Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion for City of Ketchikan Berth III Mooring Dolphins Project

NMFS Consultation Number: AKRO-2020-02183

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

Affected Species and Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species or Critical Habitat?	Is Action Likely To Jeopardize the Species?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Humpback whale (*Megaptera novaeangliae*) Mexico DPS	Threatened	Yes	No	N/A

Consultation Conducted By: National Marine Fisheries Service

Issued By:

for James W. Balsiger, Ph.D.
Administrator, Alaska Region

Date: February 11, 2021

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ADEC	Alaska Department of Environmental Conservation
AKR	Alaska Region NMFS
BA	Biological Assessment
CFR	Code of Federal Regulations
COK	City of Ketchikan
CV	Coefficient of variation

dB	Decibels
DPS	Distinct Population Segment
DQA	Data Quality Act
DTH	Down-the-hole
ECSA	Endangered Species Conservation Act
EFH	Essential Fish Habitat
ESA	Endangered Species Act of 1973
ft	feet
FR	*Federal Register*
GPS	Global Positioning System
hr	hour(s)
Hz	Hertz
IHA	Incidental Harassment Authorization
IPCC	Intergovernmental Panel on Climate Change
ITS	Incidental Take Statement
kHz	kilohertz
km	kilometer(s)
lb	pound(s)
L_E	cumulative sound exposure level
LOA	Length overall
m	meter(s)
min	minute(s)
MMPA	Marine Mammal Protection Act
µPa	microPascals
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
k	peak sound level
PR1	NMFS Office of Protected Resources, Permits and Conservation Division
PRD	Protected Resources Division, Alaska NMFS
PSO	Protected Species Observer
PTS	Permanent Threshold Shift
rms	root mean square
RPM	Reasonable and Prudent Measures
SAR	marine mammal stock assessment reports
SEL	Sound Exposure Level
SPL	Sound Pressure Level
SSV	Sound Source Verification
TL	Transmission Loss
TTS	Temporary Threshold Shift
UME	Unusual Mortality Event
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code

USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service

1 INTRODUCTION

Section 7(a)(2) of the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. §1536(a)(2)) requires each Federal agency to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When a Federal agency's action "may affect" a protected species or critical habitat, that agency is required to consult with the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS), depending upon the endangered species, threatened species, or designated critical habitat that may be affected by the action (50 CFR §402.14(a)). Federal agencies 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 authorize construction activities at the City of Ketchikan's Berth III, and the NMFS Office of Protected Resources Permits and Conservation Division (PR1). PR1 proposes to permit Marine Mammal Protection Act (MMPA) Level A take (i.e., take by injury or mortality) of harbor seals (*Phoca vitulina*), harbor porpoise (*Phocoena phocoena*), and Dall's porpoise (*Phocoenoides dalli*), and Level B take (i.e., take by harassment) of nine marine mammal species: harbor seal, harbor porpoise, Dall's porpoise, Steller sea lion (*Eumetopias jubatus*) (only the non-listed eastern DPS is expected to be present in the action area), killer whale (*Orcinus orca*), humpback whale (*Megaptera novaeangliae)*, minke whale (*Balaenoptera acutorostrata*), gray whale (*Eschrichtius robustus*), and Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), in conjunction with the action. The City of Ketchikan is the applicant. PND Engineers, Inc. prepared the biological assessment (BA), marine mammal monitoring and mitigation plan (4MP), and incidental harassment authorization (IHA) request for the City of Ketchikan. The consulting agency for this proposed action is NMFS's Alaska Region (AKR). This document represents NMFS's biological opinion on the effects of the proposed construction activities on endangered and threatened species and their designated critical habitat.

The biological opinion and incidental take statement (ITS) were prepared by NMFS AKR in accordance with section 7(b) of the ESA of 1973, as amended (16 U.S.C. § 1536), and implementing regulations at 50 CFR §402.

The biological 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 considers the effects of a proposed action by the City of Ketchikan (COK) to install three new mooring dolphins to accommodate larger cruise ships at Ketchikan Cruise Port Berth

III in Tongass Narrows, southeastern Alaska. The proposed action would address the increased demand from the cruise industry to accommodate larger class cruise ships and is necessary to provide safe moorage capacity when a Norwegian Breakaway Plus (Bliss) class cruise ship vessel, or similar, is moored at Berth III.

Bliss class vessels (326 m length overall (LOA) [1,068 ft LOA], 146,600 gross tonnage) started calling to Ketchikan during the 2019 cruise ship season. While these vessels were able to moor at Berth III, operational wind speed restrictions were required to safely moor to prevent damage to Berth III structures. To safely moor a Bliss class, or similar, vessel at Berth III, additional tie up locations are needed to the north and south ends of the berth.

The action may affect the threatened Mexico Distinct Population Segment (DPS) of humpback whale. Critical habitat has been proposed for the Mexico DPS of humpback whale (84 FR 54354, October 9, 2019), but is not yet finalized. Therefore, no designated critical habitat for any species under NMFS's jurisdiction currently exists in the action area and critical habitat will not be considered further in this biological opinion. Although critical habitat for humpback whales is not considered in this biological opinion, the effects of the action on prey resources are considered in Section 6.2.3.

This biological opinion is based on information provided in the June 2020 BA (PND Engineers 2020a); September 2020 IHA application and 4MP (PND Engineers 2020b); updated project proposals; email and telephone conversations among NMFS Alaska Region, the City of Ketchikan consultant team, the U.S. Army Corps of Engineers (USACE), and NMFS Permits and Conservation Division (PR1) staff; and other sources of information. A complete record of this consultation is on file at NMFS's Juneau, Alaska office.

1.2 Consultation History

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

- **May 14, 2020**: PND Engineers submitted an initial IHA application on behalf of the City of Ketchikan to NMFS PR1 for the non-lethal taking of marine mammals incidental to pile driving and mooring dolphin installation activities near Berth III (described below in Action Area), owned by the City of Ketchikan, during fall 2021 – winter 2022.
- **August 10, 2020:** USACE submitted a request to initiate formal Section 7 consultation to the NMFS Alaska Region. NMFS Alaska Region reviewed the initiation package from USACE, but held it in abeyance pending revisions to the IHA application and receipt of a request to initiate consultation from PR1.
- **September 22, 2020:** After several revisions, PR1 deemed the IHA application adequate and complete.
- **November 10, 2020:** PR1 published the proposed IHA in the *Federal Register* (85 FR 71612) with a comment period extending through December 10, 2020.
- **November 13, 2020:** PR1 submitted a request to initiate formal Section 7 consultation to the NMFS Alaska Region.
- **December 1, 2020:** NMFS Alaska Region received a letter from the USACE delegating the role of lead action agency to PR1 for this consultation.

- **December 17, 2020**: NMFS Alaska Region deemed the initiation package complete and initiated consultation with PR1 and USACE.
- **December 23, 2020:** NMFS Alaska Region sent a notice of Section 7 consultation request for information to the Alaska Department of Fish and Game. No comments were received.
- **January 4, 2021:** All parties agreed to the proposed mitigation measures.
- **February 9, 2021:** PR1 sent AKR the final draft IHA (RTID 0648-XA569) and notification of changes to the proposed IHA in response to public comments and new information since the proposed rule was published. Changes from the draft to final IHA include increasing the expected number of exposures and takes of humpback whales, changes to the size of Level B zones for certain down-the-hole drilling activities, and changes to make the mitigation measures in the IHA consistent with the biological opinion.

2 PROPOSED ACTION

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02).

This opinion considers the effects on listed species in the action area of installing three mooring dolphins (MD-2, MD-3, and MD-4) at Berth III.

The action is expected to occur over a 200-day period between October 1, 2021, and May 1, 2022. Actual in-water work is estimated to take a total of 4 months, 120 days, or 17 weeks and is expected to be completed by March 13, 2022. The action has the potential to affect waters in Tongass Narrows and nearby Revillagigedo Channel, approximately 3 miles to the south (Figure 1).

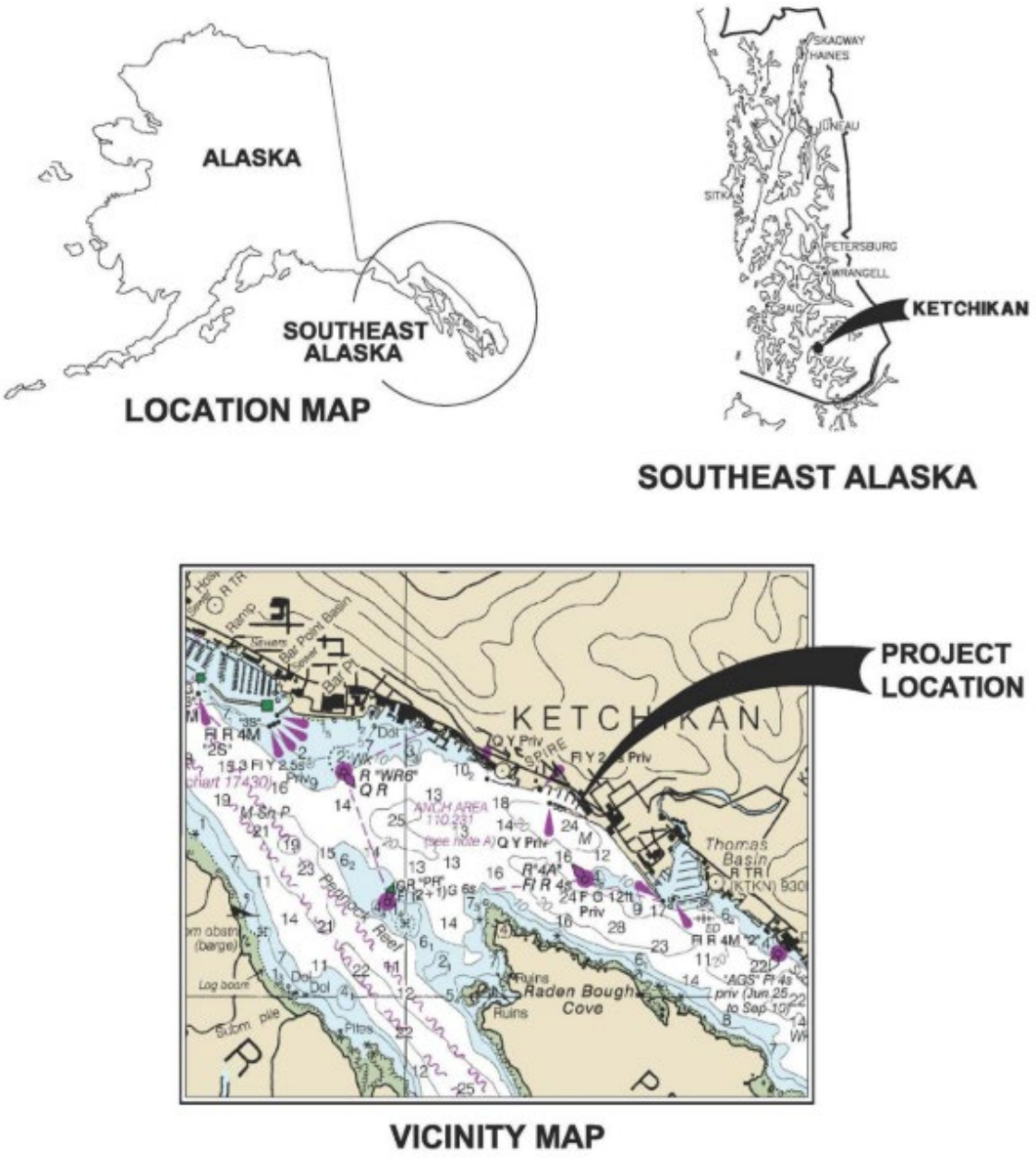


Figure 1. Project vicinity in Tongass Narrows, Ketchikan, Alaska (figure from PND Engineers 2020a).

2.1 Proposed activities

Three new mooring dolphins will be constructed: one at the north end of Berth III (MD-2) and two at the south end (MD-3 and MD-4) (Figure 2). Construction activities include mobilization, erecting and removing temporary weather structures and templates, vibratory and impact pile driving and installing rock sockets and rock tension anchors using a down-the-hole (DTH) hammer drill, pile splicing, pile-to-dolphin cap welding, and setting of catwalks. Project drawings are included in Appendix A of the BA (PND Engineers 2020a).

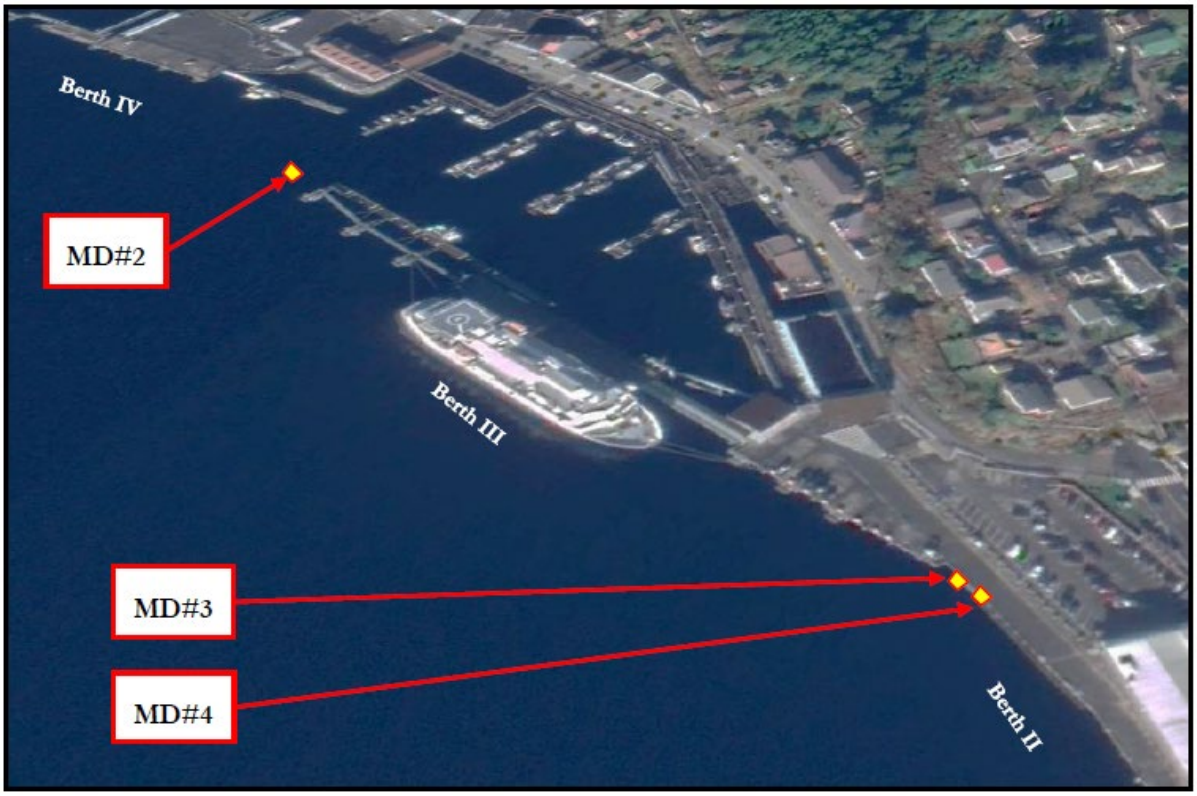


Figure 2. Location of proposed mooring dolphins at City of Ketchikan Berth III (figure from PND Engineers 2020b).

A total of 20 piles will be installed (Table 1). Eight of the piles are temporary template piles and will be removed. Pile driving will be conducted from a stationary barge (anchored or tied to existing structure), utilizing vibratory and impact hammers to install and remove piles and conduct DTH pile installation to position rock sockets and tension anchors. Rock socketing is a process where a pile is driven by conventional vibratory and impact hammers until reaching solid bedrock. If at that point the pile cannot support the needed load, a hole can be drilled into the rock with a DTH system to allow the pile to be anchored up to 10 or more feet into the solid rock. Tension anchoring involves creating an anchor hole that is smaller in diameter than the pile. The holes extend 10 to 20 feet or more below the bottom of the pile. A steel bar or other anchoring structure (*e.g.*, rod) is then grouted or cemented in place from the bottom of the anchor hole and extending up to the top of the pile. Attaching the anchor rod to the pile then helps anchor the pile in place to support the required project loads.

Table 1. Types and quantities of piles to be installed at COK Berth III.

Location	Item	Size and Type	Qty
MD-2	Dolphin and Fender Piles	48-inch (1.22 m) steel pipe piles	6
	Temporary Template Piles	30-inch (0.76 m) steel pipe piles	8
MD-3	Dolphin Piles	36-inch (0.9 m) steel pipe piles	3
MD-4	Dolphin Piles	36-inch (0.9 m) steel pipe piles	3

MD-2 will require six 48-inch diameter steel pipe piles up to 180 feet in length each. MD-3 and MD-4 will each require three 36-inch diameter steel pipe piles up to 180 feet in length each. These piles will be installed in water depths up to 110 feet and will be driven through approximately 10 feet of loose overburden substrate (Table 1).

Due to the nature of deep-water pile installation in loose sediment, a variety of methods may be required to install a single pile, including vibratory hammer, impact hammer, and DTH pile installation.[1] COK may alternate between installation methods depending on the conditions encountered. Only one installation method will occur at a time. COK may also be required to splice on additional lengths of pile (i.e., weld piles together to make them longer) with up to three splices expected per pile. Piles will be initially driven with a vibratory hammer from a barge-based crane. Following vibratory driving, an impact hammer will be used to seat the piles firmly into bedrock.

COK will initially vibratory drive all permanent piles to first refusal, which occurs when they are unable to advance the pile tip any further with a vibratory hammer. This will likely occur when the pile hits bedrock elevation. COK will seat (or secure) the tip of the pile into bedrock with an impact hammer usually to a depth of 1 to 2 feet into fractured bedrock. Once the pile has been seated (or secured) into bedrock with the impact hammer, DTH equipment will be employed to create rock sockets. Due to limited overburden, all piles will require rock sockets. Sockets up to 20 feet deep will be drill hammered through the pile shaft to the width of the associated pile. The pile will be drawn into the socket through the drill hammer action. Finally, on 4 of the 6 piles, a smaller 12-inch diameter DTH device will be used to drill a rock anchor hole into bedrock 60-feet past the pile tip. A 14-inch casing will be inserted into the pile and a 12-inch hole will be drilled up to 60 feet in depth from the base of the rock socket. The 12-inch hole for the rock anchor is drilled beneath the pile tip from within the hollow pipe pile. Three anchor rods will be inserted inside the casing extending all the way from the top of pile to the tip of the drilled 12-inch hole. The drilled 12-inch hole and casing will be filled with grout after component installation.

[1] Hereafter, "pile driving activities" will be used as a general term to include pile installation or removal using vibratory, impact, or down-the-hole (DTH) hammers.

Temporary template piles will be required for installation of the permanent piles at MD-2 and will be removed after permanent dolphin piles have been installed. Template piles are not necessary at MD-3 and MD-4 because the dock structure can be used in lieu of temporary template piles. Temporary template piles will include up to eight piles 30-inches in diameter or smaller. Once installed, each temporary template pile will measure approximately 150-feet in length and will consist of up to two sections that will be spliced together as they are installed. Installation methods for the temporary template piles will be similar to those applied for installation of permanent dolphin piles.

COK will initially vibratory drive all temporary piles to first refusal. COK will then seat the tip of pile into bedrock with an impact hammer advancing the tip 1 to 2 feet into fractured bedrock. Once a pile has been seated into bedrock with an impact hammer, COK may elect to socket hammer the pile up to 10 feet into bedrock. COK will use the vibratory hammer to remove the temporary template piles at the MD-2 after the permanent piles have been installed.

The process for installing permanent piles at MD-3 and MD-4 is identical to that described for installation of permanent piles MD-2. Although additional construction actions will be required to complete the project, the final installation of piles at MD-3 and MD-4 will be the end of all in-water construction activities.

Construction equipment is expected to consist of up to two crane barges, one material barge, and three work boats (each under 25 feet LOA). Materials would be transported to the site using a tug/barge combination. Pile driving will be conducted from an anchored barge, utilizing vibratory and impact hammers to install and remove piles and DTH hammer drill to install rock sockets and tension anchors. The barges will remain anchored on-site during construction, making only minor adjustments in position as required to perform the work.

2.2 Mitigation measures

COK has agreed to implement the following measures to avoid and minimize impacts to the Mexico DPS humpback whale.

Unless otherwise specified, the term “pile driving activities” is defined to include vibratory pile removal, vibratory pile driving, impact pile driving, and/or down-the-hole socketing and anchoring.

2.2.1 General Conditions

- *Pre-construction notification*-- At least one week prior to commencing construction, the City of Ketchikan will notify the NMFS Alaska Regional Office (see *Contact Information*) that construction is planned to begin.

- *Pre-construction briefings*-- COK must conduct briefings for construction supervisors and crews and the monitoring team prior to the start of all pile driving activity, and when new personnel join the work, in order to explain responsibilities, communication procedures, the marine mammal monitoring protocol, and operational procedures.

2.2.2 General Conditions Specific to Pile Driving

2.2.2.1 *Pre-activity Monitoring*

- Prior to the start of daily pile driving activities, or whenever a break in pile driving activities of 30 minutes or longer occurs, protected species observers (PSOs) will observe the Level A shutdown and Level B monitoring zones for a period of 30 minutes before pile driving activities may begin. If the boundaries of the Level B monitoring zone have not been monitored continuously during a work stoppage, the entire Level B zone will be surveyed again to ensure that no humpback whales have entered the Level B zone that were not previously accounted for.

- While one PSO remains at the construction site to monitor the Level A shutdown zone, two or more PSOs will start at the project site and travel along Tongass Narrows, counting all humpback whales present, until they have reached the edge of the respective Level B zone. At this point, the PSOs will identify suitable observation points from which to observe the width of Tongass Narrows for the duration of pile driving activities.
- The Level A shutdown zone will be considered cleared when a humpback whale has not been observed within the zone during the 30-minute pre-activity monitoring period.
- If a humpback whale is observed within the Level A shutdown zone, a soft-start cannot proceed until the animal has left the zone or has not been observed again within the shutdown zone for 30 minutes.
- When a humpback whale for which take is authorized is present in the Level B monitoring zone, activities may begin and Level B take will be recorded.

2.2.2.2 *Soft Start Procedures for Impact Pile Installation*

- COK must use soft start techniques when impact pile driving. A soft start requires an initial set of strikes at reduced energy, followed by a 30-second waiting period, then two subsequent reduced energy strike sets. A soft start must be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of 30 minutes or longer.

2.2.2.3 *Scheduling*

- Pile driving activities will occur only during daylight and, as described below, civil twilight hours, when visual monitoring of humpback whales can be conducted.

- Some pile driving activities may continue for up to 30 minutes after sunset during evening civil twilight, as necessary to secure a pile for safety prior to demobilization for the evening. PSO(s) will continue to observe shutdown and monitoring zones during this time.

2.2.2.4 *Pile Installation Methods*

- To minimize impacts to humpback whales and their prey, vibratory pile installation will be used as the primary method of pile installation.
- Impact driving will be minimized and used only as needed to seat the pile in its final position or to penetrate material that is too dense for a vibratory hammer.
- A single pile driving or removal method will be used at any time. There will be no simultaneous multiple pile driving activities.

2.2.3 Visual Monitoring by Protected Species Observers

2.2.3.1 *General requirements for visual monitoring*

- At least three PSOs must monitor for humpback whales during pile driving activities.
- Trained protected species observers (PSOs) will be employed to monitor the shutdown and monitoring zones listed in Table 2.
- PSOs will have no duties other than to watch for and report on events related to marine mammals during monitoring periods. PSOs will have no construction-related tasks or responsibilities while monitoring for marine mammals.
- PSOs must maintain verbal contact with construction personnel to immediately call for a halt of pile driving activities to avoid exposures, if necessary. A clear authorization and communication system will be in place to ensure that PSOs and construction crew members understand their respective roles and responsibilities.
- *Daily Briefing*-- Each day prior to commencing in-water pile driving activities, the lead PSO and the construction manager (or designee) will conduct a daily briefing to discuss the day's activities, zones to be monitored, and conduct a radio check. The construction manager (or designee) and lead PSO will maintain radio communications throughout the day so that the PSOs may be alerted to any changes in the planned construction activities and zones to be monitored. The lead PSO or monitoring coordinator will be identified during each daily briefing.
- *Shifts*-- PSOs will work in rotating shifts of 4 hours with at least 1 hour between shifts to prevent fatigue. Pile driving activities are intermittent by nature and it is anticipated that periods of rest will be interspersed throughout the day. PSOs will not perform duties as a PSO for more than 12 hours in a 24-hour period to reduce fatigue.
- *Monitoring periods*-- Marine mammal monitoring must take place from 30 minutes prior to initiation of pile driving activity through 30 minutes post-completion of pile driving activity (see *Scheduling* above in Section 2.2.2.3). Pile driving activities may commence when observers have declared the shutdown zone clear of humpback whales. In the event of a delay or shutdown of activity resulting from humpback whales in the shutdown zone (Table 2), their behavior must be monitored and documented until they leave of their own volition or have not been re-sighted in the shutdown zone for 30 minutes, at which point the activity may begin.

- *Required PSO Equipment:* PSOs will have the following to aid in determining the location of observed listed species, to take action if listed species enter the shutdown zone, and to record these events:
    - Appropriate Personal Protective Equipment
    - Portable radios and headsets to communicate with the construction supervisor and other PSOs
    - Cellular telephone as backup for radio communication
    - Contact information for the other observers, construction supervisor, and NMFS
    - Daily tide and civil twilight tables for the project area
    - Watch or chronometer
    - Binoculars (7x50 or better) (optional addition: spotting scope with built-in rangefinder or reticles)
    - Range finder (if not built-in to binoculars)
    - Hand-held GPS unit, map and compass, or grid map to record locations of marine mammals
    - Copies of marine mammal monitoring plan, IHA, and ESA mitigation measures, and/or other relevant permit requirement specifications in a sealed clear plastic cover
    - Standardized monitoring forms approved by NMFS.

2.2.3.2 *Qualifications of PSOs*

Marine mammal monitoring during pile driving activities must be conducted by NMFS-approved PSOs in a manner consistent with the following:

- Independent PSOs (i.e., not construction personnel) who have no other assigned tasks during monitoring periods must be used.
- At least one PSO must have prior experience working as a marine mammal observer during construction activities pursuant to a NMFS-issued incidental take authorization.
- Other PSOs may substitute education (degree in biological science or related field) or training for experience.
- When a team of two or more PSOs is required, a lead observer or monitoring coordinator must be designated. The lead observer must have prior experience working as a marine mammal observer during construction.
- The City of Ketchikan must submit curriculum vitae for PSOs for approval by NMFS Office of Protected Resources (see Table 3 for *Contact Information*) prior to the onset of pile driving activity, or when new PSOs are added to the project.
- All PSOs must have the qualifications:

- Visual acuity in both eyes (correction is permissible) sufficient for the discernment of moving targets at the water's surface with ability to estimate target size and distance.
- Ability to conduct field observations and collect data according to assigned protocols.
- Experience or training in the field identification of marine mammals, including the identification of behaviors.
- Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations.
- 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.
- Ability to communicate orally, by radio, cell phone, or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.

2.2.3.3 *PSO Monitoring Locations*

During pile-driving activities, a minimum of 3 onshore PSOs will be stationed at locations that provide optimal visual coverage for shutdown and monitoring zones (Figure 3).

- One PSO will remain at the construction site to monitor the shutdown zones, and two or more additional PSOs will position themselves along Tongass Narrows until they have reached an area that affords full visual view of the Level B zone. At this point, the PSOs will identify suitable observation points from which to observe the width of Tongass Narrows for the duration of pile driving activities.
- Suitable observation points are shown in Figure 3 along the shoreline of Tongass Narrows. These locations may be flexible if alternate locations with enhanced visual monitoring are found.
- All PSOs will be in constant radio contact with one another and the daily lead PSO will be in contact with the construction team to request a work stoppage, if necessary.
- PSOs stationed south of the project area will monitor for humpback whales in the Level B zone and also for whales that may enter the channel west of Pennock Island. If a whale approaches a shutdown zone, the PSO will immediately notify the lead PSO to prepare for a shutdown.
- To maximize the visual coverage of shutdown and monitoring zones, PSOs will use elevated platforms at observation points to the extent practicable.

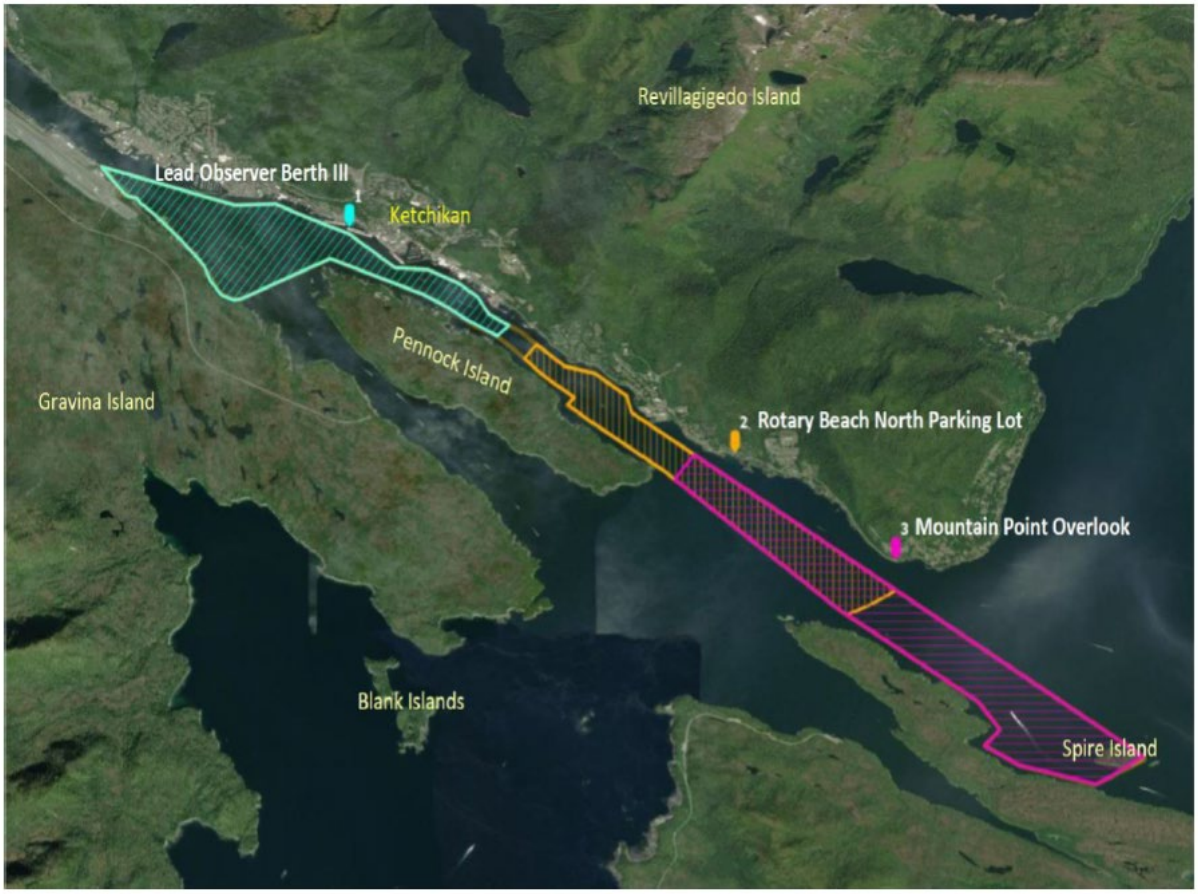


Figure 3. Locations where PSOs may be stationed to visually monitor Level B zones during the COK Berth III mooring dolphins project (PND Engineers 2020b). The zones depicted are the individual maximum viewable areas across the largest monitoring zones.

2.2.4 Monitoring and Shutdown Zones

- PSOs will monitor the shutdown and monitoring zones during pile driving activities (Table 2). All sightings of humpback whales will be documented.
- Should environmental conditions deteriorate such that humpback whales within the entire shutdown zone would not be visible, permitted activities must be delayed until the entire shutdown zone is again visible.

Table 2. Humpback whale Level A shutdown zones and Level B monitoring zones for in-water construction activities.

Pile Size	Level A Shutdown Zone (m)	Level B Monitoring Zone (m)
Vibratory Pile Driving/Removal		
30-inch piles (up to 8 hr)	40	6,300
36- and 48-inch piles (up to 8 hr)	90	12,500
Impact Pile Driving		
30-inch piles (up to 500 strikes)	500	2,200
30-inch piles (501 to 1,000 strikes)	700	2,200
30-inch piles (1,001 to 1,500 strikes)	1,000	2,200
36- and 48-inch piles (up to 500 strikes)	1,300	3,800
36- and 48-inch piles (501 to 1,000 strikes)	2,000	3,800
36- and 48-inch piles (1,001 to 1,500 strikes)	2,600	3,800
DTH Socket		
30- and 36-inch piles (up to 3 hr)	1,300	12,500
30- and 36-inch piles (>3 to 6 hr)	2,000	12,500
48-inch piles (up to 2 hr)	1,750	12,500
48-inch piles (>2 to 3 hr)	2,300	12,500
48-inch piles (>3 to 4 hr)	2,750	12,500
DTH Anchor		
12-inch hole (up to 8 hr)	150	6,500
Any other in-water or over water activities	10	-

2.2.4.1 *In-water heavy machinery work other than pile driving--*

For in-water construction and heavy machinery activities other than pile driving (e.g., moving barge to the pile location, stabbing the pile), if a humpback whale comes within 10 m, COK must cease operations and reduce vessel speed to the minimum level required to maintain steerage and safe working conditions. This zone may be monitored by trained construction personnel or a PSO.

2.2.4.2 *Level A Shutdown zones*

- No Level A take of Mexico DPS humpback whales is authorized.
- COK must establish and implement the shutdown zones indicated in Table 2 and Figures 4-11.
    - During impact driving and DTH pile installation, shutdown zone sizes with the least number of strikes or shortest time interval will initially be monitored. Shutdown

zones will sequentially be expanded to the next largest zone based on the total number of strikes or time interval as shown in Table 2.

- For example, during impact driving of 30-inch piles, a shutdown zone of 500 m associated with 0-500 strikes would be monitored until 500 strikes are attained (Table 2). Between 501-1000 strikes, a shutdown zone of 700 m would be monitored. After 1,000 strikes a 1,000 m shutdown zone would be monitored.

- If a humpback whale is entering or is observed within an established shutdown zone (Table 2), the lead PSO will halt or delay pile driving activities. Pile driving activities may not commence or resume until either the animal has voluntarily left and been visually confirmed to be beyond the shutdown zone or 30 minutes have passed without subsequent detections of the humpback whale(s) in the shutdown zone.

Figure 4. Level A shutdown zones for impact pile installation of 30-inch piles for 0-500 strikes (purple, 500 m), 501-1,000 strikes (yellow, 700 m), and 1,001-1,500 strikes (green, 1,000 m) at Mooring Dolphin 2 (MD-2), COK Berth III (PND Engineers 2020b).

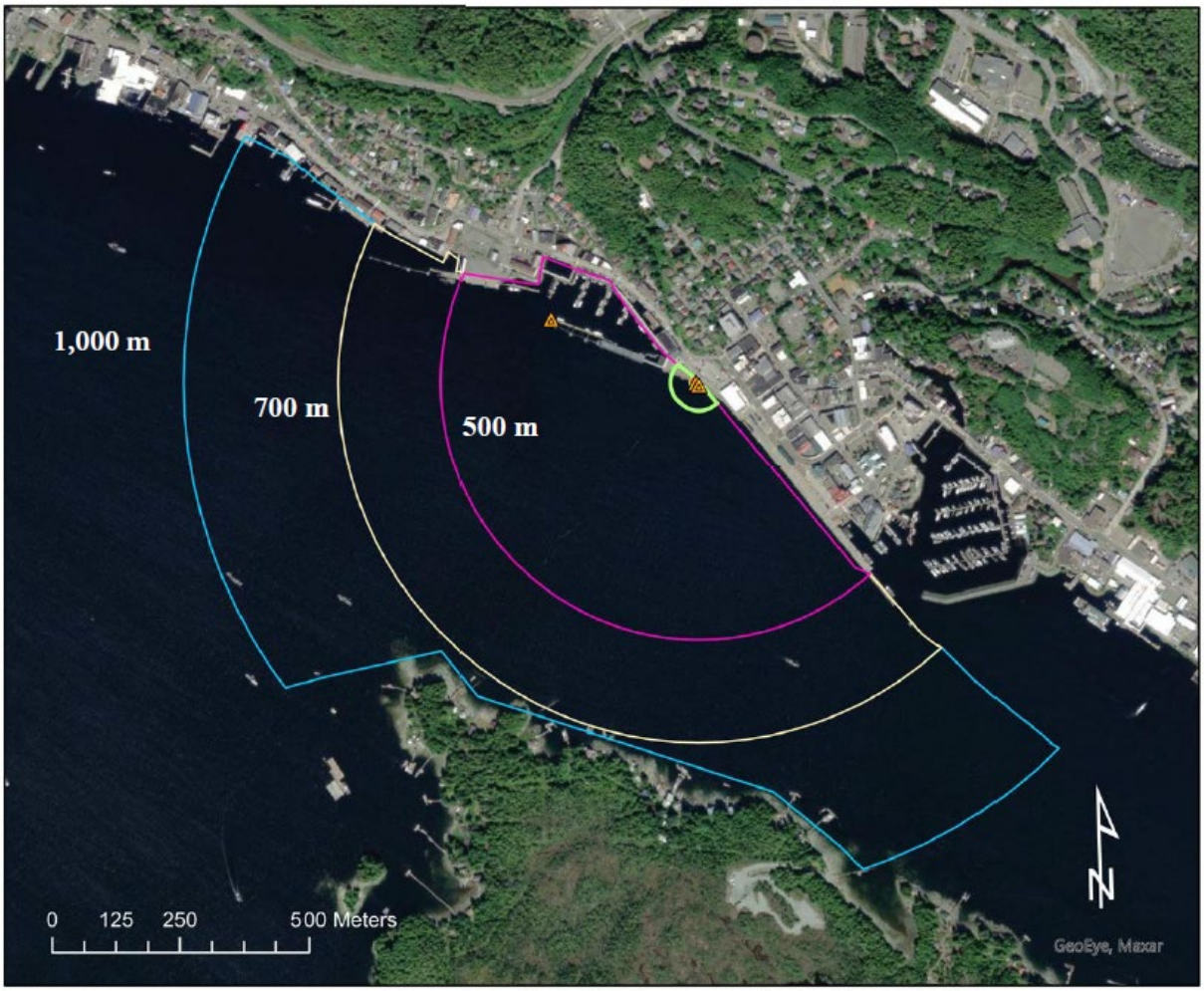


Figure 5. Level A shutdown zones for impact pile installation of 30-inch piles for 0-500 strikes (purple, 500 m), 501-1,000 strikes (yellow, 700 m), and 1,001-1,500 strikes (blue, 1,000 m) at Mooring Dolphins 3 and 4 (MD-3, MD-4), COK Berth III (PND Engineers 2020b).

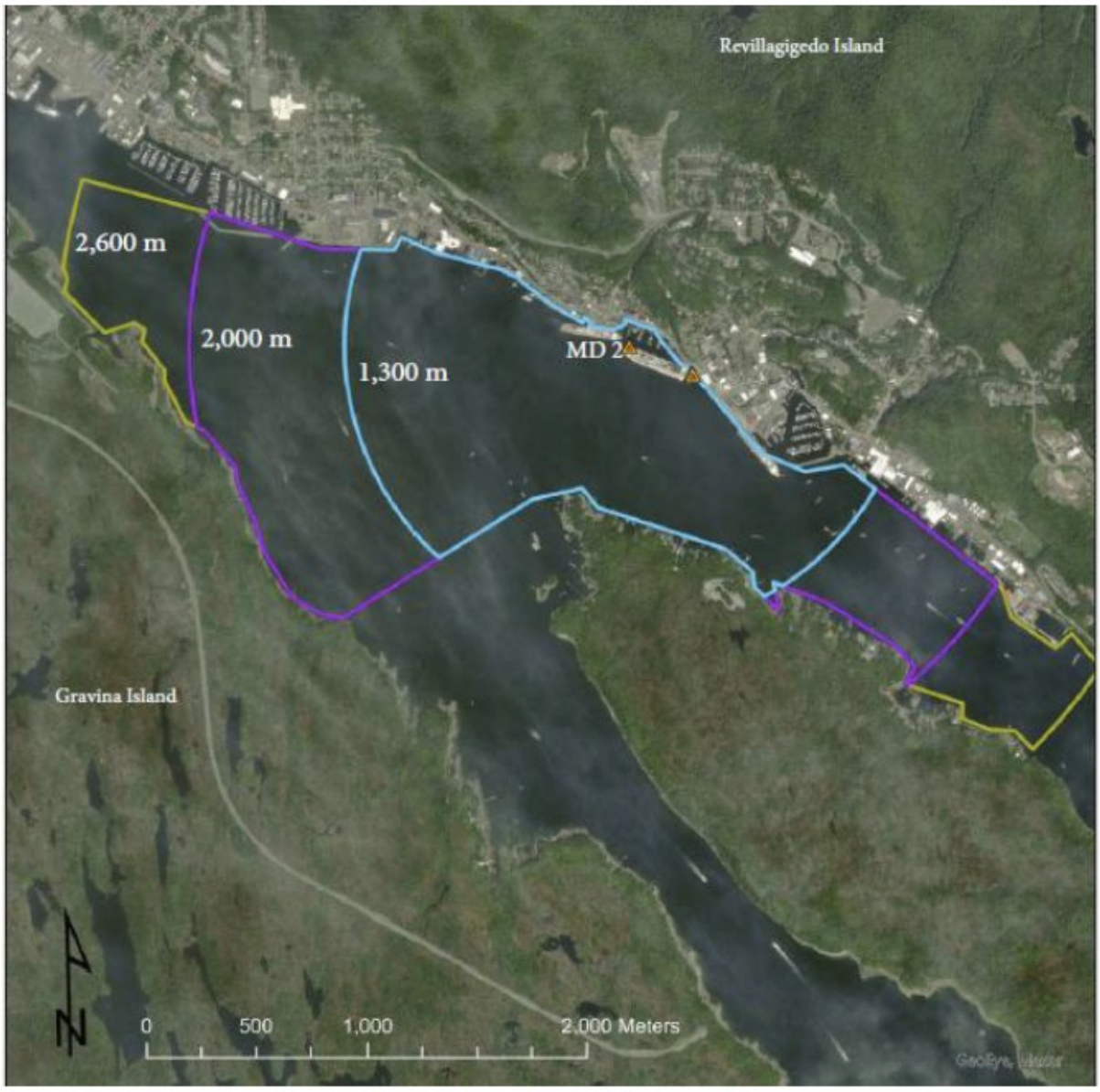


Figure 6. Level A shutdown zones for impact pile installation of 36-inch and 48-inch piles for 0-500 strikes (blue, 1,300 m), 501-1,000 strikes (purple, 2,000 m), and 1,001-1,500 strikes (yellow, 2,600 m) at Mooring Dolphin 2 (MD-2), COK Berth III (PND Engineers 2020b). Level A shutdown zones for DTH socketing of 30-inch and 36-inch piles for up to 3 hr (blue, 1,300 m), and 3-6 hr (purple, 2,000 m).

Figure 7. Level A shutdown zones for impact pile installation of 36-inch and 48-inch piles for 0-500 strikes (blue, 1,300 m), 501-1,000 strikes (purple, 2,000 m), and 1,001-1,500 strikes (yellow, 2,600 m) at Mooring Dolphins 3 and 4 (MD-3, MD-4), COK Berth III ((PND Engineers 2020b). Level A shutdown zones for DTH socketing of 30-inch and 36-inch piles for up to 3 hr (blue, 1,300 m), and 3-6 hr (purple, 2,000 m).

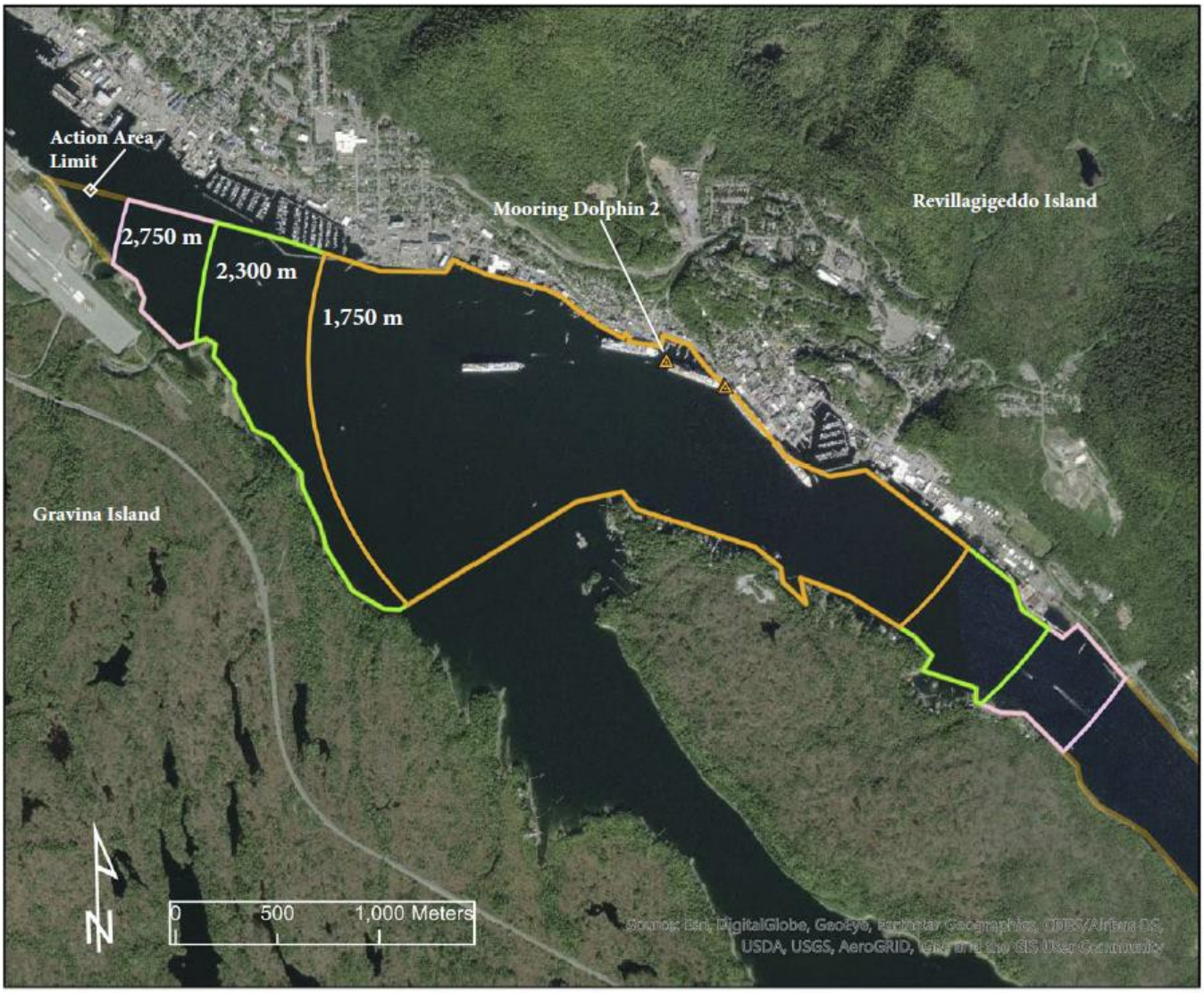


Figure 8. Level A shutdown zones for DTH socketing of 48-inch piles for up to 2 hr (yellow, 1,750 m), 2-3 hr (green, 2,300 m), 3-4 hr (pink, 2,750 m) at Mooring Dolphin 2 (MD-2), COK Berth III (PND Engineers 2020b).

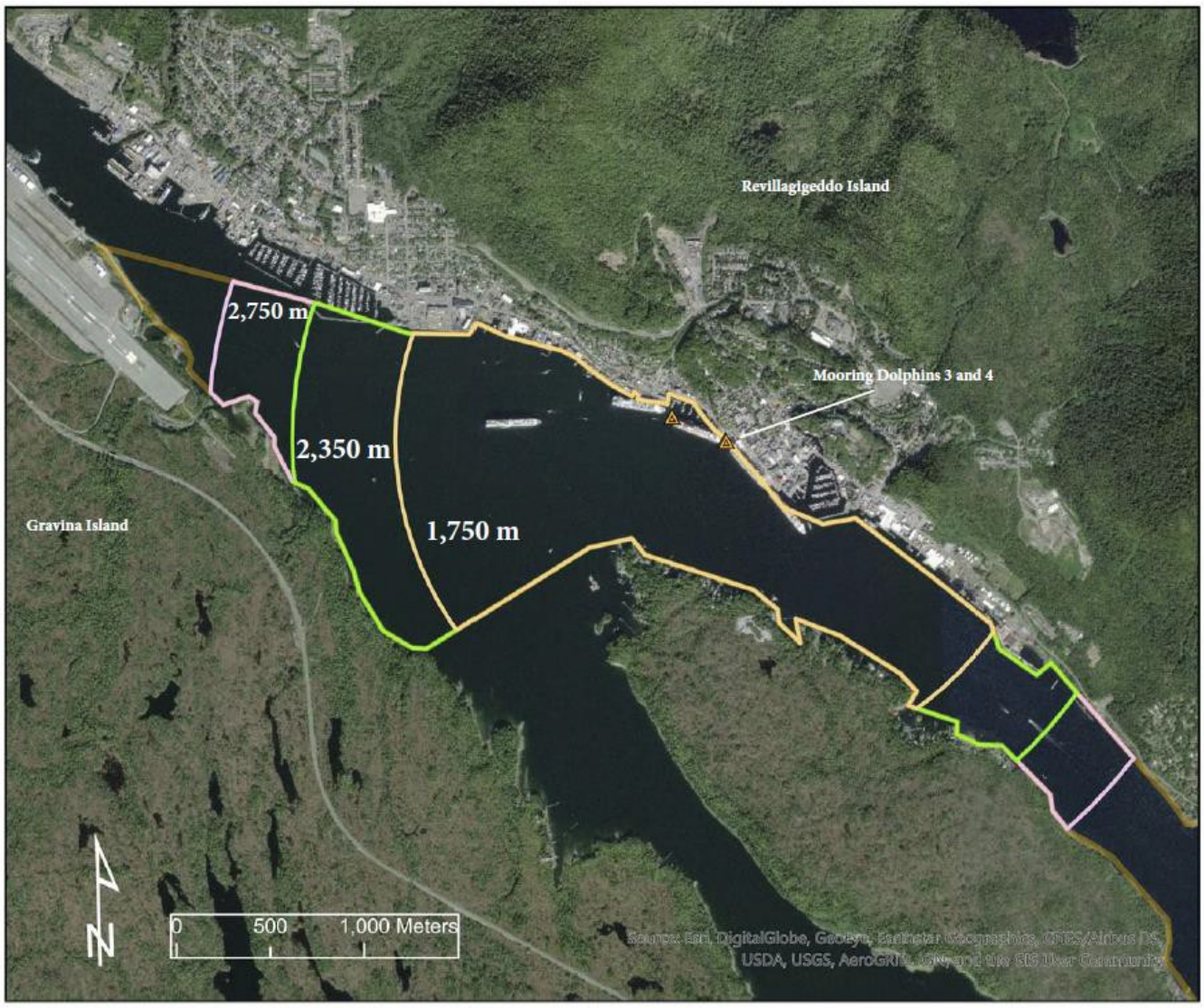


Figure 9. Level A shutdown zones for DTH socketing of 48-inch piles for up to 2 hr (yellow, 1,750 m), 2-3 hr (green, 2,300 m), 3-4 hr (pink, 2,750 m) at Mooring Dolphins 3 and 4 (MD-3, MD-4), COK Berth III (PND Engineers 2020b).

Figure 10. Level A shutdown zones for in-water or over-water non-pile driving activities (red, 10 m) and DTH anchoring up to 12-inch holes (pink, 150 m) at Mooring Dolphin 2 (MD-2), COK Berth III (PND Engineers 2020b).

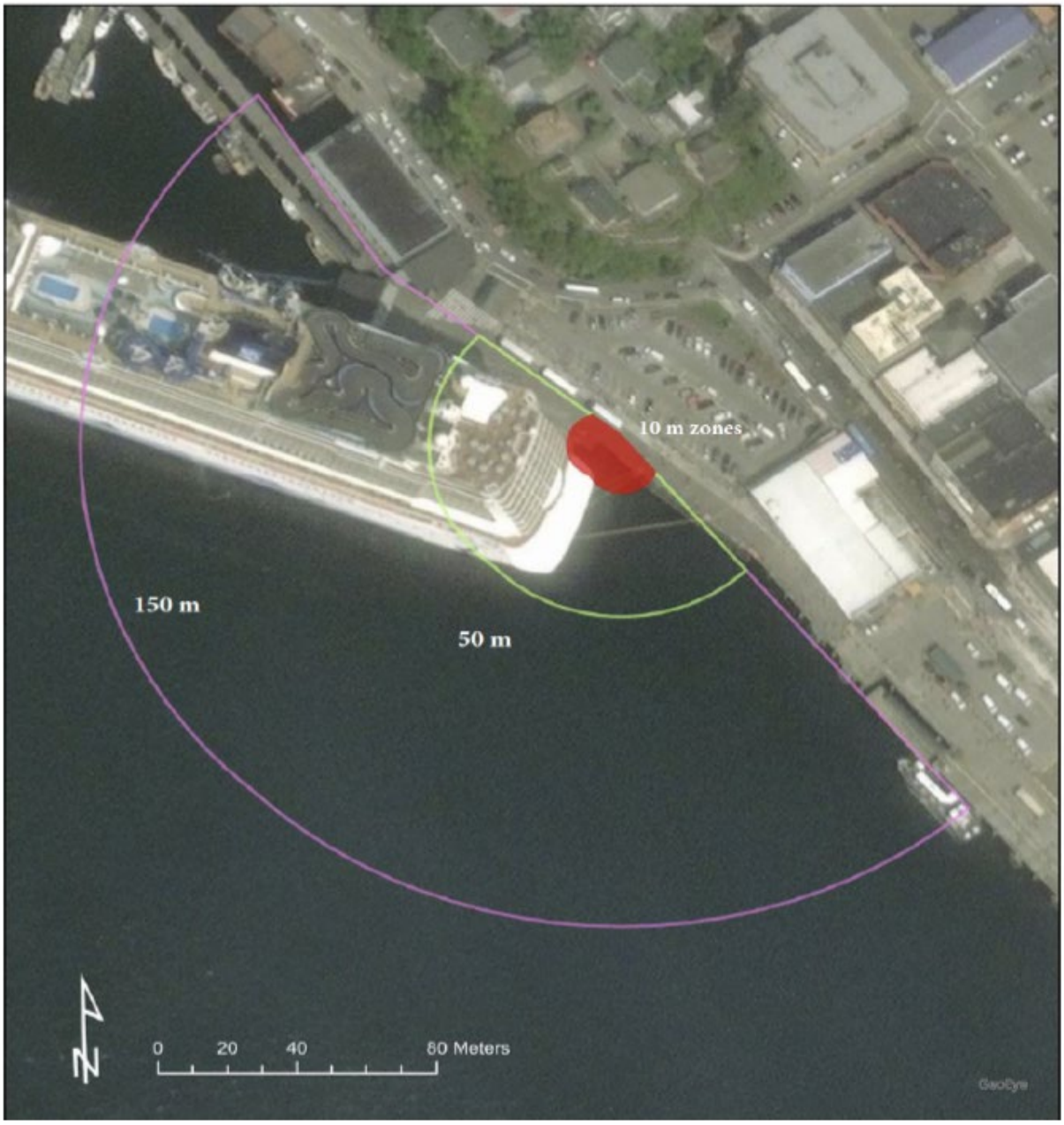


Figure 11. Level A shutdown zones for in-water or over-water non-pile driving activities (red, 10 m) and DTH anchoring up to 12-inch holes (pink, 150 m) at Mooring Dolphins 3 and 4 (MD-3, MD-4), COK Berth III (PND Engineers 2020b).

2.2.4.3 *Level B monitoring zones*

- The City of Ketchikan will implement the Level B monitoring zones shown in Table 2 and Figures 12-13.
- *Pre-activity monitoring*--While one PSO remains at the construction site to monitor the shutdown zone, two or more PSOs will start at the project site and travel along Tongass

Narrows, counting all humpback whales present, until they have reached the edge of the respective Level B zone. At this point, the PSOs will identify suitable observation points from which to observe the width of Tongass Narrows for the duration of pile driving activities.

- Individual PSOs will not be responsible for observing the entire monitoring zone at one time, but must be able to see the entire width of Tongass Narrows to monitor for humpback whales that could potentially enter the Level B zone from the north or south.
    - PSOs will only be responsible for observing the width of Tongass Narrows rather than the entirety of the Level B zone because any humpback whale entering the Level B zone would need to pass by one of these PSOs. All PSOs will be in constant radio contact with one another and the lead PSO will be in contact with the construction team to request a work stoppage, if necessary.
    - If visibility deteriorates so that the entire width of Tongass Narrows at the Level B zone boundary is not visible, additional PSOs may be positioned so that the entire width is visible, or work will be halted until the entire width is visible to ensure that any humpback whales entering or within the Level B zone are detected by PSOs.
- When a humpback whale for which take has been authorized is present in the Level B zone, pile driving activities may begin and the PSO will record take for that individual. Assuming that take has not exceeded the number authorized, pile driving activities may continue while the humpback whale is within the Level B zone. Each instance of Level B harassment will be considered authorized by the Incidental Harassment Authorization that NMFS will issue under the MMPA.
- Soft-start or ramp-up procedures may be initiated while a humpback whale is within the Level B zone.
- If a listed species for which authorization has not been granted is observed approaching or within the Level B monitoring zone (Table 2), pile driving activities must shut down immediately using delay and shut-down procedures. Activities must not resume until the animal has been confirmed to have left the area or 15 minutes (pinnipeds) or 30 minutes (cetaceans) have passed without subsequent detections of marine mammals in the Level B monitoring zone.
- If the project reaches the total level of authorized takes of Mexico DPS humpback whale as reflected in the Incidental Take Statement, and a humpback whale is observed approaching the Level B monitoring zone, pile driving activities must shut down immediately using delay and shut-down procedures. Activities must not resume until the animal has been confirmed to have left the area or 30 minutes have passed without subsequent detections of a humpback whale in the Level B monitoring zone.

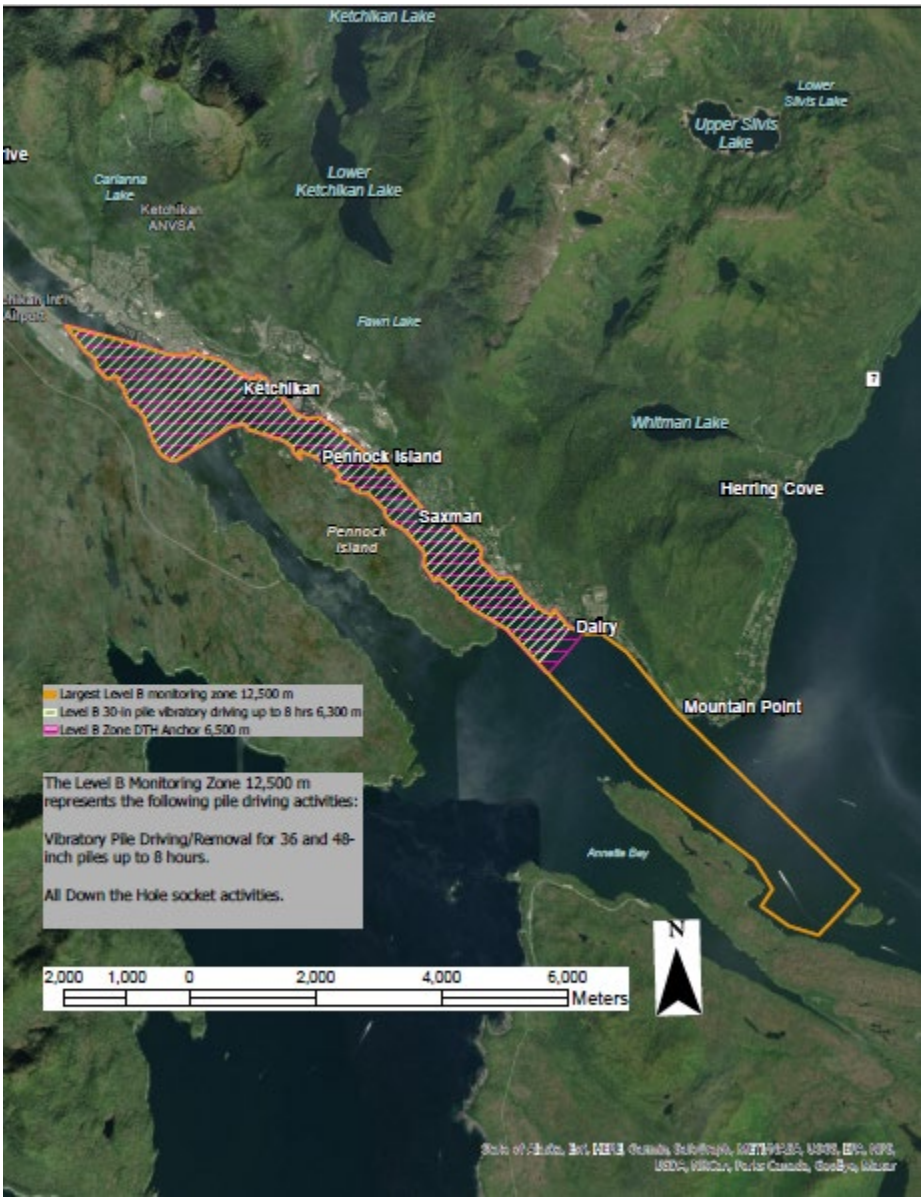


Figure 12. Level B monitoring zones for zones larger than 6,300 m at COK Berth III (PND Engineers 2020b).

Figure 13. Level B monitoring zones for all impact pile driving of 30-in piles (pink, 2,200 m) and 36- and 48-inch piles (blue, 3,800 m) at COK Berth III (PND Engineers 2020b).

2.2.5 Reporting

2.2.5.1 *Daily activity logs*

A NMFS-approved Marine Mammal Observation Record will be completed by each PSO for each day of in-water construction that requires a PSO. The record will include the following information:

- Date and time that each monitoring period begins and ends;
- PSO locations during marine mammal monitoring;
- Construction activities occurring during each daily observation period, including how many and which type of piles were driven or removed and by which method (i.e., impact or vibratory, DTH);

- Weather parameters (e.g., wind speed, percent cloud cover, visibility) and water conditions (e.g., tidal stage, sea state) during each monitoring period and estimated observable distance (if less than the Level B monitoring zone distance);
- The number, sex, and age class (if possible) of marine mammals observed, by species, relative to the pile location, and if pile driving or removal was occurring at time of sighting;
- Description of any marine mammal behavior patterns during observation, including bearing from PSO, direction of travel, concurrent in-water construction activity, and estimated time spent within the Level A and Level B zones while the source was active;
- Distance and bearings from pile driving activities to marine mammals and distance from the marine mammal to the observation point;
- Record of whether an observation required the implementation of shutdown procedures and the duration each shutdown.
- Locations of all marine mammal observations

2.2.5.2 *Interim monthly reports*

• During construction, the COK will submit brief, monthly reports that summarize PSO observations and recorded takes of humpback whales. Monthly reporting will allow NMFS to track the amount of take (including estimated takes), to allow re-initiation of consultation in a timely manner, if necessary.

• The reporting period for each monthly PSO report will be the entire calendar month, and reports will be submitted by close of business on the tenth day of the month following the end of the reporting period (e.g., the monthly report covering September 1–30, 2021, would be submitted to NMFS by close of business on October 10, 2021).

• Monthly reports will be submitted by email to NMFS Office of Protected Resources and NMFS Alaska Region Protected Resources Division (See Table 3 for *Contact Information*).

2.2.5.3 *Final report*

The COK will submit a draft final report on all monitoring conducted under the IHA and this biological opinion within 90 calendar days after completion of pile driving/removal and DTH activities, or 60 days prior to the issuance of any subsequent IHA for this action, whichever comes first.

- If comments are received from NMFS, a final report addressing NMFS's comments must be submitted within 30 days after receipt of comments.
- If no comments are received from NMFS within 30 days, the draft final report will be considered the final report.
- This report must contain, at minimum, the following information:
    - A summary of the Daily Activity Logs described above;

- 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;
- 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; and
- All PSO datasheets and/or raw sighting data (submitted in a separate electronic file from the Final Report and entered into a searchable spreadsheet or database).

- Draft and final reports will be submitted by email to NMFS Office of Protected Resources and NMFS Alaska Region Protected Resources Division (See Table 3 for *Contact Information*).

2.2.6 Estimation of Take

In order to document observed instances of Level B take, PSOs will record all humpback whale observations, regardless of location. The observer's location, as well as the location of the pile being driven, is known from a GPS. The location of the animal is estimated as a distance from the 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 Level B take 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 calculate observed exposures to quantify total takes.

2.2.6.1 *Calculating takes of Mexico DPS humpback whales—*

Exposures will be calculated based on the total number of humpback whales observed (or estimated) in the Level B monitoring zone multiplied by 6.1 percent (the percentage of humpback whales in the action area estimated to be from the listed Mexico DPS (Wade et al. 2016)). Therefore, for every 16 humpback whales observed in the monitoring zone, approximately one (6.1 %) would be considered a Mexico DPS humpback whale that was exposed to sound capable of causing harassment.

2.2.6.2 *Notification of authorized take utilization--*

COK will immediately notify NMFS Alaska Region Protected Resources Division (see Table 3 for *Contact Information*) when a cumulative total of 98 humpback whales have been detected in the Level B zone while in-water construction activities were underway that would expose them to noise levels exceeding the Level B threshold. This would equate to six instances of exposure of Mexico DPS humpback whales (equivalent to approximately 80 percent of the authorized take for this action).

2.2.7 Reporting Injured or Dead Marine Mammals

2.2.7.1 *For injuries or mortalities to animals from activities related to the project*

In the unanticipated event that the specified activity clearly causes the take of a listed marine mammal in a manner not authorized by the Incidental Take Statement, the City of Ketchikan will immediately cease the specified activities and report the incident to the NMFS Office of Protected Resources, and the NMFS Alaska Region 24-hour Stranding Hotline (see Table 3 for *Contact Information*).

The report must include the following information:

- Time, date, and location (latitude/longitude) of the first discovery of the injured or killed listed marine mammal (and updated location information if known and applicable);
- Species identification (if known) or description of the animal(s) involved;
- Condition of the animal(s) (including carcass condition if the animal is dead);
- Observed behaviors of the animal(s), if alive;
- Photographs or video footage of the animal(s) (if available); and
- General circumstances under which the animal was affected by project activities.

Activities will not resume until NMFS is able to review the circumstances of the unauthorized take. NMFS will work with the City of Ketchikan to determine what, if any, additional measures are appropriate to minimize the likelihood of further unauthorized take and ensure ESA and MMPA compliance. The City of Ketchikan will not resume their activities until notified by NMFS.

2.2.7.2 *For injured or dead animals from unknown causes*

In the event that the City of Ketchikan discovers an injured or dead marine mammal within the action area, and the lead PSO determines that the cause of the injury or death is unknown or the death is relatively recent (e.g., in less than a moderate state of decomposition), the City of Ketchikan must immediately report the incident to the NMFS Office of Protected Resources and the NMFS Alaska Region 24-hour Stranding Hotline (see Table 3 for *Contact Information*).

The report must include the same information identified in Section 2.2.7.1 above.

Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with the City of Ketchikan to determine whether additional mitigation measures or modifications to the activities are appropriate.

2.2.7.3 *For injured or dead animals unrelated to the action*

In the event that the City of Ketchikan discovers an injured or dead marine mammal, and the lead observer determines that the injury or death is not associated with or related to the specified activities (e.g., evidence of prior injury or a carcass with moderate to advanced decomposition, or scavenger damage), the City of Ketchikan must report the incident to the NMFS Office of

Protected Resources and the NMFS Alaska Region 24-hour Stranding Hotline (see Table 3 for *Contact Information*) within 24 hours of the discovery.

2.2.8 Strike Avoidance

Vessels associated with the proposed action will adhere to the Alaska Humpback Whale Approach Regulations when transiting to and from the project site (see 50 CFR §§ 216.18, 223.214, and 224.103(b)). Under these regulations it is prohibited for a vessel to:

- approach by any means, including by interception (i.e., placing a vessel in the path of an oncoming humpback whale so that the whale surfaces within 100 yards (91.4 m) of the vessel), within 100 yards of any humpback whale;
- cause a vessel or other object to approach within 100 yards of a humpback whale; or
- disrupt the normal behavior or prior activity of a whale by any other act or omission. A disruption of normal behavior may be manifested by, among other actions on the part of the whale, a rapid change in direction or speed; escape tactics such as prolonged diving, underwater course changes, underwater exhalation, or evasive swimming patterns; interruptions of breeding, nursing, or resting activities, attempts by a whale to shield a calf from a vessel or human observer by tail swishing or by other protective movement; or the abandonment of a previously frequented area.
- Notwithstanding the prohibitions above, vessels must operate at a slow, safe speed when near a humpback whale (safe speed is defined in regulation (see 33 CFR § 83.06)).

Additionally,

- Vessels will follow established transit routes and will travel <10 knots while in the action area. The speed limit within Tongass Narrows is 7 knots for vessels over 23 feet in length.
- If a humpback whale comes within 10 m (32.8 ft) of a vessel during construction, the vessel will reduce speed to the minimum level required to maintain safe steerage and working conditions until the humpback whale is at least 10 m (32.8 ft) away from the vessel.

2.2.9 Oil and Spill Prevention

- Fuels, lubricants, chemicals and other hazardous substances will be stored above the high tide line to prevent spills.
- Oil booms will be readily available for containment should any releases occur.
- To prevent spills or leakage of hazardous material during construction, standard spill-prevention measures will be implemented during construction. The Contractor will provide and maintain a spill clean-up kit on-site at all times.

- The contractor will monitor equipment and gear storage areas for drips or leaks regularly, including inspection of fuel hoses, oil drums, oil or fuel transfer valves and fittings, and fuel storage that occurs at the project site. Equipment will be maintained and stored properly to prevent spills.
- If contaminated or hazardous materials are encountered during construction, all work in the vicinity of the contaminated site will be stopped until a corrective action plan is devised and implemented to minimize impacts on surface waters and organisms in the project area.
- Spills of oil or other hazardous materials will be reported to the U.S. Coast Guard and NMFS (see Table 3 for *Contact Information*).

2.2.10 Contact Information

Table 3. Contact information for the City of Ketchikan's Berth III project for this biological opinion and incidental harassment authorization.

Topic	**Contact Information**
NMFS ESA Section 7 Consultation	NMFS Alaska Regional Office Protected Resources Division *Alaska Region Section 7 Coordinator:* Greg Balogh, Greg.Balogh@noaa.gov, 907-271-3023 *Consultation Biologist:* Julie Scheurer, Julie.Scheurer@noaa.gov, 907-586-7111
NMFS MMPA IHA Authorization	NMFS Office of Protected Resources Permits Division Rob Pauline, Robert.Pauline@noaa.gov 301-427-8408
PSO Monitoring Reports & Data Submittal	AKR.section7@noaa.gov -and- Robert.Pauline@noaa.gov
Reporting of Stranded, Injured, or Dead Marine Mammals	NMFS Alaska Region 24-hr Stranding Hotline 877-925-7773 -and- NMFS Office of Protected Resources Permits Division Rob Pauline, Robert.Pauline@noaa.gov 301-427-8408
Oil Spill & Hazardous Materials Response	U.S. Coast Guard National Response Center: 1-800-424-8802 and

	AKRNMFSSpillResponse@noaa.gov
Illegal Activities *(not related to project activities; e.g., feeding, unauthorized harassment, or disturbance to marine mammals)*	NMFS Office of Law Enforcement (AK Hotline): 1-800-853-1964
Unauthorized Take by Project Activities	NMFS Alaska Regional Office 907-586-7236 and *Alaska Region Section 7 Coordinator:* Greg Balogh, Greg.Balogh@noaa.gov, 907-271-3023 and *Section 7 Consultation Biologist:* Julie Scheurer, Julie.Scheurer@noaa.gov, 907-586-7111 and NMFS Office of Protected Resources Permits Division Rob Pauline, Robert.Pauline@noaa.gov 301-427-8408

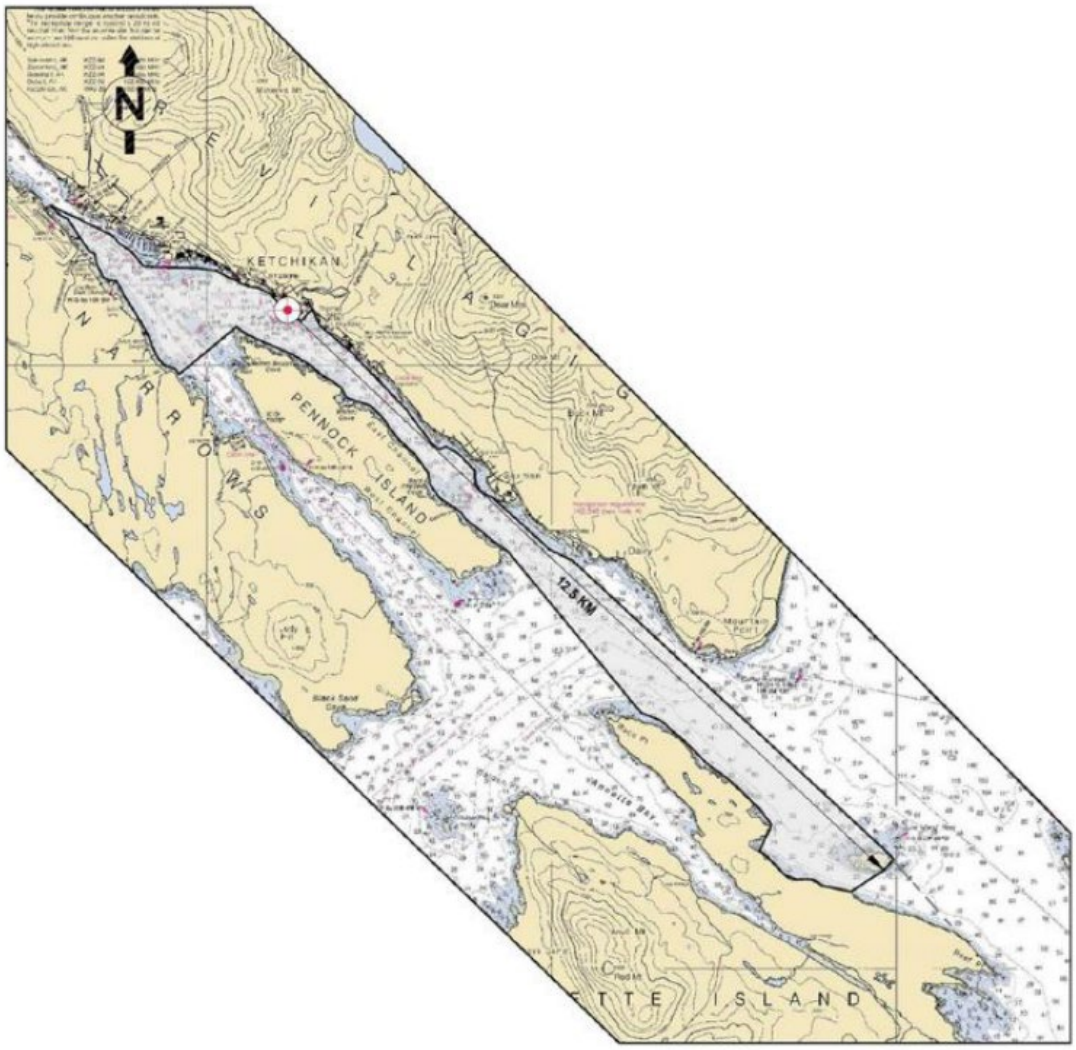
2.3 Action Area

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

The action area includes the area in which pile driving and other in-water work activities will take place, the ensonified area around pile driving activities, and other in-water work activities associated with the project (Figure 14).

Ketchikan is located in Southeast Alaska on the western coast of Revillagigedo Island, near the southernmost boundary of Alaska (Figure 1). Ketchikan encompasses an area of approximately 3 square miles (7.8 km^2) of land and 1 square mile (2.6 km^2) of water. The site is located on the east side of Tongass Narrows, an 11-mile-long (17.7 km), narrow marine channel between Revillagigedo and Gravina islands. Berth III is part of the Port of Ketchikan, an active marine commercial and industrial area.

At the project site where piles will be driven, water depths range between approximately 60 ft (18.3 m) and 160 ft (48.8 m) (PND Engineers 2006). Tidal currents generally range from 0.3 to 1.6 miles per hour (0.5-2.6 km/hr) during flood and ebb tides (PND Engineers 2006). The tide range in Ketchikan is more than 20 ft (6.7 m). Water depths in the area of Tongass Narrows that will be ensonified by this project are generally 160 ft (53.3 m) or shallower, but get deeper past the southern end of Pennock Island reaching depths up to 625 ft (208.3 m).



Source: NOAA chart 17429

Figure 14. Action area for the City of Ketchikan's Berth III new mooring dolphins project based on the largest ensonified zone to be monitored (approximately 12 km).

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. Because there is no critical habitat in or near the action area, we do not consider adverse modification further in this biological opinion.

"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 will result in a jeopardy biological opinion (51 FR 19926, 19934 (June 2, 1986)).

We use the following approach to determine whether the proposed action described in Section 2 is likely to jeopardize listed species:

- Identify those aspects (or stressors) of the proposed action that are likely to have direct or indirect effects on listed species. As part of this step, we identify the action area – the spatial and temporal extent of these direct and indirect effects.
- Identify the rangewide status of the species likely to be adversely affected by the proposed action. This section describes the current status of each listed species relative to the conditions needed for recovery. *Status of the Species* is discussed in Section 4 of this biological 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 biological 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. The *Effects of the Action* are described in Section 6 and the *Exposure Analysis* is described in Section 6.4 of this biological 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 6.5 of this biological 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 biological 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 appreciably reduce the likelihood of both survival and recovery of the species in the wild by reducing its

numbers, reproduction, or distribution. This assessment is made in full consideration of the status of the species (Section 4). *Integration and Synthesis* with risk analyses are described in Section 8 of this biological opinion.

- Conclusions regarding jeopardy are presented in Section 9. These conclusions flow from the logic and rationale presented in Section 8.

4 STATUS OF THE SPECIES AND CRITICAL HABITAT

One ESA-listed marine mammal species under NMFS's jurisdiction may occur in the action area: the threatened Mexico DPS humpback whale. No critical habitat for any ESA-listed species occurs within the action area (Table 4).

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

Species	Status	Listing	Critical Habitat
Humpback whale, Mexico DPS *(Megaptera novaeangliae)*	Threatened	September 8, 2016 81 FR 62260	Proposed October 9, 2019 84 FR 54354

4.1 Climate Change

Factors which affect the ocean, like temperature and pH can have direct and indirect impacts on marine mammals and the resources they depend upon. First, we provide background on the physical effects climate change has caused on a broad scale; then we focus on changes that have occurred in Alaska. Next, we provide an overview of how these physical changes translate to biological effects.

4.1.1 Physical Effects

4.1.1.1 *Air Temperature*

There is consensus throughout the scientific community that atmospheric temperatures are increasing, and will continue to increase, for at least the next several decades (Watson and Albritton 2001; Oreskes 2004). The Intergovernmental Panel on Climate Change (IPCC) estimated that since the mid-1800s, average global land and sea surface temperature has increased by 0.85°C (±0.2°C), with most of the change occurring since 1976 (IPCC 2019). This temperature increase is greater than what would be expected given the range of natural climatic variability recorded over the past 1,000 years (Crowley 2000).

Continued emission of greenhouse gases is expected to cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems (IPCC 2019). Data show that 2019 was the second warmest year in the 140-year record, and global land and ocean surface temperatures departed +0.95°C (+1.71°F) from average[2]. The five warmest years in the 1880–2019 record

have all occurred since 2015, with nine of the 10 warmest years having occurred since 2005[2]. July, 2019, was Earth's hottest month on record (Blunden and Arndt 2020).

The impacts of climate change are especially pronounced at high latitudes. Across Alaska, average air temperatures have been increasing, and the average annual temperature is now 1.65-2.2°C (3-4°F) warmer than during the early and mid-century (Thoman and Walsh 2019). Winter temperatures have increased by 3.3°C (6°F) (Chapin et al. 2014) and the snow season is shortening (Thoman and Walsh 2019). Alaska had its warmest year on record in 2019, with a statewide average temperature of 32.2°F, 6.2°F above the long-term average. This surpassed the previous record of 31.9°F in 2016. The four warmest years on record for Alaska have occurred in the past 6 years[3].

4.1.1.2 *Ocean Heat*

Higher air temperatures have led to higher ocean temperatures. More than 90% of the excess heat created by global climate change is stored in the world's oceans, causing increases in ocean temperature (IPCC 2019; Cheng et al. 2020). The upper ocean heat content, which measures the amount of heat stored in the upper 2000 m (6,561 ft) of the ocean, was the highest on record in 2019 by a wide margin, and is the warmest in recorded human history (Cheng et al. 2020). The seas surrounding Alaska have been unusually warm in recent years, with unprecedented warmth in some cases (Thoman and Walsh 2019).

A marine heat wave is a coherent area of extreme warm temperature at the sea surface that persists (Frölicher et al. 2018). The largest recorded marine heat wave occurred in the northeast Pacific Ocean from 2013-2015 (Frölicher et al. 2018). It was called "the blob". The blob first appeared off the coast of Alaska in the winter of 2013-2014 and by the end of 2015 it stretched from Alaska to Baja California. Consequences of this event included an unprecedented harmful algal bloom that extended from the Aleutian Islands to southern California, mass strandings of marine mammals, shifts in the distribution of invertebrates and fish, and shifts in abundance of several fish species (Cavole et al. 2016). The 2018 Pacific cod stock assessment[4] estimated that the female spawning biomass of Pacific cod is at its lowest point in the 41-year time series, following three years of poor recruitment and increased natural mortality as a result of the blob. It is thought that marine mammals in the Gulf of Alaska were also likely impacted by the low prey availability associated with warm ocean temperatures that occurred (Bond et al. 2015; Peterson et al. 2016; Sweeney et al. 2018).

4.1.1.3 *Ocean Acidification*

For 650,000 years or more, the average global atmospheric carbon dioxide (CO_2) concentration varied between 180 and 300 parts per million (ppm), but since the beginning of the industrial revolution in the late 1700s, atmospheric CO_2 concentrations have been increasing rapidly, primarily due to anthropogenic inputs (Fabry et al. 2008; Lüthi et al. 2008). The world's oceans have absorbed approximately one-third of the anthropogenic CO_2 released, which has buffered

[2] NOAA National Centers for Environmental Information webpage. Assessing the global climate in 2019. Available from https://www.ncei.noaa.gov/news/global-climate-201912, accessed November 10, 2020.
[3] NOAA National Centers for Environmental Information webpage. Assessing the U.S. Climate in 2019. Available at https://www.ncei.noaa.gov/news/national-climate-201912, accessed November 10, 2020.
[4]NOAA Fisheries, Alaska Fisheries Science Center website. Available at https://apps-afsc.fisheries.noaa.gov/REFM/stocks/Historic_Assess.htm, accessed December 2, 2020.

the increase in atmospheric CO_2 concentrations (Feely et al. 2004; Feely et al. 2009). Despite the oceans' role as large carbon sinks, the CO_2 level continues to rise and is currently over 410 ppm[5].

As the oceans absorb CO_2, the pH of seawater is reduced. This process is referred to as ocean acidification. Ocean acidification reduces the saturation states of certain biologically important calcium carbonate minerals like aragonite and calcite that many organisms use to form and maintain shells (Bates et al. 2009; Reisdorph and Mathis 2014). When seawater is supersaturated with these minerals, calcification (growth) of shells is favored. Likewise, when the sea water becomes undersaturated, dissolution is favored (Feely et al. 2009).

High latitude (colder) oceans have naturally lower saturation states of calcium carbonate minerals than more temperate or tropical waters, making Alaska's oceans more susceptible to the effects of ocean acidification (Fabry et al. 2009; Jiang et al. 2015). Undersaturated waters are potentially highly corrosive to any calcifying organism, such as corals, bivalves, crustaceans, echinoderms and many forms of zooplankton such as copepods and pteropods (Fabry et al. 2008; Bates et al. 2009). Pteropods, which are often considered indicator species for ecosystem health, are prey for many species of carnivorous zooplankton, fishes including salmon, mackerel, herring, and cod, and baleen whales (Orr et al. 2005). Because of their thin shells and dependence on aragonite, under increasingly acidic conditions, pteropods may not be able to grow and maintain shells (Lischka and Riebesell 2012). It is uncertain if these species, which play a large role in supporting many levels of the Alaskan marine food web, may be able to adapt to changing ocean conditions (Fabry et al. 2008; Lischka and Riebesell 2012)

4.1.2 Biological Effects

Climate change is projected to have substantial direct and indirect effects on individuals, populations, species, and the structure and function of marine, coastal, and terrestrial ecosystems in the foreseeable future (Hinzman et al. 2005; Burek et al. 2008; Doney et al. 2012; Huntington et al. 2020). The physical effects on the environment described above have impacted, are impacting, and will continue to impact marine species in a variety of ways (IPCC 2014), such as:

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

Some of the biological consequences of the changing ocean conditions are shown in Table 5.

[5] NOAA Global Monitoring Laboratory website. Trends in Atmospheric Carbon Dioxide. Available at https://www.esrl.noaa.gov/gmd/ccgg/trends/, accessed November 10, 2020.

Table 5. A summary of possible direct and indirect health effects for humpback whales related to climate change, adapted from Burek et al. (2008).

Effect	Result
Direct	
Increase in ocean temperature	Changes in distribution and range (fish, whales) Increase in harmful algal blooms Loss of suitable habitat Change in prey base
Ocean acidification	Changes in prey base
Indirect	
Changes in infectious disease transmission (changes in host–pathogen associations due to altered pathogen transmission or host resistance)	Increased host density due to reduced habitat, increasing density-dependent diseases. Epidemic disease due to host or vector range expansion. Increased survival of pathogens in the environment. Interactions between diseases, loss of body condition, and increased immunosuppressive contaminants, resulting in increased susceptibility to endemic or epidemic disease.
Alterations in the predator–prey relationship	Affect body condition and, potentially, immune function.
Changes in toxicant pathways (harmful algal blooms, variation in long-range transport, biotransport, runoff, increased use of the Arctic)	Mortality events from biotoxins Toxic effects of contaminants on immune function, reproduction, skin, endocrine systems, etc.

Changes in ocean surface temperature may impact species migrations, range, prey abundance, and overall habitat quality. For ESA-listed species that undertake long migrations, if either prey availability or habitat suitability is disrupted by changing ocean temperature regimes, the timing of migration can change. For example, cetaceans with restricted distributions linked to cooler water temperatures may be particularly exposed to range restriction (Learmonth et al. 2006; Isaac 2009). Macleod (2009) estimated that, based on expected shifts in water temperature, 88 percent of cetaceans will be affected by climate change, 47 percent will be negatively affected, and 21 percent will be put at risk of extinction. Of greatest concern are cetaceans with ranges limited to non-tropical waters, and preferences for shelf habitats (Macleod 2009). Other typically subarctic species, such as humpback, minke, and fin whales, appear to be expanding their ranges to include higher latitudes in response to climate change (Brower et al. 2018).

4.2 Status of Listed Species- Humpback whale (*Megaptera novaeangliae*)

This biological opinion examines the status of the listed species that is likely to be adversely affected by the proposed action. For this action, the threatened Mexico DPS humpback whale is the only listed species that we expect to be present in the action area. The status is determined by the level of extinction risk that the Mexico DPS humpback whale faces, 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. This section also helps to inform the description of the species' current reproduction, numbers, and distribution.

The sections below summarize information on the population structure and distribution of humpback whales in the action area to provide a foundation for the exposure analyses that appear later in this biological 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 biological opinion. That is, we rely on the species' status and trend to determine whether or not the action's direct or indirect effects are likely to increase the species' probability of becoming extinct or failing to recover.

More detailed background information on the status of the Mexico DPS humpback whale can be found in a number of published documents including: stock assessment reports on Alaska marine mammals (Muto et al. 2020), the humpback whale status review (Bettridge et al. 2015), and a report on estimated abundance and migratory destinations for North Pacific humpback whales (Wade et al. 2016). In addition, PSO monitoring reports from the ADOT&PF Tongass Narrows project informed our estimates of the distribution and abundance of humpback whales in the action area (NMFS 2019).

4.2.1 Population Structure and Conservation Status

The humpback whale was listed as endangered under the Endangered Species Conservation Act (ESCA) on December 2, 1970 (35 FR 18319). Congress replaced the ESCA with the ESA in 1973, and humpback whales continued to be listed as endangered. NMFS recently conducted a global status review and changed the status of humpback whales under the ESA. The globally listed species was divided into 14 DPSs, four of which are endangered, one is threatened, and the remaining nine are not listed under the ESA (81 FR 62260; September 8, 2016). Three humpback whale DPSs occur in Alaska waters. The Hawaii DPS is not listed, the Mexico DPS is listed as threatened, and the Western North Pacific DPS is listed as endangered. The Mexico DPS humpback whale is the only ESA-listed species that we expect to occur within the action area. Critical habitat was proposed on October 9, 2019 (84 FR 54354), but has not yet been designated for the listed Western North Pacific or Mexico DPSs.

4.2.2 Humpback Whales in Southeast Alaska

Wade et al. (2016) estimated abundance of humpback whales within all sampled winter and summer areas in the North Pacific, and estimated migration rates between these areas. The probability of encountering whales from each of the four North Pacific DPSs in various feeding areas is summarized in Table 5 below (NMFS 2016). As shown in Table 5 for Southeast Alaska and Northern British Columbia, only whales from the Mexico and Hawaii DPSs are likely to be present in the action area.

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

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

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

Whales from the Mexico and Hawaii DPSs overlap in Southeast Alaska. The Mexico DPS is comprised of approximately 3,264 (CV=0.06) animals (Wade et al. 2016) with an unknown population trend, though likely to be in decline (81 FR 62260). Under the MMPA, the stock structure is being revised to match the DPSs described in Wade et al. (2016). The Central North Pacific stock (which corresponds with the Hawaii and Mexico DPSs) is estimated to be comprised of 10,103 (CV=0.3) animals (Muto et al. 2020). The population trend for the Central North Pacific stock is estimated to be increasing at a maximum annual rate of 7 percent (Muto et al. 2020).

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 (National Park Service Fact Sheet available at http://www.nps.gov/glba). In recent years, whales have been reported intermittently during winter in Tongass Narrows near Ketchikan (see next section). 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; Moran et al. 2018).

Relatively high densities of humpback whales occur throughout much of Southeast Alaska and northern British Columbia, particularly during the summer months (Muto et al. 2020). The abundance estimate for humpback whales in Southeast Alaska is estimated to be 6,137 (CV=0.07) animals which includes whales from the Hawaii DPS (~94%) and Mexico DPS (~6%) (Wade et al. 2016). Although migration timing varies among individuals, most whales depart for Hawaii or Mexico in fall or winter and begin returning to Southeast Alaska in spring, with continued returns through the summer and a peak occurrence in Southeast Alaska during late summer to early fall. However, there are significant overlaps in departures and returns (Baker et al. 1985; Straley 1990).

4.2.3 Humpback Whales in the Action Area

No systematic studies have documented humpback whale abundance near Ketchikan. Based on observations of local boat charter captains and watershed stewards, humpback whales regularly utilize the surrounding waters and are occasionally observed near Ketchikan, most often on a seasonal basis. Most observations occur during the summer with sporadic occurrences during other seasons.

Humpback whales occur frequently in Tongass Narrows during summer and fall months to feed, but are less common during winter and spring. In a recent biological opinion for the Alaska Department of Transportation & Public Facilities' (ADOT&PF) Tongass Narrows Project, NMFS estimated that, on average, a group of two humpback whales may be present in Tongass Narrows every three days (NMFS 2019). Recent marine mammal monitoring for that project detected daily occurrences of a single humpback whale in Tongass Narrows for several weeks during November 2020. During fall 2018, Ketchikan Airport staff and ferry captains reported an increase in the frequency of occurrence of humpback whales in the vicinity of the Tongass Narrows Project. Anecdotal evidence suggests that humpback whales may be increasingly present in the action area. Therefore, for the COK Berth III project, NMFS estimated that one whale may be present in the action area daily throughout the duration of the project.

4.2.4 Natural History

4.2.4.1 *Reproduction and growth*

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

4.2.4.2 *Feeding and prey selection*

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

Humpback whales are relatively generalized in their feeding compared to some other baleen whales. In the Northern Hemisphere, known prey includes euphausiids (krill), copepods, herring, juvenile salmonids, Arctic cod, walleye pollock, pteropods, and cephalopods (Johnson and Wolman 1984; Perry et al. 1999; Straley et al. 2018). Foraging is confined primarily to higher latitudes (Stimpert et al. 2007).

4.2.4.3 *Diving and social behavior*

In Hawaiian waters, humpback whales remain almost exclusively within the 1,800 m isobath and usually within water depths less than 182 m. Maximum diving depths are approximately 170 m but usually less than 60 m (Hamilton et al. 1997). Humpback whales observed feeding on Stellwagen Bank dove less than 40 m (Hain et al. 1995). Because most humpback prey is likely

found above 300 m depths most humpback dives are probably relatively shallow. Hamilton et al. (1997) tracked one whale near Bermuda possibly diving and feeding to 240 m depth. The deepest dives in Southeast Alaska were recorded to 148 m (Dolphin 1987a).

Humpback whales may remain submerged during a dive for up to 21 min (Dolphin 1987a). In Southeast Alaska average dive times were 2.8 min for feeding whales, 3.0 min for non-feeding whales, and 4.3 min for resting whales (Dolphin 1987a).

In a review of the social behavior of humpback whales, Clapham (1996) reported that they form small, unstable social groups during the breeding season. During the feeding season they form small groups that occasionally aggregate on concentrations of food. Feeding groups are sometimes stable for long periods of time. There is good evidence of some territoriality on feeding grounds (Clapham 1994; Clapham 1996) and calving areas (Tyack 1981).

4.2.4.4 *Vocalization and hearing*

Humpback whales are considered low frequency cetaceans with an applied frequency range anticipated to be between 7 Hz to 35 kHz (NMFS 2018). Baleen whales have inner ears that appear to be specialized for low-frequency hearing. In a study of the morphology of the mysticete auditory apparatus, Ketten (1997) hypothesized that large mysticetes have acute infrasonic hearing.

Humpback whales produce a variety of vocalizations ranging from 20 Hz to 10 kHz (Winn et al. 1970; Tyack and Whitehead 1983; Payne and Payne 1985; Silber 1986; Thompson et al. 1986; Richardson et al. 1995; Au 2000; Frazer and Mercado 2000; Erbe 2002; Au et al. 2006; Vu et al. 2012).

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

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).

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

4.2.5 Stressors and Threats

The MMPA stock delineations have not yet been revised to correspond with the 14 DPSs established for humpback whales in 2016. Therefore, estimates of rates of mortality and serious injury in the stock assessment reports (SARs) do not correspond with individual DPSs. A general description of threats and stressors to all humpback whales occurring in Alaska is provided below. Please refer to the SARs for more information about rates of mortality and serious injury by MMPA stock (Muto et al. 2020).

4.2.5.1 *Commercial whaling*

Historically, commercial whaling represented the greatest threat to every population of humpback whale and was ultimately responsible for listing the humpback whale as an endangered species. From 1900 to 1965, nearly 30,000 whales were killed in whaling operations in the Pacific Ocean. Prior to that, an unknown number of humpback whales were hunted and killed (Perry et al. 1999). Humpback whales in the North Pacific were protected in 1965 by a ban on commercial whaling put into place by the International Whaling Commission (IWC). However, illegal catches by the USSR continued into the 1970s (Muto et al. 2020). This, among other factors, prompted the IWC to impose a global moratorium on all commercial whaling beginning in 1986.

4.2.5.2 *Predation*

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

4.2.5.3 *Toxins and parasites*

Toxic algae blooms are a potential stressor for humpback whales. Out of 13 marine mammal species examined in Alaska, domoic acid was detected in all species examined, with humpback whale showing 38% prevalence. Saxitoxin was detected in 10 of the 13 species, with the highest prevalence in humpback whales (50%) (Lefebvre et al. 2016). The occurrence of the nematode *Crassicauda boopis* appears to increase the potential for kidney failure in humpback whales and may be preventing some populations from recovering (Lambertsen 1992).

4.2.5.4 *Subsistence harvest*

Subsistence harvest of humpback whales is prohibited under the Whaling Convention Act. There were no confirmed takes of humpback whales from the Mexico DPS by subsistence hunters in Alaska for the 2013–2017 period, although one humpback of unknown DPS origin was taken illegally for subsistence near Toksook Bay in 2016 (Muto et al. 2020).

4.2.5.5 *Unusual Mortality Event (UME)*

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

4.2.5.6 *Fishery interactions and entanglements*

Humpback whales are occasionally entangled during interactions with commercial, recreational, and subsistence fishing gear, marine debris, vessel ground tackle, and other anchored lines (Muto et al. 2020). Mortalities and serious injuries attributed to specific fisheries and gear types are summarized in Tables 1 and 2 of Muto et al. (2020).

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

A photographic study of humpback whales in Southeast Alaska in 2003 and 2004 found at least 53% of individuals showed some kind of scarring from entanglement (Neilson et al. 2005).

4.2.5.7 *Vessel collisions*

Vessel collisions with humpback whales remain a significant management concern, given the increasing abundance of humpback whales foraging in Alaska, as well as the growing presence of marine traffic in Alaska's coastal waters. Based on these factors, injury and mortality of humpback whales as a result of vessel strike will continue into the future. The potential for ship strikes may increase as vessel traffic in northern latitudes increases with changes in sea-ice coverage (Muto et al. 2020).

Neilson et al. (2012) reviewed 108 whale-vessel collisions in Alaska from 1978–2011 and found that 86% involved humpback whales. Collision hotspots occurred in Southeast Alaska in popular whale watching locations

4.2.5.8 *Other stressors*

Elevated levels of sound from anthropogenic sources (e.g., shipping, military sonar) are a potential concern for humpback whales in the North Pacific (Muto et al. 2020). A humpback was reported entangled in a research wave rider buoy off the U.S. West Coast in 2014 (Carretta et al. 2020). Other potential impacts include possible changes in prey distribution with climate change,

[6] NMFS Office of Protected Resources website: https://www.fisheries.noaa.gov/national/marine-life-distress/2015-2016-large-whale-unusual-mortality-event-western-gulf-alaska. Accessed June 4, 2018.

entanglement in or ingestion of marine debris, impacts from oil and gas activities, and disturbance from whale watching activities (Muto et al. 2020).

5 ENVIRONMENTAL BASELINE

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (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.

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

5.1 Recent Biological Opinions for Projects in the Action Area

NMFS has issued a number of biological opinions for construction projects in Tongass Narrows in recent years including:

- Ketchikan Berth IV Dock Upgrades (PCTS #AKR-2018-9764), Ketchikan Dock Company, July 2018.
- Tongass Narrows (Gravina Access) Project (ECO # AKRO-2019-03432), Alaska Department of Transportation and Public Facilities, December 2019.
- Berth II Rock Pinnacle Removal Project, (ECO # AKRO-2019-00553), City of Ketchikan, July 2019.

These biological opinions are available on the NMFS Alaska Region website at: https://www.fisheries.noaa.gov/alaska/consultations/section-7-biological-opinions-issued-alaska-region.

5.2 Marine Vessel Activity

The action area normally experiences high levels of marine vessel traffic with highest volumes occurring May through September. Marine vessels that use the action area include cruise ships, passenger ferries, commercial freight vessels/barges, commercial tank barges, U.S. Coast Guard vessels, commercial fishing boats, charter vessels, recreational vessels, kayaks, and floatplanes[7].

Cruise ships are the largest vessels that routinely use the action area. At any given time during the summer (May–September), as many as five large cruise ships may be moored or at anchor in the Port of Ketchikan. Cruise ship stops in Ketchikan generally increased through the 1990s and peaked in 2005. Forty-six ships were expected to visit Ketchikan in 2019 with a total of 576 stops and more than 1.14 million passengers. This was an increase from 40 ships with 504 stops and 1.07 million passengers in 2018[8]. Owing to the COVID-19 pandemic, tourism and cruise ship traffic were practically non-existent in 2020 and it is uncertain how long it may take for tourism cruise ship traffic to return to pre-COVID levels in Alaska. Despite this temporary setback in the tourism and cruise industries, the length of the cruise ship season, size of ships, numbers of ships, numbers of stops, and numbers of passengers are all expected to increase in the future.

Two passenger ferries transport passengers across Tongass Narrows from the City of Ketchikan to the airport on Gravina Island year-round, 7 days a week, 16 hours a day, making up to 60 crossings of the channel each day. These vessels, the M/V *Ken Eichner 2* and the M/V *Oral Freeman,* are each 116 ft (35.4 m) long and are powered by twin diesel 850 hp motors. The airport ferries can carry up to 20 vehicles and 50–100 passengers at a time. Each crossing takes approximately 3.5 minutes at speeds averaging 5 kt and not exceeding 9 kt.[9]

The Alaska Marine Highway also operates ferries year-round in Ketchikan. Ketchikan receives ferry service seven days per week in the summer, and typically five to six days per week in the winter.[10]

The waters of the Inside Passage support marine cargo transportation. According to automatic identification system passage-line data plots obtained from the Marine Exchange of Alaska, in 2011, 1,489 vessels moved north or south between Alaska and British Columbia. The data show that 288 vessels moved east or west between the Dixon Entrance and the Pacific Ocean during the year. Cargo ships calling at Prince Rupert dominated the east-west large vessel traffic. Cruise ships, tugs, and ferries dominated the north-south traffic (Nuka Research and Planning Group 2012).

Numerous commercial and charter fishing vessels and recreational craft, such as powerboats and sailboats, operate in the project vicinity. The Ketchikan Port & Harbors Department operates and

[7] U.S. Coast Guard (USCG). Tongass Narrows Voluntary Waterway Guide. Available at http://seapa.com/waterway/TNVWG.pdf, accessed November 2020.
[8] Ketchikan Visitors Bureau Visitor Statistics. Available https://www.visit-ketchikan.com/en/Membership/Visitor-Statistics, accessed July 2020 and not updated with 2019 statistics.
[9] Ketchikan Gateway Borough website (available at https://www.borough.ketchikan.ak.us/147/Airport-Ferry, accessed Jan. 2019), and personal communication with Mike Carney, General Manager of Ketchikan International Airport (Dec. 2018).
[10] Alaska Marine Highway website. Available at https://www.dot.state.ak.us/amhs/, accessed January 2021.

maintains five boat harbors (Bar Harbor, Thomas Basin, Casey Moran, Knudson Cove, and Hole-In-The-Wall), the Port of Ketchikan, and three launch ramps that are heavily used[11].

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

Vessel strikes are a leading cause of mortality in large whales. Neilson et al. (2012) reported the following summary statements about humpback whale and vessel collisions in Southeast Alaska.

- Most vessels that strike whales are less than 49 ft (15 m) long
- Most fatal vessel 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

The NMFS Alaska Marine Mammal Stranding Network database has records of 96 confirmed vessel strikes involving large whales between 2005 and 2019, 60% occurred within Southeast Alaska and 58 involved humpback whales, but none were reported within or near the action area.

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)). See Section 2.2.8 *Strike Avoidance* for additional information. In addition to the approach regulations discussed above, some whale watching companies in the Ketchikan area participate in NMFS's Whale SENSE program, agreeing to practice additional precautions around whales. NMFS implemented Whale SENSE Alaska in 2015, a voluntary program developed in collaboration with the whale-watching industry that recognizes companies who commit to responsible practices. More information is available at https://whalesense.org.

Since 2011, cruise lines, pilots, NMFS, and National Park Service (NPS) biologists have worked together to produce weekly whale sightings maps to improve situational awareness for cruise ships and state ferries in Southeast Alaska. In 2016, NMFS and NPS launched Whale Alert, another voluntary program that receives and shares real-time whale sightings with controlled access to reduce the risk of ship strike and contribute to whale avoidance. More information is available at https://www.fisheries.noaa.gov/resource/tool-app/whale-alert.

5.3 Fishery Interactions Including Entanglements

Entanglement of marine mammals in fishing gear and other human-made material is a major threat to their survival worldwide. Other materials also pose entanglement risks including marine debris, mooring lines, anchor lines, and underwater cables. While in many instances, marine mammals may be able to disentangle themselves (see Jensen et al. 2009), other entanglements result in lethal and sublethal trauma to marine mammals including drowning, injury, reduced foraging, reduced fitness, and increased energy expenditure (van der Hoop et al. 2016).

[11] City of Ketchikan, Port and Harbors. Available at https://www.ktn-ak.us/port-harbors, accessed March 2018.

The NMFS Alaska Marine Mammal Stranding Network database has records of 224 large whale entanglements between 2000 and 2020.[12] Of these, 64 percent were humpback whales from Southeast Alaska. Most of these whales were entangled with gear between the beginning of June and the beginning of September, when they were on their nearshore foraging grounds in Alaska waters. Between 2000 and 2020, 20 percent of humpback entanglements in Southeast Alaska were with pot gear, 30 percent with gillnet gear, and less than 1 percent were associated with longline gear. Humpback whales have been reported as entangled in the action area or near the action area in recent years, including two near Ketchikan in 2011 and one near Gravina Island in 2019.

Based on events that have not been attributed to a specific fishery listed on the 2020 MMPA List of Fisheries (85 FR 21079; April 16, 2020), the minimum mean annual mortality and serious injury rate from gear entanglements in unknown fisheries is 7.7 humpback whales for the Central North Pacific stock 2013-2017 (Muto et al. 2020).

The minimum average annual mortality and serious injury rate due to interactions with all fisheries in 2013-2017 is 18 Central North Pacific humpback whales (9.5 in commercial fisheries + 0.4 in recreational fisheries + 0.4 in subsistence fisheries + 7.7 in unknown fisheries), and 1.3 Western North Pacific humpback whales (0.7 in commercial fisheries + 0.4 in recreational fisheries + 0.2 in unknown fisheries) (Muto et al. 2020). All events occurred within the area of known overlap between stocks. Since the stock is unknown, the mortality and serious injury is reflected in the stock assessment reports for both stocks.

Commercial fisheries may indirectly affect whales by reducing the amount of available prey or affecting prey species composition.

5.4 Pollution

A number of contaminant discharges into marine waters have been reported within the action area. Intentional sources include domestic, municipal, and industrial wastewater discharges such as graywater from cruise ships. A number of historically contaminated sites are associated with underground storage tanks (UST). Many of these UST cleanup sites are listed as complete on the Alaska Department of Environmental Conservation's (ADEC) Contaminated Sites Database[13]. Five active contaminated sites within the project vicinity are in proximity to the shoreline of Revillagigedo and Gravina Island. The ADEC Spills Database records of 1,214 spills since 1995 that have occurred in Tongass Narrows, 56 of which occurred between 2018 and March 2020. Spills generally consisted of hydraulic oil, diesel, aviation fuel, gasoline, and engine lube/gear oil. Spills over the last 3 years were generally less than 1 gallon, but up to 250 gallons (PND Engineers 2020a).

5.5 Climate Change

As discussed in Section 4.1, there is widespread consensus within the scientific community that atmospheric temperatures on earth are increasing. Recent studies and observations have shown changes in distribution (Brower et al. 2018), body condition (Neilson and Gabriele 2020), and

[12] NMFS Alaska Marine Mammal Stranding Network database, accessed November 5, 2020.
[13] ADEC website, accessed January 4, 2021, available at https://dec.alaska.gov/spar/csp/

migratory patterns[14] of humpback whales, likely in response to climate change. The indirect effects of climate change on Mexico DPS humpback whales over time would likely include changes in the distribution of ocean temperatures suitable for many stages of their life history, the distribution and abundance of prey, and the distribution and abundance of competitors or predators.

5.6 Coastal Zone Development

Coastal zone development results in the loss and alteration of nearshore marine mammal habitat and changes in habitat quality. Increased development may prevent marine mammals from reaching or using important feeding, breeding, and resting areas. The shoreline at the project site is highly developed, with man-made structures and impervious surfaces at the shoreline. Within and near the project area, there is little coastline area that has not been impacted by human development. There is moderate shoreline development on nearby Pennock and Gravina islands. The majority of the City of Ketchikan is located on Revillagigedo Island. Marine facilities include fish processing plants, small boat harbors, cruise ship and ferry terminals, float plane docks, a dry dock, shipyard, and other infrastructure. Ketchikan International Airport is located on Gravina Island.

5.7 In-Water Noise

Ambient underwater noise levels in Tongass Narrows range from 120-130 dB and fluctuate temporally, with levels at the highest during summer months (HDR 2018). Main sources of underwater background sounds originate from man-made sources such as coastal construction, seafood processing facilities, aircraft, upland vehicle traffic and vessels including recreational vessels, passenger ferries, commercial freight vessels/barges, cruise ships, charter vessels and commercial fishing vessels. Natural sounds consist of marine mammal and fish sounds and surface-generated wind and waves.

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

6 EFFECTS OF THE ACTION

"Effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time

[14] Dr. Suzie Teerlink, National Marine Fisheries Service, Alaska Region, personal communication, February 9, 2021.

and may include consequences occurring outside the immediate area involved in the action (50 CFR §402.02).

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

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

6.1 Project Stressors

Based on our review of the BA (PND Engineers 2020a), the IHA application (PND Engineers 2020b), personal communications, and available literature as referenced in this biological opinion, our analysis recognizes that the proposed action may cause these primary stressors:

- Underwater noise produced by impulsive and continuous noise sources related to pile driving activities including vibratory pile driving and removal, impact pile driving, and down-the-hole drilling;
- Injury or disturbance due to vessel traffic or vessel noise;
- Disturbance to seafloor, marine mammal habitat, and marine mammal prey; and
- Pollution from unauthorized spills.

6.2 Stressors Not Likely to Adversely Affect ESA-listed Humpback Whales

Based on a review of available information, we determined the following stressors are either unlikely to occur or likely to have minimal impacts on Mexico DPS humpback whales.

6.2.1 Vessel strike

Vessel strike associated with the proposed action is extremely unlikely. Project vessels are anticipated to consist of up to two crane barges, one material (supply) barge and three work boats each under 25 feet. Materials will be transported to the site using a tug/barge combination. The barges will remain anchored on-site during construction, making only minor adjustments in position as required to perform the work.

Tug towing operations for construction occur at relatively low speeds (5 knots), and the maximum transit speed for tugs and barges is anticipated to be 7 knots. Once barges are towed to the construction site, they will be anchored, limiting risk of strike. Skiffs may transport workers very short distances and low speeds from shore to the work platform.

Between 2013 and 2017 the minimum mean annual mortality and serious injury rate due to ship strikes reported in Alaska for humpback whales was 2.3 whales (Muto et al. 2020). These incidents account for a very small fraction of the total humpback whale population (Laist et al. 2001). Of the reported vessel strikes of humpback whales in the Ketchikan vicinity between 2007 and 2017, one was reported within Tongass Narrows. That whale arrived in the Ketchikan

Harbor on the bulbous bow of a cruise ship when it came into port, but it is uncertain if it was struck in Tongass Narrows or elsewhere.

Vessel activity is common throughout the action area. Most ship strikes of large whales occur when vessels are traveling at speeds of 10 knots or more (Laist et al. 2001; Jensen and Silber 2004). While cruise ships may travel at speeds over 20 knots in open water, cruise ships are required to travel at speeds averaging less than 7 knots when entering Tongass Narrows, and slower when approaching Berth III. Therefore, it is unlikely that a cruise ship will collide with a humpback whale in the action area. Additionally, the installation of mooring dolphins is not expected to change the amount or speed of cruise ship traffic in Tongass Narrows, rather just the size of the ships to accommodate an increase in passenger demand. Thus, we do not expect an increased risk of vessel strike from cruise ships in the action area as a result of the action.

Because Berth III will be able to accommodate larger cruise ships carrying more passengers, there will likely be an increase in the number of tourists once tourism rebounds from the COVID pandemic. To meet the tourism needs of increased numbers of cruise ship passengers, other types of marine vessel traffic for day tours (like charter fishing vessels, sightseeing vessels, ferries, and float planes) will also likely increase. An overall increase in vessel traffic could affect listed humpback whales through increased noise, harassment, risk of vessel strike, or pollution. The volume of any additional vessel traffic attributable to this project from day tours is uncertain, but given the high level of tourism vessel and other vessel activity that already occurs in the area, and the low numbers of humpback whales present in the area, the effects of this marginal increase in vessel traffic on Mexico DPS humpback whales would be too small to detect or measure and are therefore inconsequential.

Vessel disturbance or strikes of Mexico DPS humpback whales are not expected as a result of the proposed action because 1) vessel traffic associated with the project is minimal; 2) relatively few humpback whales use Tongass Narrows; 3) only about 6.1 percent of humpback whales that occur in the area are from the listed Mexico DPS; 4) all vessels, including project vessels and cruise ships arriving at Berth III, are limited to a speed of 7 knots or less in Tongass Narrows; and 5) vessels will adhere to the Alaska Humpback Whale Approach Regulations when transiting to and from the project site (see 50 CFR §§ 216.18, 223.214 and 224.103(b)) that prohibit approaching within 100 yards of humpback whales. All of these factors limit the risk of strike; therefore, we conclude that vessel strike is extremely unlikely to occur.

6.2.2 Vessel noise

Tongass Narrows near Ketchikan is a busy industrial port with median background noise levels measured at 117.1 dB re 1 µPa (Warner and Austin 2016), and much of that noise is from vessels. Vessel noise transmitted through water is a continuous noise source. Broadband source levels for tugs and barges have been measured at 145 to 170 dB re 1 µPa, and 151 to 152 dB re 1µPa for small vessels with outboard motors (Richardson et al. 1995). Sound from vessels within this size range would reach the 120 dB threshold at distances between 86 m and 233 m (282 and 764 feet) from the source (Richardson et al. 1995).

Vessel noise associated with this action will be minimal because most work will be conducted from anchored barges and work platforms. Workers will be transported to and from these

platforms by skiffs traveling only short distances from shore and at slow speeds. Up to three barges will be moved into place by tugs traveling short distances from shore at slow speeds.

NMFS anticipates minimal low-level exposure of short-term duration to listed humpback whales from vessel noise related to this action. If animals are exposed and do respond, they may exhibit slight deflection from the noise source and engage in low-level avoidance behavior, short-term vigilance behavior, or short-term masking behavior, but these behaviors are not likely to result in adverse consequences for the animals. The nature and duration of response is not anticipated to be a significant disruption of important behavioral patterns such as feeding or resting. The action area is not considered high quality habitat for humpback whales so slight avoidance of the area is not likely to adversely affect them. The few vessels involved in the action will travel only short distances at slow speeds. Additionally, the infrequent occurrence of humpback whales in the action area, adherence to the mitigation measures, and vessels following the Alaska Humpback Whale Approach Regulations and Marine Mammal Code of Conduct should minimize close approaches and exposure to noise from vessels related to this action. The impact of vessel noise on Mexico DPS humpback whales is therefore determined to be minimal.

Installing new mooring dolphins at Berth III will allow cruise ships to more safely dock in Ketchikan. Cruise ships also contribute to vessel noise in the action area during the summer tourist season. Average broadband source levels for cruise ships have been estimated at 181 ± 3 dB re: 1 µPa (Hatch et al. 2008) and 182 dB re: 1 µPa (Kipple and Gabriele 2007). Allen et al. (2012) recorded source levels for four categories of vessels, recording cruise ships as the loudest of 24 ships in these categories with the highest broadband source level calculated at 219 ± 3.8 dB re: 1 µPa. Allen et al. (2012) also found that source levels typically increased with vessel size and speed. Bliss Class vessels may produce more underwater sound because of their larger size. Alternatively, ship quieting technologies on new vessels may mean that Bliss vessels are actually quieter than their older, smaller counterparts. Additionally, the installation of mooring dolphins at Berth III will make mooring of Bliss class cruise ships safer and more efficient. If less maneuvering (e.g., engine thrusting) is required to moor the vessel, vessel noise may actually be reduced from the status quo. This action is not expected to increase the number of cruise ships visiting Ketchikan and any increase in noise from these vessels is expected to be minimal. Therefore, the impact of additional vessel noise from larger cruise ships on Mexico DPS humpback whales is determined to be minimal.

6.2.3 Disturbance to seafloor, habitat, and prey resources

The proposed action will have temporary impacts on water quality (increases in turbidity levels) and on prey species distribution. Pile driving may cause temporary and localized turbidity through sediment disturbance. Turbidity plumes during pile installation and removal will be localized around the pile. Due to temporary, localized, and low levels of turbidity increases, it is not anticipated that turbidity would result in immediate or long-term effects to the Mexico DPS humpback whale or their prey.

Construction activities would produce continuous (i.e., vibratory pile driving and drilling) and impulsive (i.e., impact driving) sounds. Fish react to sounds that are especially strong and/or intermittent low-frequency sounds. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. Hastings and Popper (2005) identified several

studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented effects of pile driving on fish, although several are based on studies related to large, multiyear bridge construction projects (e.g., Scholik and Yan 2001; Scholik and Yan 2002; Popper and Hastings 2009). Impulsive sounds at received levels of 160 dB may cause subtle changes in fish behavior. SPLs of 180 dB may cause noticeable changes in behavior (Pearson et al. 1992; Skalski et al. 1992). SPLs of sufficient strength have been known to cause injury to fish and fish mortality.

The most likely impact to fish from pile driving and drilling activities at the project area would be temporary behavioral avoidance of the area. The duration of fish avoidance of this area after pile driving ceases is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. In general, impacts to marine mammal prey species are expected to be minor and temporary given the small area of pile driving within the action area relative to known feeding areas for humpback whales. In general, we expect fish will be capable of moving away from project activities to avoid exposure to noise. We expect the area in which stress, injury, TTS, or changes in balance of prey species may occur will be limited to a few meters directly around the pile driving and drilling operations. We consider potential adverse impacts to prey resources from pile-driving and drilling in the action area to be unlikely.

Studies on euphausiids and copepods, two of the more abundant and biologically important groups of zooplankton, have documented some sensitivity of zooplankton to sound (Chu et al. 1996; Wiese 1996); however, any effects of pile driving and drilling activities on zooplankton would be expected to be restricted to the area within a few feet or meters of the project and would likely be sub-lethal.

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).

Construction activities will temporarily increase in-water noise and may adversely affect prey in the action area. The timing of in-water construction, with a no-work window between March 15–June 15, 2022, has been planned to avoid major spawning and migration times (NMFS 2020). Adverse effects on prey species populations during project construction will be short-term, based on the short duration of the project. After pile driving activities are completed, habitat use and function are expected to return to similar pre-construction levels and fish are expected to repopulate the area.

Given the numbers of fish and other prey species in the vicinity, the short-term nature of effects on fish species, and the mitigation measures to protect fish and marine mammals during construction, the proposed action is not expected to have measurable effects on the distribution or abundance of potential marine mammal prey species. Any behavioral avoidance by fish of the disturbed area would still leave sufficiently large areas of fish and marine mammal foraging habitat outside Tongass Narrows.

The surrounding area is heavily trafficked by large and small ships and is not a significant foraging ground for humpback whales. There are no known aggregations of forage fish important to humpback whales in the project vicinity that will be impacted by the action. BMPs and minimization practices used by the City of Ketchikan to minimize potential environmental effects from project activities are outlined in the *Mitigation Measures* section of this opinion (Section 2.2). Additionally, the City of Ketchikan has agreed to implement the EFH conservation recommendations from NMFS Habitat Conservation Division (NMFS 2020). In summary, the effects of disturbance to the seafloor, habitat, and prey resources resulting from the mooring dolphin installation activities are expected to have a negligible impact on Mexico DPS humpback whales.

6.2.4 Introduction of pollutants into waters

Measures to prevent spills of oil and other pollutants as described in Section 2.2.9 *Oil and Spill Prevention* of this opinion will be implemented during construction. Plans will be in place and materials available for spill prevention and cleanup activities at the marine terminal to limit potential contamination. Construction will be conducted in accordance with Clean Water Act Section 404 and 401 regulations to minimize potential construction-related impacts on water quality, and any effects to Mexico DPS humpback whales would be immeasurably small. Therefore, we conclude that the effects from this stressor are negligible.

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

In conclusion, based on review of available information, we determined effects from vessel strike and disturbance are extremely unlikely to occur. We consider the effects to Mexico DPS humpback whales to be negligible.

We determined vessel noise associated with the action is not likely to have measurable impact; therefore, we consider the effects to Mexico DPS humpback whales to be negligible.

We determined disturbance to seafloor, habitat, and prey resources, and introduction of pollutants are not likely to have measurable impact; therefore, we consider the effects to Mexico DPS humpback whales to be negligible.

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

6.3 Stressors Likely to Adversely Affect ESA-listed Humpback Whales

Underwater noise from pile driving activities is likely to adversely affect Mexico DPS humpback whales. This stressor will be analyzed further in the *Exposure Analysis* and *Response Analysis.*

6.3.1 Description of sound sources

The marine soundscape is comprised of both ambient and anthropogenic sounds. Ambient sound is defined as the all-encompassing sound in a given place and is usually a composite of sound from many sources both near and far. The sound level of an area is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (e.g., waves, wind, precipitation, earthquakes, ice, atmospheric sound), biological (e.g., sounds

produced by marine mammals, fish, and invertebrates), and anthropogenic sound (e.g., vessels, dredging, aircraft, construction).

Natural sound sources at any given location and time comprise "ambient" sound, while the sum of ambient sounds and typical anthropogenic sound comprises the "background" sound. Received levels of ambient and background sound depends not only on the source levels (as determined by current weather conditions and levels of biological and shipping activity) but also on the ability of sound to propagate through the environment. In turn, sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor, and is frequency-dependent. As a result of the dependence on a large number of varying factors, ambient sound levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10-20 dB from day to day (Richardson et al. 1995). The result is that, depending on the source type and its intensity, sound from the specified activity may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals.

In-water construction activities associated with the project would include vibratory pile driving and pile removal, impact pile driving, and DTH pile installation. The sounds produced by these activities fall into one of two general sound types: impulsive and non-impulsive. Impulsive sounds (e.g., explosions, gunshots, sonic booms, impact pile driving) are typically transient, brief (less than one second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (ANSI (American National Standards Institute) 1986; NIOSH (National Institute for Occupational Safety and Health) 1998; ANSI (American National Standards Institute) 2005; NMFS 2018). Non-impulsive sounds (e.g. aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems) can be broadband, narrowband or tonal, brief or prolonged (continuous or intermittent), and typically do not have the high peak sound pressure with rapid rise/decay time that impulsive sounds do (ANSI 1995; NIOSH 1998; NMFS 2018). The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (e.g., Ward 1997 in Southall et al., 2007).

Impact hammers operate by repeatedly dropping a heavy piston onto a pile to drive the pile into the substrate. Sound generated by impact hammers is characterized by rapid rise times and high peak levels, a potentially injurious combination (Hastings and Popper 2005). Vibratory hammers install piles by vibrating them and allowing the weight of the hammer to push them into the sediment. Vibratory hammers produce significantly less sound than impact hammers. Peak sound pressure levels (SPLs) may be 180 dB or greater, but are generally 10 to 20 dB lower than SPLs generated during impact pile driving of the same-sized pile (Oestman et al., 2009). Rise time is slower, reducing the probability and severity of injury, and sound energy is distributed over a greater amount of time (Nedwell and Edwards 2002; Carlson et al., 2005).

A DTH hammer drill is used to place hollow steel piles or casings by drilling. A DTH hammer drill is a drill bit that drills through the bedrock using a pulse mechanism that functions at the bottom of the hole. This pulsing bit breaks up rock to allow removal of debris and insertion of the pile. The head extends so that the drilling takes place below the pile. The pulsing sounds produced by DTH hammer drills were previously thought to be continuous. However, recent sound source verification (SSV) monitoring has shown that DTH hammer drill can create sound

that can be considered impulsive (Denes et al. 2019). Therefore, NMFS characterizes sound from DTH pile installation as being impulsive when evaluating potential Level A harassment (i.e., injury) impacts and as being non-impulsive when assessing potential Level B harassment (i.e., behavior) effects.

The likely or possible impacts of COK's proposed activity on marine mammals could involve both non-acoustic and acoustic stressors. As discussed above in Section 6.2, *Stressors Not Likely to Adversely Affect ESA-listed Species*, potential non-acoustic stressors could result from the physical presence of the equipment and personnel; however, any impacts to marine mammals are expected to primarily be acoustic in nature. Acoustic stressors include effects of heavy equipment operation during pile installation and removal.

6.3.2 Acoustic thresholds

COK intends to conduct construction activities that would introduce underwater noise into the marine environment that may result in disturbance to listed species.

Since 1997 NMFS has used generic sound exposure thresholds to determine whether an activity produces underwater sounds that might result in impacts to marine mammals (70 FR 1871, 1872). NMFS recently developed comprehensive guidance on sound levels likely to cause injury to marine mammals through onset of permanent threshold shifts (PTS: Level A harassment) and temporary threshold shifts (TTS; Level B harassment) (81 FR 51693). NMFS is in the process of developing guidance for behavioral disruption (Level B harassment). However, until such guidance is available, NMFS uses the following conservative thresholds of underwater sound pressure levels[15], expressed in root mean square[16] (rms), from broadband sounds that cause behavioral disturbance, and referred to as Level B harassment under section 3(18)(A)(ii) of the MMPA:

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

Under the PTS/TTS Technical Guidance, NMFS uses the 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 and L_E for non-impulsive sounds (Table 7):

[15] 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.

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

Table 7. Summary of PTS onset acoustic thresholds for Level A harassment (NMFS 2018).

Hearing Group	**PTS Onset Thresholds* (Received Level)**	
	Impulsive	**Non-impulsive**
Low-Frequency (LF) Cetaceans	*Cell 1* $L_{p,}$0-pk,flat: 219 dB $L_{E,p,}$ LF,24h: 183 dB	*Cell 2* $L_{E,p}$, LF,24h: 199 dB
Mid-Frequency (MF) Cetaceans	*Cell 3* $L_{p,}$0-pk,flat: 230 dB $L_{E,p,}$ MF,24h: 185 dB	*Cell 4* $L_{E,p}$, MF,24h: 198 dB
High-Frequency (HF) Cetaceans	*Cell 5* $L_{p,}$0-pk,flat: 202 dB $L_{E,p}$,HF,24h: 155 dB	*Cell 6* $L_{E,p,}$ HF,24h: 173 dB
Phocid Pinnipeds (PW) (Underwater)	*Cell 7* $L_{p,}$0-pk.flat: 218 dB $L_{E,p}$,PW,24h: 185 dB	*Cell 8* $L_{E,p,}$PW,24h: 201 dB
Otariid Pinnipeds (OW) (Underwater)	*Cell 9* $L_{p,}$0-pk,flat: 232 dB $L_{E,p}$,OW,24h: 203 dB	*Cell 10* $L_{E,p,}$OW,24h: 219 dB

* Dual metric 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 are recommended for consideration.

Note: Peak sound pressure level ($L_{p,}$0-pk) has a reference value of 1 µPa, and weighted cumulative sound exposure level ($L_{E,p}$) has a reference value of 1µPa^{2}s. In this Table, thresholds are abbreviated to be more reflective of International Organization for Standardization standards (ISO 2017). The subscript "flat" is being included to indicate peak sound pressure are flat weighted or unweighted within the generalized hearing range of marine mammals (i.e., 7 Hz to 160 kHz). 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 weighted cumulative sound exposure level thresholds could be exceeded in a multitude of ways (i.e., varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these thresholds will be exceeded.

The MMPA, as well as applicable regulations at 50 CFR § 216.3, define "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering, but which does not have the potential to injure a marine mammal or marine mammal stock in the wild [Level B harassment].

While the ESA does not define "harass," NMFS issued guidance interpreting the term "harass" under the ESA 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 incidental harassment of listed species under the MMPA—whether Level A or Level B—constitutes an incidental take under the ESA and must be authorized by the Incidental Take Statement (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 (Level B harassment) and potential injury. With the addition of mitigation measures (including shutdown zones), no mortalities or permanent impairment to hearing are anticipated.

6.4 Exposure Analysis

As discussed in the *Approach to the Assessment* section of this biological opinion, exposure analyses are designed to identify the listed species that are likely to co-occur with these effects in space and time and the nature of that co-occurrence. In this step of our analysis, we try to identify the number of individuals that are likely to be exposed to an action's effects and the populations or subpopulations those individuals represent. Response analyses determine how listed species are likely to respond after being exposed to an action's effects on the environment or directly on listed species themselves. Our assessments try to detect the probability of lethal responses, physical damage, physiological responses (particular stress responses), behavioral responses, and social responses that might result in reducing the fitness of listed individuals. Ideally, our response analyses consider and weigh evidence of adverse consequences, beneficial consequences, or the absence of such consequences.

NMFS expects that humpback whales will be exposed to underwater noise from pile driving activities (including vibratory pile driving and removal, impact pile driving, and DTH socketing and anchoring). Possible responses by Mexico DPS humpback whales to the sound produced by pile driving activities include:

- Physical Responses
    - Temporary or permanent hearing impairment (threshold shifts)
    - Non-auditory physiological effects
- Behavioral responses

6.4.1 Ensonified area

This section describes the operational and environmental parameters of the activity that allow NMFS to estimate the area ensonified above the acoustic thresholds, and are based on only a single construction activity occurring at a time. The applicant has proposed a mitigation measure that there will be no simultaneous multiple pile driving activities.

The sound field in the project area is the existing background noise plus additional construction noise from the proposed project. Marine mammals may be affected via sound generated by the primary components of the project (i.e., vibratory pile driving, vibratory pile removal, impact pile driving, and DTH pile installation). NMFS used acoustic monitoring data from other locations to develop the source levels used to calculate distances to the Level A and Level B thresholds for different sizes of piles and installation/removal methods. The values used and the source from which they were derived are summarized in Table 8 and described in detail below.

Table 8. Estimates of mean underwater sound levels generated during vibratory pile removal, vibratory pile installation, impact pile installation, and DTH pile installation

Method and Pile Type	Sound Source Level at 10 meters			Literature Source
	SPL rms	SPL_{PK}	SS_{SEL}	
Vibratory Hammer				
30-inch steel piles	161.9	--	--	Denes et al. (2016)
36-and 48-inch steel piles	168.2	--	--	Austin et al. (2016)
Impact Hammer				
30-inch diameters	195	208.5	180.7	Denes et al. (2016)
36- and 48-inch[1]	198.6	213.2[2]	186.7[3]	Austin et al. (2016)
DTH Pile Installation				
DTH Sockets (48-inch)[4]	166.2	--	168	Extrapolated from DTH SSV studies listed below; Denes et al. (2016)
DTH Sockets (30-, 36-inch)[4]	166.2	194	164	Reyff & Heyvaert (2019); Reyff (2020); Denes et al. (2019); Denes et al. (2016)
DTH Anchors (12-inch)	162	172	146	Guan and Miner (2020)

[1]Sound source levels for 48-in piles are used as a proxy to calculate harassment isopleths for 36-in piles
[2]Measured at 14 m
[3]Measured at 11 m
[4]DTH drilling source levels for 24-in piles from Denes et al (2016) was used as a proxy for 30-in to 48-in piles
SS SEL = single strike sound exposure level; dB peak = peak sound level; rms = root mean square

Vibratory hammers produce constant sound when operating, and produce vibrations that liquefy the sediment surrounding the pile, allowing it to penetrate to the required seating depth. An impact hammer would then generally be used to place the pile at its intended depth through rock or harder substrates. The actual durations of each installation method vary depending on the type and size of the pile. An impact hammer is a steel device that works like a piston, producing a series of independent strikes to drive the pile. Impact hammering typically generates the loudest noise associated with pile installation.

Sound source levels for vibratory installation of 30-inch steel piles were obtained by Denes et al. (2016) during the installation of 30-inch steel pipe piles at the Ketchikan Ferry Terminal. Vibratory removal of 30-inch piles is expected to be quieter than installation, so the sound source level for installation is used as a conservative proxy. Sound source levels for vibratory installation of 48-inch steel piles were measured by Austin et al. (2016) during the installation of test piles at the Port of Anchorage. As a conservative measure, the sound source levels for the 48-inch piles also will be used as a proxy to calculate Level A and Level B isopleths for 36-inch piles.

Sound source levels for impact installation of 30-inch steel piles were measured by Denes et al. (2016) during the installation of piles at the Ketchikan Ferry Terminal. Sound levels for impact installation of 48-inch steel piles were measured by Austin et al. (2016) during the installation of test piles at the Port of Anchorage. Overall median levels were not reported for peak and single strike SEL values. As a conservative measure, the highest values reported for peak and single strike SEL were used. The highest levels reported were a peak of 213.2 dB re: 1 µPa at 14 m and a single strike SEL of 186.7 dB re: 1 µPa2–sec on pile IP5 at 11 m (Austin et al. 2016). Sound source levels for 48-inch piles driven at Anchorage are used as a proxy to calculate isopleths for 36-inch piles to be driven at Ketchikan.

DTH pile installation includes drilling (non-impulsive sound) and hammering (impulsive sound) to penetrate rocky substrates (Denes et al. 2016; Denes et al. 2019; Reyff and Heyvaert 2019). DTH pile installation was initially thought be a non-impulsive noise source. However, Denes et al. (2019) concluded from their study at Thimble Shoal, VA, that DTH should be characterized as impulsive based on a >3 dB difference in sound pressure level in a 0.035-second window (Southall et al. 2007) compared to a 1-second window. Therefore, DTH pile installation is treated as both an impulsive and non-impulsive noise source. In order to evaluate Level A harassment, DTH pile installation activities are evaluated according to the impulsive criteria and the User Spreadsheet may be employed. Level B harassment isopleths are determined by applying non-impulsive criteria and using the 120 dB threshold which is also used for vibratory driving.

The source level used to derive Level B harassment isopleths for DTH pile installation (socketing) of 30-inch diameter and larger pile sizes was derived from the Denes et al. (2016) study in Kodiak, Alaska. The reported median source value for drilling was determined to be 166.2 dB RMS. The source level used to derive the Level B harassment isopleth for DTH anchoring of 12-inch piles was 162 dB RMS, from Guan and Miner (2020). Guan and Miner (2020) measured sound levels for DTH installation of two 18-inch piles at Biorka Island, AK. The larger median RMS value of the two piles was used as a conservative proxy for 12-inch piles at Berth III.

For Level A harassment calculations COK used a sound source level for DTH anchoring of 12-inch holes of 146 dB SEL (Guan and Miner 2020); and 164 dB SEL for DTH socketing of 30- and 36-inch piles (Denes et al. 2019; Reyff and Heyvaert 2019; Reyff 2020), Because no information was available for source levels for 48-inch piles, 168 dB SEL was extrapolated by linear regression from Denes et al. (2019),Reyff and Heyvaert (2019), and Reyff (2020).

6.4.1.1 *Calculating distances to Level A thresholds*

NMFS developed a spreadsheet tool[17] to help implement the 2018 Technical Guidance (NMFS 2018) that incorporates the duration of an activity into the estimation of a distance to the Level A isopleth. This estimation can then be used in conjunction with marine mammal density or occurrence to help predict takes. NMFS notes that because of some of the assumptions included in the methods used for these tools, the isopleths estimated may be overestimates, and the

[17] NMFS User Spreadsheet Tool, version 2.2 (updated December 2020), available at https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance, accessed January 21, 2021.

resulting estimate of Level A take may overestimate the number of animals that actually experience PTS if they should cross the Level A isopleth. However, these tools offer the best available way to conservatively predict appropriate isopleths until more sophisticated modeling methods are widely available. NMFS continues to develop ways to quantitatively refine these tools, and will qualitatively address the output where appropriate. For stationary sources such as impact driving, vibratory driving, and DTH pile installation, the NMFS User Spreadsheet predicts the distance at which a marine mammal would incur PTS if it remained at that distance the whole duration of the activity.

Inputs used in the User Spreadsheet are shown in Table 8, and the resulting Level A isopleths are shown in Table 9. Level A harassment thresholds for impulsive sound sources (impact pile driving, DTH pile installation) are defined for both SELcum and Peak SPL, with the threshold that results in the largest modeled isopleth for each marine mammal hearing group used to establish the Level A harassment isopleth. Note that the peak SPL for DTH installation of 48-in piles is unknown as no sound source verification testing has been conducted on piles of that size. The single strike SEL was extrapolated using a linear regression of measurements for smaller piles during DTH installation. In this project, Level A harassment isopleths based on SELcum were always larger than those based on Peak SPL.

Table 9. User Spreadsheet (version 2.2) input parameters for pile driving activities for calculating Level A isopleths.

Equipment Type	**Vibratory Pile Driver (Installation/ Removal of 30-in steel piles)**	**Vibratory Pile Driver (Installation of 36 and 48-in steel piles)**	**Impact Pile Driver (30-in steel piles)**	**Impact Pile Driver (36 and 48-in steel piles)**	**DTH Sockets**		**DTH Anchor (12-in steel piles)[2]**
					30-, 36-in[1]	**48-in**	
Spreadsheet Tab Used	A.1 Vibratory Pile Driving (Stationary: non-impulsive, continuous)	A.1 Vibratory Pile Driving (Stationary: non-impulsive, continuous)	E.1 Impact Pile Driving (Stationary: impulsive, intermittent)	E.1 Impact Pile Driving (Stationary: impulsive, intermittent)	E.2 DTH Pile Driving (Stationary: impulsive, intermittent)		E.2 DTH Pile Driving (Stationary: impulsive, intermittent)
Source Level	161.9 RMS	168.2 RMS	180.7 SS SEL	186.7 SS SEL	164 SS SEL/194 SPLpk	168 SS SEL	146 SS SEL/172 SPLpk
Weighting Factor Adjustment (kHz)	2.5	2.5	2	2	2		2
(a)Activity duration (time) within 24 hours (b) Number of strikes per pile (impact), OR number of strikes per second (DTH) (c) Number of piles per day	(a) Up to 6 hrs OR >6-8 hrs (c) 1	(a) Up to 6 hrs OR >6-8 hrs (c) 1	(a) 1-10 minutes (b) Up to 500 strikes (c) 1	(a) 1-10 minutes (b) Up to 500 strikes (c) 1	(a) Up to 3 hrs OR >3-6 hrs (b) 10 strike/sec (c) 1	(a) Up to 2 hrs OR >2-3 hrs OR >3-4 hrs (b) 10 strike/sec (c) 1	(a) Up to 6 hrs OR >6-8 hrs (b) 10 strike/sec (c) 1
			(a) >10-20 minutes (b) 501-1,000 strikes (c) 1	(a) >10-20 minutes (b) 501-1,000 strikes (c) 1			
			(a) >20-30 minutes (b) 1,001-1,500 strikes (c) 1	(a) >20-30 minutes (b) 1,001-1,500 strikes (c) 1			
Propagation (xLogR)	15	15	15	15	15		15
Distance of source level measurement (meters)	10	10	10	11	10		10

[1] DTH drilling source levels for 42-in piles from Reyff and Heyvaert (2019), Reyff (2020), and Denes et al. (2019) were used as a proxy for 30- and 36-in piles.
[2] DTH drilling source levels for 18-in piles from Guan and Miner (2020) were used as a proxy for 12-in piles.

Table 10. Calculated distances to Level A harassment isopleths (m) during pile driving activities for low frequency cetaceans such as humpback whales.

Source	Daily Duration	Distance to Level A (PTS onset) Isopleth (m) for Low Frequency Cetaceans
30-inch Vibratory (Installation or Removal)	0-6 hr	25.9
	6-8 hr	31.4
36- and 48-inch Vibratory[1]	0-6 hr	68.1
	6-8 hr	82.5
DTH Socket (30-, 36-inch)	0-3 hr	1,225.6
	3-6 hr	1,945.5
DTH Socket (48-inch)	Up to 2 hr	1,728.3
	>2 to 3 hr	2,264.8
	>3 to 4 hr	2,743.6
DTH Anchor (12-inch)	Up to 6 hr	122.8
	>6 to 8 hr	148.7
30-inch Diesel Impact	Up to 500 strikes (1-10 minutes)	442
	501-1,000 strikes (>10-20 minutes)	701.6
	1,001-1,500 strikes (>20-30 minutes)	919.3
36- and 48-inch Diesel Impact	Up to 500 strikes (1-10 minutes)	1,221.2
	501-1,000 strikes (>10-20 minutes)	1,938.5
	1,001-1,500 strikes (>20-30 minutes)	2,540.1

6.4.1.2 *Calculating distances to Level B thresholds*

Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source (e.g., frequency, predictability, duty cycle), the environment (e.g., bathymetry), and the receiving animals (hearing, motivation, experience, demography, behavioral context) and can be difficult to predict (Southall et al. 2007; Ellison et al. 2012). Based on the available science and the practical need to use a threshold that is both predictable and measurable for most activities, NMFS uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS predicts that marine mammals are likely to be behaviorally harassed in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 µPa rms for continuous or non-impulsive sources (e.g., vibratory pile-driving) and above 160 dB re 1 µPa rms for non-explosive impulsive (e.g., impact pile-driving) or intermittent sources.

COK's proposed construction activity for the Berth III mooring dolphins includes the use of continuous and impulsive sources, and therefore the 120 and 160 dB re 1 µPa rms thresholds for Level B behavioral harassment are applicable.

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:

$$TL = B * \text{Log10} (R1/R2), \text{ where}$$

TL = transmission loss in dB

B = transmission loss coefficient; for practical spreading equals 15

R1 = the distance of the modeled SPL from the driven pile, and

R2 = the distance from the driven pile of the initial measurement

When site-specific transmission loss measurements are not available, the recommended TL coefficient for most nearshore environments is the default practical spreading value of 15. This value results in an expected propagation environment that would lie between spherical and cylindrical spreading loss conditions, which is the most appropriate assumption for COK's proposed activity.

Using the practical spreading model, COK determined underwater noise would fall below the Level B threshold of 120 dB rms for marine mammals at a maximum radial distance of 16,343 m for vibratory pile driving of 36 and 48-inch diameter piles. This distance determines the maximum Level B harassment zone for the project. Other activities, including rock anchoring and impact pile driving, have smaller Level B harassment zones. All Level B harassment isopleths are reported in Table 10 below. It should be noted that based on the geography of Tongass Narrows and the surrounding islands, sound will not reach the full distance of the Level B harassment isopleth.

The largest Level B Harassment isopleth will be truncated by land masses at approximately 12,500 meters to the southeast and approximately 3,590 meters northwest of the project area. Constraining land masses include Revillagigedo, Gravina, Pennock, and Spire islands.

Table 11. Calculated distances to Level B isopleths.

Source	**Meters to Level B isopleth**
30-inch vibratory (installation or removal)	6,213
36- and 48-inch vibratory	16,343
DTH installation (socketing, 30-inches and larger)	12,023
DTH anchoring of 12-inch piles	6,310
30-inch impact	2,154
36- and 48-inch impact	3,744

6.4.2 Estimating marine mammal occurrence

In this section we provide the information about the presence, density, or group dynamics of humpback whales that informed the take calculations.

Humpback whales occur frequently in Tongass Narrows during summer and fall months to feed, but are less common during winter and spring. Recent marine mammal monitoring by the Alaska Department of Transportation & Public Facilities (ADOT&PF) for the Tongass Narrows Project (NMFS 2019) detected daily occurrences of a single humpback whale in Tongass Narrows during November 2020. For the proposed project, NMFS estimates that one whale may be present in the action area daily throughout the duration of the project.

Based on occurrence information in the area, we estimate that one humpback whale will be within the Level B harassment zone daily for 17 weeks. Therefore:

(7 x 17) = 119 exposures of humpback whales to Level B harassment

As described in Section 4.2.1, an estimated 6.1 percent of humpback whales in Southeast Alaska are from the Mexico DPS (Wade et al. 2016). Therefore, of the 119 animals potentially exposed to Level B harassment due to Berth III pile driving activities, we expect that 6.1%, or 7 of these 119 exposures would be ESA-listed Mexico DPS humpback whales, and the remaining 112 would most likely be from the non-listed Hawaii DPS.

COK requested no authorization for serious injury or mortality or take by Level A harassment because these large whales can be effectively monitored and work can be halted before animals enter the Level A shutdown zone when they are present. While some of the calculated Level A shutdown zones are large (up to 2,800 m), the narrow width of Tongass Narrows (less than 600 m) reduces the size of the Level A zone to be monitored. Additionally, multiple PSOs will monitor Tongass Narrows to ensure that no humpback whales enter the Level A shutdown zone

undetected. Humpbacks are usually readily visible; therefore, shutdown measures can be implemented prior to any humpback whales entering Level A shutdown zones.

Table 12. Amount of proposed incidental harassment (takes) of Mexico DPS humpback whales from Berth III pile driving activities. Take estimates are rounded to the nearest whole number.

Species	Proposed Authorized Level A Takes	Proposed Authorized Level B Takes
Mexico DPS humpback whale (*Megaptera novaeangliae*)	0	7

6.4.3 Exposure to underwater noise from pile driving activities

Mexico DPS humpback whales may be present within the waters of the action area during the time that the in-water work is being conducted and could be exposed to temporarily elevated underwater noise levels resulting in harassment.

Temporarily elevated underwater noise during pile driving activities has the potential to result in Level B (behavioral) harassment of marine mammals. Level A harassment (resulting in injury) is not expected to occur as a result of the proposed action because shutdown zones will be implemented and the mitigation measures proposed in Section 2.2 will reduce the potential for exposure to levels of underwater noise above the injury threshold established by NMFS.

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 TTS; 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) the number of days of activities.

Exposure Assumptions

- An animal occurring within the Level A ensonified zone during pile driving activities would only be counted as Level A take, not both Level A and Level B take, even though the Level A zone is within the Level B zone.
- Exposures are based on total number of days that pile driving activities could occur and that animals might occur in the ensonified zone.
- All humpback whales occurring in the portion of the action area that is ensonified to levels that are expected to cause harassment during pile driving activities are assumed to be incidentally taken (i.e., exposures to sound levels at or above the relevant thresholds equate to take).
- An individual animal can only be taken once during a 24-hour period.
- For animals that may occur in groups, each individual in the group exposed to levels of sound capable of causing harassment would be considered taken.
- Level B exposure estimates are unmitigated and do not take into account monitoring and mitigation efforts to reduce take as described in Section 2.2.

- The percentage of humpback whale exposures that are estimated to be from the threatened Mexico DPS (6.1 %) are based on percentages reported in Wade et al. (2016).

6.5 Response Analysis

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

Loud underwater noise can result in physical effects on the marine environment that can affect marine organisms. Possible responses by Mexico DPS humpback whales to the impulsive and continuous sound produced by pile installation and removal, rock socketing, and vessel noise include:

- Physical Response
  - Temporary or permanent hearing impairment (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

6.5.1 Responses to major noise sources (pile driving/removal activities)

As described in the *Exposure Analysis*, Mexico DPS humpback whales are anticipated to occur in the action area and are anticipated to overlap with noise associated with pile installation and removal activities. We assume that some individuals are likely to be exposed and respond to these impulsive and continuous noise sources.

Between October 2021 and March 2022, with proper implementation of the mitigation measures and shutdown procedures described in Section 2.2, we do not anticipate that any Mexico DPS humpback whales will be exposed to noise levels loud enough, long enough, or at distances close enough for the proposed action to cause Level A harassment. We expect no more than 7 instances of exposure by Mexico DPS humpback whales to noise levels sufficient to cause Level B harassment, as described in Section 6.4.2. All level B instances of take are anticipated to occur at received levels greater than 120 dB or 160 dB for continuous and impulsive noise sources, respectively.

The introduction of anthropogenic noise into the aquatic environment from pile driving activities is the primary means by which marine mammals may be harassed from COK's specified activity. In general, animals exposed to natural or anthropogenic sound may experience physical and psychological effects, ranging in magnitude from none to severe (Southall et al. 2007). In general, exposure to pile driving and removal noise has the potential to result in auditory threshold shifts and behavioral reactions (e.g., avoidance, temporary cessation of foraging and vocalizing, changes in dive behavior). Exposure to anthropogenic noise can also lead to non-observable physiological responses such an increase in stress hormones. Additional noise in a marine mammal's habitat can mask acoustic cues used by marine mammals to carry out daily functions such as communication and predator and prey detection. The effects of pile driving and removal noise on marine mammals are dependent on several factors, including, but not limited to, sound type (e.g., impulsive vs. non-impulsive), the species, age and sex class (e.g., adult male vs. mom with calf), duration of exposure, the distance between the pile and the animal, received levels, behavior at time of exposure, and previous history with exposure (Wartzok et al. 2003; Southall et al. 2007). Here we discuss physical auditory effects (threshold shifts) followed by behavioral effects.

6.5.1.1 *Threshold Shifts*

NMFS defines a noise-induced threshold shift (TS) as a change, usually an increase, in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018). In other words, a threshold shift is a hearing impairment and may be temporary (such as ringing in your ears after a loud rock concert), or permanent (such as the loss of the ability to hear certain frequencies or partial or complete deafness). The amount of threshold shift is customarily expressed in dB. As described in NMFS (2018), there are numerous factors to consider when examining the consequence of TS, including, but not limited to: 1) the signal temporal pattern (e.g., impulsive or non-impulsive), 2) likelihood an individual would be exposed for a long enough duration or to a high enough level to induce a TS, 3) the magnitude of the TS, 4) time to recovery (seconds to minutes or hours to days), 5) the frequency range of the exposure (i.e., spectral content), 6) the hearing and vocalization frequency range of the exposed species relative to the signal's frequency spectrum (i.e., how and animal uses sound within the frequency band of the signal; e.g., Kastelein et al. 2014), and 7) the overlap between the animal and the sound source (e.g., spatial, temporal, and spectral).

Temporary Threshold Shift (TTS)

TTS is the mildest form of hearing impairment that can occur during exposure to a strong sound (Kryter 1970). While experiencing TTS, the hearing threshold rises, and a sound must be stronger in order to be heard. In terrestrial mammals, TTS can last from minutes or hours to days (in cases of strong TTS). For sound exposures at or somewhat above the TTS threshold, hearing sensitivity in both terrestrial and marine mammals recovers rapidly after exposure to the sound ends. Few data exist on the sound levels and durations necessary to elicit mild TTS in marine mammals, and none of the published data describe TTS elicited by exposure to multiple pulses of sound. Available data on TTS in marine mammals are summarized in Southall et al. (2007).

For low-frequency cetaceans, no behavioral or auditory evoked potential threshold data exist. Therefore, hearing thresholds were estimated by synthesizing information from anatomical measurements, mathematical models of hearing, and animal vocalization frequencies (NMFS 2018).

Although some Level B exposures may occur during the course of the proposed action, not all instances of Level B take will result in TTS because the estimated noise thresholds for the onset of TTS are conservative. If TTS does occur, it is expected to mild and temporary and not likely to affect the long term fitness of the affected individuals.

Permanent Threshold Shift (PTS)

When PTS occurs, there is physical damage to the sound receptors in the ear. In severe cases, there can be total or partial deafness, while in other cases the animal has an impaired ability to hear sounds in specific frequency ranges (Kryter 1985). There is no specific evidence that exposure to pulses of sound can cause PTS in any marine mammal. However, given the possibility that mammals close to a sound source can incur TTS, it is possible that some individuals will incur PTS. Single or occasional occurrences of mild TTS are not indicative of permanent auditory damage, but repeated or (in some cases) single exposures to a level well above that causing the onset of TTS might elicit PTS.

Relationships between TTS and PTS thresholds have not been studied in marine mammals but are assumed to be similar to those in humans and other terrestrial mammals, based on anatomical similarities. PTS might occur at a received sound level at least several decibels above that which induces mild TTS if the animal were exposed to strong sound pulses with rapid rise time. For non-impulsive exposures (i.e., vibratory pile driving), a variety of terrestrial and marine mammal data sources indicate that threshold shift up to 40 to 50 dB may be induced without PTS, and that 40 dB is a conservative upper limit for threshold shift to prevent PTS. An exposure causing 40 dB of TTS is therefore considered equivalent to PTS onset (NMFS 2018).

For the proposed project activities, the calculated distances to the Level A isopleths range from approximately 25 m to more than 2,700 m. The shutdown zones to be implemented are larger than the calculated isopleths to ensure that no humpback whales are exposed to noise levels that could cause PTS or other Level A disturbance. No exposures are anticipated at levels resulting in PTS due to conservative estimates of Level A isopleths and mitigation measures to shut down pile driving activities if a humpback whale approaches a Level A zone.

6.5.1.2 *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, internal 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 activities to cause auditory impairment or other physical effects in marine mammals. Available data suggest that such effects, if they occur at all, would presumably be limited to short distances from the sound source and to activities that extend over a prolonged period. The available data do not allow identification of a specific exposure level above which non-auditory effects can be expected (Southall et al. 2007) or any meaningful quantitative

predictions of the numbers (if any) of marine mammals that might be affected in those ways. Marine mammals that show behavioral avoidance of pile driving, including some odontocetes and some pinnipeds, are especially unlikely to incur auditory impairment or non-auditory physical effects.

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.

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 stress hormones returned to their previous level within 24 hours 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 factors, including behavioral and physiological responses, females appear to be more sensitive or respond more strongly than males (Kight and Swaddle 2011).

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

We expect a small number of individual humpback whales may experience TTS and may experience non-auditory physiological effects from project activities. Therefore, we expect ESA-listed humpback whales may experience mild stress responses in reaction to project activities

within the Level B zone. However, we expect most humpback whales would leave the ensonified areas to avoid excessive noise and avoid stress. If humpbacks are not displaced and remain in a stressful environment (i.e., within the harassment zone of pile driving activities), we expect the stress response will dissipate shortly after the cessation of pile driving activities. However, in any of the above scenarios, we do not expect significant or long-term harm to individuals from a stress response because of this action.

6.5.1.3 *Behavioral Disturbance Reactions*

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.

Disturbance includes a variety of effects, including subtle changes in behavior, more conspicuous changes in activities, and displacement. Behavioral responses to sound are highly variable and context-specific, and reactions, if any, depend on species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day, and many other factors (Southall et al. 2007).

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok et al. 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure. Behavioral state may affect the type of response as well. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson et al. 1995; NRC 2003; Wartzok et al. 2003).

Controlled experiments with captive marine mammals showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway et al. 1997; Finneran et al. 2003). Observed responses of wild marine mammals to loud pulsed sound sources (typically seismic guns or acoustic harassment devices, but also including pile driving) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds 2002; Wartzok et al. 2003; Thorson and Reyff 2006; Nowacek et al. 2007). Responses to continuous sound, such as vibratory pile installation, have not been documented as fully as responses to pulsed sounds.

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 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).

6.5.1.4 *Auditory Masking*

Natural and artificial sounds can disrupt behavior by masking, or interfering with, a marine mammal's ability to hear other sounds. Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher levels. Chronic exposure to excessive, though not high-intensity, sound could cause masking at particular frequencies for marine mammals that utilize sound for vital biological functions. Masking can interfere with detection of acoustic signals such as communication calls, echolocation sounds, and environmental sounds important to marine mammals. Therefore, under certain circumstances, marine mammals whose acoustical sensors or environment are being severely masked could also be impaired from maximizing their performance or fitness in survival and reproduction. If the coincident (masking) sound were anthropogenic, it could be potentially harassing if it disrupted hearing-related behavior. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs only during the sound exposure. Because masking (without resulting in threshold shift) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

Masking occurs at the frequency band the animals utilize, so the frequency range of the potentially masking sound is important in determining any potential behavioral impacts. Lower frequency man-made sounds are more likely to affect detection of communication calls and other potentially important natural sounds such as surf and prey sound. Anthropogenic sounds may also affect communication signals when both occur in the same sound band and thus reduce the communication space of animals (Clark et al. 2009) and cause increased stress levels (Foote et al. 2004; Holt et al. 2009).

Masking has the potential to affect species at the population or community levels as well as at individual levels. Masking affects both senders and receivers of the signals and can potentially have long-term chronic effects on marine mammal species and populations. Recent research suggests that low frequency ambient sound levels have increased by as much as 20 dB (more than a three-fold increase in terms of SPL) in the world's ocean from pre-industrial periods, and that most of these increases are from distant shipping (Hildebrand 2009). All anthropogenic sound sources, such as those from vessel traffic, pile driving, and dredging activities, contribute to the elevated ambient sound levels, thus intensifying masking.

Noise from pile driving activities is relatively short-term. It is possible that pile driving noise or vessel noise resulting from this proposed action may mask acoustic signals important to Mexico DPS humpback whales, but the limited affected area and infrequent occurrence of humpback whales in the action area would result in insignificant impacts from masking. Any masking event

that could possibly rise to Level B harassment under the MMPA would occur concurrently within the zones of behavioral harassment already estimated for vibratory pile driving, and which have already been taken into account in the *Exposure Analysis*.

6.5.2 Response analysis summary

Humpback whales' probable responses to pile installation and removal include TTS, increased stress, and/or short-term behavioral disturbance reactions such as changes in activity and vocalizations, masking, avoidance or displacement, or habituation. These reactions and behavioral changes are expected to be temporary and subside quickly when the exposures cease. The primary mechanism by which these behavioral changes may affect the fitness of individual animals is through the animals' energy budget, time budget, or both (the two are related because foraging requires time). Large whales such as humpbacks have the ability to store substantial amounts of energy, which allows them to survive for months on stored energy during migration and while in their wintering areas, and their feeding patterns allow them to acquire energy at high rates. Tongass Narrows has not been identified as important foraging habitat for humpback whales, and the proposed activities are not expected to displace foraging animals. Because humpbacks are not expected to be feeding in the action area, there is little incentive for them to remain in the action area while the disturbance is occurring and we expect most animals would leave the area during pile driving activities if they were disturbed. The individual and cumulative energy costs of the behavioral responses we have discussed are not likely to reduce the energy budgets of humpback whales, and their probable exposure to noise sources are not likely to reduce their fitness.

7 CUMULATIVE EFFECTS

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

Some continuing non-Federal activities are reasonably certain to contribute to climate change within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline versus cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the *Environmental Baseline* (Section 5).

All of the activities described in the *Environmental Baseline* are expected to continue into the future. The Berth III new mooring dolphins project is intended to allow the City of Ketchikan to more safely and securely moor Bliss-class cruise ships vessels. The action will provide a more reliable ingress and egress for ships over a much wider range conditions and is important to improving conditions contributing to a safe, accessible, and commercially viable existing navigation facility. The action is unlikely to increase the number of cruise vessels using Berth III; however, the number of visitors arriving on cruise ships will grow as the size of cruise ships increases, and the length of the cruise ship season has been increasing by a few days each year. The current trend is for increasing numbers of tourists and vessels in Alaska. Tourism and community development are expected to continue, likely increasing the demands for

transportation, goods, and services. Tongass Narrows will continue to function as the main transportation corridor for the City of Ketchikan and surrounding communities.

8 INTEGRATION AND SYNTHESIS

This 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 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. These assessments are made in full consideration of the *Status of the Species* (Section 4).

As discussed in the *Approach to the Assessment* (Section 3) section of this biological opinion, we begin our risk analysis by asking whether the probable physical, physiological, behavioral, or social responses of endangered or threatened species are likely to reduce the fitness of endangered or threatened individuals or the growth, annual survival or reproductive success, or lifetime reproductive success of those individuals.

Based on the results of the exposure and response analyses, we expect a maximum of 119 instances of Level B harassment of humpback whales by noise from pile driving activities (impact, vibratory, and DTH), and 6.1 percent (7 individuals) of those instances of harassment of humpback whales are anticipated to affect animals from the Mexico DPS. Exposure to vessel noise from transit and potential for vessel strike may occur, but adverse effects from vessel disturbance and noise are likely to be negligible due to the small marginal increase in such activities relative to the environmental baseline and the transitory nature of vessels. Adverse effects from vessel strike are considered extremely unlikely because of the few additional vessels introduced by the action and the unlikelihood of these type of interactions. Disturbance to seafloor, habitat, and prey resources are not expected to adversely affect humpback whales because these disturbance are temporary, and the action area is not important habitat to humpback whales for foraging, migrating, breeding, or other essential life functions. Mitigation measures and adherence to Clean Water Act regulations are expected to minimize the risk of exposure of humpback whales to the potential introduction of pollutants into the action area.

As discussed in the *Proposed Action* and *Status of the Species* sections, this action does not overlap in space or time with humpback whale breeding. Some Mexico DPS humpback whales feed in Southeast Alaska in the summer and fall months and migrate to Mexican waters for breeding and calving in the late winter months. As a result, the probable responses to pile driving and removal noise are not likely to reduce the current or expected future reproductive success of Mexico DPS humpback whales or reduce the rates at which they grow, mature, or become reproductively active.

Therefore, these exposures are not likely to reduce the abundance, reproduction rates, or growth rates (or increase variance in one or more of these rates) of the populations those individuals represent. The short duration of sound generation and the implementation of mitigation measures to reduce exposure to high levels of sound reduce the likelihood that exposure would cause a behavioral response that may affect vital functions, or cause TTS or PTS. Additionally, when considered in conjunction with the effects of the proposed action, cumulative effects of future

state or private activities in the action area are likely to affect humpback whales at a level comparable to present. The current and recent population trends for humpback whales in Southeast Alaska indicate that these levels of activity are not hindering population growth.

We do not expect the effects of the proposed project activities combined with the existing activities described in the *Environmental Baseline* (Section 5) and the cumulative effects (Section 7) to hinder population growth of Mexico DPS humpback whales. As a result, this project is not likely to appreciably reduce Mexico DPS humpback whales' likelihood of surviving or recovering in the wild.

9 CONCLUSION

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS's biological opinion that the proposed action is not likely to jeopardize the continued existence of the Mexico DPS of humpback whale.

10 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA prohibits the take of endangered species unless there is a special exemption. NMFS extended all the prohibitions of section 9 to threatened Mexico DPS humpback whales through a rule issued pursuant to ESA section 4(d) (81 FR 62260, 62314; September 8, 2016). "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 NMFS guidance, the term "harass" under the ESA means to: "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (Wieting 2016). The MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment] (16 U.S.C. §1362(18)(A)(i) and (ii)). For this consultation, NMFS anticipates that any take will be by harassment only. No serious injury, mortality, or Level A takes are contemplated or authorized. This ITS is valid only for the activities described in this biological opinion that have a federal nexus, and which have been authorized under section 101(a)(5) of the MMPA.

Under the terms of Section 7(b)(4) and Section 7(o)(2) of the ESA, taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA, provided that such taking is in compliance with the terms and conditions of an Incidental Take Statement (ITS). Section 7(b)(4)(C) of the ESA provides that if an endangered or threatened marine mammal is involved, the taking must first be authorized by Section 101(a)(5) of the MMPA. Accordingly, the terms of this incidental take statement and the exemption from Section 9 of the ESA become effective only upon the issuance of MMPA authorization to take the marine mammals identified. 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 and report 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) fail to require the authorization holder to adhere to the terms and conditions of the ITS through enforceable terms that are added to the authorization, or (2) fail to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

10.1 Amount of Extent of Take

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

The taking of Mexico DPS humpback whales will be by incidental harassment only. The taking by serious injury or death is prohibited and will result in the modification, suspension, or revocation of the ITS. Table 12 lists the amount and timing of authorized take (incidental take by harassment) for this action. The method for estimating the number of animals exposed to sound levels expected to result in Level B harassment is described in Section 6.4. NMFS anticipates that 119 instances of Level B harassment of humpback whales may occur. Of these 119 animals, 6.1% (or 7 animals) are predicted to be from the Mexico DPS. Therefore, NMFS is authorizing 7 Level B harassment takes under the ESA. As a result, NMFS will not consider that The City of Ketchikan has reached its take limit until 119 humpback whales have been observed in the Level B zone during in-water construction activities.

Pile driving activities will be halted as soon as possible when it appears a humpback whale is approaching the Level A shutdown zone and before it reaches the Level A isopleth. No Level A take of marine mammals is authorized in this biological opinion.

Table 13. Summary of anticipated instances of exposure to sound from pile driving activities resulting in the incidental take of Mexico DPS humpback whales by Level B harassment. These take numbers reflect only the individuals that are expected to be from the ESA-listed DPS that may be present in the action area.

Species	**Total Amount of Take Associated with Proposed Action**		**Anticipated Temporal Extent of Take**
	Level A	**Level B**	
Mexico DPS humpback whale	0	7	October 1, 2021 through March 13, 2022

10.2 Effect of the Take

The only takes authorized during the proposed action are Level B takes by acoustic harassment from pile driving activities. No serious injury or mortality or Level A harassment is anticipated or authorized as part of this proposed action. This consultation has assumed that exposure to pile driving activities might disrupt one or more behavioral patterns that are essential to an individual animal's life history. However, any behavioral responses of these whales and any associated disruptions are not expected to affect their fitness, reproduction, survival, or recovery.

In Section 9 of this biological 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 Mexico DPS humpback whales.

10.3 Reasonable and Prudent Measures

Reasonable and prudent measures (RPMs) are those actions "necessary or appropriate to minimize the impacts, i.e., amount or extent, of incidental take" (50 CFR § 402.02). RPMs are nondiscretionary. RPMs do not reiterate the mitigation measures that are included in the proposed action (described in Section 2.2). We presume the action agency will require adherence to all of those mitigation measures. Failure to do so would void this ITS and constitute a change to the action that may require reinitiating consultation. The RPMs included below, along with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. NMFS concludes that the following RPMs are necessary and appropriate to minimize or to monitor the incidental take of Mexico DPS humpback whales resulting from the proposed action.

1. The USACE and PR1 will ensure the creation and implementation of a monitoring and reporting program that allows NMFS AKR to evaluate the exposure estimates contained in this biological opinion and that underlie this ITS.
2. The USACE and PR1 will ensure the implementation of any additional mitigation measures applicable to humpback whales that are required by the IHA to be issued by NMFS Permits Division.

10.4 Terms and Conditions

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

In order to be exempt from the prohibitions of section 9 of the ESA, the USACE and PR1 must ensure adherence to the following terms and conditions, which implement the RPMs described above. The USACE and PR1 or any contractor has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR §402.14).

Partial compliance with these terms and conditions may result in more take than anticipated, and may invalidate this take exemption. These terms and conditions constitute no more than a minor

change to the proposed action because they are consistent with the basic design of the proposed action.

To carry out RPMs #1 and 2 the USACE, PR1, or its authorization holder must undertake the following:

1. Submit a draft marine mammal monitoring and mitigation plan to NMFS AKR for review prior to commencing in-water construction activities.
2. Immediately report to NMFS AKR (see Table 3 for *Contact Information*) the taking of any ESA-listed marine mammal in a manner other than that described in this ITS.

11 Conservation Recommendations

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

1. Project vessel crews should participate in the WhaleAlert program to report real-time sightings of whales while transiting in the waters of Southeast Alaska and to minimize the risk of vessel strikes. More information is available at https://www.fisheries.noaa.gov/resource/tool-app/whale-alert.

In order to keep NMFS's Protected Resources Division informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the USACE and PR1 should notify NMFS of any conservation recommendations they implement.

12 Reinitiation of Consultation

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

13 Data Quality Act Documentation and Pre-dissemination Review

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

13.1 Utility

This document records the results of an interagency consultation. The information presented in this document is useful to NMFS, the USACE, the City of Ketchikan, 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 https://www.fisheries.noaa.gov/alaska/consultations/section-7-biological-opinions-issued-alaska-region. 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 biological opinion contain 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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