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

Endangered Species Act Section 7(a)(2) Biological Opinion
O'Connell Bridge Lightering Float Pile Replacement Project, Sitka, Alaska

NMFS Consultation Number: AKRO-2018-00245

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

Affected Species and Determinations:

ESA-Listed Species	Status	Is the Action Likely to Adversely Affect Species?	Is the Action Likely to Adversely Affect Critical Habitat?	Is the Action Likely To Jeopardize the Species?	Is the Action Likely To Destroy or Adversely Modify Critical Habitat?
Humpback Whale, Mexico DPS (*Megaptera novaeangliae*)	Threatened	Yes	N/A	No	N/A
Sperm Whale (*Physeter macrocephalus*)	Endangered	No	N/A	No	N/A
Fin Whale *(Balaenoptera physalus)*	Endangered	No	N/A	No	N/A
North Pacific Right Whale *Eubalaena japonica)*	Endangered	No	No	No	No
Steller Sea Lion, Western DPS (*Eumetopias jubatus)*	Endangered	Yes	No	No	No

Consultation Conducted By: National Marine Fisheries Service, Alaska Region

Issued By:

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

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TERMS AND ABBREVIATIONS

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

1 INTRODUCTION

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

Section 7(b)(3) of the ESA requires that at the conclusion of consultation, NMFS and/or USFWS provide an opinion stating how the Federal agency's action is likely to affect ESA-listed species and their critical habitat. If incidental take is reasonably certain to occur, section 7(b)(4) requires the consulting agency to provide an incidental take statement (ITS) that specifies the impact of any incidental taking, specifies those reasonable and prudent measures necessary to minimize such impact, and sets forth terms and conditions to implement those measures.

For the actions described in this document, the action agencies are the U.S. Army Corps of Engineers (USACE), which proposes to permit the removal and replacement of six existing 16-inch diameter piles located in Sitka Sound, Sitka, Alaska; and NMFS's Office of Protected Resources, Permits and Conservation Division (PR1), which proposes to issue an incidental harassment authorization (IHA) pursuant to section 101(a)(5)(D) of the Marine Mammal Protection Act of 1972, as amended (MMPA) (16 U.S.C. 1361 *et seq.*), to the City and Borough of Sitka (CBS) for harassment of marine mammals incidental to construction operations The consulting agency is NMFS's Alaska Regional Office.

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

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

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

1.1 Background

This opinion is based on information provided to us in the November 2018 IHA application and marine mammal monitoring and mitigation plan (Solstice Alaska Consulting 2018), initiation package (USACE 2018), and the proposed IHA. Other sources of information relied upon included updated project proposals, emails and telephone conversations between NMFS Alaska Region, PR1, and USACE's non-Federal representative (CBS as represented by Solstice Alaska Consulting, Inc.[Solstice]). A complete record of this consultation is on file at NMFS's office in Juneau, Alaska.

The proposed action involves the removal of six existing 16-inch diameter piles, replacing them with six 16-inch diameter piles that are more deeply socketed at the O'Connell Bridge Lightering Float (float) located in Sitka Sound, Sitka, AK, so that it can be used by large vessels (Figure 1).

Figure 1. O'Connell Bridge Lightering Float Location (Solstice Alaska Consulting 2018).

This opinion considers the effects of the repair and operation of the float, and the associated proposed issuance of an IHA. These actions may affect the following species: Mexico distinct population segment (DPS) humpback whales (*Megaptera novaeangliae*), sperm whales (*Physeter macrocephalus*), fin whales *(Balaenoptera physalus)*, North Pacific right whales *Eubalaena japonica)*, and western DPS Steller sea lions (*Eumetopias jubatus*). No designated critical habitat is located within the action area. The nearest designated critical habitat, for Steller sea lions, is Biorka haulout located ~27 km south of the project area.

1.2 Consultation History

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

- **October 29, 2018:** Solstice submitted IHA application and Draft Biological Assessment.
- **October 31, 2018:** NMFS received formal section 7 consultation initiation request from USACE (USACE 2018)
- **November 7, 2018:** NMFS received a letter from USACE designating CBS as represented by Solstice as their non-federal representative.
- **November 18, 2018:** Solstice submitted revised IHA application and Marine Mammal Monitoring and Mitigation Plan
- **December 4, 2018:** NMFS submitted an additional information request on the revised IHA application.
- **December 19, 2018**: NMFS determined that initiation package was sufficient, and initiated consultation with USACE.
- **February 7, 2019:** NMFS's PR1 submitted a request to initiate formal section 7 consultation (NMFS 2019).

NMFS initiated consultation on December 19, 2018, but consultation was held in abeyance for 38 days due to a lapse in appropriations and resulting partial government shutdown. Consultation resumed on January 28, 2019.

2 DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

2.1 Proposed Action

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

This opinion considers the effects of the CBS's repair and operation of the float (to be permitted by the USACE), as well as NMFS PR1's issuance of an IHA to take marine mammals by harassment under the MMPA incidental to these actions in Sitka Sound near Sitka, AK, between June 1, 2019 and May 31, 2020.

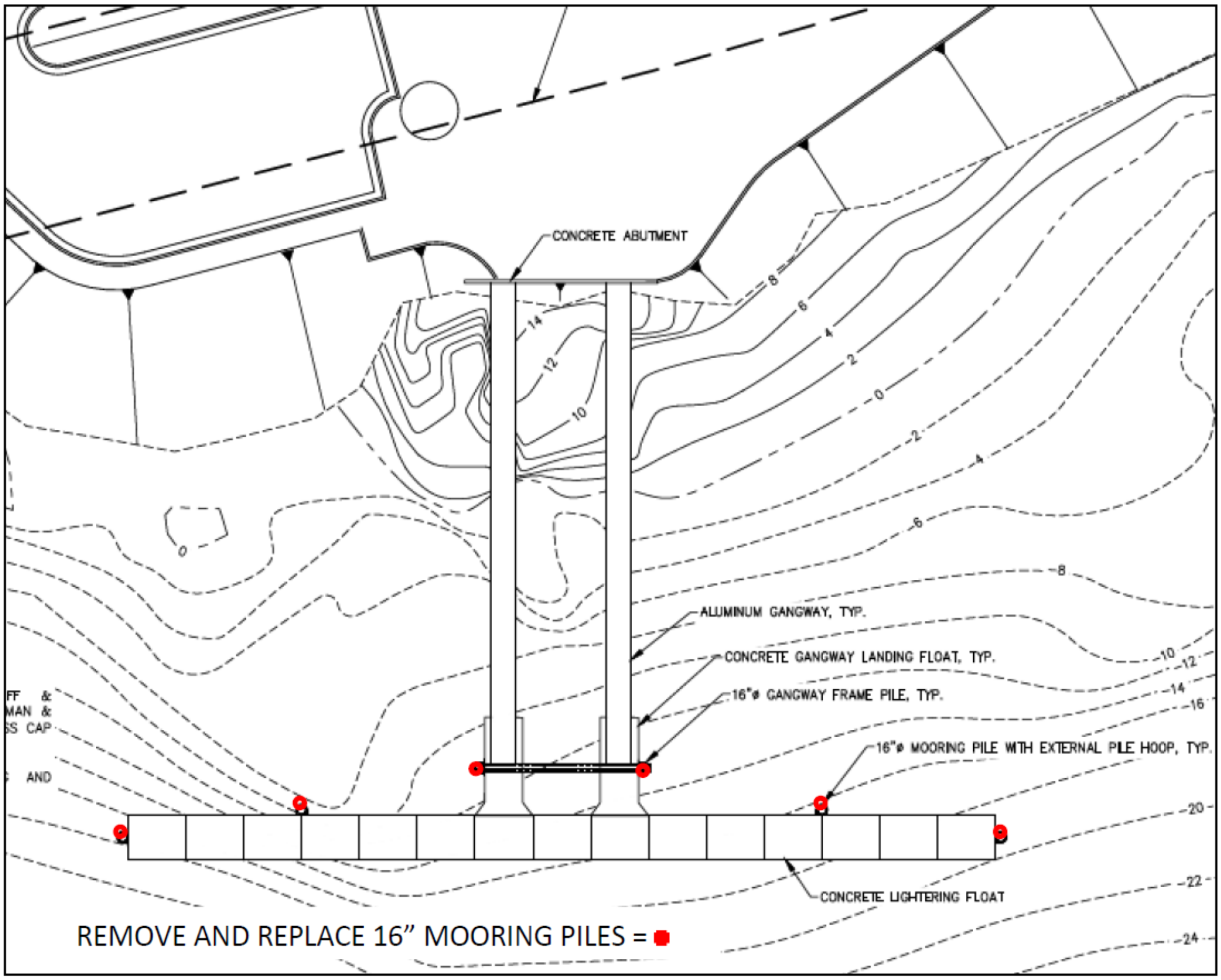

Figure 2. **Site Plan for the proposed Lightering Float Pile Replacement Project (Solstice Alaska Consulting 2018).**

2.1.1 Construction of Dock

In response to demand for larger vessels, the CBS plans to remove and replace the six piles that support the O'Connell Bridge Lightering Float. The existing float consists of two 100-foot long by 5-foot wide aluminum gangways and a 180-foot long by 10-foot wide concrete modular float system restrained by six 16-inch diameter steel pipe piles that are socketed 4 feet deep into bedrock (Figure 2.) The existing piles would be removed and replaced with six new 16-inch diameter steel piles that would be socketed twelve feet deep into bedrock. Pile installation and removal is expected to occur over three days. Construction includes the following activities over and in Sitka Sound:

1. Temporarily remove the existing concrete lightering float and associated aluminum gangways;

2. Remove six 16-inch diameter steel pipe piles that support the float;

3. Install six 6-inch diameter galvanized steel pipe piles;

4. Reinstall the floating dock and gangways.

To remove the existing piles the contractor would attempt to direct pull the piles with a crane. If the direct pull method is ineffective, the piles would be extracted with a vibratory hammer. The new piles would be vertically stabilized by being vibrated into the existing 4-foot deep sockets. Next the piles would be socketed into the underlying bedrock with a down-hole drill and under-reamer bit (the drill will be used first to drill a hole in the bedrock to a depth of approximately 12 feet and then to socket the pile into the bedrock). After the pile is socketed, the contractor may choose to impact proof the piles using an impact hammer to confirm that piles are set into bedrock. (Solstice Alaska Consulting 2018).

2.1.2 Transport of Material and Equipment

Materials and equipment, including the dock, would be transported to the project site by barge. Anchored barges would be used to stage construction materials and equipment. A twenty-five-foot skiff with 250 horse power motor would be used to support dock construction. Vessels are anticipated to transit from Sitka, but may come from other communities following standard transit routes.

2.1.3 Dates and Duration of Activities

Construction is expected to occur over three days. On the first day the existing piles would be removed, and the new piles would be vibrated into position. Over the second and third day, the new piles would be socketed into bedrock. At the end of the third day, the piles would be impact proofed, if necessary. Approximately 0.5 cubic yards total of 3/8-inch aggregate may be placed in the annular space between the piles and the bedrock socket for stability.

Table 1 provides a conservative estimate of the amount of time required for pile installation.

Table 1. Pile Driving Construction Summary (Solstice Alaska Consulting 2018).

Description	Project Component		
	Existing Pile Removal	**Permanent Pile Installation**	**Max Installation/ Removal per Day**
Pile Diameter and Type	16-inch steel	16-inch steel	--
# of Piles	6 piles	6 piles	--
Vibratory Pile Removal/Driving			
Max # of Piles Vibrated Per Day	6 piles	6 piles	12 piles
Vibratory Time Per Pile	5 minutes	5 minutes	--
Vibratory Time per day	30 minutes	30 minutes	60 minutes
Vibratory Time Total	30 minutes	30 minutes	--
Socketing (down-hole drilling)			
Max # of Piles Socketed	0	3 piles	3 piles

Description	Project Component		
	Existing Pile Removal	Permanent Pile Installation	Max Installation/ Removal per Day
per Day			
Socket Time Per Pile	0	2 hours	--
Socket Time per Day	0	6 hours	6 hours
Socket Time Total	0	12 hours	--
Impact Pile Driving			
Max # of Piles Impacted Per Day	0	6 piles	6 piles
# of Strikes Per Pile	0	2-5 strikes	30 strikes
Impact Time Per Pile	0	30 seconds	--
Impact Time per Day	0	3 minutes	3 minutes
Impact Time Total	0	3 minutes	--

2.1.4 Acoustic Sources

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

The following equipment would be used (Solstice Alaska Consulting 2018):

- Vibratory Hammer: ICE 44B/12,450 pounds static weight
- Diesel Impact Hammer: Delmag D46/Max Energy 107,280 ft-pounds
- Drilled shaft drill: Holte 100,000 ft-lb. top drive with down-the-hole (DTH) hammer and bit
- Socket drill: Holte 100,000 ft-lb. top drive with DTH hammer and under-reamer bit

Vibratory Hammer

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

Sound pressure levels[1] are expressed in root mean square[2] (RMS). Source level broadband SPLs for vibratory hammering 16-inch piles for the project are based on measurements of driving 24-inch steel piles at the Naval Base Kitsap in Bangor, Washington ((NAVFAC) 2012) and from acoustic modeling of nearshore marine pile driving at Navy installations in Puget Sound (Navy 2015). Based on this information, we anticipate a source level RMS of 161 dB re 1 uPa at 10 m.

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[1] 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.

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

Impact Hammer

An impact hammer is a steel device that works like a piston. The pile is first moved into position and set in the proper location using a choker cable or vibratory hammer. The impact hammer is held in place by a guide (lead) that aligns the hammer with the pile. A heavy piston moves up and down, striking the top of the pile and driving it into the substrate.

Source level broadband SPLs for impact hammering 16-inch piles for the project are based on measurements of driving 24-inch steel piles at the Kodiak Ferry Terminal project (Denes et al. 2016). Based on this information, we anticipate a source level RMS of 168.2 SEL dB re 1 μPa2s at 10 m (for Level A, or sounds likely to cause injury) and 181.3 SPL dB re 1 μPa at 10 m (for Level B, or behavioral disruption) For more detail on the description of Level A and Level B impacts, see Section 6.1.2.2 Acoustic Thresholds.

DTH Hydro-Hammering

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

Although DTH hydro-hammering has impulsive source components, the high frequency of 1,100 blows/minute combined with long continuous operation intervals of several minutes make its signature noise more like a non-impulsive source and therefore we treat it as such in this opinion.

There is very limited source level and sound source verification data available for DTH. In May 2016, a Numa Patriot 180 hammer was used to drive 24-inch diameter piles at a ferry terminal at Kodiak, AK (Denes et al. 2016, Warner and Austin 2016). Acoustic signatures for DTH hydro-hammering were recorded at ranges of 10–30 m from the pile. In order to be consistent with recent IHAs involving DTH, PR1 and PRD agreed that median RMS valus would be used for estimating source levels. Using the median source levels broadband SPL rms measured from Kodiak, we anticipate a source level RMS of 166.2 dB re 1 uPa at 10 m.

2.1.5 Mitigation Measures

CBS Proposed Mitigation Measures

CBS proposes to incorporate the mitigation measures below to minimize potential impacts from project activities.

General Construction Mitigation Measures

1. The project uses the most compact design possible, while meeting the demands of the vessels that would use the facility.
2. Wood that has been surface or pressure-treated with creosote or treated with pentachlorophenol will not be used. If treated wood must be used, any wood that comes in contact with water will be treated with waterborne preservatives in accordance with

Best Management Practices developed by the Western Wood Preservers Institute (Institute 2017). Treated wood will be inspected before installation to ensure that no superficial deposits of preservative material remain on the wood.
3. The project uses a design that does not require dredging, blasting, or fill.
4. Plans for avoiding, minimizing, and responding to releases of sediments, contaminants, fuels, oil, and other pollutants will be developed and implemented.
5. Spill response equipment will be kept on-site during construction and operation.
6. Floats or barges will not be grounded at any tidal stage.

Pile Driving and Removal Mitigation Measures General Conditions

1. Soft start for impact pile driving—Impact pile driving will begin with an initial set of 3 strikes from the impact hammer at 40 percent energy, followed by a one-minute waiting period, then two subsequent 3-strike sets. 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.
2. All piles will be driven with a vibratory hammer or socketed until a desired depth is achieved (or until refusal) prior to using an impact hammer.
3. To minimize construction noise levels as much as possible, the contractor will first attempt to direct pull old, abandoned piles; if those efforts prove to be ineffective, they will proceed with a vibratory hammer.
4. When the impact hammer is used, a pile cushion will be placed inside the drive cap to reduce noise.
5. The impact hammer will be operated at reduced fuel setting as long as is practicable.

NMFS PR1 Proposed Mitigation

PR1 proposes to issue an IHA for non-lethal "takes"[3] of marine mammals by Level B harassment (as defined by the MMPA) incidental to CBS's proposed action. When issued, the IHA will be valid from June 1, 2019, to May 31, 2020, and will authorize the incidental harassment of one ESA-listed whale species and one ESA-listed sea lion species, as well as three non-ESA-listed whale and pinniped species. Table 2 shows the amount of proposed take for the two ESA-listed species in the proposed IHA.[4]

[3] The MMPA defines "harassment" as "any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild" (referred to as Level A harassment) or "has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering" (referred to as Level B harassment). 16 U.S.C. 1362(18)(A)(i) and (ii). For the purposes of this consultation, NMFS considers that a take by "harassment" – a non-lethal take – occurs when an animal is exposed to certain sound levels described below in Section 6 of this opinion.

[4] Please see proposed IHA for MMPA-authorized takes of marine mammal species not listed under the ESA.

Table 2. Amount of proposed incidental harassment (takes) of ESA-listed species in the proposed IHA

Species	Proposed Authorized Level A Takes	Proposed Authorized Level B Takes
Western DPS Steller sea lion (*Eumatopias jubatus*)	0	1[5]
Mexico DPS Humpback whale (*Megaptera noviaengliae*)	0	1[6]

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

Establishing Exclusion and Disturbance Zones

Exclusion Zone (i.e., shutdown zone) – For all pile driving/removal and DTH hammering activities, CBS will establish an exclusion zone intended to contain the area in which SPLs equal or exceed the auditory injury criteria for cetaceans and pinnipeds. The purpose of an exclusion zone is to define an area within which shutdown of activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area), thus preventing injury (Level A harassment) of marine mammals (see *Response Analysis* Section 6.3).

The shutdown zone will be 10 m in all cases during impact pile driving, vibratory pile driving/removal, and drilling/socketing pile installation for both humpback whales and Steller sea lions, except for drilling activity which will include a 55 m shutdown zone for humpback whales. This will provide a buffer for the calculated Level A isopleths shown in Table 8. The placement of Protected Species Observers (PSOs) during all pile driving and drilling activities (described in detail in the Monitoring and Reporting Section) will ensure shutdown zones are visible.

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

[5] The proposed IHA indicated a requested Level B take of 33 Steller sea lions. Of the proposed takes, 3% are anticipated to occur to ESA-listed western DPS animals. Zero Level A takes are anticipated due to a small level A zone that can be effectively monitored and shut down. The basis for this apportionment is described below in Section 4.3.2

[6] The proposed IHA indicated a requested Level B take of 15 humpback whales. Of the proposed takes, 6.1% are anticipated to occur to ESA-listed Mexico DPS animals. Zero Level A takes are anticipated due to a small level A zone that can be effectively monitored and shut down. The basis for this apportionment is described below in Section 4.3.1.

for documenting instances of Level B harassment. Nominal radial distances for disturbance zones are shown in Table 3.

Table 3. Level B Harassment Monitoring Zones

Pile Driving Noise Source	Monitoring Zones for Take by Level B Harassment (radius from the sound source, in meters)
Vibratory Pile Driving	
16-inch steel removal and installation (12 piles) (~1 hour on 1 day)	5,500
DTH Hydro Hammering	
16-inch steel installation (6 piles) (6 hours per day on 2 days)	7,700
Impact Pile Driving	
16-inch steel installation (6 piles) (~3 minutes per day on 1 day)	265

Given the size of the disturbance zone for vibratory pile driving and DTH drilling (~13 km, however sound will be truncated where land forms block underwater transmission, with a maximum distance of 7.7 km into Camp Coogan Bay; see Figure 3), it is impossible to guarantee that all animals would be observed, or to make comprehensive observations of fine-scale behavioral reactions to sound. Thus, only a portion of the zone would be observed. However, using two PSOs strategically positioned, the observable zone provides a representative sample and extrapolation of take is reasonable. In order to document observed instances of harassment, observers record all marine mammal observations, regardless of location. The observer's location, as well as the location of the pile being driven, should be recorded, and is known from a GPS device. The location of the animal is estimated at a distance from the observer, which is then compared to the location from the pile. It may then be estimated whether the animal was exposed to sound levels constituting incidental harassment on the basis of predicted distances to relevant thresholds in post-processing of observational and acoustic data, and a precise accounting of observed incidences of harassment created. This information may then be used to extrapolate observed takes to reach an approximate understanding of total takes beyond the observable distance. The total number of exposures will be extrapolated by dividing the number of observed animals by the percentage of the monitoring zone that was visible.

Pre-Activity Monitoring – Prior to the start of daily in-water construction activity, or whenever a break in pile driving/removal or drilling of 30 minutes or longer occurs, PSOs will observe the shutdown and monitoring zones for a period of 30 minutes. The shutdown zone will be cleared when a marine mammal has not been observed within the zone for the 30-minute period. If a marine mammal is observed within the shutdown zone, a soft-start cannot proceed until the animal has left the zone or has not been observed for 15 minutes. If the Level B harassment zone has been observed for 30 minutes and non-permitted species are not present within the zone, soft start procedures can commence and work can continue even if visibility becomes impaired within the Level B harassment monitoring zone. When a marine mammal permitted for Level B take is present in the Level B harassment zone, activities may begin and Level B take will be recorded. As stated above, if the entire Level B harassment zone is not visible at the start of construction, piling driving or drilling activities can begin. If work ceases for more than 30 minutes, the pre-activity monitoring of both the Level B harassment and shutdown zone will commence.

Protected Species Observers (PSOs)
Monitoring shall be conducted by NMFS-approved PSOs. Trained observers shall be placed from the best vantage point(s) practicable to monitor for marine mammals and implement shutdown or delay procedures when applicable through communication with the equipment operator. Observer training must be provided prior to project start, and shall include instruction on species identification (sufficient to distinguish the species in the project area), description and categorization of observed behaviors and interpretation of behaviors that may be construed as being reactions to the specified activity, proper completion of data forms, and other basic components of biological monitoring, including tracking of observed animals or groups of animals such that repeat sound exposures may be attributed to individuals (to the extent possible).

Monitoring will be conducted 30 minutes before, at all times during, and 30 minutes after pile driving/removal and drilling activities. In addition, observers shall record all incidents of marine mammal occurrence, regardless of distance from activity, and shall document any behavioral reactions in concert with distance from piles being driven or removed. Pile driving/removal and drilling activities include the time to install or remove a single pile or series of piles, as long as the time elapsed between uses of the pile driving equipment is no more than 30 minutes.

PSOs will scan the waters using binoculars, and/or spotting scopes, and will use a handheld GPS or range-finder device to verify the distance to each sighting from the project site. All PSOs will be trained in marine mammal identification and behaviors and are required to have no other project-related tasks while conducting monitoring. In addition, monitoring will be conducted by qualified observers, who will be placed at the best vantage point(s) practicable to monitor for marine mammals and implement shutdown/delay procedures when applicable by calling for the shutdown to the hammer operator. CBS would adhere to the following observer qualifications:

1. Independent observers (i.e., not construction personnel) are required.
2. At least one observer must have prior experience working as an observer.
3. Other observers may substitute education (degree in biological science or related field) or training for experience.
4. PR1 will require submission and approval of observer CVs.

CBS must ensure that observers have the following additional qualifications:

1. Ability to conduct field observations and collect data according to assigned protocols;
2. Experience or training in the field identification of marine mammals, including the identification of behaviors;
3. Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations;
4. Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates, times, and reason for

implementation of mitigation (or why mitigation was not implemented when required); and marine mammal behavior; and

5. Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.

Two land-based PSOs will be used to monitor the area during all pile driving and removal, and drilling activities. One PSO would monitor from the O’Connell Bridge, which features a high vantage point with unobstructed views of, and close proximity to, the project site. A second monitor will be stationed east of the construction site, likely off Islander Drive. PSOs will work in shifts lasting no longer than 4 hours with at least a 1-hour break between shifts, and will not perform duties as a PSO for more than 12 hours in a 24-hr period to reduce PSO fatigue.

A draft marine mammal monitoring report will be submitted to NMFS within 90 days after the completion of pile driving and removal and drilling activities. It will include an overall description of work completed, a narrative regarding marine mammal sightings, and associated PSO data sheets. Specifically, the report must include:

- Dates and times (begin and end) of all marine mammal monitoring.
- Construction activities occurring during each daily observation period, including how many and what type of piles were driven or removed and by what method (i.e., impact or vibratory).
- Weather parameters and water conditions during each monitoring period (e.g., wind speed, percent cover, visibility, sea state).
- The number of marine mammals observed, by species, relative to the pile location and if pile driving or removal was occurring at time of sighting.
- Age and sex class, if possible, of all marine mammals observed.
- PSO locations during marine mammal monitoring.
- Distances and bearings of each marine mammal observed to the pile being driven or removed for each sighting (if pile driving or removal was occurring at time of sighting).
- Description of any marine mammal behavior patterns during observation, including direction of travel.
- Number of individuals of each species (differentiated by month as appropriate) detected within the monitoring zone, and estimates of number of marine mammals

taken, by species (a correction factor may be applied to total take numbers, as appropriate).

- Detailed information about any implementation of any mitigation triggered (e.g., shutdowns and delays), a description of specific actions that ensued, and resulting behavior of the animal, if any.
- Description of attempts to distinguish between the number of individual animals taken and the number of incidences of take, such as ability to track groups or individuals.

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.

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by the proposed IHA, such as an injury, serious injury, or mortality, CBS would immediately cease the specified activities and report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS:
jolie.harrison@noaa.gov, (301)-427-8420
and the Alaska Regional Stranding Coordinator:
barbara.mahoney@noaa.gov, (907) 271-3448

The report must include the following information:

- Description of the incident;
- Environmental conditions (e.g., Beaufort sea state, visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available).

Activities would not resume until NMFS is able to review the circumstances of the prohibited take. NMFS would work with CBS to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA and ESA compliance. CBS would not be able to resume their activities until notified by NMFS via letter, email, or telephone.

In the event that CBS discovers an injured or dead marine mammal, and the lead PSO determines that the cause of the injury or death is unknown and the death is relatively recent (*e.g.*, in less than a moderate state of decomposition as described in the next paragraph), CBS will immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the Alaska Regional Stranding Coordinator. The report must include the same information identified in the paragraph above. Activities would be able to continue while NMFS reviews the circumstances of the incident. NMFS would work with CBS to determine whether modifications in the activities are appropriate.

In the event that CBS discovers an injured or dead marine mammal and the lead PSO determines that the injury or death is not associated with or related to the activities authorized in the IHA (e.g., previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), CBS will report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the Alaska Regional Stranding Coordinator, within 24 hours of the discovery. CBS will provide photographs, video footage (if available), or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network.

Use of Pile Caps/Cushions
Pile driving softening material (i.e. pile caps/cushions) will be used to minimize noise during vibratory and impact pile driving. 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

Direct Pull
To minimize construction noise levels as much as possible, the contractor will first attempt to direct pull old piles; if those efforts prove to be ineffective, they will proceed with a vibratory hammer.

Reduced Energy
To reduce noise production, the vibratory hammer will be operated at a reduced energy setting (30 to 50 percent of its rated energy).

Soft Start
The use of soft-start procedures are believed to provide additional protection to marine mammals by providing warning and/or giving marine mammals a chance to leave the area prior to the hammer operating at full capacity. For impact pile driving, contractors will be required to provide an initial set of strikes from the hammer at reduced energy, with each strike followed by a 30-second waiting period. This procedure will be conducted a total of three times before impact pile driving begins. Soft start will be implemented at the start of each day's impact pile driving (if more than one day) and at any time following cessation of impact pile driving for a period of thirty minutes or longer. Soft start is not required during vibratory pile driving and removal activities.

Vessel Interactions
The following mitigation measures will be required to avoid or minimize exposure of marine mammals to vessel noise:

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

There are no interdependent or interrelated activities associated with this action. All activities that would not occur but for the action are addressed in this Opinion.

2.2 Action Area

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

The proposed repair project is located at the O'Connell Bridge Lightering Float within Crescent Bay of Sitka Sound near Sitka, Alaska. The action area includes: (1) the area in which construction activities will take place, (2) an ensonified area around the pile removal and installation activities[7] (see Figure 3), and (3) the transit route from other locations in Southeast Alaska to Sitka.

Within this area, the loudest sound source from the proposed action, with the greatest propagation distance, is anticipated to be associated with DTH hydro-hammering. Received levels from DTH hydro-hammering with a source level of 166.2 dB re 1 uPa (rms), may be expected on average to decline to 120 dB re 1 μPa (rms) within ~15,140 km of the pile using a practical spreading (15 Log R) model (Solstice Alaska Consulting 2018). The 120 dB isopleth was chosen because that is where we anticipate DTH hydro-hammering noise levels would approach ambient noise levels (i.e., the point where no measurable effect from the project would occur). However, the action area would be truncated where land masses obstruct underwater sound transmission; thus, the action area is largely confined to marine waters within Eastern Channel of Sitka Sound, extending approximately 7.7 kilometers through Crescent Bay, Middle Channel, and into Eastern Channel and encompassing approximately 7.26 square kilometers (Figure 3).

The action area includes transit areas for mobilization and demobilization of construction equipment. Mobilization and demobilization is anticipated to occur in Southeast Alaska. All vessels associated with project construction will avoid the 3,000 ft (914 m) aquatic zones surrounding any major Steller sea lion rookery or haulout.

[7] See Section 2.1.5 of this opinion for additional details about how this radius was determined.

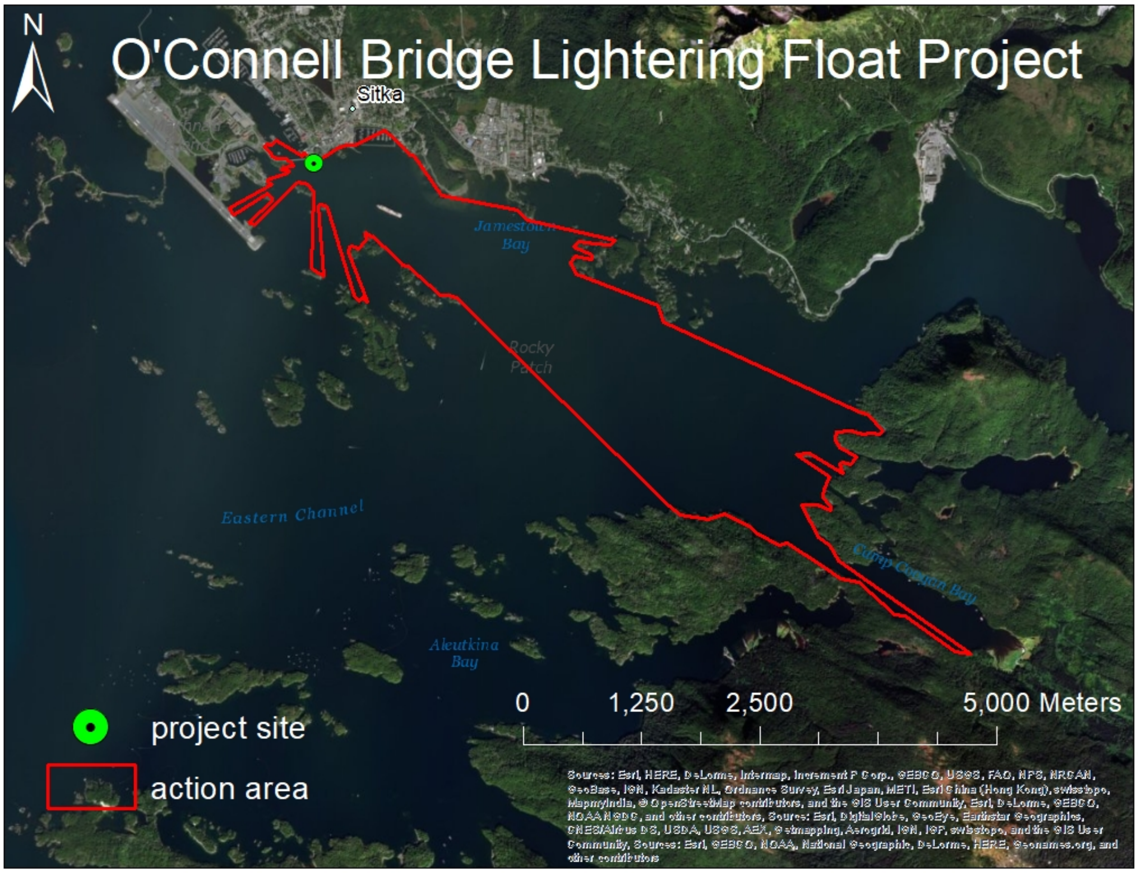

Figure 3. Estimated Level B ensonified area associated with pile installation for the CBS O'Connell Bridge Lightering Float project. The 120 dB isopleth extends approximately 8 km from the sound source (PND Engineers 2018).

3 APPROACH TO THE ASSESSMENT

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

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

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

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

We use the following approach to determine whether the proposed action described in Section 2 is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify those aspects (or stressors) of the proposed action that are likely to have direct or indirect effects on listed species or critical habitat. As part of this step, we identify the action area – the spatial and temporal extent of these direct and indirect effects.
- Identify the range-wide status of the species and critical habitat likely to be adversely affected by the proposed action. This section describes the current status of each listed species and its critical habitat relative to the conditions needed for recovery. We determine the range-wide status of critical habitat by examining the condition of its PBFs - which were identified when the critical habitat was designated. Species and critical habitat status are discussed in Section 4 of this opinion.
- Describe the environmental baseline including: past and present impacts of Federal, state, or private actions and other human activities *in the action area*; anticipated impacts of proposed Federal projects that have already undergone formal or early section 7

consultation; and the impacts of state or private actions that are contemporaneous with the consultation in process. The environmental baseline is discussed in Section 5 of this opinion.

- Analyze the effects of the proposed actions. Identify the listed species that are likely to co-occur with these effects in space and time, and the nature of that co-occurrence (these represent our *exposure analyses*). In this step of our analyses, we try to identify the number, age (or life stage), and sex of the individuals that are likely to be exposed to stressors and the populations or subpopulations those individuals represent. NMFS also evaluates the proposed action's effects on critical habitat features. The effects of the action are described in Section 6 of this opinion with the exposure analysis described in Section 6.2 of this opinion.
- Once we identify which listed species are likely to be exposed to an action's effects and the nature of that exposure, we examine the scientific and commercial data available to determine whether and how those listed species are likely to respond given their exposure (these represent our *response analyses*). Response analysis is considered in Section 6.3 of this opinion.
- Describe any cumulative effects. Cumulative effects, as defined in NMFS's implementing regulations (50 CFR § 402.02), are the effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. Future Federal actions that are unrelated to the proposed action are not considered because they require separate section 7 consultation. Cumulative effects are considered in Section 7 of this opinion.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat. In this step, NMFS adds the effects of the action (Section 6) to the environmental baseline (Section 5) and the cumulative effects (Section 7) to assess whether the action could reasonably be expected to: (1) appreciably reduce the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species and critical habitat (Section 4). Integration and synthesis with risk analyses occurs in Section 8 of this opinion.
- Reach jeopardy and adverse modification conclusions. Conclusions regarding jeopardy and the destruction or adverse modification of critical habitat are presented in Section 9. These conclusions flow from the logic and rationale presented in the Integration and Synthesis Section 8.
- If necessary, define a reasonable and prudent alternative to the proposed action. If, in completing the last step in the analysis, NMFS determines that the action under consultation is likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat, NMFS must identify a reasonable and prudent alternative (RPA) to the action.

4 RANGEWIDE STATUS OF THE SPECIES AND CRITICAL HABITAT

Five species of marine mammals listed under the ESA under NMFS's jurisdiction may occur in the action area. This opinion considers the effects of the proposed action on these species (Table 4). The nearest designated critical habitat for Steller sea lions is Biorka located approximately 50 km southwest of the construction area.

Table 4. Listing status and critical habitat designation for marine mammals considered in this opinion.

Species	Status	Listing	Critical Habitat
Humpback Whale, Mexico DPS *Megaptera novaeangliae*	Threatened	NMFS 1970, 35 FR 18319 NMFS 2016 81 FR 62260	Not designated
Sperm Whale *Physeter macrocephalus*	Endangered	NMFS 1970 35 FR 18319	Not designated
Steller Sea Lion, Western DPS *Eumetopias jubatus*	Endangered	NMFS 1997, 62 FR 24345	1993 58 FR 45269
Fin Whale *Balaenoptera physalus*	Endangered	NMFS 1970 35 FR 12222	Not designated
N. Pacific Right Whale *Eubalaena japonica*	Endangered	NMFS 2008 73 FR 12024	2008 73 FR 19000

4.1 Species and Critical Habitats Not Likely to be Adversely Affected

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

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

4.1.1 Steller Sea Lion Critical Habitat

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

1. Alaska rookeries, haulouts, and associated areas identified at 50 CFR 226.202(a), including:
   1.1. Terrestrial zones that extend 914 m (3,000 ft) landward

1.2. Air zones that extend 914 m (3,000 ft) above the terrestrial zone

1.3. Aquatic zones that extend 914 m (3,000 ft) seaward from each major rookery and major haulout east of 144° W. longitude

1.4. Aquatic zones that extend 37 km (23 mi) seaward from each major rookery and major haulout west of 144° W. longitude

2. Three special aquatic foraging areas identified at 50 CFR 226.202(c):

2.1. Shelikof Strait

2.2. Bogoslof

2.3. Seguam Pass

The ensonified area associated with the project does not overlap with designated critical habitat. The nearest critical habitat is Biorka (blue dot near Sitka in Figure 4) located 50 km southwest of Sitka, and outside of the ensonified area. While transit routes to and from the construction site are currently unknown, mitigation measures require all vessels associated with construction operations to avoid the 3,000 ft (914 m) aquatic zone surrounding any designated critical habitat in Southeast Alaska.

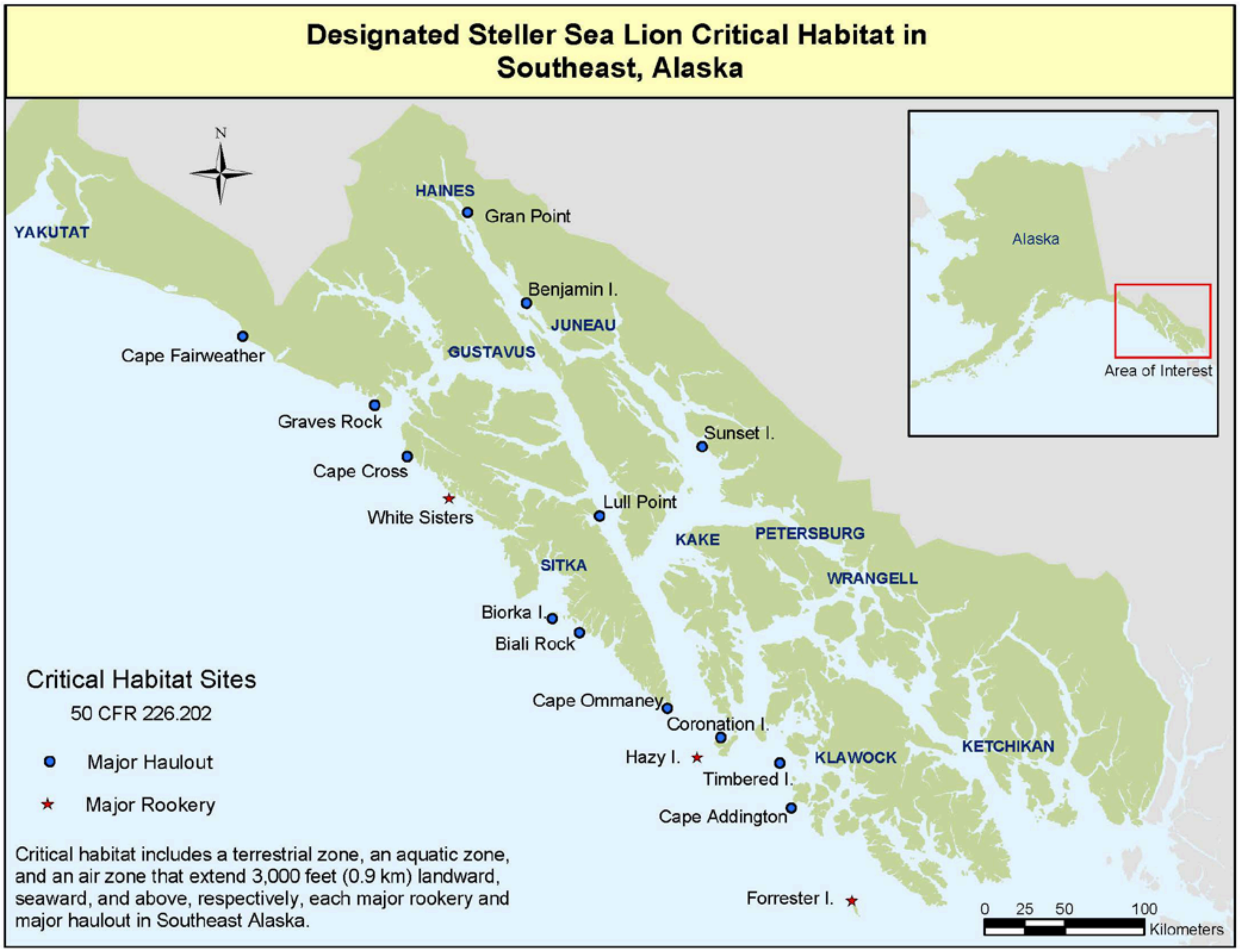

Figure 4. Designated critical habitat for Steller sea lions in Southeast Alaska.

The transit route will not pass near enough to landmasses to encounter hauled-out pinnipeds. It is unlikely that vessel transit will impact critical habitat surrounding haulouts and rookeries to any measurable degree considering vessels will avoid designated aquatic zones. We conclude any impacts to these PBFs are likely to be insignificant.

4.1.2 Fin Whales, North Pacific Right Whales, and Sperm Whales

Although fin whales and North Pacific right whales are shown on NMFS's Species Distribution Mapper as having ranges overlapping with the action area, these species are rare in Southeast Alaska and occur more commonly offshore (Neilson et al. 2012).

Tagged sperm whales have recently been tracked within the Gulf of Alaska, with one whale tracked at the west end of Sitka Sound during August 2016 (SEASWAP 2017). Tagging studies primarily show that sperm whales use the deep water slope habitat extensively for foraging (Mathias et al. 2012). Interaction studies between sperm whales and the longline fishery have been focused along the continental slope of the eastern Gulf of Alaska in water depths between about 1,970 and 3,280 ft (600 and 1,000 m) (Straley et al. 2005, Straley et al. 2014). The shelf-edge/slope waters of the Gulf of Alaska are far outside of the action area. Though we do not expect sperm whales will occur in the action area where pile driving activities will occur, it is possible these species may be encountered during transit from staging areas to the construction site in Sitka Sound. Therefore, it is possible the species may be at risk for vessel strike.

However, it is extremely unlikely that vessels will strike sperm whales, fin whales, or North Pacific right whales for the following reasons:

- Few, if any, sperm whales, fin whales or N. Pacific right whales are likely to be encountered because they are generally found in deeper waters than those in which the transit route will occur.
- Project duration is limited to 3 days.
- NMFS's guidelines for approaching marine mammals discourage vessels approaching within 100 yards of marine mammals

We conclude that the stressors associated with removal and replacement of piles are extremely unlikely to affect fin whales, North Pacific right whales, or sperm whales because they are not anticipated to overlap in time and space, and the effects of ship strike associated with equipment mobilization and demobilization are also extremely unlikely to occur. Therefore, effects to fin whales, North Pacific right whales, and sperm whales are discountable.

4.2 Climate Change

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

The timeframe for the proposed action is three days of construction between June 1, 2019 and May 31, 2020, which is a relatively short duration to detect any noticeable climate change impacts. We present potential climate change effects on listed species and their habitat below. The average global surface temperature rose by 0.85º C from 1880 to 2012, and it continues to rise at an accelerating pace (IPCC 2014b). The 15 warmest years on record since 1880 have occurred in the 21st century, with 2015 being the warmest (NCEI 2016). The warmest year on record for average ocean temperature is also 2015 (NCEI 2016). Since 2000, the Arctic (latitudes between 60º and 90º N) has been warming at more than twice the rate of lower latitudes (Jeffries et al. 2014) due to "Arctic amplification," a characteristic of the global climate system influenced by changes in sea ice extent, atmospheric and oceanic heat transports, cloud cover, black carbon, and many other factors (Serreze and Barry 2011).

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

- Shifting abundances
- Changes in distribution

- Changes in timing of migration
- Changes in periodic life cycles of species

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

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

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

The effects of these changes to the marine ecosystems of the Gulf of Alaska, and how they may affect Steller sea lions, are uncertain. Warmer waters could favor productivity of some species of forage fish, but the impact on recruitment of important prey fish of Steller sea lions is unpredictable. Recruitment of large year-classes of gadids (e.g., pollock) and herring has occurred more often in warm than cool years, but the distribution and recruitment of other fish (e.g., osmerids) could be negatively affected (NMFS 2008c).

As temperatures in the Arctic and subarctic waters are warming and sea ice is diminishing, there is an increased potential for harmful algal blooms that produce toxins to affect marine life (see Figure 5). Biotoxins like domoic acid and saxitoxin may pose a risk to marine mammals in Alaska. In addition, increased temperatures can increase Brucella infections. In the Lefebvre et al. (2016) study of marine mammal tissues across Alaska, 905 individuals from 13 species were sampled including humpback whales, bowhead whales, beluga whales, harbor porpoises, northern fur seals, Steller sea lions, harbor seals, ringed seals, bearded seals, spotted seals, ribbon seals, Pacific walruses, and northern sea otters. Domoic acid was detected in all 13 species examined and had a 38% prevalence in humpback whales, and a 27% prevalence in Steller sea lions. Additionally, fetuses from a beluga whale, a harbor porpoise, and a Steller sea lion contained detectable concentrations of domoic acid documenting maternal toxin transfer in these species. Saxitoxin was detected in 10 of the 13 species, with the highest prevalence in humpback whales (50%) and a 10% prevalence in Steller sea lions (Lefebvre et al. 2016).

Figure 5. Algal toxins detected in 13 species of marine mammals from Southeast Alaska to the Arctic from 2004 to 2013 (Lefebvre et al. 2016).

4.3 Status of Listed Species that are Likely to be Adversely Affected

This opinion examines the status of each species that is likely to be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in the definition of jeopardizing the continued existence of the species under 50 CFR § 402.02.

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

4.3.1 Mexico DPS Humpback Whale

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

Distribution

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

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

Humpback whales are present in Southeast Alaska in all months of the year. Most Southeast Alaska humpback whales winter in low latitudes, but some individuals have been documented over-wintering near Sitka and Juneau (NPS Fact Sheet available at http://www.nps.gov/glba). Late fall and winter whale habitat in Southeast Alaska appears to correlate with areas that have over-wintering herring, such as Sitka Sound (Baker et al. 1985, Straley 1990, Straley 2017).

Humpback whales are most common near the O'Connell Bridge in November, December, and January (Figure 6). In late fall and winter, herring sometimes overwinter in deep fjords in Silver Bay and Eastern Channel of Sitka Sound, and humpback whales aggregate in these areas to feed on them. In summer when prey is dispersed throughout Sitka Sound, humpback whales also disperse throughout the Sound and away from the project area (Straley 2017).

Between September and May between 1994 and 2000, marine biologist Jan Straley conducted weekly land-based surveys of marine mammals from Sitka's Whale Park, located at the entrance to Silver Bay (no surveys were done in June, July, and August). Many humpback whales were observed during these surveys (Straley 2017).

Survey data indicate that the typical group size for humpback whales in the area is between 2 and

4 whales, and approximately 2.18 whales occur in the area per day. The maximum group size is unknown. When present in the area, humpback whales are foraging primarily on herring (Straley 2017).

Most of the humpback whales that are found feeding in Sitka Sound in winter migrate to their mating and calving grounds in Hawaii and Mexico; however, this likely occurs after herring have moved out of the project area. Humpback whales have been documented making this migration in under forty days, allowing whales to feed longer in Alaska before they migrate south for mating and calving activities (Straley 1997, Straley 2017).

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

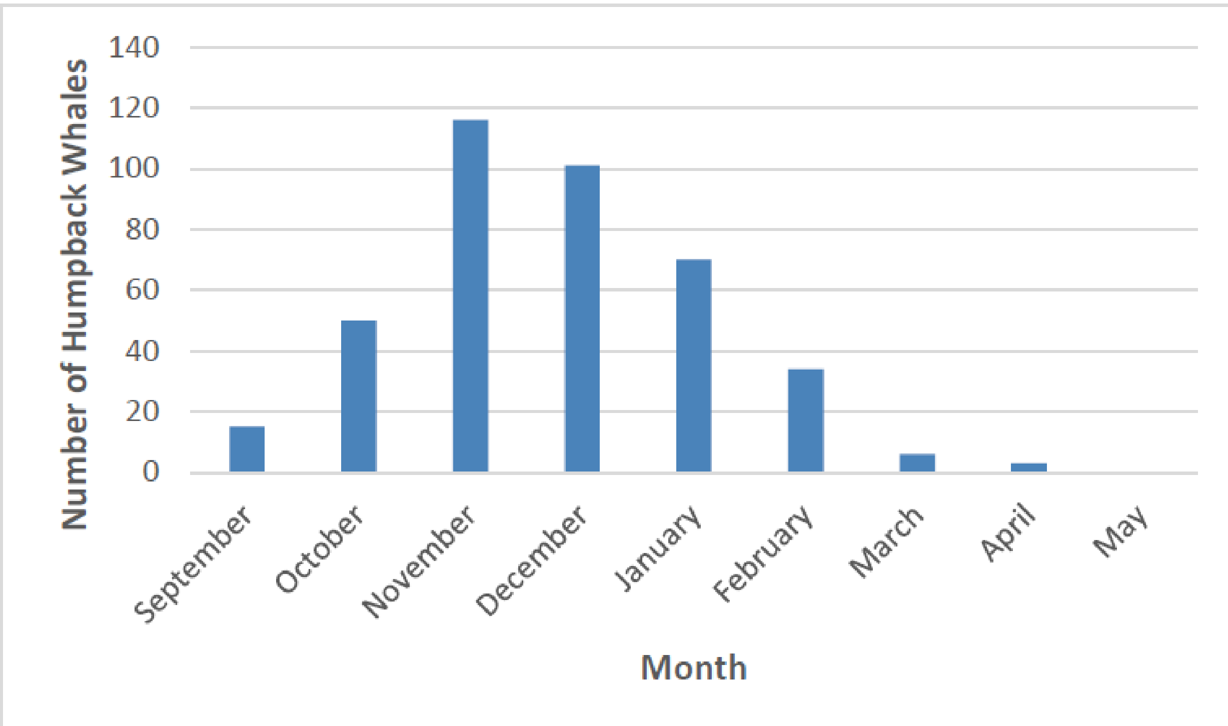

Figure 6. Humpback Whale Counts from Land-Based Surveys at Whale Park, Sitka from September Through May Between 1994 and 2000. (Adapted from Straley 2017).

Ferguson et al. (2015) identified areas around Sitka and overlapping with the action area as a Biologically Important Area (BIA) for humpback whale feeding during summer (June-August) and fall (September-November) (Figure 7).

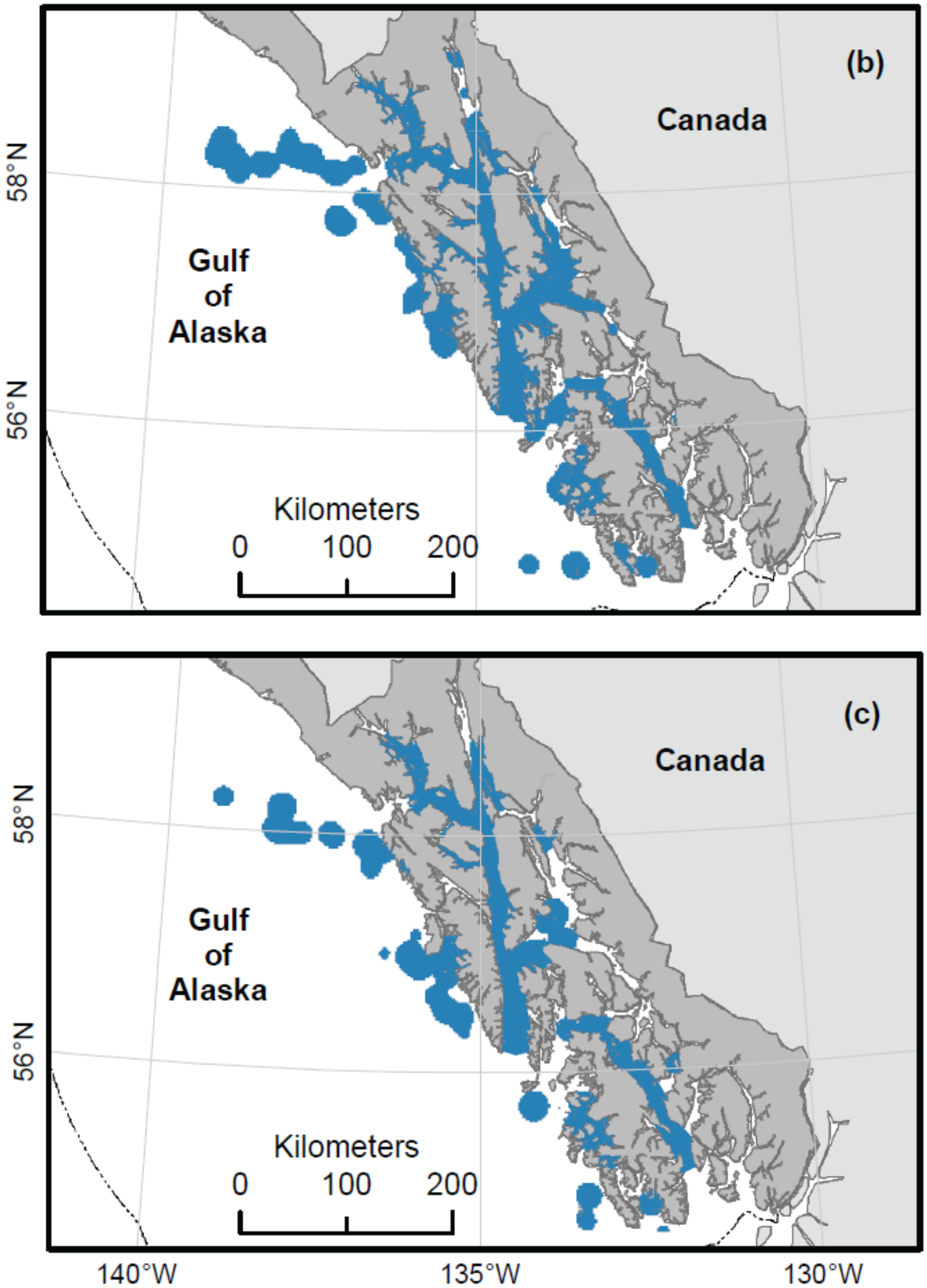

Figure 7. Seasonal humpback whale biologically important feeding areas in Southeast Alaska for (b) summer (June-August), and (c) fall (September-November) (Ferguson et al. 2015), showing overlap with the action area.

Life History

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

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

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

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

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

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

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

1. Complex songs with components ranging from at least 20 Hz–5 kHz with estimated source levels from 144– 174 dB; these are mostly sung by males on the breeding grounds (Winn et al. 1970b, Richardson et al. 1995, Au 2000, Frazer and Mercado 2000, Au et al. 2006a);
2. Social sounds in the breeding areas that extend from 50Hz – more than 10 kHz with most energy below 3kHz (Tyack and Whitehead 1983, Richardson et al. 1995); and
3. Feeding area vocalizations that are less frequent, but tend to be 20 Hz–2 kHz with estimated sources levels in excess of 175 dB re 1 Pa at 1m (Thompson et al. 1986, Richardson et al. 1995).

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

Status and Population Dynamics

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

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

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

Table 5. Probability of encountering humpback whales from each DPS in the North Pacific Ocean (columns) in various feeding areas (on left). Gray highlighted area includes the action area Adapted from Wade et al. (2016).

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

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

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

4.3.2 Western DPS Steller Sea Lion

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

Distribution

Steller sea lions are distributed throughout the northern Pacific Ocean, including coastal and inland waters in Russia (Kuril Islands and the Sea of Okhotsk), east to Alaska, and south to central California (Año Nuevo Island) (Figure 8). Animals from the eastern DPS occur primarily east of Cape Suckling, Alaska (144° W), and animals from the endangered western DPS occur primarily west of Cape Suckling. The western DPS includes Steller sea lions that reside primarily in the central and western Gulf of Alaska, Aleutian Islands, and those that inhabit and breed in the coastal waters of Asia (e.g., Japan and Russia). The eastern DPS includes sea lions living primarily in Southeast Alaska, British Columbia, California, and Oregon.

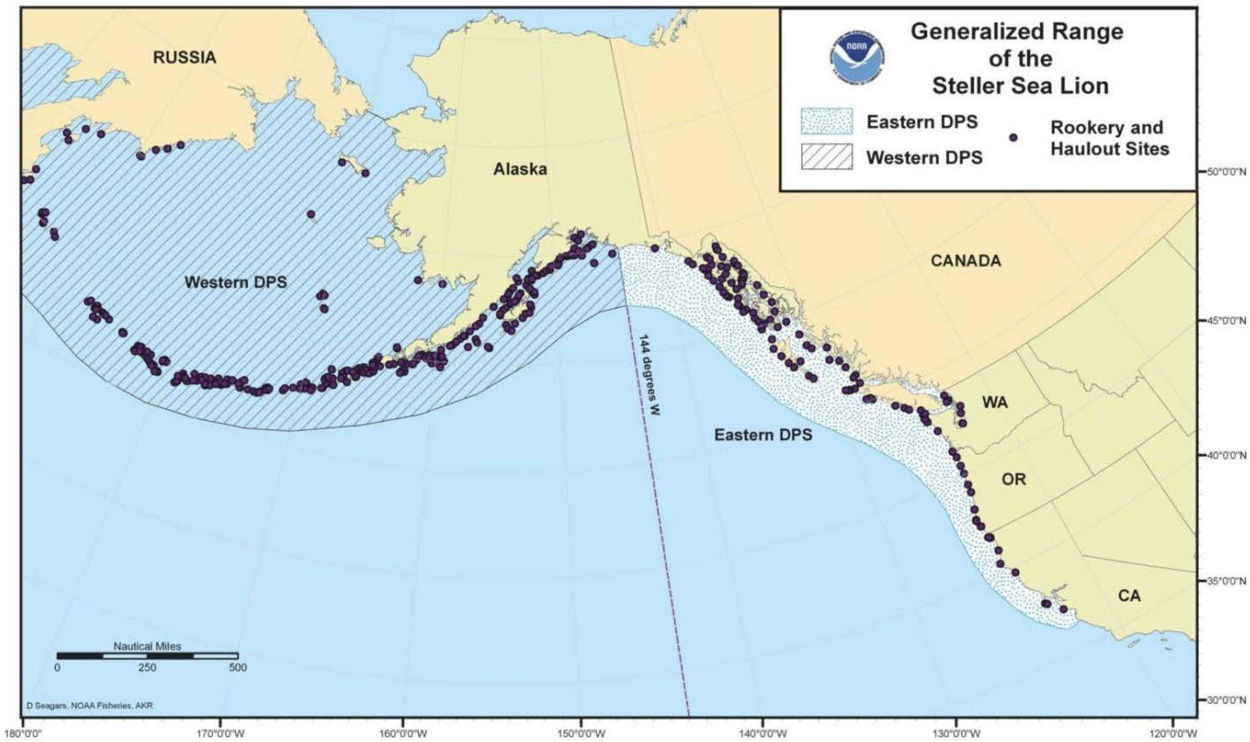

Figure 8. Generalized range of Steller sea lion, including rookery and haulout locations.

<u>Southeast Alaska Distribution</u>

Within the action area, Steller sea lions are anticipated to be a mix of animals from the eastern and western DPSs. Studies have confirmed movement of animals across the 144° W longitude boundary (Raum-Suryan et al. 2002, Pitcher et al. 2007, Fritz et al. 2013, Jemison et al. 2013). Jemison et al. (2013) found regularly occurring temporary movements of western DPS Steller sea lions across the 144° W longitude boundary, and some western DPS females have likely emigrated permanently and given birth at White Sisters and Graves Rock rookeries. The vast majority of these sightings have been in northern Southeast Alaska, north of Frederick Sound (the action area is in northern Southeast Alaska). Fritz et al. (2016) estimated an average annual movement of western DPS Steller sea lions to Southeast Alaska of 1,039 animals. Studies indicate the females from both stocks have produced pups at both Southeast Alaska rookeries: White Sisters and Graves Rock (Gelatt et al. 2007).

Steller sea lions occur year-round in the project area. As noted above, from September to May between 1994 and 2000, marine biologist Jan Straley conducted weekly land-based surveys of marine mammals from Sitka's Whale Park, located at the entrance to Silver Bay (these land based surveys were not performed in June, July, and August). From 2000 to 2016, Straley also collected marine mammal data from small vessels or Allen Marine's 100 foot tour catamarans throughout the year. Based on Straley's surveys, Steller sea lion numbers are highest near the project area, in Silver Bay and Eastern Channel of Sitka Sound, in January and February (Figure 9). Sea lions were often seen in groups of 4 or more; however, a group of more than 100 was sighted on at least 1 occasion (Straley 2017).

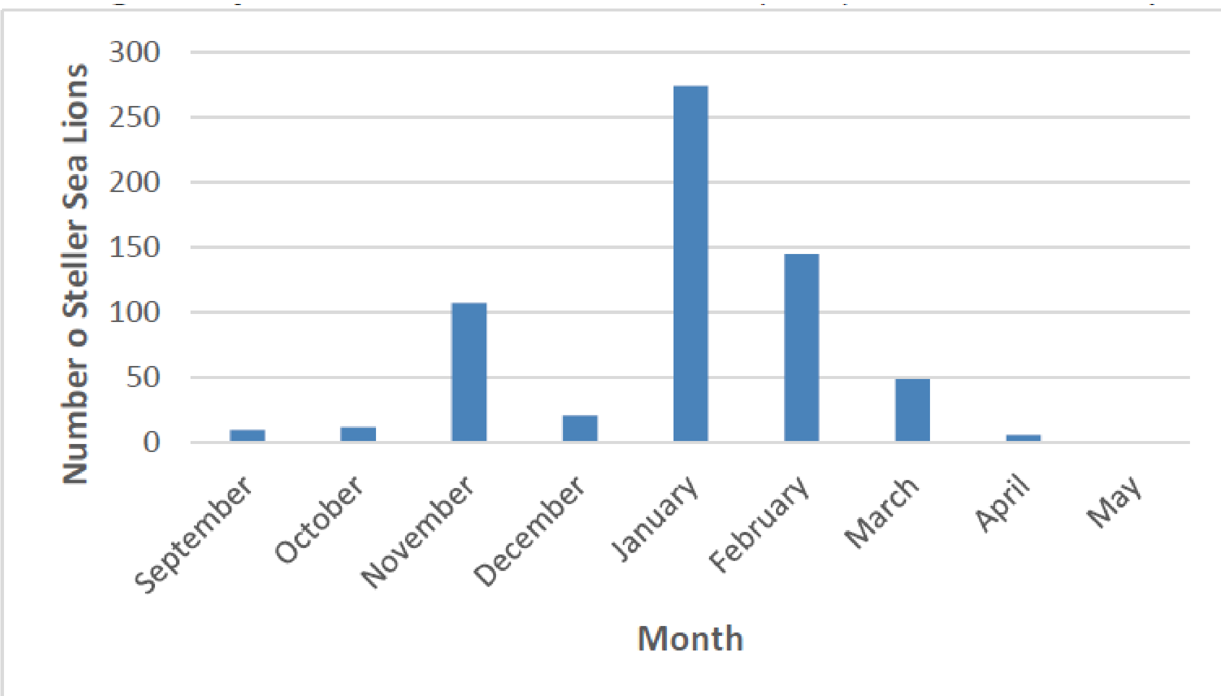

Figure 9. Steller Sea Lion Counts from Land-Based Surveys at Whale Park from September through May between 1994 and 2000. (Adapted from Straley 2017)

Sea lions are residents of the project vicinity and commonly feed in the area. Survey data indicate a typical group of 1-2 sea lions, a maximum group size of over 100 sea lions, and approximately 4 sea lions occurring per day.

Brand data confirm that western DPS Steller sea lions are sometimes present near Sitka Sound. The Biorka haulout (~50 km southwest of the action area) is likely the predominant haulout used by the Steller sea lions that are found transiting into and out of the action area, along with nearby Sea Lion Island, Jacob Rocks, as well as the Biali Rocks rookery. From 2000-2016, 226 unique branded individuals were documented at these sea lion sites nearest Sitka. Of these, three individuals (2%) were from the western DPS, and the remaining 223 (98%) were from the eastern DPS (Jemison 2017). If we assume that branded and unbranded animals follow similar movement patterns, we can conclude that the proportion of western DPS to eastern DPS are equivalent between the branded and unbranded population. We also account for proportions of western population associated with pup production in that region, which has been estimated to increase the percentage (Hastings 2019). Therefore, for purposes of this analysis, NMFS will consider 3% of the total Steller sea lion density in the action area to be from the endangered western DPS and the remaining 97% to be from the unlisted eastern DPS.

The seasonal ecology of Steller sea lions in Southeast Alaska has been studied by relating the distribution of sea lions to prey availability (Womble et al. 2009). Figure 10 depicts a likely seasonal foraging strategy for Steller sea lions in Southeast Alaska. These results suggest that seasonally aggregated high-energy prey species, such as eulachon and herring in late spring and salmon in summer and fall, influence the seasonal distribution of Steller sea lions in some areas of Southeast Alaska (Womble et al. 2009).

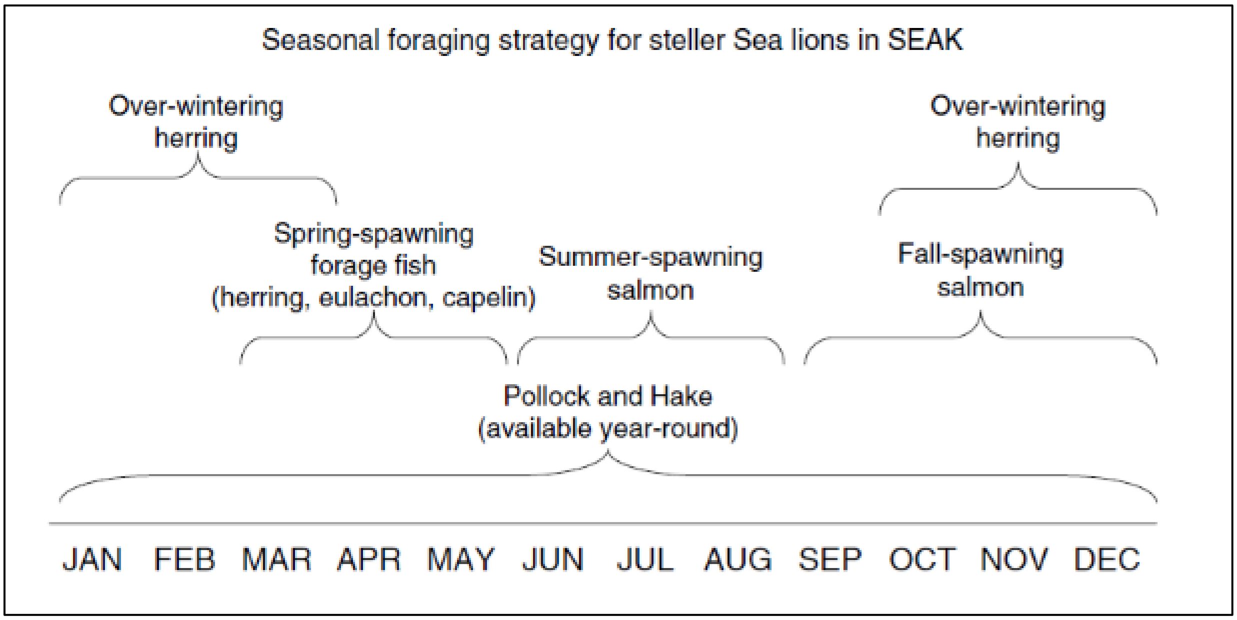

Figure 10. Seasonal foraging ecology of Steller sea lions in Southeast Alaska (Womble et al. 2009).

The action area and surrounding waters contain abundant sources of prey species, which draw Steller sea lions in to forage year-round. In particular, herring overwinter in Silver Bay attracting high numbers of Steller sea lions (Womble et al. 2009).

Life History

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

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

The ability to detect sound and communicate underwater and in-air is important for a variety of Steller sea lion life functions, including reproduction and predator avoidance. NMFS categorizes Steller sea lions in the otariid pinniped functional hearing group with an applied frequency range between 60 and 39 kHz in water (NMFS 2018).

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

Population Dynamics

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

Status

The Steller sea lion was listed as a threatened species under the ESA on November 26, 1990 (55 FR 49204). In 1997, NMFS reclassified Steller sea lions as two DPSs based on genetic studies and other information (62 FR 24345); at that time the eastern DPS was listed as threatened and the western DPS was listed as endangered. On November 4, 2013, the eastern DPS was removed from the endangered species list (78 FR 66140).

Steller sea lions are hunted for subsistence purposes. As of 2009, data on community subsistence harvest are no longer being consistently collected; therefore, the most recent estimate of annual statewide (excluding St. Paul Island) harvest[8] is 172 individuals from the 5-year period from 2004 to 2008. More recent data from St. Paul and St. George are available; the annual harvest is 30 and 2.4 sea lions respectively from the 5-year period from 2011 to 2015. This results in a total harvest of 204 individuals (172+30+2.4) (Muto et al. 2017, 2018). In addition, data were collected on Alaska Native harvest of Steller sea lions for 7 communities on Kodiak Island for 2011 and 15 communities in Southcentral Alaska in 2014; the Alaska Native Harbor Seal Commission and ADF&G estimated a total of 20 adult sea lions were harvested on Kodiak Island in 2011, and 7.9 sea lions (CI = 6-15.3) were harvested in Southcentral Alaska in 2014, with adults comprising 84% of the harvest (Muto et al. 2017, 2018).

Additional threats to the species include environmental variability, competition with fisheries, predation by killer whales, toxic substances, incidental take due to interactions with active

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

fishing gear, illegal shooting, entanglement in marine debris, disease and parasites, and disturbance from vessel traffic, tourism, and research activities. All threats to the species in the action area are discussed further in Section 5 of this opinion.

Critical Habitat

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

5 ENVIRONMENTAL BASELINE

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

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

5.1 Factors Affecting Species within the Action Area

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

"Alaska Marine Mammal Stock Assessments, 2017" (Muto et al. 2018).

- Available online at https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region

"Recovery Plan for the Steller Sea Lion, Eastern and Western Distinct Population Segments (*Eumetopias jubatus*)" (NMFS 2008a)

- Available online at https://alaskafisheries.noaa.gov/sites/default/files/sslrpfinalrev030408.pdf

"Status Review of the Humpback Whale (*Megaptera novaeangliae*)" (Bettridge et al. 2015)

- Available online at http://www.nmfs.noaa.gov/pr/species/Status%20Reviews/humpback_whale_sr_2015.pdf

5.1.1 Climate Change

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

Climate change has the potential to impact species abundance, geographic distribution, migration patterns, timing of seasonal activities (IPCC 2014a), and species viability into the future. Climate change is also expected to result in the expansion of low oxygen zones in the marine environment (Gilly et al. 2013). Though predicting the precise consequences of climate change on highly mobile marine species, such as many of those considered in this opinion, is difficult (Simmonds and Isaac 2007), recent research has indicated a range of consequences already occurring.

The indirect effects of climate change would result from changes in the distribution of temperatures suitable for the distribution and abundance of prey and the distribution and abundance of competitors or predators. For example, variations in the localized recruitment of herring in or near the action area caused by climate change could change the distribution and localized abundance of humpback whales. However, we have no information to indicate that this has happened to date. Warmer waters could favor productivity of some species of forage fish in the action area, but the impact on recruitment of important prey fish of Steller sea lions is unpredictable. Recruitment of large year-classes of gadids (e.g., pollock) and herring has occurred more often in warm than cool years, but the distribution and recruitment of other fish (e.g., osmerids) could be negatively affected (NMFS 2008a).

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

5.1.2 Fisheries

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

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

Based on events that have not been attributed to a specific fishery listed on the MMPA List of Fisheries (82 FR 3655; January 12, 2017), the minimum mean annual mortality and serious injury rate from gear entanglements in unknown fisheries is 8.8 humpback whales for the Central North Pacific stock 2011-2015 (Muto et al. 2018).

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

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

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

5.1.3 Fishing Gear and Marine Debris Entanglement

Although the Steller Sea Lion Recovery Plan (NMFS 2008b) ranked interactions with fishing gear and marine debris as a low threat to the recovery of the western DPS, it is likely that many entangled sea lions may be unable to swim to shore once entangled, may die at sea, and may not be available to count (Loughlin 1986, Raum-Suryan et al. 2009). Based on data collected by ADF&G and NMFS, Helker *et al.* (2016) reported Steller sea lions to be the most common species of human-caused mortality and serious injury between 2011 and 2015. There were 468 cases of serious injuries to eastern DPS Steller sea lions from interactions with fishing gear and marine debris. While these cases are attributed to the eastern DPS because they occurred east of 144° W, eastern and western DPS animals overlap in Southeast Alaska, and these takes may have been western DPS animals. Raum-Suryan et al. (2009) observed a minimum of 386 animals either entangled in marine debris or having ingested fishing gear over the period 2000-2007 in Southeast Alaska and northern British Columbia. Over the same period, there were 241 cases of mortality and serious injury reported for the western DPS: 31 in U.S. commercial fisheries, 1.4 in unknown fisheries (commercial, recreational, or subsistence), 2 in marine debris, 2.6 due to other causes (arrow strike, entangled in hatchery net, illegal shooting, research), and 204 in subsistence harvest. These animals mostly interacted with observed trawl (13) longline (2.8) troll (1), and gillnet (15) fisheries, typically resulting in death (Muto et al. 2018).

5.1.4 Harvest

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

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

As of 2009, data on community subsistence harvest are no longer being collected for Steller sea lions; therefore, the most recent estimate of annual statewide (excluding St. Paul Island and St. George) harvest[9] is 172 individuals from the 5-year period from 2004 to 2008. More recent data from the Pribilof Islands are available; the mean annual harvest is 32 sea lions from the 5-year period from 2011 to 2015 for a total of 204 Steller sea lions/year (Muto et al. 2018). More subsistence harvest data are presented above in the Status of the Species section.

5.1.5 Natural and Anthropogenic Noise

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

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

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

Because responses to anthropogenic noise vary among species and individuals within species, it is difficult to determine long-term effects. Habitat abandonment due to anthropogenic noise exposure has been found in terrestrial species (Francis and Barber 2013). Clark et al. (2009a)

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

identified increasing levels of anthropogenic noise as a habitat concern for whales because of its potential effect on their ability to communicate (i.e., masking). Some research (Parks 2003, McDonald et al. 2006, Parks 2009) suggests marine mammals compensate for masking by changing the frequency, source level, redundancy, and timing of their calls. However, the long-term implications of these adjustments, if any, are currently unknown.

5.1.5.1 *Noise Related to Construction Activities*

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

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

In 2018 NMFS conducted two consultations with PR1 on the issuance of IHAs to take marine mammals incidental to dock and ferry terminal construction in Southeast Alaska (Ketchikan Berth, and Tenakee Springs Ferry Terminal). The incidental take statements in the two biological opinions estimated 1,159 western DPS Steller sea lions and 36 Mexico DPS humpback whales, total, would be taken (by Level B harassment) as a result of exposure to continuous sounds at received levels at or above 120 dB re 1 μPa_{rms} and impulsive sounds at received levels at or above 160 dB re 1 μPa_{rms}. No Level A harassment was authorized.

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

5.1.6 Pollutants and Discharges

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

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

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

The Vessel Incidental Discharge Act (VIDA), signed into law on December 4, 2018, establishes a new framework for the regulation of vessel incidental discharges under CWA Section 312(p). VIDA requires EPA to develop performance standards for those discharges within two years of enactment and requires the U.S. Coast Guard to develop implementation, compliance, and enforcement regulations within two years of EPA's promulgation of standards.

Under VIDA, all provisions of the Vessel General Permit remain in force and effect until the U.S. Coast Guard regulations are finalized.

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

5.1.7 Scientific Research

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

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

5.1.7.1 *Whales*

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

Currently permitted research activities include:

- Counting/surveying
- Opportunistic collection of sloughed skin and remains
- Behavioral and monitoring observations
- Various types of photography and videography
- Skin and blubber biopsy sampling
- Fecal sampling

- Suction-cup, dart/barb, satellite, and dorsal fin/ridge tagging

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

5.1.7.2 *Pinnipeds*

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

Out of the 16 research permits active in 2016, two permits (Permit Nos. 15142 and 15324) include behavioral observations, counting/surveying, photo-identification, and capture and restraint (by hand, net, cage, or board), for the purposes of performing the following procedures:

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

Permit Nos. 15142 and 15324 also include incidental harassment of non-target seals during the course of performing the permitted activities. Two additional permits (Permits Nos. 14610 and 18537) include harassment takes of bearded and ringed seals incidental to permitted research activities, and targeting bowhead whales and western DPS Steller sea lions respectively. Permit 18537 has the potential for overlapping in time and space with the O'Connell Bridge Lightering Float project, but is focused primarily on haulouts and rookeries located outside the action area.

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

5.1.8 Vessel Interactions

Ship strikes and other interactions with vessels unrelated to fisheries occur frequently with humpback whales. Neilson et al. (2012) summarized 108 large whale ship-strike events in Alaska from 1978 to 2011, 25 of which are known to have resulted in the whale's death. Eighty-six percent of these reports involved humpback whales. The minimum mean annual mortality and serious injury rate due to ship strikes reported in Alaska is 2.7 Central North Pacific humpback whales per year between 2010 and 2014. Most vessel collisions with humpbacks are reported from Southeast Alaska (Muto et al. 2017, 2018).

Neilson et al. (2012) also reported the following summary statements about humpback whale and vessel collisions in Southeast Alaska.

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

Further, the authors used previous locations of whale strikes to produce this kernel density estimation. The high risk areas shown in red in Figure 11 are also popular whale-watching destinations (Neilson et al. 2012). The action area is identified as an area of medium risk in this analysis.

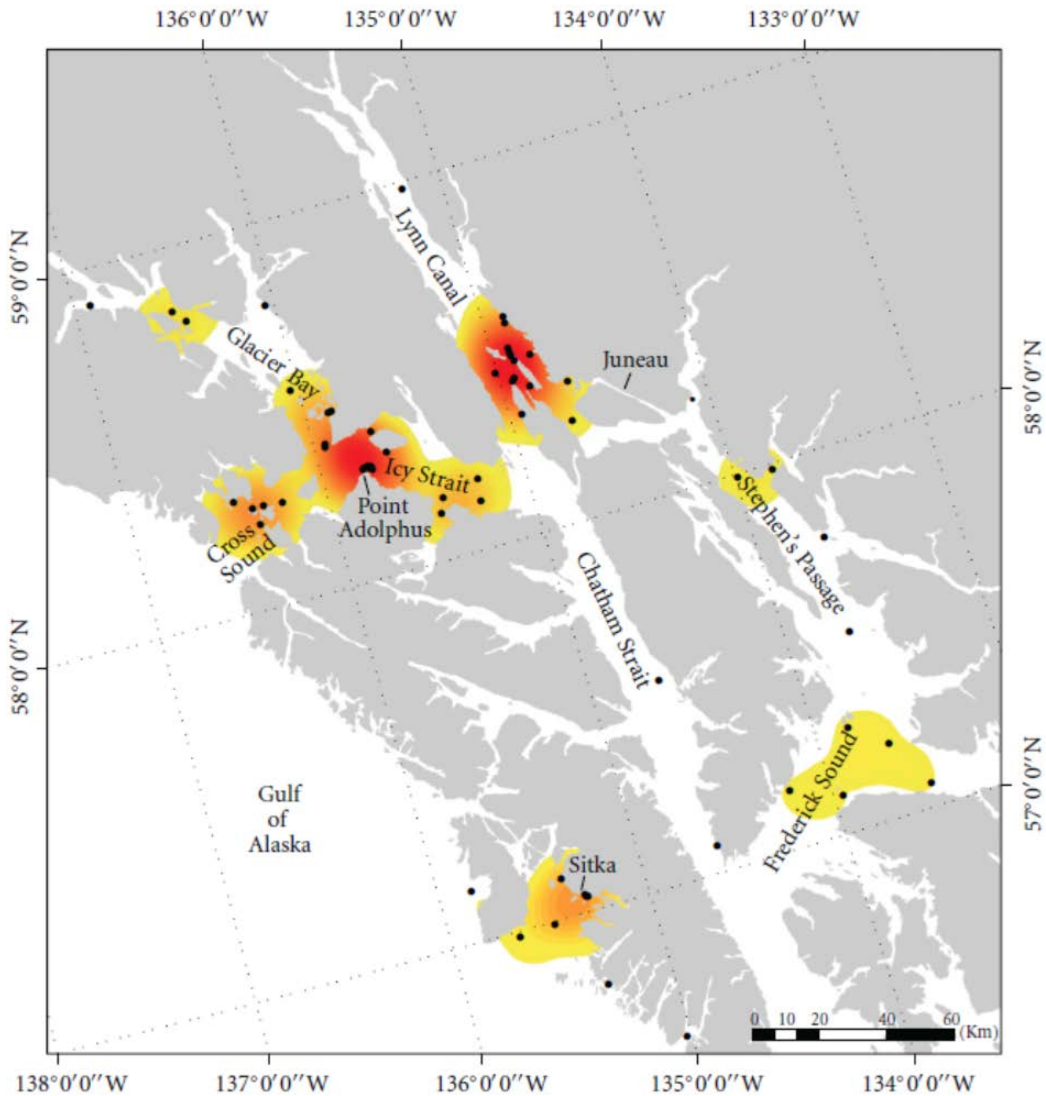

Figure 11. High Risk Areas for Vessel Strike in northern Southeast Alaska. Used with permission from (Neilson et al. 2012).

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

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

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

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

There are at least four documented occurrences of Steller sea lions being struck by vessels in Southeast Alaska; three were near Sitka, and one was south of Juneau. Although risk of ship strike has not been identified as a significant concern for Steller sea lions (Loughlin and York 2000), the recovery plan for this species states that Steller sea lions may be more susceptible to ship strike mortality or injury in harbors or in areas where animals are concentrated (e.g., near rookeries or haulouts) (NMFS 2008a).

NMFS's guidelines for approaching marine mammals discourage vessels approaching within 100 yards of animals. There is no designated critical habitat for Steller sea lions within the ensonified portion of the action area, and vessels will stay 3,000 ft away from any designated critical habitat during transit.

5.1.9 Environmental Baseline Summary

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

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

6 EFFECTS OF THE ACTION

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

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

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

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

6.1 Stressors

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

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

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

6.1.1 Stressors Not Likely to Adversely Affect ESA-listed Species

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

6.1.1.1 *Vibratory and Impact Pile Driving Airborne Noise*

Airborne noises could affect hauled out pinnipeds. Loud noises can cause hauled-out pinnipeds to flush back into the water, leading to disturbance and possible injury. Noise generated during pile driving and removal activities would attenuate to the harbor seal in-air threshold (90 dB) at approximately 53 m and attenuate to the threshold for other pinnipeds (e.g., Steller sea lions) (100 dB) at approximately 17m (Solstice Alaska Consulting 2018).

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

6.1.1.2 *Vessel Strike*

The possibility of vessel strike is extremely unlikely. While there have been a limited number of vessel strikes reported near Sitka, these involved vessels transiting at high speeds. During construction activities vessel speed will be very low (i.e., 2 km/hr [1 kt] or less), and the maximum transit speed for tug and barge vessels proposed for use is 18.5 km/hr (8-10 kts). Once vessels get to the construction site, they will be anchored.

The proposed lightering float will facilitate larger vessels, specifically yachts, fish processors, and research vessels. The purpose of this project is to accommodate existing vessels that need a place to dock for short stays in Sitka. Therefore, this project is not expected to increase vessel traffic in Alaskan waters (Solstice Alaska Consulting 2018).

In Southeast Alaska, there have been 25 reports of humpback whale collisions with vessels and one report of a Steller sea lions collision between 2010 and 2016 (see Figure 11) (NMFS 2016d). Between 2011 and 2015 the mean minimum annual human-caused mortality and serious injury rate for humpback whales based on vessel collisions in Alaska was reported in the NMFS Alaska Regional Office stranding database as 0.4 (Muto et al. 2018). However, these incidences account for a small fraction of the total humpback whale population (Laist et al. 2001).

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

Mitigation measures described in Section 2.1.5 require all vessels associated with project construction to avoid the 3,000 ft (914 m) designated aquatic zones surrounding major Steller sea lion rookeries or haulout locations east of 144°W longitude. Operations of the lightering dock are not expected to increase vessel traffic. Finally, construction will only last ~3 days. All of these factors limit the risk of strike. We conclude the probability of strike occurring is extremely unlikely and therefore effects are discountable.

6.1.1.3 *Disturbance of Seafloor*

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

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

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

6.1.1.4 *Underwater Sounds from Vessels*

There are two phases of vessel noise and associated disturbance related to the proposed action. The first is vessel noise associated with construction, and the second is vessel noise associated with operation of the lightering float.

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

Vessel noise associated with this action will be transmitted through water and constitutes a continuous noise source. NMFS anticipates that whenever noise is produced from vessel operations, it may overlap with western DPS Steller sea lions and Mexico DPS humpback whales, and that some individuals are likely to be exposed to these continuous noise sources. Broadband source levels for tugs and barges have been measured at 145 to 170 dB re 1 μPa, and 170 to 180 dB re 1μPa for small ships and supply vessels (Richardson et al. 1995). Sound from vessels within this size range would reach the 120 dB threshold distances between 86 m and 233 m (282 and 764 feet) from the source (Richardson et al. 1995). Listed cetaceans and pinnipeds have the potential to overlap with vessel noise associated with the proposed construction activities.

Ferries, cruise ships, yachts, fishing vessels and tenders, barges, tugboats, and other commercial and recreational vessels use Sitka Sound and Sitka harbors (CBS 2017, Nuka 2012). May through October there is an increase in vessel traffic due to peak fishing season and an increase in cruise ships and associated recreational vessels (Nuka 2012). Sitka Harbor Department supports several fish processing facilities, wharfs, seaplane floats, and five city operated harbors (World Port Source 2018).

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

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

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

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

The action area does not include Steller sea lion critical habitat, and the mitigation measures in Section 2.1.5 require all vessels associated with project construction will avoid the 3,000 ft (914 m) designated aquatic zones surrounding any major rookery or haulout as they transit to and from the project site. The limited number of vessels associated with the proposed actions are anticipated to be transiting at speeds of 10 knots or less, and vessels will primarily be anchored at the construction site unless deploying people or supplies.

We anticipate low level exposure of short-term duration to listed marine mammals from vessel noise, and do not expect significant behavioral reactions. We anticipate that noise associated with transiting vessels would drop to 120 dB within 233 meters (or less) of most vessels associated with the proposed action (Richardson et al. 1995). Considering that regulations restrict approaching humpback whales within 100 yards, a Steller sea lion or humpback whale that perceived the vessel noise at that distance is likely to ignore such a signal and devote its attentional resources to stimuli in its local environment. If animals do respond, they may exhibit slight deflection from the noise source, engage in low-level avoidance behavior, short-term vigilance behavior, or short-term masking response behavior, but these behaviors are not likely to result in adverse consequences for the animals. The nature and duration of response is not anticipated to be a significant disruption of important behavioral patterns such as feeding or resting. Temporary avoidance of the action area is not likely to adversely affect these species. Therefore, the impact of vessel transit on Mexico DPS humpback whales and western DPS Steller sea lions is not anticipated to reach the level of harassment under the ESA, and is considered insignificant.

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

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

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

We also determined the impact from underwater noise from vessels is considered insignificant. Although these stressors individually are not likely to adversely affect listed species, the effects of these stressors combined are considered and addressed in the Integration and Synthesis portion of the opinion.

6.1.2 Stressors Likely to Adversely Affect ESA-listed Species

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

6.1.2.1 *Sound Measurements Used in this Document*

"Sound pressure" is the sound force per unit micropascals (μPa), where 1 pascal (Pa) is the pressure resulting from a force of one newton exerted over an area of one square meter. "Sound pressure level" is expressed as the ratio of a measured sound pressure and a reference level. The commonly used reference pressure in underwater acoustics is 1 μPa, and the units for sound pressure levels are decibels (dB) re 1 μPa. Sound pressure level (in dB) = 20 log (pressure/reference pressure).

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

6.1.2.2 *Acoustic Thresholds*

As discussed in Section 2, *Description of the Proposed Action*, CBS intends to use a wide variety of noise-generating equipment in the action area (see Section 2.1.4).

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

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

Under the PTS/TTS Technical Guidance, NMFS uses the following thresholds for underwater sounds that cause injury, referred to as Level A harassment under section 3(18)(A)(i) of the MMPA (NMFS 2018). These acoustic thresholds are presented using dual metrics of cumulative sound exposure level (L_E) and peak sound level (PK) for impulsive sounds[10] and L_E for non-impulsive sounds (see Table 6):

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

Table 6. PTS Onset Acoustic Thresholds for Level A Harassment (NMFS 2018).

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

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

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

- 100 dB re 20µPa$_{rms}$ for non-harbor seal pinnipeds

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

While the ESA does not define "harass," NMFS recently issued guidance interpreting the term "harass" under the ESA as to: "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (Wieting 2016). For the purposes of this consultation, any action that amounts to incidental harassment under the MMPA—whether Level A or Level B—constitutes an incidental "take" under the ESA and must be authorized by the ITS (see Section 10).

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

6.2 Exposure

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

Table 8 provides the modeled distances to Level A and Level B exposure thresholds from continuous and impulsive noise sources used to estimate potential exposure to ESA-listed species (Solstice Alaska Consulting 2018).

6.2.1 Exposure to Major Noise Sources

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

Assumptions

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

For the continuous noise sources of vibratory pile driving and DTH, there may be an accumulation of sound caused by both activities during a full 8 hour day when calculating Level A harassment isopleths.

Exposure Assumptions

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

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

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

Mitigation measures will be required through the MMPA permitting process to reduce the adverse effects of exposure to major noise sources on marine mammals from the proposed construction activities. These include the use of shutdown zone, employment of PSOs, and soft start procedures, and are described in detail in Section 2.1.5.

Approach to Estimating Exposure to Major Noise Sources

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

Source Level Estimates

Piles installation associated with the proposed action are 16-in steel piles. However, there is limited data for this size of pile. In order be conservative in our noise propagation estimates, we used source level information for installing 24-inch steel piles (NAVFAC 2012, Denes et al. 2016). Table 7 provides the source values and parameters used in calculating zones of influence for each source type.

The distances to the Level A and Level B harassment thresholds were calculated based on vibratory installation source levels from the Naval Base Kitsap at Bangor EHW-1 Pile Replacement Project, in Bangor, Washington (NAVFAC 2012) for 24-inch diameter steel piles, and the impact installation source levels from the Kodiak Ferry Terminal Project in Kodiak, Alaska (Denes et. al. 2016) for 24-inch diameter steel piles. The vibratory source level is a proxy based on mean measured source levels from installing 24-inch steel piles at the Naval Base Kitsap in Bangor, Washington (NAVFAC 2012) and from acoustic modeling of nearshore marine pile driving at Navy installations in Puget Sound (United States Navy 2015). The DTH source level is a proxy based on median measured sources levels from drilling of 24-inch diameter piles to construct the Kodiak Ferry Terminal (Denes et al. 2016). Sound pressure level root-mean-square (SPL rms) values were used to calculate distance to Level A and B harassment isopleths for impact pile driving. The source levels of 168.2 SEL (for Level A harassment) and 181.3 dB at 10 m SPL (for Level B harassment) are the mean measured levels from the Kodiak Ferry Terminal project for impact installation of 24-in steel piles (Denes et al. 2016).

Distances to Level A and Level B Sound Thresholds

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

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

$$TL = B * \log10(R_1/R_2), \text{ where}$$

R_1 = the distance of the modeled SPL from the driven pile, and
R_2 = the distance from the driven pile of the initial measurement.

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

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

Table 7 describes the NMFS User Spreadsheet input parameters used to calculate Level A harassment isopleths. For stationary sources such as pile driving and drilling, NMFS User Spreadsheet predicts the closest distance at which, if a marine mammal remained at that distance (or greater) the whole duration of the activity, it would not incur PTS. Inputs used in the User Spreadsheet and the resulting isopleths are reported in Tables 7 and 8. Isopleths for Level B harassment associated with impact pile driving (160 dB) and vibratory pile driving/removal and drilling (120 dB) were also calculated and are can be found in Table 8.

Table 7. User spreadsheet input parameters used for calculating Level A harassment isopleths.

Spreadsheet Tab Used	Vibratory Driving	Drilling/Socketing	Impact Driving
	A.1) Vibratory Driving - Stationary Source: Non-impulsive, Continuous	A) Stationary Source: Non-impulsive, Continuous	E.1): Impact Pile Driving (Stationary Source: Impulsive, Intermittent
Source Level (dB)	161 RMS SPL	167.7 RMS SPL	168.2 SEL
Weighting Factor Adjustment (kHz)	2.5	2	2

Spreadsheet Tab Used	Vibratory Driving	Drilling/Socketing	Impact Driving
	A.1) Vibratory Driving - Stationary Source: Non-impulsive, Continuous	A) Stationary Source: Non-impulsive, Continuous	E.1): Impact Pile Driving (Stationary Source: Impulsive, Intermittent
a) Number of piles in 24-hr	12	n/a	6
b) Number of strikes/pile	n/a	n/a	5
c) Duration of sound (hours) within 24-h period	n/a	6	n/a
d) Duration of drive single pile (minutes)	5	n/a	n/a
Propagation (xLogR)	15	15	15
Distance of source level measurement (meters)	10	10	10
*n/a: not applicable			

Modeled results are presented in Table 8 with the distances in meters to marine mammal Level A and Level B thresholds for impulsive and continuous sources. The distances are based on NMFS PTS/TTS Technical Guidance for Level A (NMFS 2018) and generic sound exposure thresholds for Level B (70 FR 1871). The reported radii for 24-hr SEL (Level A) thresholds are based on the assumption that marine mammals remain stationary or at a constant exposure range during the entire 24-hr period, which is an extremely unlikely scenario.

Table 8. Calculated distances to Level A harassment and Level B harassment isopleths during pile installation and removal and drilling (Solstice Alaska Consulting 2018).

Distance (m) to Level A and Level B Thresholds				
Activity	Source Level at 10 meters (dB)	Level A		Level B
		Low- Frequency Cetaceans	Otariid	
Vibratory Pile Driving/Removal				
16-inch steel removal and installation (12 piles) (~1 hour on 1 day)	161 SPL	6.8	0.3	5,412
Drilling/Socketing Pile Installation				
16-inch steel installation (6 piles) (6 hours per day on 2 days)	166.2 SPL	50.1	2.1	12,022 *
Impact Pile Driving				
16-inch steel installation (6 piles) (~3 minutes per day on 1 day)	168.2 SEL/181.3 SPL	9.9	0.4	263
* Ensonified area would be truncated by land masses with a maximum extent of 7.7 km.				

Exposure Estimates
Density information is not available for marine mammals in the project area. Potential exposures for marine mammals were estimated from several sources. Between the months of September through May from 1994 to 2002, weekly surveys were conducted at Sitka's Whale Park, located at the easternmost end of Eastern Channel. More recent data (from 2002 to present) were collected from small vessels or Allen Marine 100-foot catamarans during school field trips in and around Eastern Channel. Additionally, marine mammal observational data was collected in the Sitka Channel as part of the Gary Paxton Industrial Park (GPIP) Multipurpose Dock Project (Solstice Alaska Consulting 2018). Monitors were present during twenty-two days of in water work as part of this project. This included ten days between October 9th and 20th, 2017 for wooden pile removal, where only one monitor was present each day and twelve days between October 22nd and November 9th, where two observers were monitoring during new pile installation. Additionally, data was collected in January and October/November of 2017 in the Sitka Channel when Petro Marine Services removed and replaced a fuel float in the Sitka Channel and recorded marine mammal observations (Solstice Alaska Consulting 2018). Finally, marine mammal observation reports covering the months of June through September, 2018 were also reviewed (Solstice Alaska Consulting 2018, Turnagain 2018)(Solstice Alaska Consulting 2018, Turnagain 2018)(Solstice Alaska Consulting 2018, Turnagain 2018)(.

Western DPS Steller Sea Lion
Steller sea lions are common in the action area and are expected to be encountered during pile removal, driving, and drilling. In the project vicinity Steller sea lions typically occur in groups of 1-8 animals (Solstice Alaska Consulting 2018), with an estimated maximum group size of 100 animals (Straley 2017). Steller sea lions can occur in the action area every day during construction. CBS conservatively estimates that a group of 8 Steller sea lions may occur within the Level B harassment zone every day that pile driving occurs (11 animals in a group x 1 group x 3 days of pile driving activity = 24 animals). Therefore, NMFS PR1 proposes to authorize 24 takes of sea lion by Level B harassment.

As described in Section 4.3.2, intermixing of western and eastern DPS Steller sea lions occurs in Southeast Alaska. For this application, we assume that two percent of the animals in the action area could be from the western DPS based on brands seen at the 4 Steller sea lion sites nearest Sitka: Sea Lion Island, Kaiuchali Rocks, Jacob Rocks, Biali Rocks ((Jemison 2017). Therefore, we apportion potential Level B takes accordingly to each DPS. Out of a total 24 exposures, one animal is anticipated to be from the ESA-listed western DPS (Table 9).

No Level A takes are anticipated for Steller sea lions. The maximum linear distance (from the noise source) to the threshold for a Level A take for sea lions (OPW) is 2.1 m (see Table 8), and shutdown zones will be applied to prevent Level A exposure.

Mexico DPS Humpback Whale
Humpback whales are the most commonly observed baleen whale in Southeast Alaska, particularly during spring and summer months. Humpback whales are most abundant in Sitka Sound from late fall through April when they forage on large densities of herring (Liddle et al. 2015). Humpback whales frequent the action area and could be encountered during any given day of pile driving/removal activities. In the project vicinity, humpback whales typically occur in groups of 1 to 2 animals. Most humpback whales observed in the area were solitary. When more

than one whale was observed, available survey data reports a typical group size of 2-4 whales (Straley 2017). During work on GPIP Dock, groups of 5 and 10 individuals were seen a few times, but most of the time, single whales were observed (Solstice Alaska Consulting 2018). CBS conservatively estimates that a group of 5 humpback whales may occur within the Level B harassment zone every day of the 3-day construction window during active pile driving (5 animals in a group x 1 group each day × 3 days of pile driving = 15 animals). Therefore, NMFS PR1 proposes to authorize 15 Level B harassment takes of humpback whales.

Based on Wade et al. (2016), the probability is that 93.9 percent of the humpback whales taken would be from the Hawaii DPS (not listed under ESA) and 6.1 percent of the humpback whales taken would be from the ESA-listed threatened Mexico DPS. Thus, it is anticipated that this action will result in one Level B exposure of Mexico DPS humpbacks (Table 9).

No Level A takes are anticipated for humpback whales. The linear distance (from the noise source) to the threshold for a Level A low frequency cetaceans is 50 m (see Table 8), and shutdown zones will be applied to prevent Level A exposure.

Table 9. Amount of proposed incidental harassment (takes) of ESA-listed species in the proposed IHA.

Species	Proposed Authorized Level A Takes	Proposed Authorized Level B Takes
Western DPS Steller sea lion (*Eumatopias jubatus*)	0	1[11]
Mexico DPS Humpback whale (*Megaptera novaeangliae*)	0	1[12]
Note: Take estimates are rounded up to the nearest whole number		

CBS intends to avoid Level A harassment take by shutting down removal or installation activities at the approach of any marine mammal into their representative Level A harassment (PTS onset) zone. The shutdown zone for both species is 10 m.

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

6.3 Response Analysis

As discussed in the *Approach to the Assessment* section of this opinion, response analyses determine how listed species are likely to respond after being exposed to an action’s effects on the environment or directly on listed species themselves. Our assessments try to detect the

[11] The proposed IHA indicated a requested Level A take of 0 Steller sea lions, and a Level B take of 33 Steller sea lions. Of the proposed takes, 3% are anticipated to be ESA-listed western DPS animals. The basis for this apportionment is described above in Section 4.3.2

[12] The proposed IHA indicated a requested Level A take of 0 humpback whales, and a Level B take of 15 humpback whales. Humpback whales in southeast Alaska include individuals from two DPSs. 6.1% are anticipated to be ESA-listed Mexico DPS animals. The basis for this apportionment is described above in Section 4.3.1.

probability of lethal responses, physical damage, physiological responses (particular stress responses), behavioral responses, and social responses that might result in reducing the fitness of listed individuals. Ideally, our response analyses consider and weigh evidence of adverse consequences, beneficial consequences, or the absence of such consequences.

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

Physical Response
- Auditory threshold shifts
- Non-auditory physiological effects

Behavioral responses
- Auditory interference (masking)
- Tolerance or Habituation
- Change in dive, respiration, or feeding behavior
- Change in vocalizations
- Avoidance or Displacement
- Vigilance

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

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

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

We estimate zero Mexico DPS humpbacks and zero western DPS Steller sea lions may be exposed at noise levels loud enough, long enough, or at distances close enough to cause Level A harassment (see Section 6.2.1, *Exposure to Major Noise Sources*, Table 9). In addition, 1 Mexico DPS humpback, and 1 western DPS Steller sea lion may be exposed to noise levels sufficient to cause Level B harassment. All Level B instances of take are anticipated to occur at received levels ≥ 120 dB or 160 dB for continuous and impulsive noise sources respectively.

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

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

Cetacean Responses (Mexico DPS Humpback Whale)

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

Humpback whales produce a wide variety of sounds. During the breeding season males sing long, complex songs, with frequencies in the 20-5000 Hz range and intensities as high as 181 dB (Payne 1970, Winn et al. 1970a, Thompson et al. 1986). Source levels average 155 dB and range from 144 to 174 dB (Thompson et al. 1979). Social sounds in breeding areas associated with aggressive behavior in male humpback whales are very different than songs and extend from 50 Hz to 10 kHz (or higher), with most energy in components below 3 kHz (Tyack and Whitehead 1983, Silber 1986). These sounds appear to have an effective range of up to 9 km (Tyack and Whitehead 1983). Humpback whales produce sounds less frequently in their summer feeding areas. Feeding groups produce distinctive sounds ranging from 20 Hz to 2 kHz, with median durations of 0.2-0.8 seconds and source levels of 175-192 dB (Thompson et al. 1986). These sounds are attractive and appear to rally animals to the feeding activity (D'Vincent et al. 1985, Sharpe and Dill 1997).

This information leads us to conclude that humpback whales exposed to sounds produced by pile driving/removal and DTH hammering activities are likely to respond behaviorally (as described below) if they are exposed to low-frequency sounds. However, because whales are not likely to communicate at source levels that would damage the tissues of other members of their species, this evidence suggests that received levels of up to 175-192 dB are not likely to damage the tissues of humpback whales (Thompson et al. 1986). Received levels associated with this project are not anticipated to exceed 168.2 dB.

Humpback whales are present in the action area all months of the year, but are most common near the O’Connell Bridge in November, December, and January (Figure 6).

Pile driving/removal and DTH hammering activities associated with the O'Connell Bridge lightering float project would likely impact Mexico DPS humpback whales both physically and behaviorally from sounds produced during construction (details of probable responses are provided below). Although, the level of this disturbance will depend on whether the whales are feeding or traveling, as well as other factors, such as the age of the animal, whether it tolerates the sound, etc. In addition to targeted studies in marine mammals indicating that frequency (beyond just differing sensitivities at different frequencies) can affect the likelihood of auditory impairment incurred, there is increasing evidence that contextual factors other than received sound level, including activity states of exposed animals, the nature and newness of the sound, and the relative spatial positions of sound and receiver, can strongly affect the probability of behavioral response (Ellison et al. 2012).

Pinniped Responses (Western DPS Steller Sea Lion)
The ability to detect sound and communicate underwater and in-air is important for a variety of Steller sea lion life functions, including reproduction and predator avoidance. NMFS categorizes Steller sea lions in the otariid pinniped functional hearing group with an applied frequency range between 60 and 39 kHz in water (NMFS 2018).

Steller sea lions occur year-round in the project area, but numbers are highest near the project area, in Silver Bay and Eastern Channel of Sitka Sound, in January and February (Figure 9). Pile driving/removal and DTH hammering activities associated with the O'Connell Bridge lightering float project would likely impact western DPS Steller sea lions both physically and behaviorally from sounds produced during construction (details of probable responses are provided below). Although, the level of this disturbance will depend on whether the sea lions are feeding or traveling, as well as other factors such as the age of the animal, whether it tolerates the sound, etc. In addition to targeted studies in marine mammals indicating that frequency (beyond just differing sensitivities at different frequencies) can affect the likelihood of auditory impairment incurred, there is increasing evidence that contextual factors other than received sound level, including activity states of exposed animals, the nature and newness of the sound, and the relative spatial positions of sound and receiver, can strongly affect the probability of behavioral response (Ellison et al. 2012).

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

Threshold Shifts
Exposure of marine mammals to very loud noise can result in physical effects, such as changes to sensory hairs in the auditory system, which may temporarily or permanently impair hearing. TTS is a temporary hearing change and its severity is dependent upon the duration, frequency, sound pressure, and rise time of a sound (Finneran and Schlundt 2013). TTSs can last minutes to days. Full recovery is expected and this condition is not considered a physical injury. At higher received levels, or in frequency ranges where animals are more sensitive, PTS can occur. When PTS occurs, auditory sensitivity is unrecoverable (i.e., permanent hearing loss). Both TTS and

PTS can result from a single pulse or from accumulated effects of multiple pulses from an impulsive sound source (i.e., impact pile driving) or from accumulated effects of non-pulsed sound from a continuous sound source (i.e., vibratory or DTH hammering). In the case of exposure to multiple pulses, each pulse need not be as loud as a single pulse to have the same accumulated effect.

Few data are available to define the hearing range, frequency sensitivities, or sound levels necessary to induce TTS or PTS in whales and pinnipeds. The best available information for whales and pinnipeds comes from captive studies of toothed whales and California sea lions, studies of terrestrial mammal hearing, and extensive modeling (Finneran et al. 2000, Schlundt et al. 2000, Finneran et al. 2002, Finneran et al. 2003, Nachtigall et al. 2003, Nachtigall et al. 2004, Finneran et al. 2005, Finneran et al. 2007, Lucke et al. 2009, Mooney et al. 2009a, Mooney et al. 2009b, Finneran et al. 2010a, Finneran et al. 2010b, Finneran and Schlundt 2010, Popov et al. 2011a, Popov et al. 2011b, Kastelein et al. 2012a, Kastelein et al. 2012b). _ENREF_56 Finneran et al. (2003) exposed two California sea lions to single underwater pulses up to 183 dB re 1 μPa_{p-p} and found no measurable TTS following exposure. Southall et al. (2007) estimated TTS will occur in pinnipeds exposed to a single pulse of sound at 212 dB re 1 μPa_{0-p} and PTS will occur at 218 dB re 1 μPa_{0-p}.

Based on this information, NMFS established the following Level A impulsive sound thresholds for low-frequency cetaceans and otariid pinnipeds in the water as 183 dB re1 $\mu Pa^2 \cdot s$, and 203 dB re1 $\mu Pa^2 \cdot s$ respectively (NMFS 2018). Considering the applicant has agreed to shut down if marine mammals approach or occur within the Level A zones, TTS and PTS are unlikely to occur.

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

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

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

To experience TTS from a continuous source, a humpback whale will have to remain in the <7 m radius ZOI for continuous noise sources for an extended period of time, and will need to remain in the ZOI even longer to experience PTS. For Steller sea lions continuous Level A zones were smaller at up to 1 m (see Table 8). The reported radii for 24-hr SEL (Level A) thresholds are based on the assumption that marine mammals remain stationary or at a constant exposure range during the entire 24-hr period, which is an extremely unlikely scenario, though it is possible they may remain in the area if highly motivated by the presence of a food source. In this instance, it is possible that a whale could experience TTS if it chooses to remain in the ensonifed area for an extended period. Though the exact time a whale will need to remain in the ensonified area to experience threshold shift is not known. Based on the findings from Nachtigall et al. (2003) and Nachtigall et al. (2004), we estimate a whale will need to remain in the ensonified zone for tens of minutes to experience low-level TTS and likely several to tens of hours to experience PTS, if at all. Considering the applicant has agreed to shut down if marine mammals approach or occur within the Level A zones, TTS and PTS are unlikely to occur.

Non-auditory Physiological Effects

Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to strong underwater sound include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage (Cox et al. 2006, Southall et al. 2007). Studies examining such effects are limited. In general, little is known about the potential for pile driving/removal or DTH hammering to cause auditory impairment or other physical effects in marine mammals. Available data suggest that such effects, if they occur at all, would presumably be limited to short distances from the sound source and to activities that extend over a prolonged period. The available data do not allow identification of a specific exposure level above which non-auditory effects can be expected (Southall et al. 2007) or any meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in those ways. Marine mammals that show behavioral avoidance of pile driving, including some cetaceans and some pinnipeds, are especially unlikely to incur auditory impairment or non-auditory physical effects.

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

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

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

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

These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as "distress."

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

Behavioral Responses

Processive stressors require high-level cognitive processing of sensory information (Herman and Cullinan 1997, Anisman and Merali 1999, de Kloet et al. 2005, Wright et al. 2007). Behavioral responses are influenced by an animal's assessment of whether a potential stressor poses a threat or risk. Behavioral responses may include: changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where sound sources are located; and/or flight responses (e.g., pinnipeds flushing into water from haulouts or rookeries).

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

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

The onset of behavioral disturbance from anthropogenic sound depends on both external factors (characteristics of sound sources and their paths) and the specific characteristics of the receiving animals (hearing, motivation, experience, demography) and is difficult to predict (Southall et al. 2007). Below we describe some of the anticipated behavioral responses to major noise sources associated with the proposed action.

Tolerance, Habituation, and Sensitization

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

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

Masking

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

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

Noise from pile driving/removal and DTH hammering is relatively short-term. It is possible that pile driving/removal and DTH hammering noise resulting from this proposed action may mask acoustic signals important to western DPS Steller sea lions and Mexico DPS humpback whales, but the short-term duration (approximately 3 days), limited affected area, and pauses between operations would limit the impacts from masking. Any masking event that could possibly rise to Level B harassment under the MMPA would occur concurrently within the zones of behavioral harassment already estimated for vibratory pile driving and DTH hammering, and which have already been taken into account in the exposure analysis.

Changes in Vocalization

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

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

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

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

The O’Connell Bridge Lightering Float project has the potential to cause changes in vocalization for both humpback whales and Steller sea lions.

Responses While Feeding

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

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

Responses While Migrating and Resting

Steller sea lions are known to rest in the water by rafting together at the surface and could respond negatively to unexpected noise in the water. Steller sea lions do not migrate but sometimes travel great distances during foraging bouts or to reach prey hotspots at particular times during the year. Unexpected noise in the environment could potentially cause sea lions to avoid certain areas they use to transit to either prey hotspots or haulouts or rookeries.

Migrating whales respond more strongly to noise than do feeding whales. While we do not have information on migrating whale responses to pile driving noise, we do have information on whale responses to other impulsive noise sources, such as seismic operations. Avoidance responses of migrating humpback whales to impulsive airgun noise appear consistent with bowhead and gray whale avoidance at received levels between 150-180 dB (Richardson et al. 1995). Migrating humpbacks showed localized avoidance of operating airguns in the range of received levels 157-164 dB. In addition, humpback whales seemed more sensitive to seismic airgun noise while exhibiting resting behavior (McCauley et al. 2000). For resting humpback pods that contained cow-calf pairs, the mean airgun noise level for avoidance was 140 dB re 1 µPa rms, and a startle response was observed at 112 dB re 1µ Pa rms (McCauley et al. 2000). When calves are small, comparatively weak and possibly vulnerable to predation and exhaustion, the potential continual dislocation of these animals in a confined area would interrupt this resting and feeding stage, with potentially more serious consequences than any localized avoidance response to an operating seismic vessel as seen during their migratory swimming behavior (McCauley et al. 2000). For comparison with the proposed action, impact pile driving (also an impulsive source) is anticipated to attenuate to the 160 dB re 1 µPa rms threshold at 263 m from the source, which greatly decreases potential impact to migrating or resting whales.

Avoidance

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

Studies of bowhead, gray, and humpback whales have determined that received levels of pulses in the 160-170 dB re 1 µPa rms range seem to cause obvious avoidance behavior in a substantial fraction of the animals exposed.

Avoidance is one of many behavioral responses whales and Steller sea lions may exhibit when exposed to the pile driving/removal and DTH hammering noise from this proposed action. Other behavioral responses include: evasive behavior to escape exposure or continued exposure to a sound that is painful, noxious, or that they perceive as threatening, which we assume would be accompanied by acute stress physiology; increased vigilance of an acoustic stimulus, which would alter the animal's time budget (that is, during the time they are vigilant, they are not engaged in other behavior); and continued pre-disturbance behavior with the physiological consequences of continued exposure.

Responses of Prey Resources

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

Of all known Steller sea lion prey species, only Chinook and coho salmon have been studied for effects of exposure to pile driving noise (Halvorsen et al. 2012). These studies defined very high noise level exposures (SEL_{cum} of 210 dB re 1μPa^{2}·s) as threshold for onset of injury, and supported the hypothesis that one or two mild injuries resulting from pile driving exposure at these or higher levels are unlikely to affect the survival of the exposed animals, at least in a laboratory environment. Hart Crowser Inc. et al. (2009) studied the effects on juvenile coho salmon from pile driving of sheet piles at the Port of Anchorage in Knik Arm of Cook Inlet. The fish were exposed in-situ (in that location) to noise from vibratory or impact pile driving at distances ranging from less than 1 meter to over 30 meters. The results of this study showed no mortality of any of the test fish within 48 hours of exposure to the pile driving activities, and for the necropsied fish, no effects or injuries were observed as a result of the noise exposure (NMFS 2016e). Noise generated from pile driving can reduce the fitness and survival of fish in areas used by foraging marine mammals; however, given the small area of pile driving within the action area relative to known feeding areas in Steller sea lions, and the fact that any physical changes to this habitat would not be likely to reduce the localized availability of fish (Fay and Popper 2012), it is unlikely that western DPS Steller sea lion prey would be affected due to the project activities. In general, we expect fish will be capable of moving away from project activities if they experience discomfort. We expect the area in which stress, injury, TTS, changes in balance, or changes in prey species may occur (if at all) will be limited to a few meters directly around the pile driving and DTH hammering operations. We consider potential adverse impacts to prey resources from pile-driving and DTH hammering in the action area to be unlikely.

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

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

6.3.2 Response Summary

No Level A take of western DPS Steller sea lion or Mexico DPS humpback whales is anticipated. The maximum distance at which a Steller sea lions or humpback whales may be exposed to noise levels that exceed Level A thresholds is 0.4 m and 50 m respectively during impact pile driving (see Table 8). At this distance a PSO can effectively monitor and shutdown operations if a Steller sea lion or humpback whale is observed. No Level A takes are anticipated.

It is anticipated that for the major noise sources associated with the proposed action (impact pile driving, vibratory pile removal and driving, and DTH hammering), the distances to the Level B isopleth (120 dB for continuous noise sources, and 160 dB for impulsive noise sources) range from 263 m – 7.7 km depending on the source and threshold of concern (Solstice Alaska Consulting 2018).

Based on this information, we would not anticipate humpback whales or Steller sea lions to devote attention to a noise stimulus beyond the 120 dB isopleth (for continuous noise sources), which may be more than 7 km from the source, and beyond the 160 dB isopleth (for impulsive noise sources) which may reach more than 263 m. At these distances, a marine mammal that perceives a signal is likely to ignore such a signal and devote its attention to stimuli in its local environment (that is, they would filter the sound out as background noise or ignore it) (Miller et al. 1999, Richardson 1999). Because of their distance from the noise source, we would also not anticipate humpback whales or Steller sea lions would change their behavior or experience physiological stress responses at received levels < 120 dB or <160 dB for continuous and impulsive sources, respectively; these animals may exhibit slight deflection from the noise source, but this behavior is not likely to result in adverse consequences for the animals exhibiting that behavior. Feeding humpbacks, however, may cease calling or alter vocalization at significantly lower received levels.

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

At some distance that is closer still, these species are likely to engage in more active avoidance behavior. Of the humpback whales and Steller sea lions that may be exposed to Level B harassment noise from the proposed action (estimated 2 exposures of listed species), some whales and sea lions are likely to reduce the amount of time they spend at the ocean's surface, increase their swimming speed, change their swimming direction to avoid construction operations, change their respiration rates, increase dive times, increase vigilance, reduce feeding behavior, or alter vocalizations and social interactions (Richardson et al. 1986, Ljungblad et al. 1988, Richardson and Malme 1993, Greene et al. 1999, Frid and Dill. 2002, Christie et al. 2009, Koski et al. 2009, Blackwell et al. 2010, Funk et al. 2010, Melcon et al. 2012). Based on the proposed action, we would expect these kind of responses at maximum distances out to 7.7 km for vibratory and DTH hammering, and distances out to 263 m for impact pile driving (Table 8) (Solstice Alaska Consulting 2018). However, these exposures are anticipated to be separated temporally considering the applicant does not anticipate more than one installation operation occurring simultaneously (Solstice Alaska Consulting 2018).

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

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

Of the responses considered above, we do not expect TTS or PTS will occur. We expect masking, behavioral responses, and physical and physiological effects may occur in Mexico DPS humpback whales and western DPS Steller sea lions. Though project activities may cause interruptions in communications (masking), avoidance of the action area, and stress associated with these disruptions in exposed individual whales and pinnipeds, we expect all effects will be temporary. Prey species may experience stress, injury, TTS, or changes in balance in a small radius directly around the pile driving or DTH hammering activities or startle and disperse when exposed to sounds from project activities. We do not expect effects to prey species will be sufficient to affect ESA-listed whales or pinnipeds.

7 CUMULATIVE EFFECTS

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

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

8 INTEGRATION AND SYNTHESIS OF EFFECTS

The Integration and Synthesis section is the final step of NMFS's assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 6) to the environmental baseline (Section 5) and the cumulative effects (Section 7) to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) result in appreciable reductions in the likelihood of the survival or recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) result in the adverse modification or destruction of critical habitat as measured through potential reductions in the value of designated critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species (Section 4).

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

In Section 4.1.1 we determined that it is unlikely that vessel transit will impact critical habitat surrounding haulouts and rookeries to any measurable degree considering vessels will avoid designated aquatic zones. We concluded any impacts to these PBFs are likely to be insignificant.

In Section 4.1.2 we concluded that the stressors associated with removal and replacement of piles are extremely unlikely to affect fin whales, North Pacific right whales, or sperm whales because they are not anticipated to overlap in time and space, and the effects of ship strike associated with equipment mobilization and demobilization are also extremely unlikely to occur. Therefore, effects to fin whales, North Pacific right whales, and sperm whales are discountable.

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

- Climate change
    - Prey distribution

  - Habitat quality
- Fisheries interactions
- Gear and Ocean Debris Entanglement
- Subsistence harvests
- Natural and anthropogenic noise
- Pollutants and discharges
- Scientific research
- Ship strike

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

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

- 0 (Level A) and 1 (Level B) exposure of western DPS Steller sea lions
- 0 (Level A) and 1 (Level B) exposure of Mexico DPS humpback whales

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

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

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

Though project activities may cause interruptions in communications (masking), avoidance of the action area, and stress associated with these disruptions in exposed individual whales and pinnipeds, we expect all effects will be temporary.

We determined effects from in-air noise and vessel strike are extremely unlikely to occur and were discountable. We determined disturbance of seafloor is not likely to have measurable impact and was insignificant. We also determined the impact from underwater noise from vessels is considered insignificant.

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

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

9 CONCLUSION

After reviewing the current status of ESA-listed species, the environmental baseline for the action area, the anticipated effects of the proposed activities, and the possible cumulative effects, it is NMFS's biological opinion that the USACE's permitting of CBS's proposed action, and PR1's proposed issuance of an IHA to CBS for the proposed O'Connell Bridge Lightering Float Project near Sitka, Alaska is not likely to jeopardize the continued existence of the following species:

- Mexico DPS Humpback whale
- Western DPS Steller sea lion

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

- Sperm whale
- Steller sea lion critical habitat
- Fin whale
- North Pacific right whale

10 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA prohibits the "take" of endangered species without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (16 USC 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 recent NMFS guidance, the term "harass" under the ESA means to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (Wieting 2016). The MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment] (16 U.S.C. § 1362(18)(A)(i) and (ii)). Only Level B takes are anticipated and authorized for the proposed action.

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

Section 7(b)(4)(C) of the ESA specifies that in order to provide an Incidental Take Statement for an endangered or threatened species of marine mammal, the taking must first be authorized under section 101(a)(5) of the MMPA. Accordingly, **the terms of this Incidental Take Statement and the exemption from Section 9 of the ESA become effective only upon the issuance of MMPA authorization to take the marine mammals identified here**. Absent such authorization, this ITS is inoperative.

The terms and conditions described below are nondiscretionary. The 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, the USACE and PR1 must monitor the progress of the action and its impact on the species as specified in the ITS (50 CFR 402.14(i)(3)). If the USACE or PR1 (1) fails to require the authorization holder to adhere to the terms and conditions of the ITS through enforceable terms that are added to the authorization, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

10.1 Amount or Extent of Take

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

NMFS anticipates the proposed O'Connell Bridge Lightering Float Project, between June 1, 2019 and May 31, 2020, is likely to result in the incidental take of ESA-listed species by Level B harassment. Based on the nature of the activity and the anticipated effectiveness of the mitigation measures (discussed in detail in Section 2.1.5), Level A harassment is neither anticipated nor proposed to be authorized. As discussed in Section 6.2 of this opinion, the proposed action is expected to take the following number of ESA-listed individuals described in Table 10.

Table 10. Summary of instances of exposure associated with the proposed pile driving/removal and DTH hammering resulting in incidental take of ESA-listed species by Level A and Level B harassment.

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

While the MMPA authorization is valid for a year, construction is expected to take approximately three days.

Level B harassment of these individuals will occur by exposure to received sound from continuous sound sources with received sound levels of least 120 dB re 1 µPa_{rms} (i.e., vibratory or DTH hammering), or exposure to received sound from impulsive sound sources with received

[14] The proposed IHA indicated a requested Level A take of 0 Steller sea lions, and a Level B take of 33 Steller sea lions. Of the proposed takes, 3% are anticipated to be ESA-listed western DPS animals. The basis for this apportionment is described above in Section 4.3.2

[15] The proposed IHA indicated a requested Level A take of 0 humpback whales, and a Level B take of 15 humpback whales. Humpback whales in southeast Alaska include individuals from two DPSs, and 6.1% are anticipated to be ESA-listed Mexico DPS animals. The basis for this apportionment is described above in Section 4.3.1.

sound levels of least 160 dB re 1 μPa_{rms} (i.e., impact hammering). The take estimate is based on the best available information of whale and pinniped surveys and sightings in the area that will be ensonified from the proposed activities. Death or injury is not expected or authorized for any individual whales or pinnipeds that are exposed to these sounds.

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

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

10.2 Effect of the Take

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

All of the authorized takes from the proposed action are associated with behavioral harassment from acoustic noise (Section 6.2.1). Although the biological significance of behavioral responses remains unknown, this consultation has assumed that exposure to major noise sources might disrupt one or more behavioral patterns that are essential to an individual animal's life history. However, any behavioral responses of these individual whales and pinnipeds to major noise sources and any associated disruptions are not expected to affect the fitness, reproduction, survival, or recovery of these species.

10.3 Reasonable and Prudent Measures

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

1. This ITS is valid only for the activities described in this opinion, and which have been authorized under section 101(a)(5) of the MMPA.
2. The taking of western DPS Steller sea lion and Mexico DPS humpback whales shall be by incidental harassment only. The taking by serious injury or death is prohibited by and will result in the modification, suspension, or revocation of the ITS.
3. The USACE and PR1 must implement and monitor the effectiveness of mitigation measures incorporated as part of the proposed authorization for the incidental taking of ESA-listed marine mammals pursuant to section 101(a)(5)(D) of the MMPA, as specified below. In addition, they must submit a report to NMFS AKR that evaluates the mitigation measures and reports the results of the monitoring program, as specified below.

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

10.4 Terms and Conditions

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

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

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

1. USACE and PR1 shall require their permitted operators to possess a current and valid Incidental Harassment Authorization issued by NMFS under section 101(a)(5) of the MMPA, and any take must occur in compliance with all terms, conditions, and requirements included in such authorizations.
2. A final PSO report and completed marine mammal observation record forms (developed by applicant) will be provided within 90 days of completion of the project and will include all items listed in Section 2.1.5.

11 CONSERVATION RECOMMENDATIONS

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

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

Behavioral responses of marine mammals: We recommend that PR1 summarize findings from past IHA holders about behavioral responses of ESA-listed species to sounds from DTH

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

hammering. Better understanding of how ESA-listed species have responded to sounds from past projects will inform our exposure and response analyses in the future.

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

12 REINITIATION NOTICE

This concludes formal consultation on the USACE’s permitting of the proposed O’Connell Bridge Lightering Float Project and PR1’s issuance of an IHA to CBS. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if:

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

13 DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

13.1 Utility

This document records the results of an interagency consultation. The information presented in this document is useful to NMFS AKR, PR1, USACE, and the general public. These consultations help to fulfill multiple legal obligations of the named agencies. The information is also useful and of interest to the general public as it describes the manner in which public trust resources are being managed and conserved. The information presented in these documents and used in the underlying consultations represents the best available scientific and commercial information and has been improved through interaction with the consulting agency.

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

13.2 Integrity

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

13.3 Objectivity

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the ESA Consultation Handbook, ESA Regulations, 50 CFR § 402.01 et seq.

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

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

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

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