorize Halibut Point Marine Services' construction activities at the deep-water dock facility in Sitka, Alaska. NMFS PR1 proposes to authorize incidental harassment of marine mammals that might be disturbed from construction activities, pursuant to the Marine Mammal Protection Act (MMPA). The consulting agency for this proposal is NMFS's Alaska Region (AKR). This document represents NMFS's biological opinion (hereafter "Opinion") on the effects of the proposed actions on endangered and threatened species and designated critical habitat.

The Opinion and ITS were prepared by NMFS AKR in accordance with section 7(b) of the ESA (16 U.S.C. § 1536(b)) and implementing regulations at 50 CFR part 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 in Halibut Point Marine Services' (HPMS) December 2019 IHA Application (Revision #3) for the Old Sitka Dock North Dolphins Expansion Project and the Biological Assessment for this project. Other sources of information include updated project proposals, and emails and telephone conversations between NMFS Alaska Region, HPMS, USACE, and NMFS PR1 staff. A complete record of this consultation is on file at NMFS's Anchorage, Alaska office.

The proposed action involves the installation of new mooring dolphins at the deep-water HPMS dock facility in Sitka, Alaska. The installation of these dolphins will require in-water pile driving. Construction activities for this action have the potential to affect the threatened Mexico Distinct Population Segment (Mexico DPS) of humpback whale (*Megaptera novaeangliae*), the endangered sperm whale (*Physeter macrocephalus*), and the endangered western distinct population segment (western DPS) of Steller sea lion (*Eumetopias jubatus*) and its designated critical habitat.

1.2 Consultation History

Our communication with PR1, USACE, and HPMS regarding this consultation is summarized as follows:

- **August 13, 2019:** NMFS AKR received an initial Incidental Harassment Authorization (IHA) application from HPMS to NMFS PR1 and a biological assessment from USACE regarding taking of marine mammals incidental to pile driving activities at Sitka dock (described below in Action Area).
- **August-September 2019**: NMFS PR1 and NMFS AKR exchanged emails with USACE and HPMS regarding project details, sound source levels and other information.
- **October 2, 2019:** NMFS PR1 and NMFS AKR conducted an "Early Review Team" (ERT) meeting, which resulted in several recommended project changes.
- **October 8, 2019:** NMFS PR1 and NMFS AKR held a conference call with HPMS to discuss ERT recommendations. HPMS accepted all changes.
- **October 15, 2019:** NMFS received a revised IHA application, incorporating the recommended changes, from HPMS.
- **November 18, 2019**: NMFS AKR sent a notice of Section 7 consultation request for information to the Alaska Department of Fish and Game (ADF&G).
- **December 2, 2019:** NMFS received a third revision of the HPMS IHA application, incorporating additional changes recommended by NMFS.
- **January 22, 2020:** NMFS PR1 published the proposed IHA with a comment period extending through February 21, 2020.
- **January 27, 2020:** NMFS PR1 received draft recommended changes to the proposal from the Marine Mammal Commission (MMC) and discussed and agreed to certain changes with NMFS AKR.
- **January 28, 2020:** NMFS PR1 submitted a request to initiate section 7 consultation to the NMFS AKR. NMFS AKR deemed the initiation package complete and initiated consultation with NMFS PR1 and USACE.
- **March 4, 2020:** Based on comments received from MMC and recent sound source verification results, NMFS PR1 determined that down-the-hole drilling should be considered to emit both continuous and impulsive sounds. This changed the calculation of Level A harassment zones, a significant project change requiring additional information to complete the consultation.
- **March 13, 2020:** After further discussion, NMFS PR1 and NMFS AKR came to agreement on appropriate revised Level A disturbance radii. The consultation package

was deemed complete, and NMFS AKR again initiated consultation based on the revised information. The applicant, HPMS, was notified of these changes, which required a revision of the Marine Mammal Monitoring and Mitigation Plan (4MP).

- **March 16, 2020:** Revised 4MP was received from HPMS.

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. This Opinion considers the effects of the USACE authorization of construction activities at HPMS's Sitka dock to accommodate larger cruise ships, and of PR1's issuance of an IHA to take marine mammals by harassment under the MMPA incidental to HPMS's construction activities.

The average size of oceangoing cruise vessels operating in the Alaska region has increased steadily over the past decade. Cruise ships in the 1970s typically held 500 passengers and were approximately 168 m length overall (LOA). Now ships greater than 274 m LOA are the operational norm. The majority of the large ships being constructed are of the "neo-Panamax" size, 366 m LOA (Benitz 2009).

Sitka is a port-of call for cruise ships in Alaska. The HPMS deep water dock facility, located at the northeast end of Sitka Sound, is approximately five miles north of downtown Sitka. The current dock facility (Figure 1) does not meet the industry-required specifications for mooring the large neo-Panamax vessels. The purpose of this project is to add two additional mooring dolphins that will provide the adequate mooring loads required for the neo-Panamax ships.

Figure 1. Existing Halibut Point Marine Dock Facility(Photo: Chris McGraw)

2.1.1 Proposed Activities

HPMS is proposing to modify two existing dolphin structures and construct two additional dolphins at their deep-water dock facility in Sitka Sound. Construction will include vibratory pile installation and removal of template piles, vibratory and impact installation of permanent piles, and down-the-hole drilling to install bedrock anchors for the permanent piles. Pile driving, removal and drilling activity is expected to range from 2 to 8 hours each day and will occur during daylight. Construction is expected to occur over approximately 30 days, including 19 in-water work days, between October 2020 and March 2021.

2.1.2. Construction Methods

The following equipment is expected to be used (a final determination will be made through the permitting process):

- Vibratory Hammer: ICE 44B/Static weight 12,250 pounds
- Diesel Impact Hammer: Delmag D46/Max Energy 107,280 feet-pounds
- Drilled shaft drill: Holte 100,000 feet-pounds top drive with down-the-hole (DTH) hammer and bit.

Materials and equipment will 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.

Construction of the two new dolphins will begin with installation of four 30-inch template piles at the site of each new dolphin to guide the installation of the 48-inch, permanent steel piles. The applicant anticipates being able to use a vibratory hammer to install two template piles per day and expects the installation to occur over two days per dolphin (4 days, 8 temporary piles total).

Each new dolphin will consist of four 48-inch piles. Using the template to guide their placement, the 180-foot, 48-inch permanent piles will be driven into the overburden with the vibratory hammer operated at a reduced energy setting. Every 30 minutes there will be breaks in driving to splice pile sections. Each permanent pile will be seated into the bedrock with an impact hammer for an estimated 3 minutes (100 strikes). No more than two permanent piles will be installed per day. Note from Figures 2 and 3 that the new dolphins will be constructed in relatively deep water, beyond the 150-ft contour.

After the permanent piles are fully installed, the contractor will drill a 33-inch diameter shaft approximately 4.6m (15 feet) within the driven pile (down-the-hole drilling) and into the bedrock. A rebar cage will be installed in each drilled shaft and filled with concrete. Once the permanent piles are in place with the concrete anchors, and pile caps have been installed, the temporary, template piles will be removed using a vibratory hammer. No more than two 30-inch template piles will be installed or removed per day.

Modifications to Existing Dolphins

Construction will begin with removal of the existing catwalk and pile caps on the existing mooring dolphins. One 48-inch permanent pile will be installed over one existing 36-inch diameter pile on each of the two existing dolphins. Existing pile caps and catwalks will then be reinstalled. No down-the-hole drilling is proposed for the existing dolphins.

A new catwalk will be installed between the new mooring dolphins and floating dock (attached to existing Mooring Dolphin No. 1). Also, a new 410’ x 35’ floating dock will be installed between existing mooring dolphin No 1 and the existing concrete pontoon on the shore-side of the existing catwalk (see Figures 2 and 3 below). The new components will be constructed off-site and installed after the new piles are in place. Construction work is summarized in Table 1.

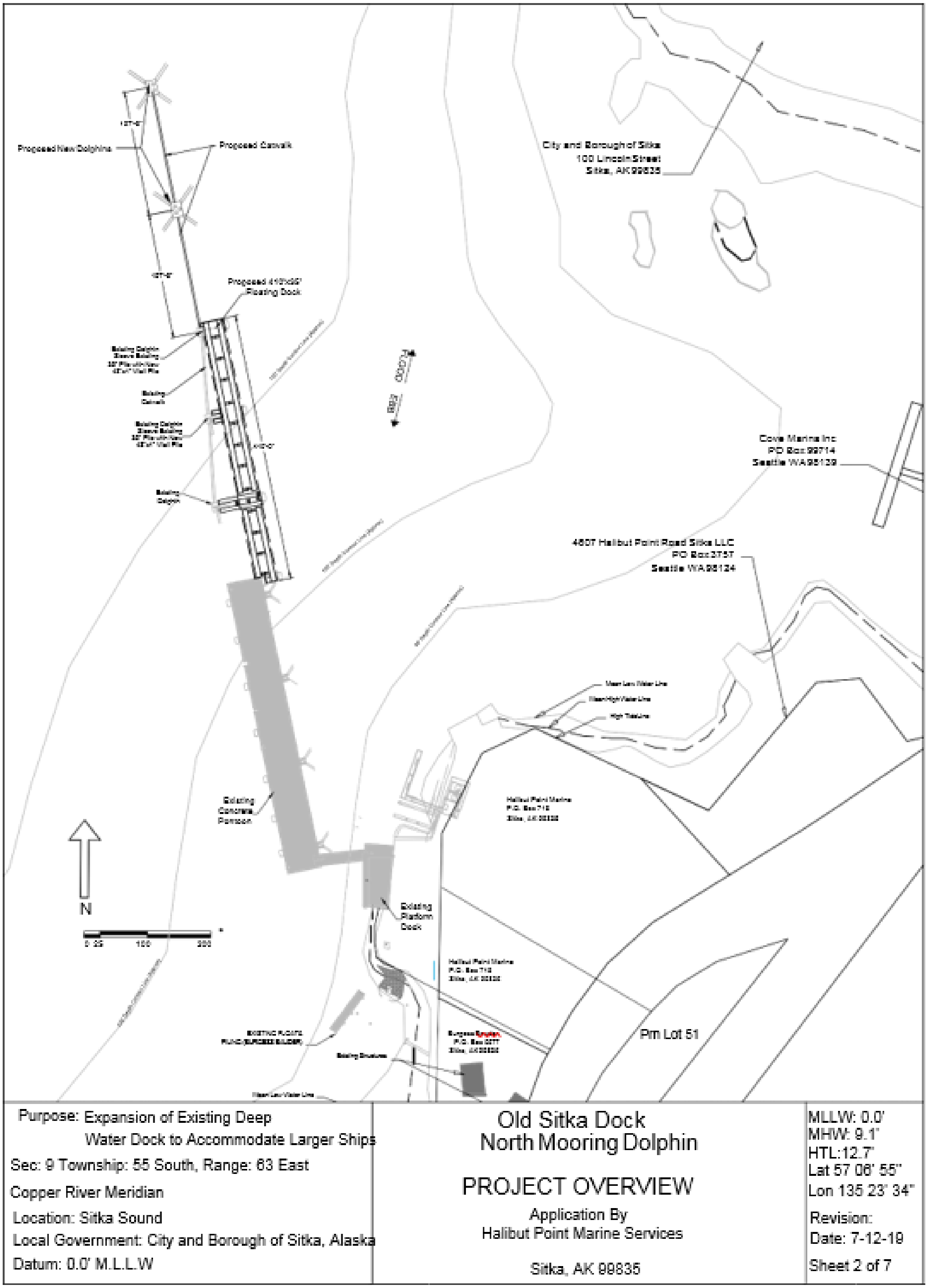


Figure 2. Overall view of Sitka Dock Expansion Project

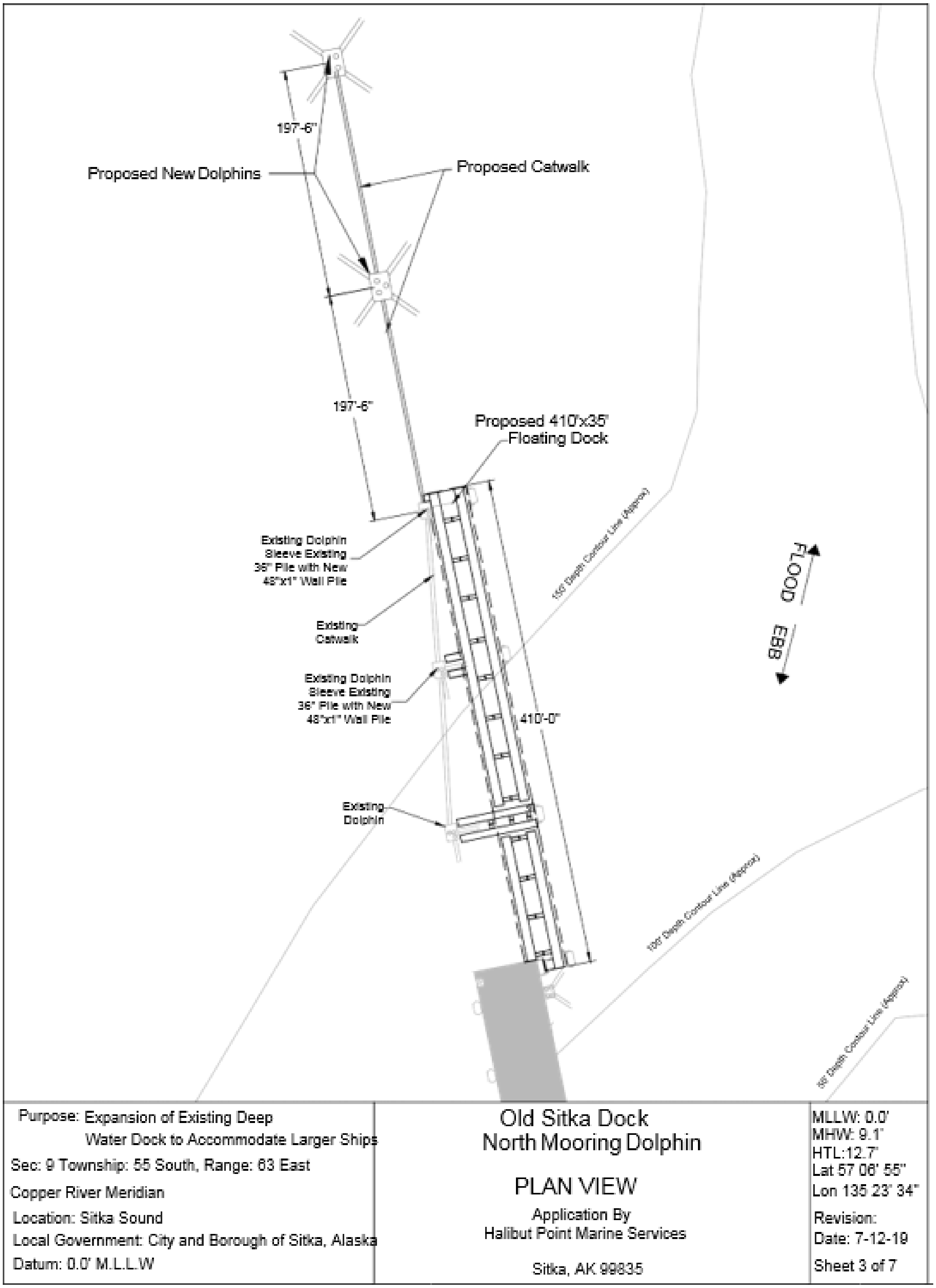


Figure 3. Detailed view of Sitka Dock Expansion Project

Table 1. Pile installation and removal summary for Sitka Dock Expansion

Description	Project Component			
	Temporary Pile Installation	**Temporary Pile Removal**	**Permanent Pile Installation**	**Max Installation/ Removal /Day**
Steel Pile Diameter (in)	30	30	48	--
# of Piles	8	8	10	--
Vibratory Pile Driving				
Total Piles	8	8	10	
Max # of Piles/ Day	2	4	2	
Vibratory Time/Pile	30 min	10 min	60 min	
Vibratory Time/ day	60 min	40 min	120 min (2 hrs)	2 hr (120 min)
Vibratory Time (Total 11 days)	240 min (4 hrs)	80 min (1.3 hrs)	600 min (10 hrs)	--
Impact Pile Driving				
Total Piles	0	0	10	
Max # of Piles / Day	0	0	2	
# Strikes / Pile	0	0	100	
Impact Time/Pile	0	0	3min	--
Impact Time / Day	0	0	6 min	6 min
Impact Time Total	0	0	30 min	--
Rock Anchor Installation (Drilled Shaft)				
Total Quantity	0	0	8	
Anchor Diameter	0	0	33”	--
Max # of Piles Anchored /Day	0	0	2	
Anchor Time Per Pile	0	0	240 min (4 hrs)	--
Anchor Time/Day	0	0	480 min (8 hrs)	480 min.(8 hrs)
Anchor Time Total (4 days)	0	0	1920 min (32 hrs)	--

2.1.3. 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 action area for the proposed dock project includes the maximum area within which project-related noise levels are expected to reach or exceed 120 dB re 1 μPa rms (henceforth 120 dB), i.e., ambient noise levels, where no measurable effect from the project would occur. Based on reported source levels (CALTRANS. 2015; Straley *et al*. 2018) and modeled sound propagation estimates (see section 6.4.3 of this Opinion), noise disturbance from project-related sounds may occur at a maximum distance of 15,849 m from the source (Table 2). The action area will be truncated where land masses obstruct underwater sound transmission (Figure 4).

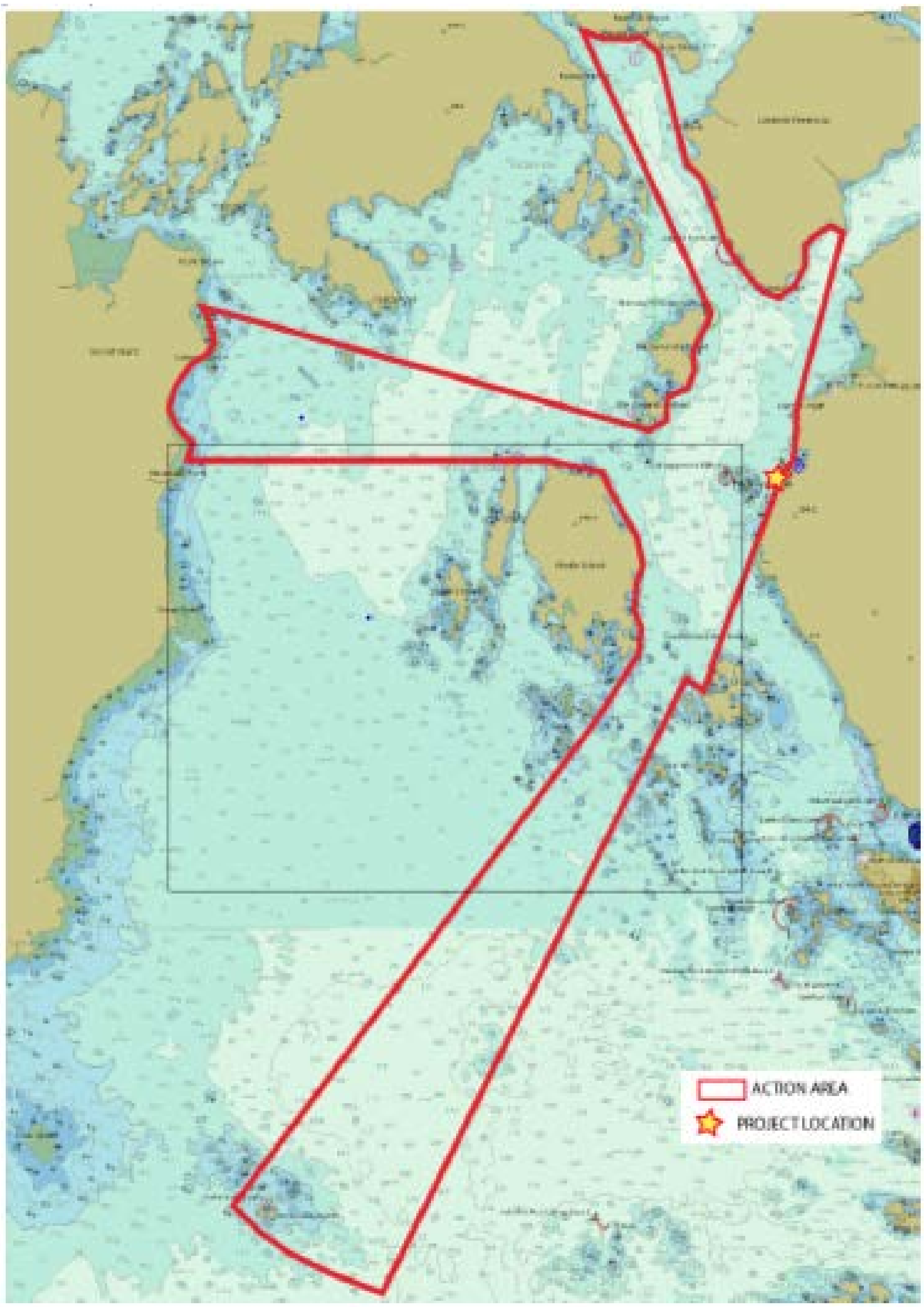


Figure 4. Action Area of Sitka Dock Expansion Project

The action area also includes a single trip from the staging area in Ketchikan to the construction site.

Table 2. Distances in meters to Level A and Level B Thresholds

Activity	Source Level at 10 meters (dB)	Level A					Level B
		Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid	Otariid	
Vibratory Pile Driving/Removal							
30-inch steel temporary installation /removal	168.0 SPL[1]	20.0	1.8	29.6	12.2	0.9	15,849
48-Inch Steel Permanent Installation	168.0 SPL[1]	31.8	2.8	46.9	19.3	1.4	15,849
Impact Pile Driving							
30-inch steel temporary installation[4]	187.3 SEL/ 198.5 SPL[2]	809.8	28.8	964.6	433.4	31.6	3,699
48-Inch Steel Permanent Installation	187.3 SEL/ 198.5SPL[2]	809.8	28.8	964.6	433.4	31.6	3,699
Anchor Drilling							
33-Inch Drilled Anchor Shaft[4]	166.2 SPL	282.5	10.0	336.5	151.2	11.1	12,023

[1]Levels derived from piles driven at Auke Bay Denes *et al.* (2016)
[2]Levels measured from the POA test pile project (Tables 8 & 9, IP5 at 11 m) (Austin *et al.* 2016). Calculated to 10 m here.
[3]From Denes *et al.* (2016).
Following comments on IHA proposal, radii for drilling have been revised to include impulsive, as well as non-impulsive characteristics of the sound. Level A radii are based on a conservative estimate that a marine mammal might remain within the Level A impulsive sound radius for 2 hours

Note from Table 2 that the source levels are the same for vibratory installation/removal of 30-inch and 48-inch piles. Typically, pile driving source levels are louder for installation/removal of larger piles. However, this is not always the case (see for example CALTRANS 2015). For the HPMS project, the best proxy source level for the 30-inch pile, in terms of similar depth and substrate, was based on the measurements of Denes *et al*. (2016) from Auke Bay (168.0 dB rms). The most appropriate proxy source level for vibratory installation of 48-inch piles was derived from Austin *et al.* (2016) (Table 11, 166.8 dB rms). These measurements were made at 11m, but even referenced to 10m (167.4 dB rms) this level was lower than the proxy source for the 30-inch pile reported in Denes *et al.* (2016). In an effort to conduct a conservative analysis, we adopted the higher source level, 168.0 dB rms, as a proxy for vibratory installation of both the 30-inch and 48-inch piles.

2.1.4. Mitigation Measures

HPMS's project design, presented in their IHA application (HPMS 2019) includes the following mitigation measures, outlined below and provided with additional detail in the Marine Mammal Monitoring and Mitigation Plan (4MP), included in HPMS's IHA application (attached to this Biological Opinion).

Standard Measures

- The project uses a design that does not require dredging, blasting, or fill.
- The project uses a design that incorporates the smallest-diameter piles practicable while still minimizing the overall number of piles.
- The project uses a design that places the cruise ship berth and piles at or beyond the 50-foot contour to avoid impacts to the nearshore zone and disturbance to important ecological resources such as submerged aquatic vegetation and diverse substrate composition.
- Floats or barges will not be grounded at any tidal stage.
- No in-water construction will take place between March 1 and October 1 to minimize disruption to the Sitka Sound herring spawning and impacts to marine mammals that congregate in Sitka Sound during the herring spawning and summer months to feed on prey.
- For in-water heavy machinery work other than pile driving (*e.g.*, movement of the barge to the pile location; positioning the pile on the substrate via a crane ("stabbing"),etc.), if a marine mammal comes within 10 m, operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions.
- Vessels will adhere to the Alaska Humpback Whale Approach Regulations when transiting to and from the project site (see 50 CFR §§ 216.18, 223.214, and 224.103(b)).
- For other species of marine mammals, vessels will follow the NMFS Alaska Marine Mammal Viewing Guidelines and Regulations(see: https://www.fisheries.noaa.gov/alaska/marine-life-viewing-guidelines/alaska-marine-mammal-viewing-guidelines-and-regulations)
- All vessels associated with construction operations will avoid the 3,000 ft (914 m) aquatic zone surrounding any designated critical habitat in Southeast Alaska when transiting to or from the project site.

Pile Driving[1] and Removal

- Much of the noise generated during pile installation comes from contact between the pile being driven and the steel template used to hold the pile in place. The contractor will use high-density polyethylene (HDPE) or ultra-high-molecular-weight polyethylene (UHMW) softening material on all templates to eliminate steel-on-steel noise generation. Use of a "Polypenco (Polyoxymethylene) cushion" was found to reduce sound pressure levels of driving 26-inch piles by 1.5 dB (MacGillvray 2018).

[1]Pile driving activities, for purposes of these mitigation measures, include both vibratory and impact pile driving, pile removal, drilling, and anchoring, and other in-water heavy construction. These activities are referred to generically as "pile driving activities" for the remainder of this mitigation measures section.

- HPMS will drive all piles with a vibratory hammer until a desired depth is achieved or refusal prior to using an impact hammer.
- To minimize effects of impact pile driving to marine mammals, a "soft start" technique will be used when impact pile driving. HPMS contractors will initiate three strikes from the impact hammer at 40 percent energy, followed by a 30-second waiting period. This procedure will be repeated two more times before production impact pile driving begins. This soft-start will be applied prior to beginning pile driving activities each day or when impact pile driving hammers have been idle for more than 30 minutes. Soft-start procedures are believed to provide additional protection to marine mammals by warning or giving marine mammals a chance to leave the area prior to the impact hammer operating at full capacity.
- To minimize turbidity and sediment disturbance, HPMS will comply with relevant recommendations in EPA Region 10 Best Management Practices for Piling Removal and Replacement (EPA 2016), including:
    - The crane operator shall remove pile slowly;
    - Upon removal from the substrate and water column, the piling shall be moved expeditiously to the containment area for processing and disposal at an approved off-site upland facility; and
    - The piling shall not be shaken, hosed off, stripped or scraped off, left hanging to drip, or any other action intended to clean or remove adhering material from the piling. Any sediment associated with removed piling must not be returned to the waterway.

Monitoring and Shutdown Zones

Level A Shutdown Zones

- There will be a nominal 10-meter shutdown zone for construction-related activity where acoustic injury is not an issue. This type of work could include (but is not limited to): (1) movement of the barge to the pile location; (2) stabbing the pile via a crane; and (3) removing the pile from the water column/substrate via a crane. For these activities, monitoring will take place immediately prior to initiation until the action is complete.
- Qualified Protected Species Observers (PSOs) will be present in the action area during all vibratory pile removal and vibratory, impact, drilling, and anchoring installation. Required qualifications, equipment and procedures of the PSOs are detailed in HPMS's Marine Mammal Monitoring and Mitigation Plan, dated March 2020, attached to this opinion.
- Three PSO's will be deployed at various monitoring locations, selected to provide an unobstructed view of all water within the shutdown zone and as much of the Level B harassment zone as possible for pile driving and drilling activities. Locations are proposed as follows (see also Figure 6):
    - PSO #1: stationed at or near the site of pile driving;
    - PSO #2: stationed on the north end of Big Gavanski Island and positioned

to be able to view north into Olga Strait and south east towards the project area;
    - PSO #3: stationed on the north end of Middle Island and positioned to be able to view west towards Kruzoff Island and east towards the project area

- The PSO marine mammal monitoring team will conduct briefings with construction supervisors and crews prior to the start of all pile driving activity and when new personnel join the work, to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.
- Pile driving, removal, and drilling will not be conducted when weather conditions or darkness restrict clear, visible observation of all waters within and surrounding the shutdown zone.
- PSOs will maintain verbal communication with the construction personnel, and pile driving/ removal will not begin until a PSO has given a notice to proceed.
- HPMS will implement the shutdown zones as outlined in Table 3 and Figure 5. These zones will be thoroughly monitored, as indicated in the 4MP for this project (attached).
- PSOs will scan the Level A monitoring (=shutdown) zone (Table 3) for the presence of listed species for 30 minutes before any pile driving or removal activities take place, or if pile driving has not occurred for over one hour. If any marine mammal is sighted within a shutdown zone during this 30- minute survey period, or during the soft-start, HPMS will delay pile driving/removal until the animal(s) is confirmed to have moved outside of and on a path away from the area, or if 15 minutes have elapsed since the last sighting of the marine mammal within the shutdown zone.
- When construction is underway, if a marine mammal appears likely to enter a Level A shutdown distance shown in Table 3, construction activities will cease immediately.[2] Pile-driving activities may resume when the animal(s) has been observed leaving the area of its own accord, or 15 minutes after the animal is last observed in the monitoring zone.
- A draft monitoring report will be provided to NMFS Alaska Region within 90 days of completion of pile driving. The report will include an overall description of work completed, a narrative description of marine mammal sightings, and associated PSO data sheets. If no comments are received from NMFS within 30 days, the draft report will constitute the final report. If comments are received, a final report addressing NMFS comments must be submitted within 30 days after receipt of comments.

[2] Note for humpback whales (low-frequency cetaceans) and Steller sea lions (Otariid pinnipeds), these distances are greater than the Level A threshold distances shown in Table 2.

Table 3. Level A Shutdown Zones in meters*

Source	Low- Frequency Cetaceans (humpback whale gray whale, minke whale)	Mid- Frequency Cetaceans (killer whale)	High- Frequency Cetaceans (harbor porpoise)	Phocid (harbor seal)	Otariid (sea lion)
In Water Construction Activities*					
Barge movements, pile positioning, sound attenuation placement*	10	10	10	10	10
Vibratory Pile Driving/Removal					
30-inch steel temporary installation/Removal	50	10	50	25	10
48-inch steel permanent installation	50	10	50	25	10
Impact Pile Driving					
48-inch steel permanent installation	825	50	100	100	50
Anchor Drilling					
33-inch drilled Anchor Shaft (8 Piles –4 hours per pile)	300	10	200	100	25

*calculated from the NMFS User Spreadsheet tool (NMFS 2018)

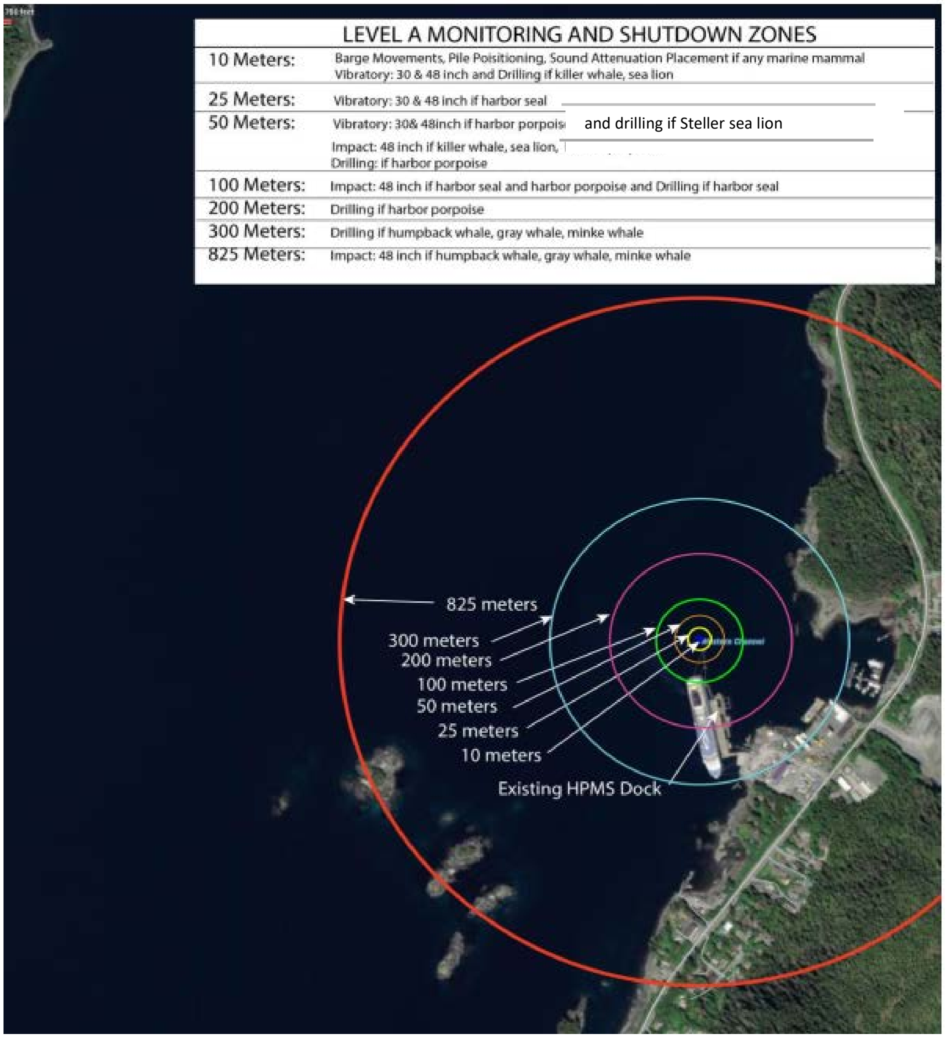


Figure 5. Level A monitoring and shutdown zones for Sitka Dock Expansion Project

Level B Monitoring Zones

HPMS is requesting Level B take of certain marine mammals, including the threatened Mexico DPS of humpback whales and endangered Western DPS of Steller sea lions. HPMS proposes not to shut down, but to monitor Level B harassment zones, areas where sound pressure levels (SPLs) are equal to or greater than 120 dB root mean square[3] (rms) for vibratory pile driving and the non-impulsive component of drilling and greater than 160 dB rms for impact driving and the impulsive component of drilling[4]. The monitoring zones associated with Level B disturbance are shown in Table 4 and depicted in Figure 6. The Exposure Analysis, Section 6.4 of this Opinion, details the derivation of Level B monitoring zone distances.

[3]Root mean square (rms) is the square root of the arithmetic average of the squared instantaneous pressure values.
[4] Recent sound source verification results indicate socket/anchor drilling sounds contain both impulsive and non-impulsive components (Reyff and Heyvaert 2019)

Table 4. Level B monitoring zones for Sitka Dock Expansion Project

Source	Monitoring Zone (m)*
Vibratory Pile Driving	
30-inch steel temporary installation (8 piles; 1 hour per day on 4 days)	15,849
30-inch steel removal (8 piles; 40 min on 2 days)	15,849
48-inch steel permanent installation (10 piles; ~2 hours per day on 5 days)	15,849
Impact Pile Driving	
48-inch steel permanent installation (10 piles; ~6 minutes per day on 5 days)	3,699
Anchor Drilling	
33-inch Anchor Shaft Drilling (8 piles; ~ 8 hours per day on 4 days)	12,023

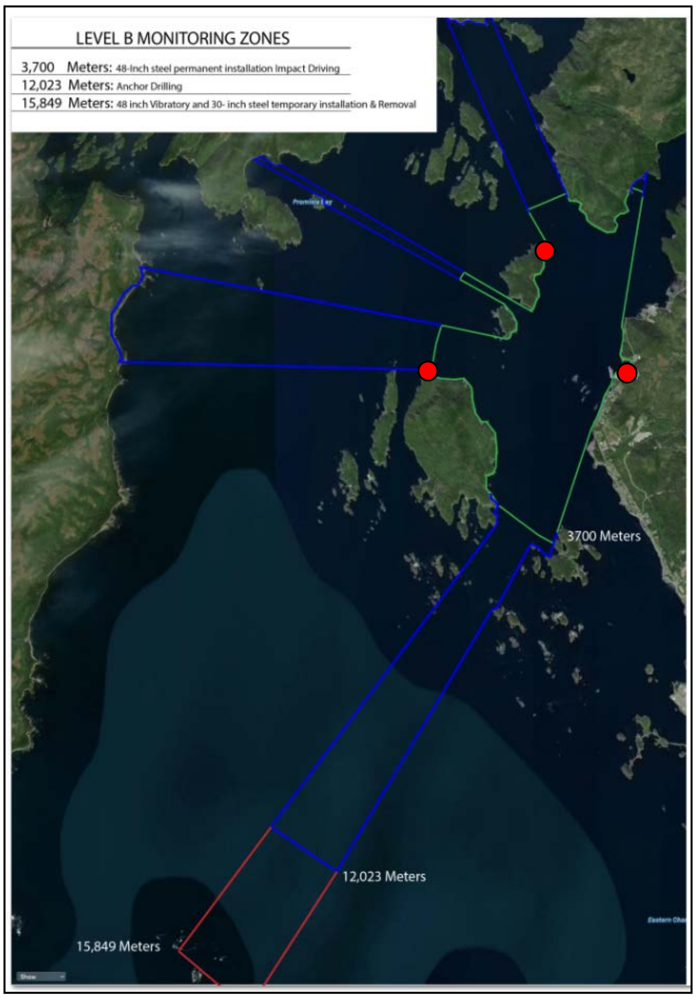


Figure 6. Level B monitoring zones for Sitka Dock Expansion Project. Red dots indicate approximate positions of the three observers.

Given the size of the monitoring zones for vibratory pile driving and drilling, only a portion may be reasonably observed by PSOs from their stations. In order to estimate instances of Level B harassment in the entire monitoring zone, the number of marine mammals observed by PSOs[5] will be divided by the proportion of the total monitoring zone observable. For example, if 30% of the monitoring zone can be seen and 3 sea lions were observed during a pile driving event, HPMS would report that 3 ÷ 0.3 or 10 sea lions had been exposed to Level B harassment sounds during that event. Based on sighting distances and positions of the three PSOs, we estimate that a minimum of 30 percent of the Level B zone will be visible during project construction activities.

Strike Avoidance

Vessels will adhere to the Alaska Humpback Whale Approach Regulations when transiting to and from the project site (see 50 CFR §§ 216.18, 223.214, and 224.103(b)). These regulations require that all vessels:

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

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

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 adverse modification analysis considers the impacts to the conservation value to the species of the designated critical habitat.

[5]PSOs record all marine mammal observations, regardless of location. The PSO's location, as well as the location of the pile being driven, is known from a GPS. The location of the animal is estimated as a distance from the PSO, 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 based on predicted distances to relevant thresholds in post-processing of observational and acoustic data, and a precise accounting of observed incidences of harassment created.

"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). NMFS considers the likely impacts both to a species' survival and to its recovery. 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 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." (50 CFR 402.02).

The designation(s) of critical habitat for the Steller's sea lion uses the term "primary constituent element" (PCE) or essential features. Revised critical habitat regulations (81 FR 7414; February 11, 2016) replaced this term with "physical or biological features" (PBFs). The approach used in conducting a "destruction or adverse modification" analysis is the same, regardless of the term used in the original designation. 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 of this opinion 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 effects on listed species or critical habitat. As part of this step, we identify the action area – the spatial and temporal extent of these effects.
- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action. This section describes the current status of each listed species and its critical habitat relative to the conditions needed for recovery. We determine the rangewide status of critical habitat by examining the condition of its PBFs - which were identified when the critical habitat was designated. Species and critical habitat status are discussed in Section 4 of this opinion.
- Describe the environmental baseline including: past and present impacts of Federal, state, or private actions and other human activities *in the action area*; anticipated impacts of proposed Federal projects that have already undergone formal or early section 7 consultation, and the impacts of state or private actions that are contemporaneous with the consultation in process. The environmental baseline is discussed in Section 5 of this opinion.
- Analyze the effects of the proposed actions. Identify the listed species that are likely to co-occur with these effects in space and time and the nature of that co-occurrence (these represent our *exposure analyses*). In this step of our analyses, we try to identify the number, age (or life stage), and gender of the individuals that are likely to be exposed to stressors and the populations or subpopulations those individuals represent. NMFS also evaluates the proposed action's effects on critical habitat features. The effects of the

action are described in Section 6 of this opinion with the exposure analysis described in Section 6.2 of this opinion.

- Once we identify which listed species are likely to be exposed to an action's effects and the nature of that exposure, we examine the scientific and commercial data available to determine whether and how those listed species are likely to respond given their exposure (these represent our *response analyses*). Response analysis is considered in Section 6.3 of this opinion.
- Describe any cumulative effects. Cumulative effects, as defined in NMFS's implementing regulations (50 CFR § 402.02), are the effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. Future Federal actions that are unrelated to the proposed action are not considered because they require separate section 7 consultation. Cumulative effects are considered in Section 7 of this opinion.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat. In this step, NMFS adds the effects of the action (Section 6) to the environmental baseline (Section 5) and the cumulative effects (Section 7) to assess whether the action could reasonably be expected to: (1) appreciably reduce the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish 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

This Opinion examines the status of each listed species that could be adversely affected by the HPMS proposed action. Three ESA-listed marine mammal species under NMFS's jurisdiction may occur in the action area: the threatened Mexico DPS humpback whale, the endangered sperm whale (*Physeter macrocephalus*), and the endangered western DPS Steller sea lion. Critical habitat has been proposed for Mexico DPS humpback whale within the project action area. Designated critical habitat for Steller sea lion does not occur within the action area (see Section 4.1.2).The species' status (Section 4.4) describes these species' current "reproduction, numbers, or distribution" (50 CFR 402.02), as these pertain to the likelihood of both survival and recovery of these species.

4.1. Species and Critical Habitat Not Likely to be Adversely Affected by the Action

4.1.1. Sperm Whales

Tagged sperm whales have recently been tracked within the Gulf of Alaska (Straley *et al*. 2014), and one sperm whale was found dead in Lynn Canal in March 2019 (NMFS Alaska Region 2019). However, tagging studies show that sperm whales primarily use deeper habitats, including the deep-water slope habitat 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 of about 600 to 1,000 m (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 to occur in the portion of the action area affected by pile driving, it is possible sperm whales may be encountered during transit from staging areas to the construction site, placing them at possible 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.
- Only one initial vessel transit to the project area will occur over the 30-day construction period (C. McGraw pers. comm. February 2020).
- A limited number of vessels are associated with construction.
- Project vessels will adhere to the NMFS guidelines for approaching marine mammals, which discourage vessels approaching within 100 yards of marine mammals.

We conclude that vessel strike is extremely unlikely to occur because sperm whales and project-associated vessels are not anticipated to overlap in time and space, and thus the proposed action is not likely to adversely affect this species.

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:

Alaska rookeries, haulouts, and associated areas identified at 50 CFR 226.202(a), including:

1. Terrestrial zones that extend 914 m (3,000 ft) landward
2. Air zones that extend 914 m (3,000 ft) above the terrestrial zone
3. Aquatic zones that extend 914 m (3,000 ft) seaward from each major rookery and major haulout east of 144° W. longitude
4. Aquatic zones that extend 20 nautical miles(37 km) seaward from each major rookery and major haulout west of 144° W. longitude
5. Three special aquatic foraging areas identified at 50 CFR 226.202(c): Shelikof Strait, Bogoslof, and Seguam Pass

The ensonified area associated with the project does not overlap with designated Steller sea lion critical habitat. The nearest critical habitat is Kaiuchali Island, a three-acre rocky islet located southwest of Biorka Island (Figure 7), over 25 km southwest of the project site. Thus, the only PBFs that may be affected by the proposed action are aquatic zones within 914 m of a major rookery of haulout.

Vessels travelling to Sitka from the south typically traverse west of Biorka Island into Sitka sound. However, given the October project start date and potential weather conditions at that time of year, it is more likely that the barge will use the Alaska Marine Highway route through Chatham and Peril Straits (C. McGraw pers. comm. February 2020), thus completely avoiding critical habitat aquatic zones. If the more westerly route into Sitka Sound is taken, mitigation measures require all vessels associated with construction operations to avoid the 3,000 ft (914 m) aquatic zone surrounding any designated critical habitat east of 144^{o} W longitude. Therefore, we conclude that any effects on Steller sea lion critical habitat would be immeasurably small.

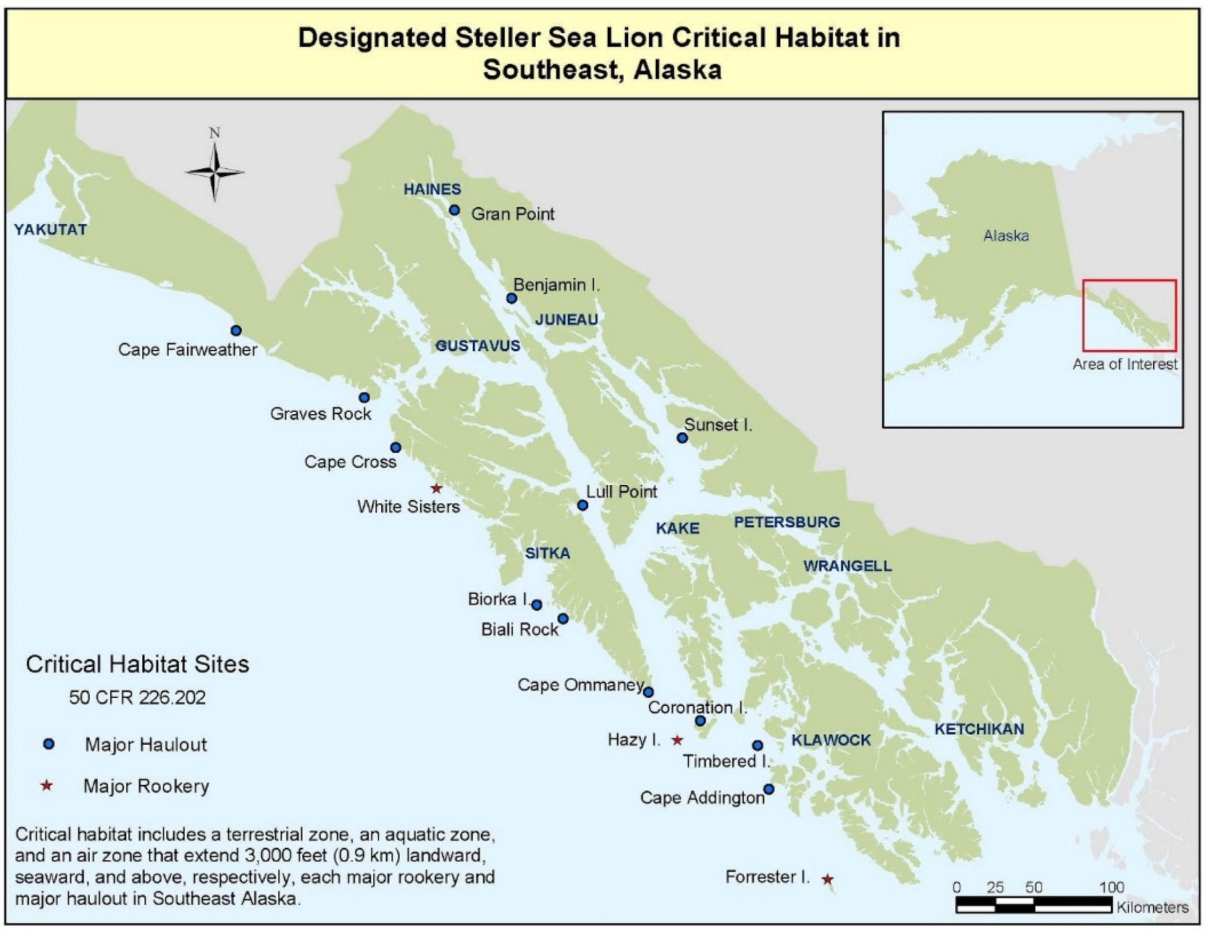


Figure 7. Designated critical habitat for Steller sea lions in Southeast Alaska

4.2. Climate Change

Before discussing the status of each species individually, this Biological Opinion will address climate change, which has the potential to affect the status not only of ESA listed, but of all species, including humans.

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

There is widespread consensus within the scientific community that atmospheric temperatures on earth are increasing and that this will continue for at least the next several decades (Oreskes 2004; Watson and Albritton 2001). In a recently published paper in the journal Bioscience, 11,258 scientists from 153 countries provide a set of data indicating “clearly and unequivocally that the planet Earth is facing a climate emergency” (Ripple *et al.* 2019). There is also consensus within the scientific community that this warming trend will alter current weather patterns and patterns associated with climatic phenomena, including the timing and intensity of extreme events such as heat waves, floods, storms, and wet-dry cycles. Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level (IPCC 2013, 2014, 2018, 2019a, 2019b; Ripple *et al.* 2019).There is little doubt that human influence has been the dominant cause of the observed warming since the mid-20th century (IPCC 2014).

The time period between 1983 and 2012 was likely the warmest 30-year period in the Northern Hemisphere in the last 1,400 years. This warming is thought to lead to increased decadal and inter-annual variability and increases in extreme weather events (IPCC 2013).The likelihood of further global-scale changes in weather and climate events is virtually certain (IPCC 2013; Overland and Wang 2007; Salinger *et al*. 2013).The year 2019 was the second warmest year in the 140-year record. Global land and ocean surface temperature departures from average were +0.95°C (+1.71°F) (NCDC 2020). The five warmest years in the 1880–2019 record have all occurred since 2015, while nine of the 10 warmest years have occurred since 2005 (NCDC 2020). The upper ocean heat content, which measures the amount of heat stored in the upper 2000 m (6561 ft) of the ocean, was the highest on record by a wide margin (NCEI 2020).

The impacts of climate change are especially pronounced at high latitudes. Average temperatures have increased across Alaska at more than twice the rate of the rest of the United States (EPA 2017). Average air temperatures across Alaska have been increasing, and the average annual temperature is now 3-4° warmer than during the early and mid-century (Thoman and Walsh 2019). Winter temperatures have increased by 6°F (Chapin et al. 2014) and the snow season is shortening (Thoman and Walsh 2019). Some of the most pronounced effects of climate change in Alaska include disappearing sea ice, shrinking glaciers, thawing permafrost, and changing ocean temperatures and chemistry (Chapin et al. 2014). Climate change is projected to have substantial effects on individuals, populations, species, and the structure and function of marine, coastal, and terrestrial ecosystems in the foreseeable future (Houghton 2001, McCarthy et al. 2001).

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

Changes of ocean ventilation rates and deoxygenation are two of the less obvious but important indirect impacts of climate change on the oceans (Shepherd *et al*. 2017). Lowered ocean oxygen is expected to occur because of (i) increased stratification on ocean circulation and hence its ventilation, due to reduced upwelling and turbulent mixing, (ii) decreased oxygen solubility at higher surface temperature, and (iii) the effects of warming on biological production. The potential consequences of reduced oxygen levels on fisheries and ecosystems may be far-reaching and significant.

4.3. Marine Mammal Hearing Groups

Marine mammals can be divided into functional hearing groups based on directly measured or estimated hearing ranges, including behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other information (Southall *et al.* 2007). Subsequently, NMFS (2016b; 2018) described generalized hearing ranges for these marine mammal hearing groups (Table 5).

Table 5. Marine Mammal Hearing Groups

Hearing Group	Generalized Hearing Range*
Low-frequency (LF) cetaceans (baleen whales, including humpback whales)	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
High-frequency (HF) cetaceans (true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*)	275 Hz to 160 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz
***** Represents the generalized hearing range for the entire group as a composite (i.e., all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall *et al*. 2007) and PW pinniped (approximation).	

4.4. Status of Listed Species Likely to be Adversely Affected by the Action

4.4.1. Humpback whale (*Megaptera novaeangliae*)

The information below is a summary of the species' status. More detailed information on the status of the Mexico DPS humpback whale can be found in a number of published documents, including stock assessment reports on Alaska marine mammals (Muto *et al*. 2019)and the humpback whale status review (Bettridge *et al.* 2015).

4.4.1.1. Status, Distribution and Hearing Ability

The humpback whale, a mysticete or "baleen" whale, was listed as endangered under the Endangered Species Conservation Act (ESCA) on December 2, 1970 (35 FR 18319). Congress replaced the ESCA with the ESA in 1973, and humpback whales continued to be listed as endangered. NMFS recently conducted a global status review and changed the status of humpback whales under the ESA. The globally listed species was divided into 14 DPSs, four of which are endangered, one is threatened, and the remaining 9 are not listed under the ESA (81 FR 62260; September 8, 2016). Three humpback whale DPSs occur in Alaska waters. The Hawaii DPS is no longer listed as endangered or threatened, the Mexico DPS is listed as threatened, and the Western North Pacific DPS is listed as endangered. Critical habitat has recently been proposed for the listed Western North Pacific, Mexico, and Central America DPSs(84 FR 54354, October 9, 2019).

Wade *et al*. (2016) estimated abundance of humpback whales within all sampled winter and summer areas in the North Pacific, and estimated migration rates between these areas. The probability of encountering whales from each of the four North Pacific DPSs in various feeding areas is summarized in Table 6 (NMFS 2016a).

Table 6. Probability of encountering humpback whales from each DPS in the North Pacific Ocean in various feeding areas. 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 Is/ 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.

As shown, only the Mexico and Hawaii DPSs are likely to be present in the Southeast Alaska action area, and an estimated 6.1% of the observed humpback whales might be from the threatened Mexico DPS.

Mexico DPS humpback whales comprise approximately 3,264 (CV=0.06) animals (Wade *et al*. 2016) with an unknown population trend, though likely to be in decline (81 FR 62260). The Hawaii DPS is estimated to comprise some 10,103 (CV=0.3) animals (Muto *et al*. 2019). The population trend for the Hawaii DPS is estimated to be increasing at an annual rate of between 5.5 and 6.0 percent (Calambokidis *et al*. 2008).

Although many Southeast Alaska humpback whales winter in low latitudes, some individuals have been documented overwintering near Sitka and Juneau (National Park Service Fact Sheet available at http://www.nps.gov/glba). Late fall and winter whale habitat in Southeast Alaska correlates with areas that have overwintering herring, such as Sitka Sound (Baker *et al*. 1985; Moran *et al*. 2018; Straley 1990). Humpback whales are the most frequently observed baleen whale in Sitka Sound. (Baker *et al.* 1985). They are most common in Sitka Sound's Eastern Channel and Silver Bay in November, December, and January (Straley *et al*. 2018), where herring sometimes overwinter in deep fjords. Within the project action area, HPMS staff report seeing few humpback whales during winter months; numbers increase during spring (March-April), to coincide with herring spawning (C. McGraw pers. comm. 2019).

Relatively high densities of humpback whales occur throughout much of Southeast Alaska and northern British Columbia (Muto *et al*. 2019). Although migration timing varies among individuals, most whales depart for Hawaii or Mexico in fall or winter and begin returning to

Southeast Alaska in spring, with continued returns through the summer and a peak occurrence in Southeast Alaska during late summer to early fall. However, there are significant overlaps in departures and returns (Baker *et al*. 1985; Straley 1990).

Given their widespread range and their opportunistic foraging strategies, humpback whales are likely to be in the project vicinity during the proposed project activities.

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

Humpback whales produce at least three kinds of sounds:

1. Complex songs with components ranging from at least 20 Hz–24 kHz with estimated source levels from 144–174 dB; these are mostly sung by males on the breeding grounds (Au *et al*. 2006; Au *et al*. 2000; Frazer and Mercado 2000; Richardson *et al*. 1995; Winn *et al*. 1970; Stimpert *et al*. 2007);
2. Social sounds in the breeding areas that extend from 50Hz – more than 10 kHz with most energy below 3kHz (Richardson *et al*. 1995; Tyack and Whitehead 1983); 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 (Richardson *et al*. 1995; Thompson *et al*. 1986).

Humpback whales are in the low frequency (LF) cetacean function hearing group (Southall *et al*. 2007).

4.4.1.2. Stressors and Threats

The MMPA stock delineations have not yet been revised to correspond with the 14 DPSs established for humpback whales in 2016. Therefore, estimates of rates of mortality and serious injury in the stock assessment reports (SAR) do not correspond exactly with individual DPSs. A general description of threats and stressors to all humpback whales occurring in Alaska is provided below. Please refer to the SARs for more information about rates of mortality and serious injury by MMPA stock (Carretta *et al*. 2017; Muto *et al*. 2019).

Commercial whaling

Historically, commercial whaling represented the greatest threat to every population of humpback whales and was ultimately responsible for listing humpback whales as an endangered species. From 1900 to 1965, nearly 30,000 whales were taken in modern whaling operations of the Pacific Ocean. Prior to that, an unknown number of humpback whales were taken (Perry *et al*. 1999). In 1965, the International Whaling Commission banned commercial hunting of humpback whales in the Pacific Ocean.

Predation

Humpback whales are killed by orcas (Dolphin 1987; Florezgonzalez *et al*. 1994; Naessig and Lanyon 2004; Whitehead and Glass 1985), and are probably killed by false killer whales and sharks. Calves remain protected near mothers or within a group; lone calves have been known to be protected by presumably unrelated adults when confronted with attack (Ford and Reeves 2008).

Toxins and parasites

Harmful algal blooms are a potential stressor for humpback whales. Domoic acid, a neurotoxin, was detected in all 13 species of marine mammals examined in Alaska, with humpback whale showing 38% prevalence. Saxitoxin was detected in 10 of the 13 species, with the highest prevalence in humpback whales (50%) and bowhead whales (32%) (Lefebvre *et al*. 2016). The occurrence of the nematode *Crassicaudaboopis* appears to increase the potential for kidney failure in humpback whales and may be preventing some populations from recovering (Lambertsen 1992).

Subsistence harvest

Subsistence harvest of humpback whales is not authorized under the Whaling Convention Act. There are no reported takes of humpback whales from the Mexico DPS by subsistence hunters in Alaska for the 2010-2014 period (Muto *et al*. 2019). One humpback whale was taken illegally by Alaska Native subsistence hunters near Toksook Bay in western Alaska in 2016, and while it could have been a member of the Mexico DPS or Western North Pacific DPS, it was more likely from the non-listed Hawaii DPS (NMFS unpublished data; Wade *et al*. 2016).

Unusual Mortality Event (UME)

NMFS declared a UME for large whales in the western Gulf of Alaska from May 22 to December 31, 2015, that included 22 humpback and 12 fin whale mortalities[6]. No specific cause for the increased mortality was identified, although it was most likely related to unusual oceanographic and climatic conditions that may have led to shifts in prey distribution or harmful algal blooms. This UME has been closed.

Fishery interactions and entanglements

Humpback whales are also killed or injured during interactions with commercial fishing gear and other entanglements. A photographic study of humpback whales in southeastern Alaska in 2003 and 2004 found at least 53% of individuals showed some kind of scarring from entanglement (Neilson *et al*. 2005). In Alaska, entanglements, mortality, or serious injury of humpback whales occurred in the following fisheries between 2010-2014: Bering Sea Aleutian Islands (BSAI) flatfish trawl, BSAI pollock trawl, Southeast Alaska salmon drift 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*. 2019). 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).

Aquaculture operations may also pose an entanglement risk to humpback whales. Although NMFS is unaware of any humpback entanglements with aquaculture operations, entanglements have been reported in other countries (Price *et al*. 2017). Humpback whales in Southeast Alaska

[6]NMFS Office of Protected Resources website: https://www.fisheries.noaa.gov/national/marine-life-distress/2015-2016-large-whale-unusual-mortality-event-western-gulf-alaska.

have been observed feeding around and near salmon aquaculture facilities (Chenoweth *et al*. 2017). In June 2018, NMFS received a report of a humpback whale damaging a floating salmon net pen near Ketchikan. The encounter did not result in an entanglement, but illustrates the potential for interactions. The aquaculture industry is growing in Alaska, increasing the potential for marine mammal entanglements.

Vessel collisions

Ship strikes and other interactions with vessels unrelated to fisheries occur frequently with humpback whales (Muto *et al*. 2018). Neilson *et al*. (2012) reviewed 108 whale-vessel collisions in Alaska from 1978–2011 and found that 86% involved humpback whales. Between 2012 and 2016 the minimum mean annual mortality and serious injury rate due to ship strikes reported in Alaska for humpback whales was 2.5 whales (Muto *et al*. 2019). These incidents account for a very small fraction of the total humpback whale population (Laist *et al.* 2001).

Vessel collisions with humpback whales remain a significant management concern, given the increasing abundance of humpback whales foraging in Alaska, as well as the growing presence of marine traffic in Alaska's coastal waters. The potential for ship strikes may increase as vessel traffic in northern latitudes increases with changes in sea-ice coverage (Muto *et al*. 2019).

Other stressors

Elevated sound from anthropogenic sources (*e.g.*, shipping, military sonar) is a potential concern for humpback whales in the North Pacific (Muto *et al*. 2019). A humpback was reported entangled in a research wave rider buoy off the U.S. West Coast (Carretta *et al*. 2017). Other potential impacts include possible changes in prey distribution with climate change, entanglement in or ingestion of marine debris, impacts from oil and gas activities, and disturbance from whale watching activities (Muto *et al*. 2019).

4.4.2. Western DPS Steller Sea Lion

We used information available in the recent stock assessment report (Muto *et al*. 2019), recovery plan (NMFS 2008a), the 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.

4.4.2.1. Status, Distribution and Hearing Ability

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

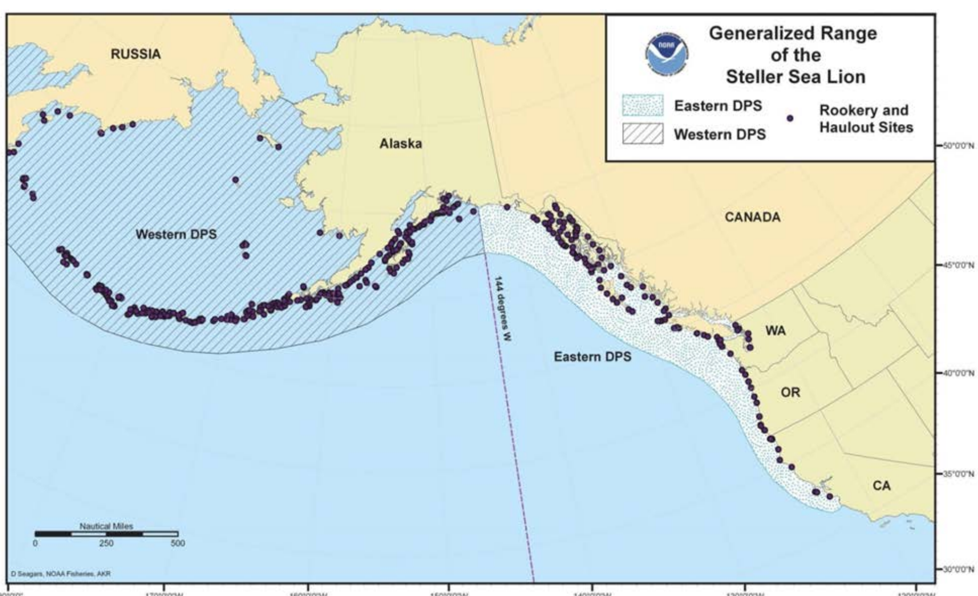
The family Otariidae encompasses "eared" seals, including fur seals. Steller sea lions, the largest otariids, show marked sexual dimorphism, with males 2-3 times larger than females. On average, adult males weigh 566 kg (1,248 lbs.) and adult females weigh on average 263 kg (580 lbs.; Fiscus 1961; Calkins and Pitcher 1982).

In the 1950s, the worldwide abundance of Steller sea lions was estimated at 240,000 to 300,000 animals, with a distribution that stretched across the Pacific Rim from southern California, Canada, Alaska, and into Russia and northern Japan. In the 1980s, Steller sea lion counts in the range of what is now recognized as the western population were declining as much as 15 percent per year. The worldwide Steller sea lion population declined by over 50 percent in the 1980s, to approximately 116,000 animals (NMFS 2008). Factors that may have contributed to this decline include incidental take in fisheries, legal and illegal shooting, predation, exposure to contaminants, disease, and ocean regime shift/ climate change (NMFS 2008; Miller and Trites 2005).

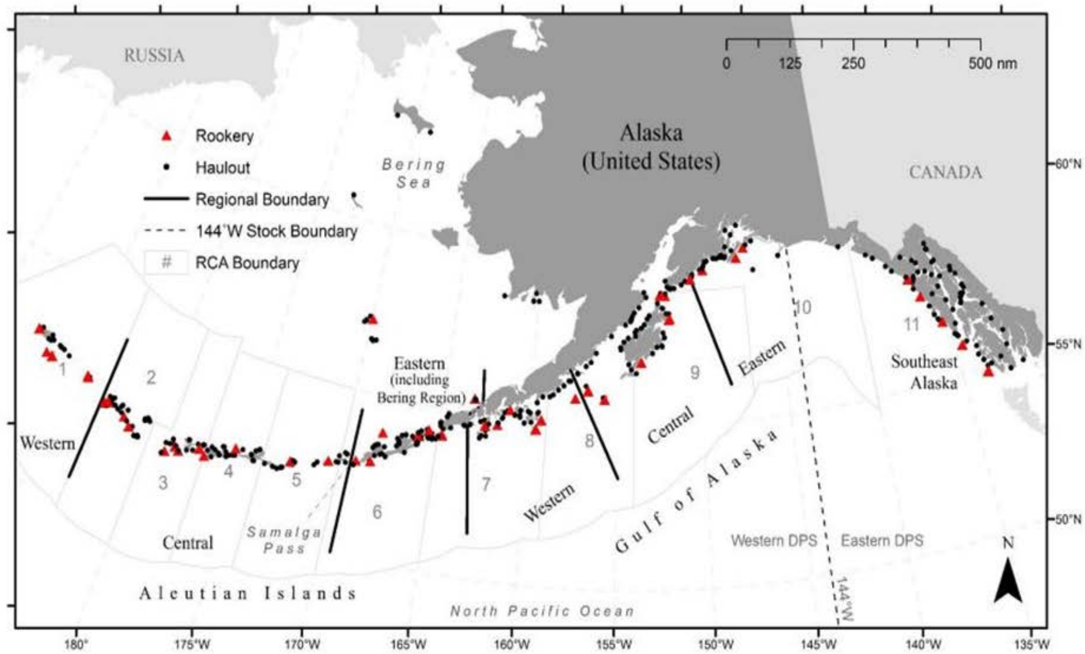
By 1990, the U.S. portion of the population had declined by about 80 percent relative to the 1950s. On April 5, 1990, NMFS issued an emergency interim rule to list the Steller sea lion as threatened (55 FR 12645; February 22, 1990). NMFS issued the final rule to list Steller sea lions as a threatened species under the ESA later that year (55 FR 49204, November 26, 1990).

NMFS reclassified Steller sea lions as two distinct population segments under the ESA in 1997 based on demographic and genetic dissimilarities (62 FR 2434; May 5, 1997). At that time, the Western DPS, which was defined as extending from Japan around the Pacific Rim to Cape Suckling in Alaska (144° W; Figure 8a, b), was listed as endangered due to its continued decline and lack of recovery, while the eastern DPS, extending from Cape Suckling (144° W) east to British Columbia and south to California, was listed as threatened, due to its less imperiled status. On November 4, 2013, the eastern DPS was removed from the endangered species list (78 FR 66140; November 4, 2013), due to its increasing population trends and recovered status.

The most recent comprehensive aerial photographic and land-based surveys of western DPS Steller sea lions in Alaska were conducted during the 2016 and 2017 breeding seasons (Sweeney *et al*. 2016, 2017).Western DPS Steller sea lion pup and non-pup counts in Alaska in 2017 were estimated to be 11,952 and 42,315 respectively.



a



b

Figure 8. a. Generalized range of Steller sea lion, showing Eastern and Western DPS division. b. NMFS Steller sea lion rookery and haulout locations by survey regions in Alaska

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 8a). 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.

Large numbers of Steller sea lions disperse widely outside of the breeding season, probably to access seasonally important prey resources. A variety of studies, including assessment of mitochondrial DNA, indicate that there is an exchange of sea lions across the stock boundary (Baker *et al.* 2005; Raum-Suryan *et al*. 2002; Pitcher *et al*. 2007; Fritz and Hinckley 2005; Fritz *et al*. 2013; Jemison *et al.* 2013). During the breeding season, sea lions, especially adult females, typically return to their natal rookery or a nearby breeding rookery to breed and pup (Hastings *et al*. 2017). However, movement of individuals, including breeding females, from Prince William Sound to Southeast Alaska began in the 1990s and two new, mixed-stock rookeries, White Sisters and Graves, were established east of 144° W (Gelatt *et al*. 2007, Jemison *et al*. 2013, O'Corry-Crowe *et al*. 2014).Some western DPS females have likely emigrated permanently and given birth at White Sisters and Graves rookeries.

Steller sea lions were seen during every month of monitoring (September to May) between 1994 and 2002 (Straley *et al.* 2018a). Individual sea lions were seen on 19 of 21 days in Silver Bay and Easter Channel during monitoring for Gary Paxton Industrial Park (GPIP) dock construction between October and November 2017 (Turnagain 2017). During 8 days of monitoring for the Petro Marine dock in January 2017, individual sea lions were seen on 3 days (Windward 2017). Observations during the original construction of the Halibut Point Marine Services dock facility recorded zero Steller sea lions within the 200-meter shutdown zone during pile driving, although observers noted individual sea lions outside the 200-meter zone 4-5 times per week. (C. McGraw pers. comm. 2019). During Straley's surveys, sea lions were often seen in groups of 2 to 3; however, a group of more than 100 was sighted on at least one occasion (Straley and Pendell 2017).

Within the action area, Steller sea lions are anticipated to be predominantly from the eastern DPS. However, a recent in-depth study of Steller sea lion mitochondrial DNA analyses the percentages of Western DPS and Eastern DPS individuals by age class at rookeries in regions east of 144° W (Hastings *et al.*2020). Based on these most recent results, we estimate that 2.2 percent of Steller sea lions observed in the action area may be from the western DPS.

The ability to detect sound and communicate underwater is important for a variety of Steller sea lion life functions, including reproduction and predator avoidance. NMFS categorizes Steller sea lions in the otariid pinniped functional hearing group, with an applied frequency range between 60 Hz and 39 kHz in water (NMFS 2016b). Studies of Steller sea lion auditory sensitivities have found that this species detects sounds underwater between 1 to 25 kHz (Kastelein *et al*. 2005), and in air between 250 Hz and 30 kHz (Mulsow and Reichmuth 2010; Reichmuth and Southall 2011). Sounds from pile installation and extraction operations are anticipated to be within the hearing range of Steller sea lions.

4.4.2.2. Stressors and Threats

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

Killer Whale Predation

The Steller Sea Lion Recovery Plan (NMFS 2008b) ranked predation by killer whales as a potentially high threat to the recovery of the western DPS. Steller sea lions in both the eastern and western stocks are eaten by killer whales (Dahlheim and White 2010).

Unlike fish-eating resident killer whales, transient killer whales subsist primarily on marine mammals, including Steller sea lions (Saultis *et al*. 2006). Transient killer whale abundance and predation on Steller sea lions has been well studied in Prince William Sound and Kenai Fjords. Steller sea lions represented 33% and 5% of the remains found in deceased killer whale stomachs in the Gulf of Alaska (GOA), depending on the specific study results (Heise *et al*. 2003). The abundance of transient killer whales in the eastern GOA was estimated to be 18 (Matkin *et al*. 2012). Nineteen transient killer whales were identified in Kenai Fjords from 2000 through 2005 and killer whale predation on six pup and three juvenile Steller sea lions was observed. It has been estimated that 11% of the Steller sea lion pups born at the Chiswell Island rookery (in the Kenai Fjords area) were preyed upon by killer whales from 2000 through 2005 (Maniscalco *et al*. 2007). These authors studied Steller sea lion pup mortality using remote video at Chiswell Island. Pup (up to 2.5 months postpartum) mortality averaged 15.4%, with causes varying greatly across years (2001–2007). They noted that high surf conditions and killer whale predation accounted for over half the mortalities. Even at this level of pup mortality, the Chiswell Island Steller sea lion population has increased (Maniscalco *et al*. 2007). The authors conclude that GOA transient killer whales have a minor impact on the recovery of the sea lions in the area.

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

Disease and Parasites

Burek *et al*. (2003) described external and internal parasites of Steller sea lions in Alaska by collecting the external parasites and examining eggs and larvae shed in feces. Their findings of particular interest were the hookworms, the lungworms, lung mites and acanthocephalans, since these have been shown to cause disease in other marine mammal species. The Steller Sea Lion Recovery Plan (NMFS 2008) ranks diseases and parasites as having a relatively low impact on the recovery of the western DPS. However, climate-change-related shifts in distribution of other species may expose Steller sea lions to novel disease vectors or parasites that could have large-scale impacts.

Environmental Variability and Drivers in the Bering Sea and GOA/North Pacific

The Steller Sea Lion Recovery Plan (NMFS 2008) ranks environmental variability as a potentially high threat to recovery of the western DPS. The Bering Sea and Gulf of Alaska are subject to periodic basin-wide physical shifts in the marine ecosystem that significantly change sea surface temperature, salinity, sea ice extent and other ocean conditions. These physical changes can affect food availability and can alter the structure of trophic relationships that influence reproduction, survival, distribution, and predator-prey interactions (Wiese *et al*. 2012). The effects of these physical mechanisms, which have been in play over evolutionary time, may be exacerbated by global warming.

Fishing Gear and Marine Debris Entanglement

Helker *et al*. (2016) report 352 cases of serious injuries to EDPS Steller sea lions from interactions with fishing gear between 2009 and 2013, mostly from trawl gear. Raum-Suryan *et al*. (2009) found 386 animals either entangled in marine debris or having ingested fishing gear over the period 2000-2007 in Southeast Alaska and northern British Columbia.

Based on historical reports and their geographic range, Steller sea lion mortality and serious injury could occur in several fishing gear types, including trawl, gillnet, longline, and troll fisheries. The estimated mean annual mortality and serious injury rate in U.S. commercial fisheries in 2012-2016 is 35 western DPS Steller sea lions (Muto *et al*. 2019). However, observer data are limited. Of these fisheries, only trawl fisheries are regularly observed; gillnet fisheries have had limited observations in select areas over short time frames with modest observer coverage. Consequently, there are little to no data on Steller sea lion mortality and serious injury in non-trawl fisheries. Therefore, the potential for fisheries-caused mortality and serious injury may be greater than is reflected in existing observer data (Muto *et al*. 2019). The Steller Sea Lion Recovery Plan (NMFS 2008) ranked interactions with fishing gear and marine debris as a low threat to the recovery of the western DPS.

Competition between Commercial Fishing and Steller Sea Lions for Prey Species

The Steller Sea Lion Recovery Plan (NMFS 2008) ranked competition with fisheries for prey as a potentially high threat to the recovery of the western DPS. Substantial scientific debate surrounds this issue. It is generally well accepted that commercial fisheries target several important Steller sea lion prey species (NRC 2003), including salmon species, Pacific cod, Atka mackerel, pollock, and others. These fisheries could be reducing sea lion prey biomass and quality at regional and/or local spatial and temporal scales such that sea lion survival and reproduction are reduced. NMFS (2014b) analyzes this threat in detail.

Subsistence/Native Harvest

Steller sea lions are hunted for subsistence purposes. As of 2009, data on community subsistence harvest are no longer being consistently collected; therefore, the best available statewide subsistence harvest estimates for a 5-year period are those from 2004 to 2008. However, data are being collected periodically in subareas, such as St. Paul and St. George. The mean annual subsistence harvest from this stock for all areas except St. Paul and St. George in 2004-2008 (172), combined with the mean annual harvest for St. Paul (30) and St. George (1.4) in 2012-2016 is 203 western Steller sea lions (Muto *et al*. 2019). The Steller Sea Lion Recovery Plan (NMFS 2008) ranked subsistence harvest as a low threat to the recovery of the western DPS.

Illegal Shooting

Illegal shooting of sea lions was thought to be a potentially significant source of mortality prior to the listing of sea lions as threatened under the ESA in 1990. The NMFS Alaska Stranding Program documents 60 Steller sea lions with suspected or confirmed firearm injuries from 2000 – 2016 in Southeast Alaska (NMFS stranding database). The Steller Sea Lion Recovery Plan (NMFS 2008) ranked illegal shooting as a low threat to the recovery of the western DPS.

On November 6, 2018, two men were sentenced in federal court for harassing and killing Steller sea lions with shotguns. The sentencing followed a federal investigation of15 Steller Sea lions found dead along the sand bars at the mouth of Copper River during the 2015 Copper River salmon gillnet season.

Mortality and Disturbance from Research Activities

Mortalities may occur incidental to marine mammal research activities authorized under ESA and MMPA. Between 2011 and 2016, there were three mortalities resulting from research on the western DPS of Steller sea lions (Muto *et al* 2019).The Steller Sea Lion Recovery Plan (NMFS 2008) ranked effects from research activities as a low threat to the recovery of the western DPS.

Vessel Disturbance

Vessel traffic, in the form of sea lion research, tourism, and other marine vessel traffic, may disrupt sea lion feeding, breeding, or aspects of sea lion behavior. The Steller Sea Lion Recovery Plan (NMFS 2008) ranked disturbance from these sources as a low threat to the western DPS.

Vessel Strike

NMFS Alaska Region Stranding Program has records of at least four occurrences of Steller sea lions being struck by vessels in Southeast Alaska; three were near Sitka, one was south of

Juneau. Vessel strike is not considered a major threat to Steller sea lions.

Toxic Substances

The Steller Sea Lion Recovery Plan ranked the threat of toxic substances as medium (NMFS 2008). Rea *et al*. (2013) found that total mercury concentrations [THg] measured in western Aleutian sea lion pups exceeded concentrations at which other fish-eating mammals can exhibit adverse neurological and reproductive effects. Their results showed20% of pups sampled in the western Aleutians exceeded mammalian risk thresholds established for both hair and blood tissues. Higher nitrogen isotope ratios suggested that pups accumulated the highest [THg] when their dams fed on higher trophic level prey during late gestation.

A portion of Silver Bay, some 18 km along the shoreline south of the project area, is listed by ADEC as a 4a impaired water body, with a final approved TMDL (total maximum daily load), which further identifies pollution sources (ADEC 2003). The Final TMDL for Silver Bay indicates that the "impaired waterbody" designation was originally identified in 1992, due to discharges from a pulp mill operation. Although the pulp mill closed in 1993, the source of impairment, wood residues, remains in Sawmill and Herring Coves (Figure 9) (ADEC 2003).

Climate Change and Ocean Acidification

As described in Sections 4.2 above and 5.4 below, marine ecosystems are susceptible to impacts from climate change and ocean acidification, linked to increasing global anthropogenic CO2 emissions. There is strong evidence that ocean pH is decreasing, ocean temperatures are increasing, and that this warming is accentuated in the Arctic. Scientists are working to understand the impacts of these changes to marine ecosystems; the extent and timescale over which western DPS Steller sea lions may be affected by these changes is unknown.

4.4.2.3. 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.

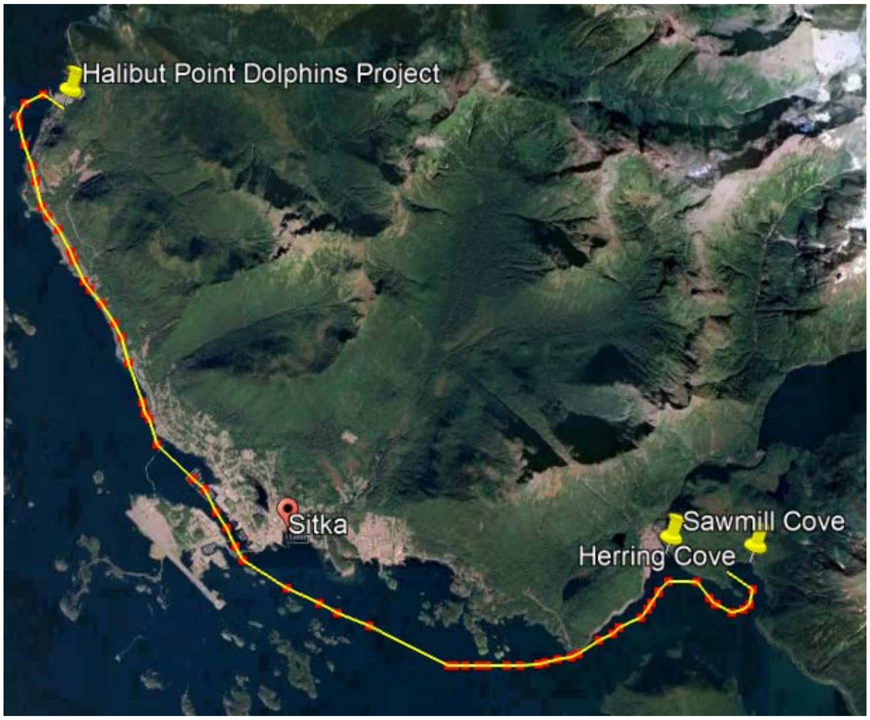


Figure 9. Spatial relation of ADEC impaired waterbodies to the Halibut Point project area

5. ENVIRONMENTAL BASELINE

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. 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. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline. We also consider natural factors that contribute to the current status of the species, its habitat, and ecosystem in the action area.

The project vicinity is an area of high human use and habitat alteration. Ongoing human activity in the action area that impacts marine mammals includes marine vessel activity, pollution, climate change, noise (*e.g.*, aircraft, vessel, pile-driving, etc.), and coastal zone development.

5.1. Marine Vessel Activity

The HPMS deep water dock facility is an active marine industrial area. Cruise ships are the largest vessels that routinely use the action area. The dock facility estimates 150 cruise ship dockings in 2019. Sitka expects as many as 200,000 cruise ship visitors in 2020, and this number may increase as larger vessels can be accommodated. Live trip traffic information for Sitka can be accessed at: https://www.cruisin.me/cruise-port-tracker/united-states/sitka-alaska/

In addition, HPMS operates a marine haulout facility that lifts approximately 200 vessels per year for maintenance work. Also, Alaska Marine Lines freight terminal, located adjacent to the HPMS facility, receives twice weekly freight container barges.

Numerous commercial and charter fishing vessels and recreational craft, such as powerboats and sailboats, operate in the project vicinity.

Vessel-based recreational activities, commercial fishing, shipping, whale-watching, and general transportation regularly occur within the action area. All of these sources of vessel traffic increase underwater noise and contribute to the risk of vessel-whale collisions.

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 approach regulations, NMFS implemented Whale Sense Alaska in 2015, 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.

5.2. Fishery Interactions Including Entanglements

Entanglement in fishing gear and other human-made material is a major threat to the survival of pinnipeds and cetaceans worldwide. While in many instances, marine mammals may be able to disentangle themselves (Jensen *et al*. 2009), other entanglements result in lethal and sublethal trauma to marine mammals including drowning, injury, reduced foraging, and increased energy expenditure (van der Hoop *et al*. 2016). Entangled marine mammals may also be hit by vessels due to an inability to avoid them.

Gear that encircles any body part can cause lacerations, partial or complete fin amputation, organ or muscle damage, and interfere with mobility, feeding, and breathing/survival. Chronic tissue damage from line under pressure can compromise an animal's physiology. Fecal samples from entangled whales had extremely high levels of cortisols (Rolland *et al*. 2005), an immune system hormone. Extended periods of pituitary release of cortisols can exhaust the immune system, making a whale susceptible to disease and infection.

The NMFS Alaska Marine Mammal Stranding Network database has records of 199 large whale entanglements between 1990 and 2016. Of these, 67% were humpback whales. Most humpbacks get entangled with gear between early June and early September, when they are on their nearshore foraging grounds in Alaska waters. Between 1990 and 2016, 29% of humpback entanglements were with pot gear and 37% with gillnet gear. Longline gear comprised only 1–2% of all humpback fishing gear interactions.

Steller sea lions also are impacted by entanglement in fishing gear and other marine debris. Surveys of Steller sea lion haulouts in Southeast Alaska and northern British Columbia documented 48.5% of 190 individuals with entangling debris around their necks, and 50% had ingested fishing gear (Raum-Suryan *et al.* 2009).

5.3. Pollution

A number of contaminant discharges pollute the marine waters of Alaska annually. Intentional sources of pollution, including domestic, municipal, and industrial wastewater discharges, are managed and permitted by the Alaska Department of Environmental Conservation (ADEC). Pollution may also occur from accidental discharges and spills.

According to the ADEC's most recent list of impaired waterbodies, there are two impaired waterbodies in the Sitka area, Silver Bay and the Katlian River,[7] which discharges into Katlian Bay. The project action area extends into the mouth of Katlian Bay. ADEC lists the Katlian River contaminants as "sediment and turbidity." A TMDL, which further identifies pollution sources, is scheduled for 2025. Marine water quality in the action area can also be affected by discharges from shipyard and other industrial activity, treated sewer system outflows, cruise ships and other vessels operating in marine waters, and sediment runoff from paved surfaces and disturbed areas.

5.4. Climate and Ocean Regime Change

Effects to marine ecosystems from climate change include ocean acidification, expanded oligotrophic gyres, shift in temperature, circulation, stratification, and nutrient input (Doney *et al*. 2012). Altered oceanic circulation and warming cause reduced subsurface oxygen concentrations (Shepherd *et al*. 2017). These large-scale shifts have the potential to disrupt existing trophic pathways as change cascades from primary producers to top level predators (Doney *et al*. 2012; Salinger *et al*. 2013).

The Intergovernmental Panel on Climate Change (IPCC) estimated that average global land and sea surface temperature has increased by 0.6°C (±0.2) since the mid-1800s, with most of the change occurring since 1976. This temperature increase is greater than what would be expected given the range of natural climatic variability recorded over the past 1,000 years (Crowley 2000). The IPCC reviewed computer simulations of the effect of greenhouse gas emissions on observed

[7] Alaska DEC. Impaired Waters map: http://www.arcgis.com/home/webmap/viewer.html?webmap=5987f5c7a33846b19b9097dddcf8332aaccessed December 2019.

climate variations that have been recorded in the past and evaluated the influence of natural phenomena such as solar and volcanic activity. Based on their review, the IPCC concluded that natural phenomena are insufficient to explain the increasing trend in land and sea surface temperature, and that most of the warming observed over the last 50 years is likely to be attributable to human activities (IPCC 2013).

The strongest warming is expected in the north, exceeding the estimate for mean global warming by a factor of 3, due in part to the “ice-albedo feedback,” whereby as the reflective areas of Arctic ice and snow retreat, the earth absorbs more heat, accentuating the warming (NRC 2012). Climate change is projected to have substantial effects on individuals, populations, species, and the structure and function of marine, coastal, and terrestrial ecosystems in the foreseeable future (NRC 2012).

It is extremely difficult to tease out how climate change might affect listed species in the project area. The effects of climate change on Mexico DPS humpback whales and Western DPS Steller sea lions over time will likely include changes in the distribution of ocean temperatures suitable for many stages of their life history, the distribution and abundance of prey, and the distribution and abundance of competitors or predators.

5.5. Coastal Zone Development

Coastal zone development results in the loss and alteration of nearshore marine mammal habitat and changes in habitat quality. Increased development may prevent marine mammals from reaching or using important feeding, breeding, and resting areas. Although much of Baranof Island is undeveloped, the shoreline in the project area is highly altered by man-made structures and impervious surfaces.

5.6. In-Water Noise

The project area is subject to noise from many anthropogenic sources, including marine vessels, shoreline and dock construction, aircraft, and land vehicles.

5.7. Competition for Prey

Competition for prey between endangered and threatened marine mammals, other marine life, and humans may exist. Humpback whales and Steller sea lions feed on schooling fish, including species that are harvested by humans commercially or for personal use. As of 2014, Sitka was the 14th largest fishing port in the U.S. by weight of landings and the 11th largest port by value, with landings of 89 million pounds of seafood worth $71.3 million (Sitka.net).

6. Effects of the Action

“Effects of the action” are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR § 402.02).

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.

NMFS identified and addressed all potential stressors; and considered all consequences of the proposed action, individually and cumulatively, in developing the analysis and conclusions in this opinion regarding the effects of the proposed action on ESA-listed species and designated critical habitat.

6.1. Project Stressors

Our analysis, based on a review of the Biological Assessment (HPMS 2019a), the IHA application (HPMS 2019b), personal communications, and available literature as referenced in this Opinion, indicates that the proposed construction activities at the Old Sitka Dock North Dolphins Expansion Project may cause these primary stressors:

- Underwater noise from:
    - in-water sound fields produced by impulsive noise such as impact pile driving;
    - in-water sound fields produced by continuous noise sources such as: vibratory pile removal, vibratory pile driving, drilling, and vessels;
- In-air sound fields produced by impulsive noise sources such as: impact pile driving
- Risk of vessels striking marine mammals; and
- Seafloor disturbance from drilling activities, pile driving

Of these stressors, exposure to impulsive and continuous noise sources will likely have the most direct impacts to Mexico DPS humpback whales and western DPS Steller sea lions.

6.2. Stressors Not Likely to Adversely Affect ESA-listed Species

6.2.1. Vessel Strike or Disturbance

Tug towing operations required for construction occur at relatively low speeds (5 knots), and the maximum transit speed for tug and barge is anticipated to be 8–10 knots. Once vessels get to the construction site, they will be anchored and will remain throughout the construction period. Skiffs may transport workers or materials very short distances and low speeds from shore to the work platform.

The small number of vessels involved in the action, the short duration of any potential exposure, and the fact that vessels will adhere to Whale Approach Regulations when transiting to and from the project site should minimize any vessel-related disturbance to marine mammals. Further, marine mammals that frequent the project area are very likely habituated to vessel disturbance due to the common presence of ferries, fishing vessels, tenders, barges, tugboats, and other commercial and recreational vessels that use the small-boat harbor and another small boat harbor north of the facility. If animals do respond, they may exhibit slight deflection from the noise source, engage in low-level avoidance behavior or short-term vigilance 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 disrupt to a measurable degree important behavioral patterns such as feeding or resting. We therefore conclude that the probability of vessel strike is extremely unlikely, and the effect of project-related vessel disturbance to listed species is immeasurably small.

6.2.2. In-Air Noise

Pile driving and extraction associated with this project will generate in-air noise above ambient levels within a portion of the action area. The predicted distances to the in-air noise disturbance threshold for hauled-out pinnipeds (100 dB rms) will extend less than or equal to 10m from any pile being driven or extracted. Because there are no natural or artificial haulouts within this distance, no in-air disturbance to hauled-out sea lions is anticipated as a result of the HPMS Project.

6.2.3. Disturbance to Seafloor

During drilling, pile removal, pile installation, and anchoring activities, a temporary and localized increase in turbidity and sedimentation near the seafloor will occur in the immediate area surrounding each pile. Mud and other substrates that accumulate inside the pile will be augered out and allowed to settle close to the base of the pile. 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). HPMS's adherence to EPA Best Management Practices for pile driving and removal (EPA 2016) will further minimize turbidity and sedimentation that could result from this project.

Considering local currents, tidal action, and implementation of best management practices, 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.

Humpback whales and Steller sea lions are not expected to come close enough to the immediate project site to encounter increased turbidity during pile driving or removal activities. Therefore, the impact from increased turbidity levels would be negligible to humpback whales and Steller sea lions and would not cause a measurable disruption of behavioral patterns.

6.2.4. Introduction of Pollutants into Waters

Construction at the HPMS site will be conducted in accordance with Clean Water Act Section 404 and 401 regulations, to minimize potential construction-related impacts on water quality. HPMS will also adhere to EPA Best Management Practices to reduce sedimentation and turbidity (EPA 2016). Consequently, we conclude that the effects from this stressor are extremely small.

6.3. Stressors Likely to Adversely Affect ESA-Listed Species

The stressor associated with the Halibut Point Dolphins Expansion Project that is likely to adversely affect Mexico DPS humpback whales and western DPS Steller sea lions is underwater noise from pile removal, installation, and rock drilling. This stressor is analyzed below in the *Exposure Analysis.*

6.3.1. Acoustic thresholds

As discussed in Section 2, *Description of the Proposed Action*, HPMS intends to conduct construction activities that would introduce acoustic disturbance into the marine environment.

Since 1997 NMFS has used generic sound exposure thresholds to determine whether an activity produces underwater 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 threshold shifts (PTS and TTS; Level A harassment) (81 FR 51693; NMFS 2016b). This Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing has even more recently been revised (NMFS 2018).

Consequences of PTS and TTS to marine mammals are described in Section 6.5, Response Analysis. NMFS is in the process of developing guidance for behavioral disruption (Level B harassment). Until such guidance is available, NMFS uses the following conservative thresholds of underwater sound pressure levels[8], expressed in root mean square[9] (rms), from broadband sounds that cause behavioral disturbance, referred to as Level B harassment under section 3(18)(A)(ii) of the 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 thresholds shown in Table 7 for levels of underwater sounds that cause injury, referred to as Level A harassment under section 3(18)(A)(i) of the MMPA (NMFS 2016b). These acoustic thresholds are presented using dual metrics of cumulative sound exposure level (L_E) and peak sound level (pk) for impulsive sounds and L_E for non-impulsive sounds (Table 7).

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

Table 7. PTS onset acoustic thresholds for Level A harassment

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

*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 (Lpk) has a reference value of 1 µPa, and cumulative sound exposure level (LE) has a reference value of 1µPa^{2}s. The term "flat" indicates that peak sound pressure should be flat weighted or unweighted within the generalized hearing range of marine mammals (i.e., 7 Hz to 160 kHz). The weighted 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.

The MMPA, as well as applicable regulations at 50 CFR § 216.3, define "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, but which does not have the potential to injure a marine mammal or marine mammal stock in the wild [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 purposes of this consultation, we consider any exposure to Level B behavioral disturbance sound thresholds to constitute harassment under the ESA.

As described below, we anticipate that exposures to listed marine mammals from noise associated with the proposed action may result in disturbance due to exposure to sound capable of causing Level B harassment. With the addition of mitigation measures including shutdown zones, no mortalities or permanent impairment to hearing are anticipated.

6.4. Exposure Analysis

Mexico DPS humpback whales and western DPS Steller sea lions may be present within the waters of the action area during the time that the in-water work is being conducted and could be exposed to temporarily elevated underwater noise levels resulting in harassment, (including vibratory pile driving and removal, impact pile driving, drilling, and anchoring).

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

6.4.1. Exposure to Level A (injury) Sound Thresholds

Using the best available science, NMFS has developed acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to incur PTS of some degree (equated to Level A harassment). With its Underwater Acoustic Thresholds Guidance, NMFS (2016b) included user spreadsheets to help estimate Level A takes of marine mammals when more sophisticated 3D modeling methods are not available. For stationary sources (*i.e.,* pile driving and drilling), NMFS's user spreadsheet predicts the closest distance at which, if a marine mammal remained at that distance for 24 hours, it would not incur PTS. HPMS used the user spreadsheet to calculate the Level A isopleths, shown in Table 2.

As discussed in Section 2.1.5 above, HPMS's proposed mitigation measures, including the monitoring zones shown in Table 2, will enable PSOs to be aware of and communicate the presence of marine mammals in the action area outside the shutdown zone (Table 3) and prepare to cease activity. As an added protective measure, we note that the shutdown zones in Table 3 are greater than the calculated Level A zones shown in Table 2 for ESA-listed species. We therefore anticipate no Level A harassment will occur from the proposed HPMS project.

6.4.2. Exposure to Level B (disturbance/harassment) Sound Thresholds

Based on both the available science and the practical need for a predictable and measurable threshold, NMFS uses received levels to estimate the onset of behavioral harassment. As indicated above (6.3.1), NMFS assumes that marine mammals are likely to be behaviorally disturbed (equivalent to Level B harassment) when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 μPa rms for continuous (*e.g.*, vibratory pile-driving, drilling) and above 160 dB re 1 μPa rms for impulsive or intermittent sources. HPMS's proposed construction activity includes the use of both continuous (vibratory pile driving and drilling) and impulsive (impact pile driving) sources, and therefore both the 120 and 160 dB re 1 μPa rms thresholds for Level B behavioral harassment are applicable.

6.4.3. Calculating the Ensonified Area

Reference sound levels used by HPMS for all vibratory and impact piling and drilling activities were derived from sound source verification (SSV) studies conducted during construction projects at the Port of Anchorage (Austin *et al*. 2016) and Auke Bay (Denes *et al*. 2016). Source levels (at 10 m) for these activities are shown in Table 2.

For in-water sound transmission, the radius of the applicable Level B threshold is calculated by the equation:

$$RL = SL – TL (\text{Log}_{10} R)$$

where RL is received level of sound, SL is the level source (1 m), TL is the transmission loss coefficient, and R is the radius at which the source level will have attenuated to the desired (160 or 120 dB) received level. Transmission loss, also referred to as spreading loss, 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. However, generally speaking, the TL coefficient in deep water (spherical spreading) is assumed to be 20, while in more shallow water, where the sound waves encounter the seafloor and surface (cylindrical spreading), TL is assumed to be 10. Because TL is affected by so many variables, NMFS often defaults to a “practical spreading loss” between these two values of 15.

Using the practical spreading value in the above equation, HPMS determined underwater noise will fall below the behavioral effects threshold of 120 dB rms for marine mammals at a distance of 15,849 meters and 12,023 meters for vibratory piling and drilling, respectively.[10] The distance of the Level B ensonified zone for impact pile driving equaled 3,699 meters. This information is summarized in Table 2 and Figure 5.

6.4.4. Estimating marine mammal occurrence

Local information about the presence, density, or group dynamics of marine mammals informs take calculations. Potential exposures to impact pile driving, vibratory pile driving/removal and drilling noises for each acoustic threshold were estimated using group size estimates and local observational data.

Humpback whale

Humpback whales frequent the action area and could be encountered during any of the 19 days of in-water construction activities. In the project vicinity, humpback whales typically occur in groups of 1 to 2 animals, with an estimated maximum group size of 4 animals. Given the size of the level B harassment zone, HPMS conservatively estimates that 4 groups of 2 humpback whales may occur within the Level B harassment zone every day of the 19-day window of in-water active construction. Based on an estimated 2 animals in a group x 4 groups each day × 19 days, HPMS calculated a maximum Level B harassment of 152 humpback whales. As described previously, an estimated 6.1 percent of humpback whales in Southeast Alaska are expected to be

[10] These distances represent calculated distances based on the practical spreading model; however, landforms will block sound from transmitting to those calculated distances, as shown in Figure 5.

from the Mexico DPS (Wade *et al*. 2016). Therefore, of the 152 animals potentially exposed to Level B harassment from construction activities, approximately 9.3 (rounded to 10) of these would be expected to be ESA-listed Mexico DPS humpback whales.

The maximum calculated distance at which a humpback whale may be exposed to noise levels that exceed Level A thresholds is 809.8m during impact pile driving (Table 2). PSOs will be stationed to ensure effective monitoring and shutdown before humpback whales enter a conservative 825 m zone to avoid Level A take. No Level A take of Mexico DPS humpback whales is anticipated.

Steller sea lion

Steller sea lions are common in the action area and are expected to be encountered every day during the 19-day in-water construction period. In the project vicinity, Steller sea lions typically occur in groups of 1-8 animals (Turnagain 2017; Windward 2017), HPMS conservatively estimates that 2 groups of 8 Steller sea lions may occur within the Level B harassment zone every day of construction. Accordingly, an estimate of 8 animals in a group x 2 groups x 19 days = 304 Steller sea lions potentially exposed to Level B harassment during project construction. Based on a recent study of Steller sea lion mitochondrial DNA mentioned above (Hastings *et al.* 2020), we estimate that 2.2 percent of Steller sea lions observed in the action area may be from the western DPS. Therefore, we estimate that 304 X .022, or 6.69 (rounded to 7) of these may be western DPS individuals.

The maximum calculated distance at which a Steller sea lion may be exposed to underwater noise levels that exceed Level A thresholds (which would occur during impact pile driving – Table 2) is 31.6m. PSOs will be stationed to ensure effective monitoring and shutdown before sea lions enter a conservative 50 m zone to avoid Level A take. No Level A take of Steller sea lions is anticipated.

6.5. 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.

As described in the Exposure Analysis, Mexico DPS humpback whales and western DPS Steller sea lions are anticipated to occur in the action area and to overlap with noise from pile removal, installation, and drilling. Some of the in-water sound source levels from the proposed action will generate noise loud enough to harass western DPS Steller sea lions and Mexico DPS humpback whales at certain distances.

The effects of project-related noise on marine mammals depend on both physical and biological factors. Physical factors include the sound magnitude, duration, and type (e.g., continuous vs. pulse), the size, type, and depth of the animal; 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. Biological factors influencing an individual's response include the species receiving the sound, and individual characteristics such as habituation, season, or motivation (Ellison *et al*. 2012).

Marine mammals depend on acoustic cues for vital biological functions (e.g., orientation, communication, finding prey, avoiding predators). In general, the effects of sounds from pile driving, pile removal, and drilling could result in one or more of the following:

- temporary or permanent hearing impairment;
- non-auditory physical or physiological effects;
- behavioral disturbance, and
- masking (Gordon 2007; Nowacek *et al*. 2007; Richardson *et al*. 1995; Southall *et al*. 2007).

6.5.1. Temporary or Permanent Hearing Impairment

Marine mammals exposed to high intensity sound repeatedly or for prolonged periods can experience hearing threshold shift, the loss of hearing sensitivity at certain frequencies (Finneran *et al*. 2003; Finneran *et al*. 2002; Finneran 2016; Kastak *et al*. 1999; Schlundt *et al*. 2000; NMFS 2018). Threshold shift can be permanent (PTS), in which case the loss of hearing sensitivity is not recovered, or temporary (TTS), in which case the animal's hearing sensitivity recovers over time (Southall *et al*. 2007). TTS may reduce fitness, survival, and reproduction, although this depends on the frequency, duration, and biological context in which it occurs.

TTS of limited duration, occurring in a frequency range that does not coincide with that used for recognition of important acoustic cues, would have little to no effect on an animal's fitness. Repeated sound exposure that causes TTS could result in PTS. As stated in the Exposure analysis, we anticipate no Level A harassment, equivalent in this case to PTS, from the proposed HPMS project. The HPMS project includes a combination of impact and vibratory pile driving, and down-the-hole drilling. These activities will not occur at the same time and there will be numerous pauses in activities producing the sounds each day. Given these pauses and the fact that many marine mammals are moving through the ensonified area and not remaining for extended periods of time, the potential for threshold shift declines.

6.5.2. Non-Auditory Physiological Effects

Stress is the primary non-auditory physiological effects that could occur in marine mammals exposed to underwater sound from the HPMS project. Marine, like terrestrial, mammals may exhibit a generalized stress response (elevated levels of "stress hormones" such as cortisol and corticosterone) to anthropogenic noise in their environment (ONR 2009; Rosen and Kumagai 2008). Prolonged exposure to stress may result in immune system suppression, reproductive failure, accelerated aging, and slowed growth.

Although most research on physiological stress response has focused on terrestrial species (Atkinson *et al*. 2015), stress responses of marine mammals have been reviewed (ONR 2009) and studied (Fair *et al* 2017; Romano *et al*. 2005). Clark *et al.* (2005) documented adrenal exhaustion in chronically stressed marine mammals. Rolland *et al.* (2012) found that noise reduction from lower exposure to ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. These and other studies lead to a reasonable expectation that some marine mammals could experience physiological stress responses upon exposure to intense and repeated sounds.

The estimated 19 days of HPMS pile extraction and installation will be staggered over a 3-month period and occur for a limited amount of time on each day (Table 1), thus limiting the potential for chronic stress. Marine mammals that show behavioral avoidance of pile driving, including some odontocetes and some pinnipeds, are especially unlikely to incur auditory impairment or non-auditory physical effects.

6.5.3. Behavioral Disturbance

Behavioral responses of marine mammals to noise can include subtle or more conspicuous changes in activities, and displacement. Marine mammal behavioral responses to sound are highly variable and context-specific, and reactions, if any, depend on species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day, and many other factors (Southall *et al*. 2007). Possible disturbance can range from mild (e.g., startle response) to severe (e.g., abandonment of vital habitat).

Observed responses of wild marine mammals to loud pulsed sound sources (typically seismic guns or acoustic harassment devices, but also including pile driving) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds 2002; Nowacek *et al*. 2007; Thorson and Reyff 2006; Wartzok *et al*. 2003).

It is likely that the onset of both vibratory or impact pile driving could result in short-term changes in an animal’s behavior. These behavioral changes may include: changing durations of surfacing and dives, number of blows per surfacing; 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 marine mammals’ behavioral responses to pile driving is difficult to predict, and in some cases, may not occur at all. For example, marine mammal monitoring for the Kodiak Ferry Dock project (ABR 2016) documented 1,281 Steller sea lions within the Level B harassment zone during pile driving or drilling, but of these, only 45 individuals (3.5%) demonstrated any evidence of behavioral disturbance. Nineteen showed alert behavior, 7 were documented fleeing, and 19 swam away from the project site. Other sea lions were engaged in activities such as milling, feeding, playing or fighting and did not change their behavior. In addition, two sea lions approached within 20 meters of active vibratory pile driving activities.

6.5.4. Masking

Auditory interference, or masking, occurs when a noise is similar in frequency and loudness to (or louder than) the auditory signal received by an animal while it is echolocating or listening for acoustic information from other animals. Masking can interfere with an animal’s ability to gather acoustic information about its environment, such as predators, prey, conspecifics, and other environmental cues (Francis and Barber 2013).

Exposure to anthropogenic noise may result in changes to cetacean vocalization behavior. For example, in the presence of potentially masking signals, humpback whales and killer whales have been observed to increase the length of their songs (Fristrup *et al*. 2003; Foote *et al*. 2004), while right whales have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al*. 2007).

Masking is likely less of a concern for Steller sea lions, which vocalize both in air and water and do not echolocate or communicate with complex underwater "songs."

The HPMS dolphins expansion project will occur in an industrialized harbor, where vessel sounds and dock activity likely occurs frequently. We expect any additional contributions to masking from project activities would be very small and of short duration relative to the existing conditions. The short duration and limited affected area of HPMS project-related noise will likely result in an insignificant amount of masking. Any masking that could possibly rise to Level B harassment would occur concurrently within the zones of behavioral harassment already estimated for vibratory pile driving, and which have already been taken into account in the *Exposure Analysis*.

6.5.5. In-Air Noise

As discussed in Section 6.5.5, no in-air disturbance of hauled-out Steller sea lions is anticipated to result from the HPMS Dolphins Expansion Project due to the short distance that such sounds will be above ambient sound levels [10 m (33 ft)] and the lack of any sea lion haulouts within that distance.

6.5.6. Effects on Habitat

Potential impacts to the surrounding habitat from physical disturbance during pile driving and removal are possible. These will be minimal because HPMS will follow EPA Best Management Practices to reduce turbidity and sedimentation. Changes to existing water quality are unlikely, because construction is occurring in an already industrial and commercial shipping area. We conclude that HPMS proposed activities at the project area would not result in permanent negative impacts to physical habitats used directly by humpback whales or Steller sea lions. However, these activities may have short-term impacts to food sources such as forage fish and invertebrates (see discussion below).

6.5.7. Effects on Potential Prey

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 (*Oncorhynchus* spp.) (Marston *et al*. 2002; Sigler *et al*. 2004; Womble *et al*. 2005).

Herring are a keystone species in Southeast Alaska, serving as a vital link between lower trophic levels, including crustaceans and small fish, and higher trophic levels. In Southeast Alaska, Pacific herring typically spawn from March to May and attract large numbers of predators (Marston *et al*. 2002)The relationship between humpback whales and these ephemeral fish runs is so strong in Southeast Alaska that the seasonal abundance and distribution of marine mammals reflects the distribution of pre-spawning and spawning herring, and overwintering aggregations of adult herring.

Construction activities will produce continuous (vibratory pile driving and drilling) and impulsive (impact driving) sounds. Fish react to intermittent low-frequency sounds that are especially strong. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of intensive sound energy. Additional studies have documented effects of pile driving on fish, (Iafrate *et al.* 2019; CALTRANS 2015). Impulsive sounds at received levels of 160 dB may cause subtle changes in fish behavior. SPLs of 180 dB may cause noticeable changes in behavior (Skalski *et al*. 1992). Sounds of sufficient strength have been known to cause injury to fish and fish mortality (Hawkins 2005).

The most likely impact to fish from pile driving and drilling activities in the project area would be temporary avoidance of the area. The duration of fish avoidance after completion of construction activities is unknown, but a rapid return to normal recruitment, distribution and behavior is expected. In general, impacts to marine mammal prey species are expected to be minor and temporary, due to the short project timeframe (19 active days over 30 days for the project).

Sitka Sound is within the seasonal southeast Alaska humpback whale feeding biologically important area (BIA) from March through November (Ferguson *et al.* 2015; https://cetsound.noaa.gov/important). Construction will occur during the tail end of the seasonally-significant BIA, and the short project duration further reduces the temporal overlap with the seasonal BIA. Additionally, the area of Sitka Sound affected by the HPMS project is small relative to the rest of the Sound, such that it allows animals within the migratory corridor to use Sitka Sound without necessarily being disturbed by the construction. Therefore, the planned project is not expected to have adverse effects on the southeast Alaska humpback whale feeding BIA.

Studies on euphausiids and copepods, some of the more abundant and biologically important groups of zooplankton, consumed by baleen whales, have documented the use of hearing receptors to maintain schooling structures (Wiese 1996) and detection of predators (Chu *et al*.1996); however Wiese (1996) concluded that crustaceans (such as zooplankton) are not particularly sensitive to sound produced by even louder impulsive sounds such as seismic operations

Any effects of pile driving and drilling activities 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. Even if some zooplankton mortality were to occur, no appreciable adverse impact on zooplankton populations is expected, due to large reproductive capacities and naturally high levels of predation and mortality of these populations.

In summary, given the short daily duration of sound associated with individual pile driving and drilling events, the relatively small areas being affected, and lack of expected effects to zooplankton populations, pile driving and drilling associated with the proposed action are not likely to have a permanent, adverse effect on any populations of fish or invertebrate species or habitat. Thus, any impacts to marine mammal habitat are not expected to cause significant or long-term consequences for individual Mexico DPS humpback whales or western DPS Steller sea lions.

7. CUMULATIVE EFFECTS

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

Some continuing non-Federal activities are reasonably certain to contribute to climate change within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline versus cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the *Environmental Baseli*ne (Section 5.0).

Cruise ships have been extending their seasons in recent years to accommodate more trips and port calls per vessel. Larger vessels and longer seasons have the potential to bring many more passengers to the region each year, which could have effects on listed species.

To meet the demands of increasing numbers of visitors to Sitka, NMFS expects that other types of marine vessel traffic (e.g., float planes, charter fishing vessels, whale watching vessels, ferries, etc.) will increase. An overall increase in vessel traffic could affect listed humpback whales or Steller sea lions through increased noise, harassment, displacement or pollution. These activities will likely occur in the vicinity of the HPMS dock facility. We do not expect the cumulative effects of these activities to hinder population growth of Mexico DPS humpback whales or Western DPS Steller sea lions.

There are currently no other known state or private activities reasonably certain to occur in the action area that may affect listed species and are not subject to section 7 consultation. While the proposed project is designed to accommodate larger ships within the harbor, it is not anticipated to result in an increase in marine traffic in the action area. We expect existing levels of fisheries harvest, noise, pollutants and discharges, and vessel traffic will continue into the future. We expect domestic 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

In this Section, we formulate a "risk analysis," by adding the effects of the action (Section 6) to the environmental baseline (Section 5) and the cumulative effects (Section 7). This informs our 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 discussed in the *Approach to the Assessment* (Section 3) section of this Opinion, we begin our risk analysis by asking whether the probable physical, physiological, or behavioral responses of endangered or threatened species are likely to reduce the fitness of endangered or threatened individuals or the growth, annual survival or reproductive success, or lifetime reproductive success of those individuals.

As part of our risk analyses, we identified and addressed all potential stressors; and considered all consequences of exposing listed species to all the stressors associated with the proposed action, individually and cumulatively, given that the individuals in the action area for this consultation are also exposed to other stressors in the action area and elsewhere in their geographic range.

8.1. Mexico DPS Humpback Whale Risk Analysis

Based on the results of the exposure analysis, we expect a maximum of 152 humpback whales may be exposed to noise from pile driving, and 6.1% or a maximum of 10 of these are anticipated to be from the Mexico DPS. Exposure to vessel noise from transit and potential for vessel strike may occur, but adverse effects from vessel disturbance and noise are likely to be insignificant due to the small marginal increase in such activities relative to the environmental baseline, the transitory nature of project-related vessel traffic, and the likely habituation of marine mammals that frequent this high vessel traffic area. Adverse effects from vessel strike are considered extremely unlikely because of the few additional vessels introduced by the action, slow speeds at which these vessels will operate and existing approach regulations.

Humpback whales' most likely responses to noise from pile driving and drilling include brief startle reactions or short-term behavioral modification. These reactions are expected to subside quickly when the exposure to pile driving noise ceases. The primary mechanism by which the behavioral changes we have discussed affect the fitness of individual animals is through the animals' energy and time budget. Large whales such as humpbacks have an ability to survive for months on stored energy during migration and while in their wintering areas, and their feeding patterns allow them to acquire energy at high rates. The individual and cumulative energy costs of the behavioral responses we have discussed are not likely to reduce the energy budgets of humpback whales, and their probable exposure to project-related noise is not likely to reduce their fitness. As discussed in the *Description of the Proposed Action* and *Status of the Species* sections, this action does not overlap in space or time with humpback whale breeding. Mexico DPS humpback whales feed in Southeast Alaska in the summer and fall months, but migrate to Mexican waters for breeding and calving in the late winter months. As a result, the probable responses to pile driving and drilling noise are not likely to reduce the current or expected future reproductive success of Mexico DPS humpback whales or reduce the rates at which they grow, mature, or become reproductively active.

The short duration of sound generation and the implementation of mitigation measures to reduce exposure to high levels of sound decrease the likelihood of a behavioral response that may affect vital functions, or cause TTS or PTS of humpback whales. When considered in conjunction with the effects of the proposed action, cumulative effects of future state or private activities in the action area are likely to affect humpback whales at a level comparable to present. As a result, this project is not likely to appreciably reduce Mexico DPS humpback whales' likelihood of surviving or recovering in the wild.

8.2. Western DPS Steller Sea Lion Risk Analysis

Based on the results of the exposure analysis, we expect a maximum of 304 Steller sea lions may be exposed to noise from pile driving, and 2.2% or 7 of these are anticipated to be from the Western DPS. It is difficult to estimate the behavioral responses, if any, that western DPS Steller sea lions in the action area may exhibit to underwater sounds generated by project activities. Though the sounds produced during project activities may not greatly exceed levels that Steller sea lions already experience in the harbor, the sources proposed for use in this project (pile-drivers and drills) are not among sounds to which they are commonly exposed. In response to project-related sounds, some Steller sea lions may move out of the area or change from one behavioral state to another, while other Steller sea lions may exhibit no apparent behavioral changes at all.

During monitoring for the Kodiak Ferry Terminal and Dock Improvements Project, only 3.5% of Steller sea lions observed within the Level B exposure area (45 of 1,281) exhibited behaviors associated with disturbance, and five of these observations appeared to be reactions to passing vessels or killer whales rather than construction activity (ABR 2016). If Steller sea lions behave similarly for the HPMS project, then only 3.5%, or 11, of the 304 sea lions estimated to occur within the Level B zone of the project area during construction activities, might be expected to exhibit detectable signs of disturbance (e.g., alert, fleeing, disorientation, or swimming away from the construction site), and less than one of these would be expected to be a western DPS individual. The soft start (ramp-up) procedures described above and in the 4MP (attached) and IHA proposal for this project (85 FR 3623) should further decrease project impacts to Steller sea lions. The largest western DPS Steller sea lion Level A zone for this project is 31.6 m. An easily observable shutdown zone of 50 m will make it extremely unlikely that western DPS Steller sea lions will be exposed to injury/Level A project-related sounds. Because we do not expect western DPS Steller sea lions to exhibit readily-observable behavioral reactions to project activities, and as discussed in section 6.5.2, we do not anticipate physiological stress effects form project noise, we conclude that project activities will not have a pronounced impact on feeding, breeding, or resting opportunities.

9. CONCLUSION

This Biological Opinion has considered the effects of this action on Mexico DPS humpback whales and western DPS Steller sea lions. The proposed action is expected to result in impacts to these species. We estimate that Level B (harassment) take of 9 Mexico DPS humpback whales and 7 western DPS Steller sea lions may occur during the term of the MMPA and USACE authorizations (*i.e.*, construction period). This harassment may cause individual marine mammals to alter their behavior for a brief period of time, but is not likely to result in injury or death. Any behavioral disruptions of Mexico DPS humpback whales or western DPS Steller sea lions from exposure to project-related noise are not expected to affect the fitness, reproduction, or survival of individuals, or the recovery of these species.

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS's biological opinion that the proposed action is not likely to jeopardize the continued existence of Mexico DPS humpback whales or western DPS Steller sea lions. NMFS also concludes that the proposed action is not likely to adversely affect Sperm whales or to destroy or adversely modify designated Steller sea lion critical habitat

10. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA prohibits the take of endangered species unless there is a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (16 U.S.C. § 1532(19)). "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 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)). For this consultation, USACE and NMFS PR1 anticipate that any take will be by Level B harassment only. No Level A takes are contemplated or authorized.

Federal regulations promulgated pursuant to section 4(d) of the ESA extend the section 9 prohibitions to the take of threatened Mexico DPS humpback whales (81 FR 62259).

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

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

The terms and conditions described below are nondiscretionary. USACE and NMFS PR1 have a continuing duty to regulate the activities covered by this ITS. In order to monitor the impact of incidental take, USACE and NMFS PR1 must monitor and report on the progress of the action and its impact on the species as specified in the ITS (50 CFR § 402.14(i)(3)). If USACE and PR1 (1) fail to require the permit 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.

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

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 (50 CFR § 402.14 (i)(1); see also 80 FR 26832 (May 11, 2015). This ITS authorizes take by harassment only. Based on the best available scientific and commercial information, we do not anticipate that responses of humpback whales and Steller sea lions to impulsive noise at received levels less than 160 dB re 1 μPa rms, or continuous noise at received levels less than 120 dB re 1 μPa rms, would rise to the level of "take" as defined under the ESA. This ITS does not authorize lethal take.

10.1.1. Mexico DPS Humpback whales

Based on observational data and groups sizes of humpback whales observed, it is estimated that 4 groups of 2 humpback whales may occur within the Level B harassment zone every day of the 19-day construction window during active construction. Based on an estimated 2 animals in a group x 4 groups each day × 19 days, we estimate a maximum Level B harassment of 152 humpback whales. As described previously, Of the 152 animals potentially exposed to Level B harassment from construction activities, an estimated 6.1 percent, or 9.3 (rounded to 10) are from the Mexico DPS (Wade *et al*. 2016).Therefore, NMFS is authorizing 10 Level B harassment takes of Mexico DPS humpback whales under the ESA. No Level A take of Mexico DPS humpbacks is anticipated or authorized.

10.1.2. Western DPS Steller Sea Lions

As described in Section 6.4, Steller sea lions typically occur in groups of 1-8 animals in the project vicinity. We estimate that 2 groups of 8 Steller sea lions may occur within the Level B harassment zone every day of in-water construction. Accordingly, an estimate of 8 animals in a group x 2 groups x 19 days = 304 Steller sea lions potentially exposed to Level B harassment during project construction. Based on a recent study of Steller sea lion mitochondrial DNA mentioned above (Hastings *et al.* 2020), we assume that 2.2 percent of Steller sea lions observed in the action area may be from the western DPS. We estimate that 304 X .022, or 6.89 (rounded to 7) of these may be western DPS individuals. Therefore, NMFS is authorizing 7 Level B harassment takes of western DPS Steller sea lions under the ESA. No Level A take of western DPS Steller sea lions is anticipated or authorized.

If take of western DPS Steller sea lions or Mexico DPS humpback whales approaches the number of takes authorized in the ITS, USACE and PR1 will notify NMFS AKR PRD by email, attn:greg.balogh@noaa.gov to determine whether reinitiation of consultation is appropriate.

10.2. Effect of the Take

Studies of marine mammals have shown that humpback whales and Steller sea lions are likely to respond behaviorally to acoustic disturbance. Only takes by acoustic harassment are authorized in this Incidental Take statement. No serious injury or mortalities are anticipated or authorized as part of this proposed action.

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

10.3. Reasonable and Prudent Measures

"Reasonable and prudent measures" (RPMs) (50 CFR 402.14) are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02).

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

RPM #1: USACE and NMFS PR1 must require HPMS to conduct operations in a manner that will minimize impacts to western DPS Steller sea lions and Mexico DPS humpback whales that occur within or in the vicinity of the project action area.

RPM #2: USACE and NMFS PR1 must require HPMS to implement a comprehensive monitoring program to ensure that western DPS Steller sea lions and Mexico DPS humpback whales are not taken in numbers or in a manner not anticipated by this Opinion, and to submit a final report to NMFS AKR evaluating the mitigation measures and the results of the monitoring program.

10.4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, USACE and PR1 and HPMS, the permittee, must comply with the following "terms and conditions" (T&Cs), which implement the RPMs described above. These T&Cs are non-discretionary and must be a binding condition of the USACE's and PR1's authorizations for the exemption in section 7(o)(2) to apply. USACE and PR1 and any permittee/ applicant have a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species, as specified in this incidental take statement (50 CFR § 402.14).

If these Federal action agencies (1) fail to require HPMS to adhere to the T&Cs of the Incidental Take Statement through enforceable terms that are added to their authorizations, 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. 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 proposed action's basic design.

<u>To carry out RPM #1</u>: USACE and NMFS PR1must require HPMS to:

A. Implement all mitigation measures, including observation and shut-down zones and other requirements, as described in the final IHA and in the 4MP attached to this Biological Opinion.
B. In the event that the proposed action causes serious injury or mortality of a marine

mammal (e.g. ship-strike, stranding, and/or entanglement), HPMS must immediately cease operations and report the incident to the NMFS Alaska Regional Stranding Coordinator at 907-271-3448 and/or by email to Jon.Kurland@noaa.gov, Greg.Balogh@noaa.gov, or Mandy.Keogh@noaa.gov, and NMFS Permits, Conservation and Education Division at 301-427-8401.

C. Following a prohibited take, USACE and NMFS PR1 will be required to reinitiate consultation under 50 CFR § 402.16, and any subsequent activities causing incidental take will not be exempt from the take prohibitions of ESA section 9. NMFS AKR will work with USACE and PR1 to determine what is necessary to minimize the likelihood of further prohibited take and ensure ESA compliance.

<u>To carry out RPM #2</u>: USACE and NMFS PR1 must require HPMS to:

A. Adhere to all monitoring and reporting requirements as detailed in the IHA issued by NMFS under section 101(a)(5) of the MMPA as reflected in the 4MP attached to this Opinion.

B. Submit a project specific report within 90 days of the conclusion of the project that analyzes and summarizes marine mammal interactions during this project. Report should be sent to the Protected Resources Division, NMFS by email to Greg.Balogh@noaa.gov. This report must contain information described in Section 7.3 of the Marine Mammal Monitoring and Mitigation Plan attached to this Biological Opinion.

11. CONSERVATION RECOMMENDATIONS

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

1. Prior to starting the project, post signs and/or air public service announcements on radio or newspaper informing the public of the work that will be taking place, along with procedures that are being implemented to protect marine mammals.
2. Install informational signs designed by NMFS but produced and posted by HPMS describing Alaska Humpback Whale Approach Regulations. These signs should be located near where cruise ships and any whale watching vessels may dock. NMFS expects this effort will minimize harassment of humpback whales by helping tourists understand why whale watching vessels should not aggressively pursue whales in the action area, not only for the duration of this project, but also into the future.
3. Prohibit fish cleaning at the dock during active construction, to avoid creating an "attractive nuisance" for sea lions or other marine mammals in the project area.
4. Report real-time sightings of whales in the project area via the Whale Alert program to minimize the risk of vessel strikes. More information is available at: https://www.fisheries.noaa.gov/resource/tool-app/whale-alert

In order to keep NMFS's Protected Resources Division informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, HPMS should notify NMFS of any conservation recommendations they implement in their final action.

12. Reinitiation of Consultation

As provided in 50 CFR 402.16, reinitiation of consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action on listed species or designated critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount of incidental take is exceeded, section 7 consultation must be reinitiated immediately.

13. Data Quality Act Documentation and Pre-dissemination Review

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

13.1. Utility

This document records the results of an interagency consultation. The information presented in this document is useful to NMFS, the USACE, the City of Sitka, AKDOT, 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 and project applicant.

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.

14. References

ABR 2016.Protected-Species Monitoring at the Kodiak Ferry Terminal & Dock Improvements Project, Kodiak, Alaska, 2015–2016. 51+ pp.

Alaska Department of Environmental Conservation (ADEC). 2003. Final Total Maximum Daily Loads in the Waters of Silver Bay, Alaska. https//dec.alaska.gov/media/18568/silverbay.pdf

Atkinson, S., D. Crocker, D.Houser, and K. Mashburn. 2015. Stress physiology in marine mammals: how well do they fit the terrestrial model? J. Comp. Physiol B185(5):463-486. https://doi.org/10.1007/s00360-015-0901-0.

Au, W. W. L., and M. Green. 2000. Acoustic interaction of humpback whales and whale-watching boats. Marine Environmental Research 49(5):469-481.

Au, W. W. L., A. A. Pack, M. O. Lammers, L. M. Herman, M. H. Deakos, and K. Andrews. 2006. Acoustic properties of humpback whale songs. Journal of the Acoustical Society of America 120(2):1103-1110.

Au, W. W. L., A. N. Popper, and R. R. Fay. 2000. Hearing by whales and dolphins. Springer-Verlag, New York, NY.

Austin, M. E., S. Denes, J. MacDonnell, and G. Warner. 2016. Hydroacoustic Monitoring Report: Anchorage Port Modernization Project Test Pile Program, version 3.0, Technical report by JASCO Applied Sciences for Kiewit Infrastructure West Co. under Contract PSA 2572.

Baker, C. S., L. M. Herman, A. Perry, W. S. Lawton, J. M. Straley, and J. H. Straley. 1985. Population characteristics and migration of summer and late-season humpback whales (*Megaptera novaeangliae*) in southeastern Alaska. Marine Mammal Science 1(4):304-323.

Baker, A.R., T.R. Loughlin, V. Burkanov, C.W. Matson, T.G.Trujillo, D.G. Calkins, J.K. Wickliffe, and J.W. Bickham. 2005. Variation of mitochondrial control region sequences of Steller sea lions: the three-stock hypothesis.J. Mammal.86:1075-1084.12.

Benitz 2009. Dimensions for Future Lock Chambers and "New Panamax" Vessels.OP'S ADVISORY TO SHIPPING No. A-02-2009. January 19, 2009. http://www.pancanal.com/common/maritime/advisories/2009/a-02-2009.pdf

Bettridge, S., C. S. Baker, J. Barlow, P. Clapham, M. Ford, D. Gouveia, D. K. Mattila, R. M. Pace, III, P. E. Rosel, G. K. Silber, and P. R. Wade. 2015. Status review of the humpback whale (*Megaptera novaeangliae*) under the Endangered Species Act, U.S. Dept. Commer., NOAA Tech. Memo., NOAA-TM-NMFS-SWFSC-540, 263 pp.\

Burek, K. A. K.B. Beckmen, T. Gelatt, and M. Moore. 2003. Parasites in Steller Sea Lions (*Eumetopias jubatus*) in Alaska. IAAAM 2003. https://www.vin.com/apputil/content/defaultadv1.aspx?pId=11159&catId=29712&id=3980995&ind=78&objTypeID=17

Calambokidis, J., E. A. Falcone, T. J. Quinn, A. M. Burdin, P. J. Clapham, J. K. B. Ford, C. M. Gabriele, R. LeDuc, D. Mattila, L. Rojas-Bracho, J. M. Straley, B. L. Taylor, J. U. R., D. Weller, B. H. Witteveen, M. Yamaguchi, A. Bendlin, D. Camacho, K. Flynn, A. Havron, J. Huggins, and N. Maloney. 2008. SPLASH: Structure of populations, levels of abundance and status of humpback whales in the North Pacific. U.S. Department of Commerce, Western Administrative Center, Seattle, Washington.

CALTRANS (California Department of Transportation) 2015. Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. Report

No. CTHWANP-RT-15-306.01.01.Authors: David Buehler, P.E., Rick Oestman, James Reyff, Keith Pommerenck, Bill Mitchell . 532 pp. https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/bio-tech-guidance-hydroacoustic-effects-110215-a11y.pdf

Calkins, D.G., and K.W. Pitcher 1982. Population assessment, ecology, and trophic relationships of Steller sea lions in the Gulf of Alaska. Pages 447-546 In: Environmental assessment of the Alaska continental shelf. U.S. DOC and U.S. DOI. Final Reports of Principal Investigators, Volume 19.

Carretta, J. V., K. A. Forney, E. M. Oleson, D. W. Weller, A. R. Lang, M. M. Muto, B. Hanson, A. J. Orr, H. Huber, M. S. Lowry, J. Barlow, J. E. Moore, D. Lynch, L. Carswell, and R. L. Brownell Jr. 2017. U.S. Pacific marine mammal stock assessments: 2016, NOAA-TM-NMFS-SWFSC-577.

Chapin, F. S., III, S. F. Trainor, P. Cochran, H. Huntington, C. Markon, M. McCammon, A. D. McGuire, and M. Serreze. 2014. Ch. 22: Alaska. Pages 514-536 *in* J. M. Melillo, T. C. Richmond, and G. W. Yohe, editors. Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program.

Chenoweth, E. M., J. M. Straley, M. V. McPhee, S. Atkinson, and S. Reifenstuhl. 2017. Humpback whales feed on hatchery-released juvenile salmon. Royal Society Open Science 4: 170180.

Chu, K., C. Sze, and C. Wong. 1996. Swimming behaviour during the larval development of the shrimp *Metapenaeus ensis* (De Haan, 1844)(Decapoda, Penaeidae). Crustaceana 69(3):368-378.

Ciminello, C., R. Deavenport, T. Fetherston, K. Fulkerson, P. Hulton, D. Jarvis, B. Neales, J. Thibodeaux, J. Benda-Joubert, and A. Farak. 2012. Determination of Acoustic Effects on Marine Mammals and Sea Turtles for the Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement. NUWC-NPT Technical Report 12,071. Newport, Rhode Island: Naval Undersea Warfare Center Division.

Clark, L.S., D.C. Pfeiffer, and D.F. Cowan. 2005. Morphology and histology of the Atlantic bottlenose dolphin adrenal gland with emphasis on the medulla. Anat. Histol. Embryol. 34: 132–140.

Crowley, T. J. 2000. Causes of climate change over the past 1000 years. Science 289(5477):270-277.

Dahlheim, M. E., and P. A. White. 2010. Ecological aspects of transient killer whales Orcinus orca as predators in southeastern Alaska. Wildlife Biology 16:308-322.

Denes, S. L., G. A. Warner, M. E. Austin, and A. O. MacGillivray. 2016. Hydroacoustic pile driving noise study - comprehensive report. Document 001285, Version 2.0. Technical report by JASCO Applied Sciences for Alaska Department of Transportation & Public Facilities.

Dolphin, W. F. 1987. Observations of humpback whale, Megaptera novaeangliae and killer whale, Orcinus orca, interactions in Alaska: comparison with terrestrial predator-prey relationships. Canadian Field-Naturalist 101(1):70-75.

Doney, S. C., M. Ruckelshaus, J. E. Duffy, J. P. Barry, F. Chan, C. A. English, H. M. Galindo, J. M. Grebmeier, A. B. Hollowed, N. Knowlton, J. Polovina, N. N. Rabalais, W. J. Sydeman, and L. D. Talley. 2012. Climate change impacts on marine ecosystems. Annual Reviews in Marine Science 4:11-37.

Ellison, W. T., B. L. Southall, C. W. Clark, and A. S. Frankel. 2012. A new context-based approach to assess marine mammal behavioral responses to anthropogenic sounds. Conservation Biology 26(1):21-28.

EPA 2016. EPA Region 10 Best Management Practices for Piling Removal and Placement in Washington State. https://www.nws.usace.army.mil/Portals/27/docs/regulatory/Forms/EPA%20BMPs%20for%20Piling%20Removal%202-18-16.pdf

EPA 2017. Climate Impacts in Alaska. https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-alaska_.html

Everitt, R., C. Fiscus, and R. DeLong. 1980. Northern Puget Sound marine mammals. Interagency Energy. Environment R & D Program Report, US EPA, EPA-600/7-80-139. US EPA, Washington, DC.

Fair, P.A., A.M. Shaefer, D.S. Houser, G.D. Bossart, T.A. Romano, C.D. Champagne, J.L. Stott, C.D. Rice, N. White and J.S. Reif. 2017. The environment as a driver of immune and endocrine responses in dolphins (*Tursiops truncatus*). PLoS One 2017; 12(5): 19 pp. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5415355/pdf/pone.0176202.pdf

Ferguson, M.C., C. Curtice, J. Harrison and S.M. Van Parijs. 2015. Biologically Important Areas for Cetaceans Within U.S. Waters – Overview and Rationale. Aquatic Mammals 2015 41(1): 2-16. https://www.aquaticmammalsjournal.org/images/files/AM_41.1_Complete_Issue.pdf

Finneran, J. J., R. Dear, D. A. Carder, and S. H. Ridgway. 2003. Auditory and behavioral responses of California sea lions (*Zalophus californianus*) to single underwater impulses from an arc-gap transducer. Journal of the Acoustical Society of America 114(3):1667-1677.

Finneran, J. J., C. E. Schlundt, R. Dear, D. A. Carder, and S. H. Ridgway. 2002. Temporary shift in masked hearing thresholds in odontocetes after exposure to single underwater impulses from a seismic watergun. Journal of the Acoustical Society of America 111(6):2929-2940.

Finneran, J.J. 2016. Auditory Weighting Functions and TTS/PTS Exposure Functions for Marine Mammals Exposed to Underwater Noise. Technical Report 3026, SSC Pacific. 79 pp. https://apps.dtic.mil/dtic/tr/fulltext/u2/1026445.pdf

Fiscus, C.H. 1961. Growth in Steller sea lion. Journal of Mammalogy 42(2):218-223.

Florezgonzalez, L., J. J. Capella, and H. C. Rosenbaum. 1994. Attack of killer whales (*Orcinus orca*) on humpback whales (*Megaptera novaeangliae*) on a South American Pacific breeding ground. Marine Mammal Science 10(2):218-222.

Foote, A. D., R. W. Osborne, and A. R. Hoelzel. 2004. Environment - Whale-call response to masking boat noise. Nature 428(6986):910-910.

Ford, J. K. B., and R. R. Reeves. 2008. Fight or flight: antipredator strategies of baleen whales. Mammal Review 38(1):50-86.

Francis, C. D., and J. R. Barber. 2013. A framework for understanding noise impacts on wildlife: An urgent conservation priority. Frontiers in Ecology and the Environment 11:305-313.

Frazer, L. N., and E. Mercado. 2000. A sonar model for humpback whale song. IEEE Journal of Oceanic Engineering 25(1):160-182.

Fristrup, K. M., L. T. Hatch, and C. W. Clark. 2003. Variation in humpback whale (Megaptera novaeangliae) song length in relation to low-frequency sound broadcasts. The Journal of the Acoustical Society of America 113:3411-3424.

Fritz, L., K. Sweeney, D. Johnson, M. Lynn, and J. Gilpatrick. 2013.Aerial and ship-based surveys of Steller sea lions(Eumetopiasjubatus)conductedinAlaskainJune-July2008through2012,andanupdateonthe status and trend of the western stock in Alaska.U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-251, 91p.

Fritz, L.W., and S. Hinckley. 2005. A critical review of the regime shift -“junk food”-nutritional stress hypothesis for the decline of the western stock of Steller sea lion. Mar. Mammal Sci. 21(3):476-518.

Gelatt, T.S., A.W. Trites, K. Hastings, L. Jemison, K. Pitcher,and G. O’Corry-Crowe. 2007. Population trends, diet, genetics, and observations of Steller sea lions in Glacier Bay National Park,p. 145-149. InJ. F.Piatt, and S. M. Gende (eds.), Proceedings of the Fourth Glacier Bay Science Symposium, October 26–28, 2004: U.S. Geological Survey Scientific Investigations Report 2007-5047.Goodwin, L., and P. A. Cotton. 2004. Effects of boat traffic on the behaviour of bottlenose dolphins (*Tursiops truncatus*). Aquatic Mammals 30(2):279-283.

Gordon, J., D. Thompson, D. Gillespie, M. Lonergan, S. Calderan, B. Jaffey, and V. Todd. 2007. Assessment of the potentail for acoustic deterrents to mitigate the impact on marine mammals of underwater noise arising from the construction of offshore windfarms. Commissioned by COWRIE Ltd. (project reference DETER-01-07).

HPMS (Halibut Point Marine Services). 2019a. Biological Assessment: Old Sitka Dock North Dolphins Expansion Project Sitka Sound, Sitka, Alaska. Revision #1: November 2019. 36+pp. on file.

HPMS (Halibut Point Marine Services). 2019b. Request for Incidental Harassment Authorization, Revision #3, December 2019. 57+pp. on file.

Hastings, M. C., and A. N. Popper. 2005. Effects of sound on fish. California Department of Transportation, Sacramento, California.

Hastings K. K., L. A. Jemison,G. W. Pendleton,K. L. Raum-Suryan, and K. W. Pitcher. 2017. Natal andbreeding philopatry of female Steller sea lions insoutheastern Alaska. PLoS ONE 12(6):e0176840.DOI: dx.doi.org/10.1371/journal.pone.0176840.

Hastings, K.K., M. J. Rehberg, G. M. O’Corry-Crowe, G. W. Pendleton, L.A. Jemison, and T. S. Gelatt. 2020. Demographic consequences and characteristics of recent population mixing and colonization in Steller sea lions, *Eumetopias jubatus*. J. Mammal. 101(1): 107–120. https://doi.org/10.1093/jmammal/gyz192

Hawkins, A. 2005. Assessing the impact of pile driving upon fish. UC Davis Recent Work.https://escholarship.org/uc/item/28n858z1

Heise, K., L. G. Barrett-Lennard, E. Saulitis, C. Matkin, and D. Bain. 2003. Examining the evidence for killer whale predation on Steller sea lions in British Columbia and Alaska. Aquatic Mammals 29:325-334.

Helker, V. T., M. M. Muto, and L. A. Jemison. 2016. Human-Caused Injury and Mortality of NMFS-managed Alaska Marine Mammal Stocks 2010-2014.

Houghton, J. 2001. The science of global warming. Interdisciplinary Science Reviews 26(4):247-257.

Iafrate JD, Watwood SL, Reyier EA, Scheidt DM, Dossot GA, Crocker SE (2016) Effects of Pile Driving on the Residency and Movement of Tagged Reef Fish. PLoS ONE 11(11): e0163638. https://doi.org/10.1371/journal.pone.0163638

IPCC 2013. Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. https://www.ipcc.ch/report/ar5/wg1/

IPCC 2014. Climate Change 2014: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. https://www.ipcc.ch/report/ar5/wg2/

IPCC 2018. Global Warming of 1.5 ºC. Special Report, October 2018. https://www.ipcc.ch/sr15/

IPCC 2019a. Climate change and land. Special Report, August 2019. https://www.ipcc.ch/report/srccl/

IPCC 2019b. The ocean and cryosphere in a changing climate. Special Report, September 2019. https://www.ipcc.ch/srocc/home/

Jemison, L.A., G. W. Pendleton, L. W. Fritz, K. K. Hastings, J. M. Maniscalco, A. W. Trites, and T. S. Gelatt. 2013. Inter-population movements of Steller sea lions in Alaska, with implications for population separation.PLoS ONE 8(8):e70167.

Jensen, A., M. Williams, L. Jemison, and K. Raum-Suryan. 2009. Somebody untangle me! Taking a closer look at marine mammal entanglement in marine debris. Pages 63-69 *in* M. Williams, and E. Ammann, editors. Marine Debris in Alaska: Coordinating our Efforts, Volume 09-01. Alaska Sea Grant College Program, University of Alaska Fairbanks.

Kastak, D., R. J. Schusterman, B. L. Southall, and C. J. Reichmuth. 1999. Underwater temporary threshold shift induced by octave-band noise in three species of pinniped. Journal of the Acoustical Society of America 106(2):1142-1148.

Kastelein, R.A., R. van Schie, W. Verboom, and D. Haan. 2005. Underwater hearing sensitivity of a male and a female Steller sea lion (Eumetopias jubatus) J.Acous.Soc.Amer.118:1820-1829.Keeling, R. F., A. Körtzinger, and N. Gruber. 2010. Ocean deoxygenation in a warming world. Annual Review of Marine Science 2(1):199-229.

Ketten, D. R. 1997. Structure and function in whale ears. Bioacoustics 8:103-135.

Laist, D. W., A. R. Knowlton, J. G. Mead, A. S. Collet, and M. Podesta. 2001. Collisions between ships and whales. Marine Mammal Science 17(1):35-75.

Lambertsen, R. H. 1992. Crassicaudosis: a parasitic disease threatening the health and population recovery of large baleen whales. Rev. Sci. Technol., Off. Int. Epizoot. 11(4):1131-1141.

Lefebvre, K. A., L. Quakenbush, E. Frame, K. B. Huntington, G. Sheffield, R. Stimmelmayr, A. Bryan, P. Kendrick, H. Ziel, T. Goldstein, J. A. Snyder, T. Gelatt, F. Gulland, B. Dickerson, and V. Gill. 2016. Prevalence of algal toxins in Alaskan marine mammals foraging in a changing arctic and subarctic environment. Harmful Algae 55:13-24.

Loughlin, T. R. 1997. Using the phylogeographic method to identify Steller sea lion stocks. Molecular Genetics of Marine Mammals Spec. Pub. 3:159-171.

MacGillvray, A. 2018. Underwater noise from pile driving of conductor casing at a deep-water oil platform. J. Acoust. Soc. Am. 143(1): 450-459.

Maniscalco, J. M., C. O. Matkin, D. Maldini, D. G. Calkins, and S. Atkinson. 2007. Assessing killer whale predation on steller sea lions from field observations in Kenai Fjords, Alaska. Marine Mammal Science 23:306-321.

Marston, B. H., M. F. Willson, and S. M. Gende. 2002. Predator aggregations during eulachon *Thaleichthys pacificus* spawning runs. Marine Ecology Progress Series 231:229-236.

Mathias, D., A.M. Thode, J. Straley, J. Calambokidis, G.S. Schorr, and K. Folkert. 2012. Acoustic and diving behavior of sperm whales (Physeter macrocephalus) during natural and depredation foraging in the Gulf of Alaska. J. Acoust. Soc. Am. 132(1): 518-532.

Matkin, C. O., J. W. Durban, E. L. Saulitis, R. D. Andrews, J. M. Straley, D. R. Matkin, and G. M. Ellis. 2012. Contrasting abundance and residency patterns of two sympatric populations of transient killer whales (Orcinus orca) in the northern Gulf of Alaska. Fishery Bulletin 110:143-155.

McCarthy, J. J. 2001. Climate change 2001: impacts, adaptation, and vulnerability: contribution of Working Group II to the third assessment report of the Intergovernmental Panel on Climate Change. Cambridge University Press.

Miller, A. J., A. W. Trites, and H. D. G. Maschner, 2005. Ocean climate changes and the Steller sea lion decline. Antarct. Res. USA, 19, 54–63.

Miller, J.H., G.R. Potty and H.K. Kim. 2016.Pile-Driving Pressure and Particle Velocity at the Seabed: Quantifying Effects on Crustaceans and Groundfish. Adv Exp Med. Biol. 2016;875:719-28.

Moran, J. R., R. A. Heintz, J. M. Straley, and J. J. Vollenweider. 2018. Regional variation in the intensity of humpback whale predation on Pacific herring in the Gulf of Alaska. Deep Sea Research Part II: Topical Studies in Oceanography 147:187-195.

Moran, J. R. and J. M. Straley. 2018. Long-term monitoring of humpback whale predation on Pacific herring in Prince William Sound. Exxon Valdez Oil Spill Trustee Council Project 16120114-N. Final Report. 73 pp.

Morton, A., and H. K. Symonds. 2002. Displacement of *Orcinus orca* (L.) by high amplitude sound in British Columbia, Canada. ICES Journal of Marine Science 59(1):71-80.

Mulsow, J. and C. Reichmuth. 2010. Psychophysical and electrophysiological aerial audiograms of a Steller sea lion (Eumetopias jubatus). Journal of the Acoustical Society of America 127:2692-2701.

Muto, M.M., V.T. Helker, R. . Angliss, B.A. Allen, P.L. Boveng, J.M. Breiwick, M.F. Cameron, P.J. Clapham, S.P. Dahle, M.E. Dahlheim, B.S. Fadely, M.C. Ferguson, L.W. Fritz, R.C. Hobbs, Y.V. Ivashchenko, A.S. Kennedy, J.M. London, S.A. Mizroch, R.R. Ream, E.L. Richmond, K.E.W. Shelden, K.L. Sweeny, R.G. Towell, P R. Wade, J.M. Waite, and A.N. Zerbini. 2019. Alaska marine mammal stock assessments, 2018. NOAA Tech. Memo. NMFS-AFSC-355, Alaska Fisheries Science Center 7600 Sand Point Way N.E. Seattle, WA 98115. https://repository.library.noaa.gov/view/noaa/20606

Naessig, P. J., and J. M. Lanyon. 2004. Levels and probable origin of predatory scarring on humpback whales (*Megaptera novaeangliae*) in east Australian waters. Wildlife Research 31(2):163-170.

NCDC. 2020. https://www.ncdc.noaa.gov/sotc/global/201913 viewed 1/16/2020

NCEI. 2020. https://www.ncei.noaa.gov/sites/default/files/2019-Global-Significant-Events-Map.png viewed 1/16/2020.

Neilson, J., C. Gabriele, J. Straley, S. Hills, and J. Robbins. 2005. Humpback whale entanglement rates in southeast Alaska. Pages 203-204 *in* Sixteenth Biennial Conference on the Biology of Marine Mammals, San Diego, California.

Neilson, J. L., C. M. Gabriele, A. S. Jensen, K. Jackson, and J. M. Straley. 2012. Summary of reported whale-vessel collisions in Alaskan waters. Journal of Marine Biology:106282.

NMFS Alaska Region. 2019. Spring/Summer 2019 AKR Stranding newsletter. www.fisheries.noaa.gov/webdam/download/91866209

NMFS. 2006. Biological Opinion on the Minerals Management Service's Oil and Gas Leasing and Exploration Activities in the U.S. Beaufort and Chukchi Seas, Alaska; and Authorization of Small Takes Under the Marine Mammal Protection Act. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Regional Office, Anchorage, AK. June 16, 2006.

NMFS. 2008. Recovery plan for the Steller sea lion (*Eumetopias jubatus*). Revision (Original 1992). National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, Silver Spring, Maryland. 325+ pp.

NMFS. 2016a. Occurrence of Distinct Population Segments (DPSs) of Humpback Whales off Alaska. National Marine Fisheries Service, Alaska Region. Revised December 12, 2016.

NMFS. 2016b. Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-55, 178 pp.

NMFS. 2018. 2018 Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-59, 167 pp.

Nowacek, D. P., L. H. Thorne, D. W. Johnston, and P. L. Tyack. 2007. Responses of cetaceans to anthropogenic noise. Mammal Review 37(2):81-115.

NRC. 2003. National Research Council. Ocean Noise and Marine Mammals. Ocean Study Board, National Academy Press, Washington, DC.

NRC. 2012. Climate change: evidence, impacts, and choices. Answers to common questions about the science of climate change. National Research Council of the National Academies.

O'Corry-Crowe, G., T. Gelatt, L. Rea, C. Bonin, and M. Rehberg. 2014. Crossing to safety: dispersal, colonization and mate choice in evolutionarily distinct populations of Steller sea lions, Eumetopias jubatus. Mol.Ecol.23(22):5415-5434.

ONR (Office of Naval Research). 2009. Effects of Stress on Marine Mammals Exposed to Sound. Final Workshop Proceedings, Arlington, VA, 4-5 November 2009. http://www.onr.navy.mil/Science-Technology/Departments/Code-32/All-Programs/Atmosphere-Research 322/~/media/File

Oreskes, N. 2004. Beyond the ivory tower. The scientific consensus on climate change. Science 306(5702):1686.

Overland, J. E., and M. Wang. 2007. Future climate of the North Pacific Ocean. Eos, Transactions American Geophysical Union 88(16):178-182.

Pachauri, R. K., and A. Reisinger. 2007. Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Intergovernmental Panel on Climate Change 1.

Parks, S.E., C.W. Clark, and P.L. Tyack. 2007. Short- and long-term changes in right whale calling behavior: The potential effects of noise on acoustic communication. Journal of the Acoustical Society of America 122 (6):3725-3731.

Parry, M. L. 2007. Climate Change 2007: Impacts, Adaptation and Vulnerability: Working Group II Contribution to the Fourth Assessment Report of the IPCC Intergovernmental Panel on Climate Change, volume 4. Cambridge University Press.

Perry, S. L., D. P. DeMaster, and G. K. Silber. 1999. The great whales: History and status of six species listed as endangered under the U.S. Endangered Species Act of 1973. Marine Fisheries Review 61(1):1-74.

Pitcher, K. W., P. F. Olesiuk, R. F. Brown, M. S. Lowry, S. J. Jeffries, J. L. Sease, W. L. Perryman, C. E. Stinchcomb, and L. F. Lowry. 2007. Abundance and distribution of the eastern North Pacific Steller sea lion (*Eumetopias jubatus*) population. Fishery Bulletin **105**:102-115.

Price, C. S., E. Keane, D. Morin, C. Vaccaro, D. Bean, and J. A. Morris. 2017. Protected species and marine aquaculture interactions. NOAA Technical Memorandum NOS NCCOS 211:85 pp.

Raum-Suryan, K. L., K. W. Pitcher, D. G. Calkins, J. L. Sease, and T. R. Loughlin. 2002. Dispersal, rookery fidelity, and metapopulation structure of Steller sea lions (Eumetopias jubatus) in an increasing and a decreasing population in Alaska. Marine Mammal Science 18:746-764.

Raum-Suryan, K. L., L. A. Jemison, and K. W. Pitcher. 2009. Entanglement of Steller sea lions (Eumetopias jubatus) in marine debris: identifying causes and finding solutions. Marine Pollution Bulletin **58**:1487-1495.

Rea, L.D.,J.M. Castellini, L. Correa, B.S. Fadely and T.M. O'Hara. Maternal Steller sea lion diets elevate fetal mercury concentrations in an area of population decline. Sci. Total Envi. 1: 454-455. https://www.ncbi.nlm.nih.gov/pubmed/23545490

Reichmuth, C. and B.L. Southall. 2011. Underwater hearing in California sea lions (Zalophus californianus): Expansion and interpretation of existing data. Marine Mammal Science 28:358-393.

Reyff, J and C. Heyvaert. 2019. Pile Driving and Drilling Sound Source Verification for White Pass and Yukon Railroad Mooring Installation, Skagway, Alaska. May 2019, updated November 2019. Illingworth and Rodkin, Job No. 18-221, prepared for: PND Engineers, Inc. Seattle, WA. 94 pp.

Richardson, W. J., C. R. Greene, Jr., C. I. Malme, and D. H. Thomson. 1995. Marine Mammals and Noise. Academic Press, Inc., San Diego, CA.

Ripple, W.J., C. Wolf. T.M. Newsome, P. Barnard, and W. Moomaw, and 11,258 Scientist Signatories from 153 Countries, 2019. World Scientists' Warning of a Climate Emergency. Bioscience biz088, Published November 5, 2019. https://doi.org/10.1093/biosci/biz088

Rolland, R. M., K. E. Hunt, S. D. Kraus, and S. K. Wasser. 2005. Assessing reproductive status of right whales (*Eubalaena glacialis*) using fecal hormone metabolites. Gen Comp Endocrinol 142(3):308-17.

Romano, T.A., M.G. Keogh, C. Kelly, P. Feng, L. Berk, C.S. Schlundt, D.A. Carder, and J.J. Finneran. 2004. Anthropogenic sound and marine mammal health: measures of the nervous and immune systems before and after intense sound exposure. Can. J. Fish. Aquat. Sci. 61: 1124–1134.

Rosen, D. A. S., and Kumagai, S. 2008. Hormone changes indicate that winter is a critical period for food shortages in Steller sea lions. Journal of Comparative Physiology B, 178, 573–583.

Salinger, M. J., J. D. Bell, K. Evans, A. J. Hobday, V. Allain, K. Brander, P. Dexter, D. E. Harrison, A. B. Hollowed, B. Lee, and R. Stefanski. 2013. Climate and oceanic fisheries: recent observations and projections and future needs. Climatic Change 119(1):213-221.

Saultis, E., C. Matkin, L. Barrett-Lennard, K. Heise and G. Ellis. 2006. Foraging strategies of sympatric killer whale (Orcinus orca) populations in Prince William Sound, Alaska. Mar. Mamm. Sci. 16(1):94-109.

Schlundt, C. E., J. J. Finneran, D. A. Carder, and S. H. Ridgway. 2000. Temporary shift in masked hearing thresholds of bottlenose dolphins, *Tursiops truncatus*, and white whales, *Delphinapterus leucas*, after exposure to intense tones. Journal of the Acoustical Society Shepherd, J.G., P.G. Brewer, A.Oschlies and A.J. Watson. 2017. of America 107(6):3496-3508.

Shepherd, J.G., P.G. Brewer, A. Oschlies and A.J. Watson. 2017. Ocean ventilation and deoxygenation in a warming world: introduction and overview. Philos. Trans. A Math. Phys. Eng. Sci.. 375(2102): 20170240. Published online 2017 Aug 7. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5559423/

Sigler, M. F., J. N. Womble, and J. J. Vollenweider. 2004. Availability to Steller sea lions (*Eumetopias jubatus*) of a seasonal prey resource: a prespawning aggregation of eulachon (*Thaleichthys pacificus*). Canadian Journal of Fisheries and Aquatic Sciences 61(8):1475-1484.

Skaslki, J., W.H. Pearson and C.I. Malme. 2011. Effects of Sounds from a Geophysical Survey Device on Catch-per-Unit-Effort in a Hook-and-Line Fishery for Rockfish (Sebastes spp.). Canadian Journal of Fisheries and Aquatic Sciences 49 (7):1357-1365.

Sobeck. 2016. Revised Guidance for Treatment of Climate Change in NMFS Endangered Species Act Decisions. Memorandum for NMFS Assistant Administrator for Fisheries to NMFS Leadership Council, June 2016, 10 p.

Southall, B. L., A. E. Bowles, W. T. Ellison, J. J. Finneran, R. L. Gentry, C. R. Greene Jr., D. Kastak, D. R. Ketten, J. H. Miller, P. E. Nachtigall, W. J. Richardson, J. A. Thomas, and P. L. Tyack. 2007. Marine mammal noise exposure criteria: Initial scientific recommendations. Aquatic Mammals 33(4):411-521.

Stimpert, A. K., D. N. Wiley, W. W. L. Au, M. P. Johnson, and R. Arsenault. 2007. ‘Megapclicks’: Acoustic click trains and buzzes produced during night-time foraging of humpback whales (*Megaptera novaeangliae*). Biology Letters 3(5):467-470.

Straley, J.M., G.S. Schorr, A.M. Thode, J. Calambokidis, C.R. Lunsford, E.M. Chenoweth, V.M. O’Connell, and R.D. Andrews. 2014. Depredating sperm whales in the Gulf of Alaska: local habitat use and long distance movements across putative population boundaries. End. Sp. Research 24: 125-135. http://sitkawhalefest.org/wordpress/wp-content/uploads/2013/12/Straley-et-al.-2014.pdf

Straley, J. M. 1990. Fall and winter occurrence of humpback whales (*Megaptera novaeangliae*) in southeastern Alaska. Report of the International Whaling Commission Special Issue 12:319-323.

Straley, J.M., K. Pendell, and G. Ganey. 2018. Marine Mammal Report-Eastern Channel Project. J. Straley Investigations, PO Box 273 Sitka, AK 99835.

Sweeney, K., L. Fritz, R. Towell, and T. Gelatt.2016.Results of Steller sea lion surveys in Alaska, June-July 2016.Memorandum to D. DeMaster, J. Bengtson, J. Balsiger, J. Kurland, and L. Rotterman, December 5, 2016.Available from MarineMammalLaboratory,AFSC,NMFS,7600SandPointWayNE,Seattle,WA 98115.

Sweeney, K., L. Fritz, R. Towell, and T. Gelatt.2017.Results of Steller sea lion surveys in Alaska, June-July 2017.Memorandumto theRecord,December5,2017. Available from

Marine Mammal Laboratory, AFSC, NMFS, 7600 Sand Point Way NE, Seattle, WA 98115.

Thoman, R. & J. E. Walsh. 2019. Alaska's changing environment: documenting Alaska's physical and biological changes through observations. H. R. McFarland, Ed. International Arctic Research Center, University of Alaska Fairbanks.

Thompson, P. O., W. C. Cummings, and S. J. Ha. 1986. Sounds, source levels, and associated behavior of humpback whales, Southeast Alaska. Journal of the Acoustical Society of America 80(3):735-740.

Thorson, P., and J. Reyff. 2006. San Francisco-Oakland Bay bridge east span seismic safety project marine mammals and acoustic monitoring for the marine foundations at piers E2 and T1, January-September 2006. Prepared by SRS Technologies and Illingworth & Rodkin, Inc. for the California Department of Transportation: 51.

Turnagain. 2017. Marine Mammal Monitoring Report from monitoring of Silver Bay in October and November 2017 during construction of the City and Borough of Sitka Gary Paxton Industrial Park (GPIP) Dock. Logs submitted to National Marine Fisheries Service by Turnagain Marine Construction.

Tyack, P.L., and H. Whitehead. 1983. Male competition in large groups of wintering humpback whales. Behaviour 83(1/2):132-154.

van der Hoop, J. M., P. Corkeron, J. Kenney, S. Landry, D. Morin, J. Smith, and M. J. Moore. 2016. Drag from fishing gear entangling North Atlantic right whales. Marine Mammal Science 32(2):619-642.

Wade, P. R., T. J. Quinn II, J. Barlow, C. S. Baker, A. M. Burdin, J. Calambokidis, P. J. Clapham, E. Falcone, J. K. B. Ford, C. M. Gabriele, R. Leduc, D. K. Mattila, L. Rojas-Bracho, J. Straley, B. L. Taylor, J. Urbán R., D. Weller, B. H. Witteveen, and M. Yamaguchi. 2016. Estimates of abundance and migratory destination for North Pacific humpback whales in both summer feeding areas and winter mating and calving areas. Paper SC/66b/IA21 submitted to the Scientific Committee of the International Whaling Commission, June 2016, Bled, Slovenia.

Wartzok, D., A. N. Popper, J. Gordon, and J. Merrill. 2003. Factors Affecting the Responses of Marine Mammals to Acoustic Disturbance. Marine Technology Society Journal 37(4):6-15.

Watkins, W. A. 1986. Whale reactions to human activities in Cape Cod waters. Marine Mammal Science 2(4):251-262.

Watson, R. T., and D. L. Albritton. 2001. Climate change 2001: Synthesis report: Third assessment report of the Intergovernmental Panel on Climate Change. Cambridge University Press.

Whitehead, H., and C. Glass. 1985. Orcas (killer whales) attack humpback whales. Journal of Mammalogy 66(1):183-185.

Wiese, F. K., W. J. Wiseman Jr, and T. I. Van Pelt. 2012. Bering Sea linkages. Deep Sea Research Part II: Topical Studies in Oceanography 65–70:2-5.

Wiese, K. 1996. Sensory capacities of euphausiids in the context of schooling. Marine & Freshwater Beh.and Physiol. 28(3):183-194.

Wieting, D. 2016. Interim Guidance on the Endangered Species Act Term "Harass". National Marine Fisheries Service, Office of Protected Resources. Silver Spring, MD. October 21, 2016.

Windward Project Solutions (Windward). 2017. Marine Mammal Monitoring Report, Sitka Channel and Middle Channel during replacement of Petro Marine's South Channel Fuel Dock. Report submitted to National Marine Fisheries Service on November 7, 2017.

Winn, H. E., P. J. Perkins, and T. C. Poulter. 1970. Sounds of the humpback whale. Pages 39-52 *in* 7th Annual Conference on Biological Sonar and Diving Mammals, Stanford Research Institute, Menlo Park.

Womble, J. N., M. F. Willson, M. F. Sigler, B. P. Kelly, and G. R. VanBlaricom. 2005. Distribution of Steller sea lions Eumetopias jubatus in relation to spring-spawning fish in SE Alaska. Marine Ecology Progress Series 294:271-282.