

DEPARTMENT OF COMMERCE**National Oceanic and Atmospheric Administration****50 CFR Part 217**

[Docket No. 171213999–9439–01]

RIN 0648–BH44

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Alaska Liquefied Natural Gas (LNG) Project in Cook Inlet

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; request for comments and information.

SUMMARY: NMFS has received a request from the Alaska Gasline Development Corporation (AGDC) for authorization to take marine mammals incidental to Alaska LNG Project in Cook Inlet, over the course of five years (2020–2025). Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is proposing regulations to govern that take, and requests comments on the proposed regulations. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorization, and agency responses will be summarized in the final notice of our decision.

DATES: Comments and information must be received no later than July 29, 2019.

ADDRESSES: You may submit comments, identified by NOAA–NMFS–2019–0064, by any of the following methods:

- *Electronic submissions:* Submit all electronic public comments via the Federal eRulemaking Portal, Go to www.regulations.gov/#!/docketDetail;D=NOAA-NMFS-2019-0064, click the “Comment Now!” icon, complete the required fields, and enter or attach your comments.

- *Mail:* Submit comments to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910–3225.

Instructions: Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered by NMFS. All comments received are a part of the public record and will generally be posted for public viewing on www.regulations.gov without change. All personal identifying

information (e.g., name, address, etc.), confidential business information, or otherwise sensitive information submitted voluntarily by the sender may be publicly accessible. Do not submit Confidential Business Information or otherwise sensitive or protected information. NMFS will accept anonymous comments (enter “N/A” in the required fields if you wish to remain anonymous). Attachments to electronic comments will be accepted in Microsoft Word, Excel, or Adobe PDF file formats only.

FOR FURTHER INFORMATION CONTACT:

Shane Guan, Office of Protected Resources, NMFS, (301) 427–8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-other-energy-activities-renewable>. In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:**Background**

The MMPA prohibits the “take” of marine mammals, with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed incidental take authorization may be provided to the public for review.

Authorization for incidental takings must be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other “means of effecting the least practicable adverse impact” on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stocks for taking for certain subsistence uses (referred to in shorthand as “mitigation”); and requirements pertaining to the mitigation, monitoring

and reporting of such takings are set forth.

NMFS has defined “negligible impact” in 50 CFR 216.103 as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.

The MMPA states that the term “take” means to harass, hunt, capture, kill or attempt to harass, hunt, capture, or kill any marine mammal. Except with respect to certain activities not pertinent here, 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).

National Environmental Policy Act

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq.*) and NOAA Administrative Order (NAO) 216–6A, NMFS must review our proposed action (*i.e.*, the issuance of an incidental harassment authorization) with respect to potential impacts on the human environment.

Accordingly, NMFS plans to adopt the Federal Energy Regulatory Commission’s (FERC’s) Environmental Impact Statement (EIS), provided our independent evaluation of the document finds that it includes adequate information analyzing the effects on the human environment of issuing the Letter of Authorization (LOA). NMFS is a cooperating agency on the FERC’s EIS.

The FERC’s EIS will be made available for public comment at <https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-other-energy-activities-renewable>.

We will review all comments submitted in response to this notice prior to concluding our NEPA process or making a final decision on the LOA request.

Summary of Request

On April 18, 2017, NMFS received a request from AGDC for a LOA to take marine mammals incidental to constructing LNG facilities in Cook Inlet. The application was deemed adequate and complete on March 14, 2018. AGDC’s request is for takes of a small number of five species of marine

mammals by Level B harassment. On April 11, 2018, NMFS published a Notice of Receipt announcing the receipt of AGDC's LOA application (83 FR 15556). Further analysis by NMFS concludes that potential effects to marine mammals from AGDC's activity could result in Level A harassment. Neither AGDC nor NMFS expects serious injury or mortality to result from this activity. However, since AGDC's LNG facility construction activities are expected to last for five years, an LOA is appropriate.

Description of Proposed Activity

Overview

AGDC proposes to construct facilities to transport and offload LNG in Cook Inlet, AK, for export. The Project activities include:

- Construction of the proposed Marine Terminal in Cook Inlet, including construction of a temporary Marine Terminal Material Offloading Facility (Marine Terminal MOF) and a

permanent Product Loading Facility (PLF).

- Construction of the Mainline (main pipeline) across Cook Inlet, including the potential construction of a temporary Mainline Material Offloading Facility (Mainline MOF) on the west side of Cook Inlet.

Components of proposed construction activities in Cook Inlet that have the potential to expose marine mammals to received acoustic levels that could result in take include:

- Vibratory and impact pile driving associated with Marine Terminal MOF and PLF construction.
- Anchor handling associated with pipelay across the Cook Inlet.

Dates and Duration

AGDC plans to start the Alaska LNG facilities construction on March 31, 2020, and complete it by the end of March 2025. Construction activities would be divided into phases, with all construction occurring between April and October from March 2020 to

December 2024. During the construction season, crews will be working 12 hours per day, 6 days per week.

Specific Geographic Region

The Alaska LNG facilities, which include a Marine Terminal and the Mainline crossing, will be constructed in Cook Inlet. The Marine Terminal would be constructed adjacent to the proposed onshore LNG Plant near Nikiski, Alaska.

In addition, a Mainline Material Offloading Facility (Mainline MOF) may be constructed on the west side of Cook Inlet to support installation of the Cook Inlet shoreline crossing and onshore construction between the Beluga Landing shoreline crossing and the Yentna River. The Mainline MOF would be located near the existing Beluga Landing.

A map of the Alaska LNG facilities action area is provided in Figure 1 below and is also available in Figures 2 to 4 in the LOA application.

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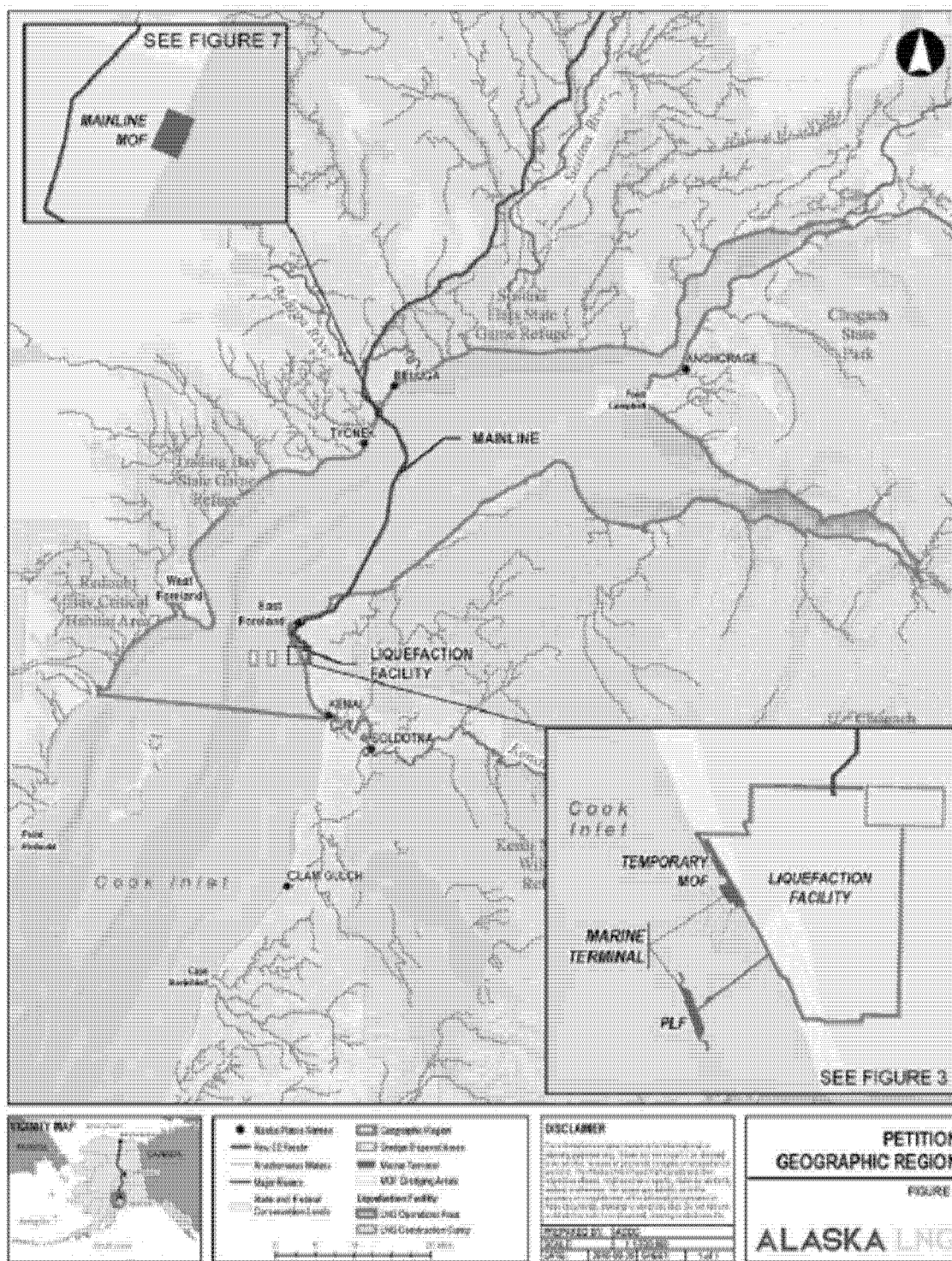


Figure 1. Geographic area of the proposed Alaska LNG facilities (AGDC, 2018) (see AGDC's LOA application for color legends).

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Detailed Description of Specific Activity

The construction of the Alaska LNG facilities includes the construction of a

product loading facility, marine terminal material offloading facility, a mainline material offloading facility, and the Mainline crossing of Cook Inlet. For all construction activities, each

season extends from 1 April through 31 October, during which construction crews would be working 12 hours per day, six days per week.

The following provides a detailed description of the Alaska LNG facilities to be constructed.

Product Loading Facility (PLF)

The proposed PLF would be a permanent facility used to load LNG carriers (LNGCs) for export. It consists of two loading platforms, two berths, a Marine Operations Platform, and an access trestle that supports the piping that delivers LNG from shore to LNGCs and includes all the equipment to dock LNGCs. Analyzed elements of the PLF are shown in Figures 3 and 4 of the LOA application, and are described as follows.

- **PLF Loading Platforms**—Two loading platforms, one located at either end of the north-south portion of the trestle, would support the loading arm package, a gangway, supporting piping, cabling, and equipment. The platforms would be supported above the seafloor on steel-jacketed structures called quadropods;

- **PLF Berths**—Two berths would be located in natural water depths greater than –53 feet (ft) mean lower low water (MLLW) and would be approximately 1,600 feet apart at opposite ends of the north-south portion of the trestle. Each berth would have four concrete pre-cast breasting dolphins and six concrete pre-cast mooring dolphins. The mooring and breasting dolphins would be used to secure vessels alongside the berth for cargo loading operations. The mooring and breasting dolphins would be supported over the seabed on quadropods. A catwalk, supported on two-pile bents, would connect the mooring dolphins to the loading platforms;

- **Marine Operations Platform**—A Marine Operations Platform would be located along the east-west portion of the access trestle (Figure 4 of the LOA application) and would support the proposed Marine Terminal Building, an electrical substation, piping, cabling, and other equipment used to monitor the loading operations. The platform would be supported above the seafloor on four-pile bents; and

- **Access Trestle**—This structure is T-shaped with a long east-west oriented section and a shorter north-south oriented section and carries pipe rack, roadway, and walkway. The pipe rack contains LNG loading system pipelines, a fire water pipeline, utility lines, power and instrument cables, and lighting. The east-west portion of the trestle extends from shore, seaward, for a distance of approximately 3,650 feet and would be supported on three-pile and four-pile bents at 120-foot intervals. The north-south oriented portion of the access

trestle is approximately 1,560 feet long, and is supported on five-pile quadropods.

Construction of the PLF and berths would be both overhead construction (conducted with equipment located on a cantilever bridge extending from shore) and marine construction (conducted with equipment located on barges/vessel).

The PLF would be constructed over the course of four ice-free seasons (Seasons 1–4); however, Season 1 activities associated with PLF construction would include only installation of onshore portions of the PLF and are therefore not described or analyzed in this document. Activities in Seasons 2 through 4 are described below.

In Season 2, the marine construction spread would be mobilized, and the cantilever bridge would be commissioned. A total of 35 bents and quadropod structures would be installed for part of the east-west access trestle, and eight quadropods would be installed to support the berth loading platforms.

In Season 3, the remainder of the bents for the east-west access trestle would be installed. Additionally, bents supporting the Marine Operations Platform and north-south trestle would be installed. A total of 26 bent and quadropod structures would be installed.

In Season 4, installation of the mooring quadropods would be completed, and the bents supporting the catwalk between the loadout platforms and the mooring dolphins would be installed. A total of 18 bent and quadropod structures would be installed.

All PLF bents and quadropods are expected to be installed with impact hammers. The anticipated production rate for installation of the bents is one bent per six construction days, and for quadropods it is one quadropod per eight work days. Pile driving is expected to occur during only two of the six days for bents and two of the eight days for quadropods. It is also assumed the impact hammer would only be operated approximately 25 percent of time during the two days of pile driving.

Marine Terminal Material Offloading Facility (Marine Terminal MOF)

The proposed Marine Terminal MOF, to be located near the PLF in Nikiski, would consist of three berths and a quay that would be used during construction of the Liquefaction Facility to enable direct deliveries of equipment modules, bulk materials, construction equipment, and other cargo to minimize the

transport of large and heavy loads over road infrastructure.

The Marine Terminal MOF quay would be approximately 1,050 feet long and 600 feet wide, which would provide sufficient space for cargo discharge operations and accommodate 200,000 square feet of staging area. It would have a general dock elevation of +32 feet MLLW.

The quay would have an outer wall consisting of combi-wall (combination of sheet piles and pipe piles) tied back to a sheet pile anchor wall, and 11 sheet pile coffer cells, backfilled with granular materials.

Berths at the Marine Terminal MOF would include:

- One Lift-on/Lift-off (Lo-Lo) berth with a maintained depth alongside of –32 feet MLLW;
- One Roll-on/Roll-off (Ro-Ro) berth with a maintained depth alongside of –32 feet MLLW; and
- One grounded barge bed with a ground pad elevation of +10 feet MLLW.

The Temporary MOF has been designed as a temporary facility and would be removed early in operations when it is no longer needed to support construction of the Liquefaction Facility.

The Temporary MOF would be constructed over the course of two construction seasons (Seasons 1 and 2).

The combi-wall and the first six of eleven coffer cells would be installed in Season 1. An equal amount of sheet pile anchor wall would be associated with the combi-wall, but this is not considered in the analysis as the anchor wall would be driven into fill and would not generate substantial underwater sound. Six 24-inch template pipe piles would be installed with a vibratory hammer before the sheet pile is installed for each coffer cell and then removed when coffer cell installation is complete. The remaining five coffer cells and fill would be installed in Season 2, along with the quadropods for the dolphins for the Ro-Ro berth.

The Marine Terminal MOF would be constructed using both land-based (from shore and subsequently from constructed portions of the Marine Terminal MOF) and marine construction methods. The anticipated production rate for installation of combi-wall and coffer cells is 25 linear feet per day per crew, with two crews operating, and vibratory hammers operating 40 percent of each 12-hour construction day. The anticipated production rate for quadropod installation is the same as described in Section 1, above.

Dredging would be conducted over two ice free seasons. Dredging at the

Marine Terminal MOF during the first season of marine construction may be conducted with either an excavator or clamshell (both mechanical dredges). Various bucket sizes may be used. Sediment removed would be placed in split hull or scow/hopper barges tended by tugs that would transport the material to the location of dredge material placement.

Dredging at the Marine Terminal MOF during the second season may be conducted with either a hydraulic (cutter head) dredger or a mechanical dredger. For a hydraulic dredger, the dredged material would be pumped from the dredge area to the disposal location or pumped into split-hull barges for transport to the placement location. If split-hull barges are used rather than direct piping of material, a manifold system may be set up to load multiple barges simultaneously. For a mechanical dredger, two or more sets of equipment would likely be required to achieve total dredging production to meet the Project schedule. Personnel transfer, support equipment, and supply would be similar to the first season. However, due to the low activity level and source levels from dredging, we do not consider there would be take of marine mammals. Therefore, dredging is not further analyzed in this document.

Mainline Material Offloading Facility (Mainline MOF)

A Mainline MOF may be required on the west side of Cook Inlet to support installation of the Cook Inlet shoreline crossing, and onshore construction between the South of Beluga Landing shoreline crossing and the Yentna River. The Mainline MOF would be located near, but at a reasonable distance, from the existing Beluga Landing. Use of the existing landing is not considered to be feasible.

The Mainline MOF would consist of a quay, space for tugs, and berths including:

- Lo-Lo Berth for unloading pipes and construction materials;
- Ro-Ro Berth and ramp dedicated to Ro-Ro operations; and
- Fuel berth dedicated to unloading fuel.

The quay would be 450 feet long (along the shoreline) and 310 feet wide (extending into the Cook Inlet). A Ro-Ro ramp (approximately 80 feet by 120 feet) would be constructed adjacent to the quay. Both the quay and the Ro-Ro ramp would consist of anchored sheet pile walls backed by granular fill. The sources for the granular material would be onshore. Surfacing on the quay would be crushed rock. Some fill material for the quay and Ro-Ro ramp

are expected to be generated by excavation of the access road. Any additional needed fill materials and crushed rock for surfacing would be barged in.

The quay and the Ro-Ro ramp are located within the 0-foot contour, so berths would be practically dry at low tide. No dredging is planned; vessels would access the berths and ground themselves during high tide cycles. The proposed top level of the Mainline MOF is +36 feet MLLW, which is about 11 feet above Mean Higher High Water (MHHW).

Approximately 1,270 feet of sheet pile would be installed for construction of the quay and Ro-Ro ramp, and a corresponding length of sheet pile would be installed as anchor wall; however, only 670 feet of sheet pile would be installed in the waters of Cook Inlet. The remainder would be installed as anchor wall in fill material, or in the intertidal area when the tide is out, and would not result in underwater sound.

The Mainline MOF would be constructed in a single construction season (Season 1). A break-down of activities per season is provided below. Crews are expected to work 12 hours per day, six days per week. The sheet pile would be installed using marine equipment, with the first 50 percent of embedment conducted using a vibratory hammer and the remaining 50 percent conducted using an impact hammer. Hammers would be expected to be operated either 25 percent of a 12-hour construction day (impact hammer) or 40 percent of a 12-hour construction day (vibratory hammer).

Mainline Crossing of Cook Inlet

The proposed Mainline, a 42-inch-diameter, natural gas pipeline, would cross the Cook Inlet shoreline on the west side of the inlet (north landfall) south of Beluga Landing at pipeline milepost (MP) 766.3, traverse Cook Inlet in a generally southward direction for approximately 26.7 miles, and cross the east Cook Inlet shoreline near Suneva Lake at MP 793.1 (south landfall). The pipe would be trenched into the seafloor and buried from the shoreline out to a water depth of approximately 35–45 feet MLLW on both sides of the inlet, approximately 8,800 feet from the north landfall and 6,600 feet from the south landfall. Burial depth (depth of top of pipe below the seafloor) in these areas would be 3–6 feet. Seaward of these sections, the concrete coated pipeline would be placed on the seafloor. Seafloor that would be directly affected by construction and operation of the Cook Inlet crossing of the Mainline is itemized in Table 6. Additional

footprint would be impacted by the use of anchors to hold the pipelay vessel in place while installing the pipeline on the seafloor.

Geophysical surveys would be conducted just prior to pipeline construction. A detailed bathymetric profile (longitudinal and cross) would be conducted. Types of geophysical equipment expected to be used for the surveys could include:

- Single-beam echosounder planned for use during this program operate at frequencies greater than 200 kilohertz (kHz);
- Multi-beam echo sounders planned for this program operate at frequencies greater than 200 kHz;
- Side-scan sonar system planned for use during this program operate at a frequency of 400 and 900 kHz; and
- Magnetometer. These instruments do not emit sound.

Operation of geophysical equipment such as echosounders and side-scan sonars at frequencies greater than 200 kHz are not considered to result in takes of marine mammals due to the extremely high frequencies emitted that are above the range of marine mammals' hearing thresholds. Magnetometers do not emit underwater sound. Therefore, geophysical surveys are not evaluated further in this document.

The pipeline would be trenched and buried in the nearshore portions of the route across the Cook Inlet.

The nearshore portion of the trench is expected to be constructed using amphibious or barge-based excavators. This portion of the trench would extend from the shoreline out to a transition water depth where a dredge vessel can be employed. On the west side of the inlet (Beluga Landing) this is expected to be from the shore out 655 feet, and on the east side (Suneva Lake) from the shoreline out 645 feet. The trench basis is to excavate a mustow slope trench that would not retain sediments (*i.e.*, a self-cleaning trench). A backhoe dredge may also be required to work in this portion of the crossing.

From the transition water depth to water depths of the –35 feet or –45 feet MLLW, a trailing suction hopper dredger would be used to excavate a trench for the pipeline. Alternative burial techniques, such as plowing, backhoe dredging, or clamshell dredging, would be considered if conditions become problematic for the dredger. After installation of the nearshore pipelines, a jet sled or mechanical burial sled could be used to achieve post dredge burial depths.

Pipeline joints would be welded together onshore in 1,000-foot-long strings and laid on the ground surface

in an orientation that approximates the offshore alignment. A pipe pull barge would be anchored offshore near the seaward end of the trench, and would then be used to pull the pipe strings from their onshore position, out into the trench.

Following pipeline installation, the trench is expected to backfill naturally through the movement of seafloor sediments. If manual backfilling is required, the backfill would be placed by reversing the flow of the trailing suction hopper dredger used offshore (see below) or mechanically with the use of excavators.

Seaward of the trenched sections, the pipeline would be laid on the seafloor across Cook Inlet using conventional pipelay vessel methods. The pipelay vessel would likely employ 12 anchors to keep it positioned during pipelay and provide resistance as it is winched ahead 80 feet each time an additional 80-foot section of pipe is added/welded on the pipe string. Dynamic positioning may be used in addition to the conventional mooring system. Mid-line buoys may be used on the anchor chains when crossing other subsea infrastructure (*i.e.*, pipelines and cables). A pipelay rate of 2,000 to 2,500 feet per 24-hour period is expected. It is

anticipated that three anchor handling attendant tugs would be used to repeatedly reposition the anchors, thereby maintaining proper position and permitting forward movement. The primary underwater sound sources of concern would be from the anchor handling tugs (AHTs) during the anchor handling for the pipelay vessel.

The pipeline crossing of Cook Inlet would be installed in two consecutive construction seasons (Seasons 3 and 4). Work from the pipelay vessel and pull barge would be conducted 24 hours per day, seven days per week, until the work planned for that season is completed. Anchor handling durations were estimated differently for the two construction seasons. Anchor handling is expected to be conducted 25 percent of the time that the pull barge is on site in Season 3. The estimate for anchor handling duration in Season 4 was based on the proposed route length, the total numbers of individual anchors moves, and the estimated time required to retrieve and reset each anchor (approximately 30 minutes per anchor to retrieve and reset). A break-down of activities per season is provided below.

Season 3

- Conduct onshore enabling works including establishing winch/laydown

and welding area, and excavation of a trench through onshore sections of the shore approach (open cut the shoreline).

- Excavate trench in very nearshore waters using land and amphibious excavation equipment.
- Conduct pre-lay excavation of the pipe trench out to depths of -35 to -45 feet MLLW using various subsea excavation methods.

- Install the pipe in the nearshore trenches using a pull barge.

Anchor handling would occur for approximately six (5.75 days) 24-hour periods in Season 3.

Season 4

- Lay unburied offshore section of Mainline across Cook Inlet using conventional pipelay vessel. The Applicant estimates that anchor handling would occur over 13 24-hour periods in Season 4.

- Tie-in the offshore section to the buried nearshore sections on both sides of the Cook Inlet.

- Flood, hydrotest, and dry the Mainline pipeline with Cook Inlet.

A summary of pile driving activities for the entire Alaska LNG facilities construction, breaking down by seasons and project elements, is provided in Table 1.

TABLE 1—IN-WATER PILE DRIVING ASSOCIATED WITH ALASKA LNG FACILITIES CONSTRUCTION

Element	Driving method	Pile type & size	Pile number or length	Number strikes/hr (impact only)	Hours pile driving/day	Number days
Season 1						
Marine Terminal MOF combi wall	Vibratory	60-in steel pipe	35	NA	4.8	5
Marine Terminal MOF combi wall	Vibratory	Sheet pile	1,075 ft	NA	4.8	5
Marine Terminal MOF cell	Vibratory	18-in steel pipe	36	NA	4.8	12
Marine Terminal MOF cell	Vibratory	Sheet pile	2,454 ft	NA	4.8	11
Season 2						
Marine Terminal MOF Cell	Vibratory	18-in steel pipe	30	NA	4.8	11
Marine Terminal MOF cell	Vibratory	Sheet pile	2,447 ft	NA	4.8	11
Marine Terminal MOF Ro-Ro dolphin quads.	Impact	24-in steel pipe	7	1,560	3	2
Marine Terminal MOF Ro-Ro dolphin quads.	Impact	48-in steel pipe	28	1,560	3	2
Mainline MOF	Vibratory	Sheet pile	670 ft	NA	4.8	3
Mainline MOF	Impact	Sheet pile	670 ft	1,560	3	2
Season 3						
Berth 1	Impact	48-in steel pipe	20	1,560	3	2
Berth 2	Impact	48-in steel pipe	20	1,560	3	2
N-S access trestle	Impact	48-in steel pipe	40	1,560	3	3
E-W access trestle	Impact	60-in steel pipe	73	1,560	3	11
Season 4						
Breasting dolphin berths 1 & 2	Impact	Steel pipe 48-in ...	8	1,560	3	1
Breasting dolphin berths 1 & 2	Impact	60-in steel pipe	32	1,560	3	3
Mooring dolphin	Impact	48-in steel pipe	2	1,560	3	1
Mooring dolphin	Impact	60-in steel pipe	8	1,560	3	1
N-S access trestle	Impact	48-in steel pipe	30	1,560	3	3

TABLE 1—IN-WATER PILE DRIVING ASSOCIATED WITH ALASKA LNG FACILITIES CONSTRUCTION—Continued

Element	Driving method	Pile type & size	Pile number or length	Number strikes/hr (impact only)	Hours pile driving/day	Number days
E-W access trestle	Impact	60-in steel pipe	28	1,560	3	4
Operation platform	Impact	60-in steel pipe	12	1,560	3	2
Season 5						
Mooring dolphin	Impact	48-in steel pipe	10	1,560	3	2
Mooring dolphin	Impact	60-in steel pipe	40	1,560	3	4
Catwalk	Impact	60-in steel pipe	8	1,560	3	4

A summary of anchor handling activities associated to mooring,

trenching, and pipe laying are provided in Table 2.

TABLE 2—DURATION OF ANCHOR HANDLING ASSOCIATED WITH ALASKA LNG FACILITIES PROJECT

Season	Activity	Hours/day	Days
3	Mooring	6.00	9
3	Pipe trenching	6.00	14
4	Pipeline days at a rate of 2,500 feet per day	6.00	53

Description of Marine Mammals in the Area of Specified Activities

Sections 3 and 4 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history, of the potentially affected species. Additional information regarding population trends and threats may be found in NMFS' Stock Assessment Reports (SAR; <https://repository.library.noaa.gov/view/noaa/18114>) and more general information

about these species (e.g., physical and behavioral descriptions) may be found on NMFS' website (<https://www.fisheries.noaa.gov/find-species>).

Table 3 lists all species with expected potential for occurrence in upper Cook Inlet and summarizes information related to the population or stock, including regulatory status under the MMPA and ESA and potential biological removal (PBR), where known. For taxonomy, we follow Committee on Taxonomy (2016). PBR is defined by the

MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS' SARs). While no mortality is anticipated or authorized here, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species and other threats.

TABLE 3—MARINE MAMMALS WITH POTENTIAL PRESENCE WITHIN THE PROPOSED PROJECT AREA

Common name	Scientific name	Stock	ESA/ MMPA status; strategic (Y/N) ¹	Stock abundance (CV, N _{min} , most recent abundance survey) ²	PBR	Annual M/S ³
Order Cetartiodactyla—Cetacea—Superfamily Mysticeti (baleen whales)						
Family Eschrichtiidae: Gray whale	<i>Eschrichtius robustus</i>	Eastern North Pacific	-; N	20,990 (0.05, 20,125)	624	132
Family Balaenopteridae: Humpback whale	<i>Megaptera novaeangliae</i>	Central North Pacific	E/D; Y	10,103 (0.300, 7,890)	83	8.5
Fin whale	<i>Balaenoptera physalus</i>	Northeast Pacific	E/D; Y	916 ⁴ (0.39, 916)	3.5	>1.3
Family Delphinidae: Killer whale	<i>Orcinus orca</i>	Eastern North Pacific Alaska Resident.	-; N	2,347 (NA, 2,347)	24	1
Beluga whale	<i>Delphinapterus leucas</i>	Cook Inlet	E/D; Y	312 (0.10, 287)	⁵ 0.57	0
Family Phocoenidae (porpoises): Harbor porpoise	<i>Phocoena phocoena</i>	Gulf of Alaska	-; N	31,046 (2.14, NA)	unk	72
Dall's porpoise	<i>Phocoenoides dalli</i>	Alaska	-; N	83,400 (0.097, NA)	unk	38
Order Carnivora—Superfamily Pinnipedia						
Family Otariidae (eared seals and sea lions): California sea lion	<i>Zalophus californianus</i>	U.S.	-; N	296,750 (NA, 153,337) ...	9,200	389
Steller sea lion	<i>Eumetopias jubatus</i>	Western U.S.	E/D; Y	53,303 (NA, 53,303)	320	31
Family Phocidae (earless seals):						

TABLE 3—MARINE MAMMALS WITH POTENTIAL PRESENCE WITHIN THE PROPOSED PROJECT AREA—Continued

Common name	Scientific name	Stock	ESA/ MMPA status; strategic (Y/N) ¹	Stock abundance (CV, N _{min} , most recent abundance survey) ²	PBR	Annual M/S ³
Harbor seal	<i>Phoca vitulina</i>	Cook Inlet/Shelikof Strait	-; N	27,386 (NA, 25,651)	770	0.04

¹ Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.

² NMFS marine mammal stock assessment reports online at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region#reports>. CV is coefficient of variation; N_{min} is the minimum estimate of stock abundance.

³ These values, found in NMFS' SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (e.g., commercial fisheries, ship strike). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value or range. A CV associated with estimated mortality due to commercial fisheries is presented in some cases.

⁴ Fin whale estimate is based on survey conducted in 2015 in the Gulf of Alaska, but this is the best available information for use here.

⁵ Because this stock does not meet the assumption that it will increase when human-caused mortality is reduced, inherent to the use of the PBR, the calculated value for PBR is likely biased and any removals from this stock will likely further prevent recovery.

Marine mammal species that could potentially occur in the proposed construction areas are included in Table 3. Detailed discussion of these species is provided in the LOA application and summary information is provided below.

In addition, sea otters may be found in Cook Inlet. However, sea otters are managed by the U.S. Fish and Wildlife Service and are not considered further in this document.

Humpback Whale

The humpback whale is distributed worldwide in all ocean basins. In winter, most humpback whales occur in the subtropical and tropical waters of the Northern and Southern Hemispheres. Humpback whales in the high latitudes of the North Pacific Ocean are seasonal migrants that feed on euphausiids and small schooling fishes (Nemoto, 1957, 1959; Clapham and Mead, 1999). The humpback whale population was considerably reduced as a result of intensive commercial exploitation during the 20th century.

The historical summer feeding range of humpback whales in the North Pacific encompassed coastal and inland waters around the Pacific Rim from Point Conception, California, north to the Gulf of Alaska and the Bering Sea, and west along the Aleutian Islands to the Kamchatka Peninsula and into the Sea of Okhotsk and north of the Bering Strait (Zenkovich, 1954; Nemoto, 1957; Tomlin, 1967; Johnson and Wolman, 1984). Historically, the Asian wintering area extended from the South China Sea east through the Philippines, Ryukyu Retto, Ogasawara Gunto, Mariana Islands, and Marmust Islands (Rice, 1998). Humpback whales are currently found throughout this historical range. Most of the current winter range of humpback whales in the North Pacific is relatively well known, with aggregations of whales in Japan, the Philippines, Hawaii, Mexico, and

Central America. The winter range includes the main islands of the Hawaiian archipelago, with the greatest concentration along the west side of Maui. In Mexico, the winter breeding range includes waters around the southern part of the Baja California peninsula, the central portions of the Pacific coast of mainland Mexico, and the Revillagigedo Islands off the mainland coast. The winter range also extends from southern Mexico into Central America, including Guatemala, El Salvador, Nicaragua, and Costa Rica (Calambokidis *et al.*, 2008).

Although there is considerable distributional overlap in the humpback whale stocks that use Alaskan waters, the whales seasonally found in lower Cook Inlet are probably of the Central North Pacific stock (Barlow *et al.*, 2011; Allen and Angliss 2015).

Humpback whale use of Cook Inlet has been observed to be confined to Lower Cook Inlet; the whales have been regularly seen near Kachemak Bay during the summer months (Rugh *et al.*, 2005). There are anecdotal observations of humpback whales as far north as Anchor Point, with recent summer observations extending to Cape Starichkof (Owl Ridge, 2014). Humpback whales will move about their range. It is possible for a small number of humpback whales to be observed near the Marine Terminal construction area, but they are unlikely to venture north into the proposed Upper Cook Inlet pipeline crossings.

Fin Whale

Within the U.S. waters in the Pacific Ocean, fin whales are found seasonally off the coast of North America and in the Bering Sea during the summer. Moore *et al.* (1998, 2006), Watkins *et al.* (2000), and Stafford *et al.* (2007) documented fin whale calling along the U.S. Pacific coast where rates were highest from August/September through February, suggesting that these may be

important feeding areas during the winter. Sirović *et al.* (2013) speculated that both resident and migratory fin whales may occur off southern California based on shifts in peaks in fin whale calling data. Sirović *et al.* (2015) noted that fin whales were detected in the Southern California Bight year-round and found an overall increase in the fin whale call index from 2006 to 2012. Soule and Wilcock (2013) documented fin whale call rates in a presumed feeding area along the Juan de Fuca Ridge, offshore of northern Washington State, and found that some whales appear to transit northwest from August to October. They speculate that some fin whales migrate northward from the Juan de Fuca Ridge in fall and southward in winter.

Fin whale use of Cook Inlet is rare, but they have been sighted during NMFS aerial surveys in Cook Inlet conducted from 2000–2016 (Shelden *et al.*, 2017).

Gray Whale

The gray whale population along the west coast of the United States belongs to the eastern North Pacific stock. During summer and fall, most gray whales of that stock feed in the Chukchi, Beaufort and northwestern Bering Seas. An exception to this is the relatively small number of whales (approximately 200) that summer and feed along the Pacific coast between Kodiak Island, Alaska and northern California (Darling, 1984; Gosho *et al.*, 2011; Calambokidis *et al.*, 2012), referred to as the “Pacific Coast Feeding Group.” Three primary wintering lagoons in Baja California, Mexico, are utilized, and some females are known to make repeated returns to specific lagoons (Jones, 1990).

Gray whale use of Cook Inlet is rare, but they have been sighted during NMFS aerial surveys in Cook Inlet conducted from 2000–2016 (Shelden *et al.*, 2017).

Killer Whale

Killer whales are widely distributed, although they occur in higher densities in colder and more productive waters (Allen and Angliss, 2015). Two different stocks of killer whales inhabit the Cook Inlet region: The Alaska Resident Stock and the Gulf of Alaska, Aleutian Islands, Bering Sea Transient Stock (Allen and Angliss, 2015).

Killer whales are occasionally observed in Lower Cook Inlet, especially near Homer and Port Graham (Shelden *et al.*, 2003; Rugh *et al.*, 2005). A concentration of sightings near Homer and inside Kachemak Bay may represent high use, or high observer-effort given most records are from a whale-watching venture based in Homer. The few whales that have been photographically identified in Lower Cook Inlet belong to resident groups more commonly found in nearby Kenai Fjords and Prince William Sound (Shelden *et al.*, 2003). Prior to the 1980s, killer whale sightings in Upper Cook Inlet were very rare (Rugh *et al.*, 2005). During aerial surveys conducted between 1993 and 2004, killer whales were observed on only three flights, all in the Kachemak and English Bay area (Rugh *et al.*, 2005). However, anecdotal reports of killer whales feeding on belugas in Upper Cook Inlet began increasing in the 1990s, possibly in response to declines in sea lions and harbor seals elsewhere (Shelden *et al.*, 2003). Observations of killer whales in beluga summering grounds have been implicated as a possible contributor to decline of Cook Inlet belugas in the 1990s, although the number of confirmed mortalities from killer whales is small (Shelden *et al.*, 2003). Recent industry monitoring programs only reported a few killer whale sightings (Kendall *et al.*, 2015). The sporadic movements and small numbers of this species suggest that there is a rare possibility of encountering this whale during Marine Terminal construction and Mainline pipelay. There is, however, a greater possibility of transiting vessels associated with the Project encountering killer whales during transit through Lower Cook Inlet.

Beluga Whale

The Cook Inlet beluga whale distinct population segment (DPS) is a small, geographically isolated, and genetically distanced population separated from other beluga populations by the Alaska Peninsula (O'Corry-Crowe *et al.*, 1997). The Cook Inlet beluga DPS was originally estimated at 1,300 whales in 1979 (Calkins, 1989) and has been the focus of management concerns since

experiencing a dramatic decline between 1994 and 1998, when the stock declined 47 percent, attributed to overharvesting by subsistence hunting (Mahoney and Shelden, 2000). Prior to subsistence hunting restrictions, harvest was estimated to annually remove 10 to 15 percent of the population (Mahoney and Shelden, 2000). Only five belugas have been harvested since 1999, yet the population has continued to decline. NMFS listed the population as "depleted" in 2000 because of the decline, and as "endangered" under the ESA in 2008 when the population failed to recover following a moratorium on subsistence harvest.

In April 2011, NMFS designated critical habitat for Cook Inlet beluga whales (76 FR 20180; April 11, 2011) in two specific areas of Cook Inlet:

- *Area 1:* All marine waters of Cook Inlet north of a line from the mouth of Threemile Creek (61°08.5' N, 151°04.4' W) connecting to Point Possession (61°02.1' N, 150°24.3' W), including waters of the Susitna River south of 61°20.0' N, the Little Susitna River south of 61°18.0' N, and the Chickaloon River north of 60°53.0' N; and
- *Area 2:* All marine waters of Cook Inlet south of a line from the mouth of Threemile Creek (61°08.5' N, 151°04.4' W) to Point Possession (61°02.1' N, 150°24.3' W) and north of 60°15.0' N, including waters within 2 nautical miles seaward of mean-high high water (MHHW) along the western shoreline of Cook Inlet between 60°15.0' N and the mouth of the Douglas River (59°04.0' N, 153°46.0' W); all waters of Kachemak Bay east of 151°40.0' W; and waters of the Kenai River below the Warren Ames bridge at Kenai, Alaska.

The Cook Inlet beluga whale population is estimated to have declined from 1,300 animals in the 1970s (Calkins, 1989) to about 340 animals in 2014 (Shelden *et al.*, 2015). The current population estimate is 328 animals (Shelden *et al.*, 2017). The precipitous decline documented in the mid-1990s was attributed to unsustainable subsistence practices by Alaska Native hunters (harvest of more than 50 whales per year) (Mahoney and Shelden, 2000). In 2006, a moratorium of the harvest of Cook Inlet beluga whales was agreed upon through a cooperative agreement between the Cook Inlet Marine Mammal Council and NMFS.

During late spring, summer, and fall, beluga whales concentrate near the Susitna River mouth, Knik Arm, Turnagain Arm, and Chickaloon Bay (Nemeth *et al.*, 2007) where they feed on migrating eulachon and salmon (Moore *et al.*, 2000). Critical Habitat Area 1

reflects this summer distribution.

During winter, beluga whales concentrate in deeper waters in the mid-inlet to Kalgin Island, and in the mustow waters along the west shore of Cook Inlet to Kamishak Bay. Although belugas may be found throughout Cook Inlet at any time of year, they generally spend the ice-free months in Upper Cook Inlet and expand their distribution south and into more offshore waters of Upper Cook Inlet in winter. These seasonal movements appear to be related to changes in the physical environment from sea ice and currents and shifts in prey resources (NMFS, 2016). Belugas spend most of their time year-round in the coastal areas of Knik Arm, Turnagain Arm, Susitna Delta, Chickaloon Bay, and Trading Bay (Goetz *et al.*, 2012). During the open-water months in Upper Cook Inlet (north of the Forelands), beluga whales are typically concentrated near river mouths (Rugh *et al.*, 2010).

Satellite tags from 10 whales tagged from 2000 through 2002 transmitted through the fall, and of those, three tags deployed on adult males transmitted through April and late May. None of the tagged beluga moved south of Chinitna Bay on the western side of Cook Inlet. A review of marine mammal surveys conducted in the Gulf of Alaska from 1936 to 2000 discovered only 31 beluga sightings among 23,000 marine mammal sightings, indicating that very few belugas occur in the Gulf of Alaska outside of Cook Inlet (Laidre *et al.*, 2000 cited in Allen and Angliss, 2014).

Based on these studies, it is anticipated that beluga whales are most likely to occur near the Marine Terminal in moderate densities during the period when sea ice is typically present in Cook Inlet north of the Forelands (December through May; Goetz *et al.*, 2012). Few belugas may occur near the Marine Terminal during the ice-free period (June through November). Belugas would not be expected to focus their foraging (dive) efforts near the proposed Marine Terminal location. If belugas do forage near the Marine Terminal, their foraging dives are more likely to be long and deep during the sea-ice season (December through May; Goetz *et al.*, 2012).

Beluga whales could be found in the vicinities of the Mainline crossing during summer-fall and the Marine Terminal construction area during winter. Previous marine mammal surveys conducted between the Beluga River and the West Forelands (Nemeth *et al.*, 2007; Brueggeman *et al.*, 2007a, b; Lomac-MacNair *et al.*, 2013, 2014; Kendall *et al.*, 2015) suggest that beluga whale numbers near the proposed

Mainline MOF on the west side of Cook Inlet and the pipeline landing peak in May and again in October, with few whales observed in the months in between.

Beluga whales are expected to occur along the entire portion of the Mainline route within Upper Cook Inlet year-round; but, as discussed previously, beluga distribution is concentrated in mustow coastal waters near Knik Arm, Chickaloon Bay, and Trading Bay during the ice-free season (June through November), and in deeper waters of the Susitna Delta, and offshore between East and West Forelands, and around Fire Island during the sea-ice season (December through May) (Goetz *et al.*, 2012). Belugas may remain near the Mainline route during the winter (December through May).

Belugas forage in the Trading Bay area from June to through November (Goetz *et al.*, 2012). Belugas may remain near the Mainline route during the winter (December through May) (Goetz *et al.*, 2012). Belugas would be expected to focus their foraging (dive) efforts near the Trading Bay area during June to November, south of where the proposed Mainline would enter Cook Inlet.

Harbor Porpoise

The Gulf of Alaska harbor porpoise stock is distributed from Cape Suckling to Unimak Pass (Allen and Angliss, 2015). They are found primarily in coastal waters less than 328 feet deep (Hobbs and Waite, 2010) where they feed on Pacific herring (*Clupea pallasii*), other schooling fishes, and cephalopods.

Although harbor porpoises have been frequently observed during aerial surveys in Cook Inlet, most sightings are of single animals, and the sightings have been concentrated nearshore between Iliamna and Tuxedni bays on the lower west side of Lower Cook Inlet (Rugh *et al.*, 2005; Shelden *et al.*, 2013). No harbor porpoises were recorded near Nikiski during NMFS aerial surveys conducted between 1993 and 2012 (Shelden *et al.*, 2013). Dahlheim *et al.* (2000) estimated the 1991 Cook Inlet-wide population at 136 animals. However, they are one of the three marine mammals (besides belugas and harbor seals) regularly seen in Upper Cook Inlet (Nemeth *et al.*, 2007), especially during spring eulachon and summer salmon runs. Brueggeman *et al.* (2007a, b) also reported small numbers of harbor porpoise between Granite Point and the Beluga River. Recent industry monitoring programs in Lower and Middle Cook Inlet reported harbor porpoise sightings in all summer months (Lomac-MacNair *et al.*, 2013,

2014; Kendall *et al.*, 2015). Because harbor porpoise have been observed throughout Cook Inlet during the summer months, they represent a species that could be encountered during all phases and locations of construction.

Dall's Porpoise

Dall's porpoise are widely distributed across the entire North Pacific Ocean. They are found over the continental shelf adjacent to the slope and over deep (2,500+ m) oceanic waters (Hall, 1979). They have been sighted throughout the North Pacific as far north as 65° N (Buckland *et al.*, 1993) and as far south as 28° N in the eastern North Pacific (Leatherwood and Fielding, 1974). The only apparent distribution gaps in Alaska waters are upper Cook Inlet and the eastern flats of the Bering Sea. Throughout most of the eastern North Pacific they are present during all months of the year, although there may be seasonal onshore-offshore movements along the west coast of the continental United States (Loeb, 1972; Leatherwood and Fielding, 1974) and winter movements of populations out of areas with ice such as Prince William Sound (Hall, 1979).

As mentioned above, Dall's porpoise's use of Cook Inlet is rare. They have been sighted during NMFS aerial surveys in Cook Inlet conducted from 2000–2016 (Shelden *et al.*, 2017), although all sightings were in south Cook Inlet over 100 miles south of the Alaska LNG project area.

California Sea Lion

The breeding areas of the California sea lion are on islands located in southern California, western Baja California, and the Gulf of California. Mitochondrial DNA analysis identified five genetically distinct geographic populations: (1) Pacific Temperate, (2) Pacific Subtropical, (3) Southern Gulf of California, (4) Central Gulf of California and (5) Northern Gulf of California (Schramm *et al.*, 2009). In that study, the Pacific Temperate population included rookeries within U.S. waters and the Coronados Islands just south of U.S./Mexico border. Animals from the Pacific Temperate population range into Canadian waters, and movement of animals between U.S. waters and Baja California waters occurs. Males from western Baja California rookeries may spend most of the year in the United States.

California sea lions are very rare in Cook Inlet and typically are not observed farther north than southeast Alaska. However, NMFS' anecdotal sighting database contains four

California sea lion sightings in Seward and Kachemak Bay. In addition, an industry survey report contains a sighting of two California sea lions in lower Cook Inlet; however, it is unclear if these animals were indeed California sea lions or mis-identified Steller sea lions (SAE, 2012). Regardless, in an abundance of caution, we have included take for California sea lions in the final IHA.

Steller Sea Lion

Steller sea lions range along the North Pacific Rim from northern Japan to California (Loughlin *et al.*, 1984), with centers of abundance and distribution in the Gulf of Alaska and Aleutian Islands. Individual sea lions disperse widely outside of the breeding season (late May–early July), probably to access seasonally important prey resources. This results in marked seasonal patterns of abundance in some parts of the range and potential for intermixing of eastern and western stock sea lions in foraging areas (Sease and York, 2003). Despite the wide-ranging movements of juveniles and adult males in particular, exchange between rookeries by breeding adult females and males (other than between adjoining rookeries) is low, although males have a higher tendency to disperse than females (NMFS, 1995; Trujillo *et al.*, 2004; Hoffman *et al.*, 2006; Jemison *et al.*, 2013). A northward shift in the overall breeding distribution has occurred, with a contraction of the range in southern California and new rookeries established in Southeast Alaska (Pitcher *et al.*, 2007).

Steller sea lion in the vicinity of the AGDC project area is the Western U.S. stock, and its use of Cook Inlet is rare, but they have been sighted during NMFS aerial surveys in Cook Inlet conducted from 2000–2016 (Shelden *et al.*, 2017).

Harbor Seal

Harbor seals inhabit coastal and estuarine waters along the West Coast, including southeast Alaska west through the Gulf of Alaska and Aleutian Islands, in the Bering Sea and Pribilof Islands (Allen and Angliss, 2015). At more than 150,000 animals state-wide, harbor seals are one of the more common marine mammal species in Alaskan waters (Allen and Angliss, 2015). Harbor seals haul out on rocks, reefs, beaches, and drifting glacial ice (Allen and Angliss, 2015).

Large numbers of harbor seals concentrate at the river mouths and embayments of Lower Cook Inlet, including the Fox River mouth in Kachemak Bay (Rugh *et al.*, 2005). Montgomery *et al.* (2007) recorded over

200 haulout sites in Lower Cook Inlet alone. However, only a few hundred seals seasonally occur in Upper Cook Inlet (Rugh *et al.*, 2005; Shelden *et al.*, 2013), mostly at the mouth of the Susitna River where their numbers vary in concert with the spring eulachon and summer salmon runs (Nemeth *et al.*, 2007; Boveng *et al.*, 2012). In 2012, up to 83 harbor seals were observed hauled out at the mouths of the Theodore and Lewis rivers during April to May monitoring activity associated with a Cook Inlet seismic program (Brueggeman, 2007a). Montgomery *et al.* (2007) also found seals elsewhere in Cook Inlet to move in response to local steelhead (*Onchorhynchus mykiss*) and salmon runs. Recent industry monitoring programs in Lower and Middle Cook Inlet reported harbor seal sightings in all summer months, both in-water and on haulouts (Lomac-MacNair *et al.*, 2013, 2014; Kendall *et al.*, 2015). During summer, small numbers of harbor seals are expected to occur near the Marine Terminal construction area near Nikiski, and along the proposed Mainline pipeline crossing route.

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (e.g., Richardson *et al.*, 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.*, low-frequency cetaceans). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 dB threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. The functional groups and the associated

frequencies are indicated below (note that these frequency ranges correspond to the range for the composite group, with the entire range not necessarily reflecting the capabilities of every species within that group):

- Low-frequency cetaceans (mysticetes): Generalized hearing is estimated to occur between approximately 7 Hz and 35 kHz;
- Mid-frequency cetaceans (larger toothed whales, beaked whales, and most delphinids): Generalized hearing is estimated to occur between approximately 150 Hz and 160 kHz;
- High-frequency cetaceans (porpoises, river dolphins, and members of the genera *Kogia* and *Cephalorhynchus*; including two members of the genus *Lagenorhynchus*, on the basis of recent echolocation data and genetic data): Generalized hearing is estimated to occur between approximately 275 Hz and 160 kHz;
- Pinnipeds in water; Phocidae (true seals): Generalized hearing is estimated to occur between approximately 50 Hz to 86 kHz; and
- Pinnipeds in water; Otariidae (eared seals): Generalized hearing is estimated to occur between 60 Hz and 39 kHz.

The pinniped functional hearing group was modified from Southall *et al.* (2007) on the basis of data indicating that phocid species have consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä *et al.*, 2006; Kastelein *et al.*, 2009; Reichmuth and Holt, 2013).

For more detail concerning these groups and associated frequency ranges, please see NMFS (2016) for a review of available information. Ten marine mammal species (7 cetacean and 3 pinniped (2 otariid and 1 phocid) species) have the reasonable potential to co-occur with the proposed construction activities. Please refer to Table 3. Of the cetacean species that may be present, three species are classified as low-frequency cetaceans (*i.e.*, gray, humpback, and fin whales), two are classified as mid-frequency cetaceans (killer and beluga whales), and two are classified as high-frequency cetaceans (*i.e.*, harbor and Dall's porpoise).

Potential Effects of Specified Activities on Marine Mammals and Their Habitat

This section includes a summary and discussion of the ways that components of the specified activity may impact marine mammals and their habitat. The *Estimated Take by Incidental Harassment* section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by this

activity. The *Negligible Impact Analysis and Determination* section considers the content of this section, the *Estimated Take by Incidental Harassment* section, and the *Proposed Mitigation* section, to draw conclusions regarding the likely impacts of these activities on the reproductive success or survivorship of individuals and how those impacts on individuals are likely to impact marine mammal species or stocks.

Potential impacts to marine mammals from the Alaska LNG project are from noise generated during in-water pile driving and anchor handling activities.

Acoustic Effects

Acoustic effects to marine mammals from the proposed Alaska LNG facilities construction mainly include behavioral disturbances and temporary masking of animals in the area. A few individual animals could experience mild levels of temporary and/or permanent hearing threshold shift.

The AGDC's LNG facilities construction project using in-water pile driving and anchor handling during trenching and pipe laying could adversely affect marine mammal species and stocks by exposing them to elevated noise levels in the vicinity of the activity area.

Threshold Shift (noise-induced loss of hearing)—Exposure to high intensity sound for a sufficient duration may result in auditory effects such as a noise-induced threshold shift (TS)—an increase in the auditory threshold after exposure to noise (Finneran *et al.*, 2005). Factors that influence the amount of threshold shift include the amplitude, duration, frequency content, temporal pattern, and energy distribution of noise exposure. The magnitude of hearing threshold shift normally decreases over time following cessation of the noise exposure. The amount of TS just after exposure is the initial TS. If the TS eventually returns to zero (*i.e.*, the threshold returns to the pre-exposure value), it is a temporary threshold shift (TTS) (Southall *et al.*, 2007). When animals exhibit reduced hearing sensitivity (*i.e.*, sounds must be louder for an animal to detect them) following exposure to an intense sound or sound for long duration, it is referred to as a noise-induced TS. An animal can experience TTS or permanent threshold shift (PTS). TTS can last from minutes or hours to days (*i.e.*, there is complete recovery), can occur in specific frequency ranges (*i.e.*, an animal might only have a temporary loss of hearing sensitivity between the frequencies of 1 and 10 kHz), and can be of varying amounts (for example, an animal's hearing sensitivity might be reduced

initially by only 6 dB or reduced by 30 dB). PTS is permanent, but some recovery is possible. PTS can also occur in a specific frequency range and amount as mentioned above for TTS.

For marine mammals, published data are limited to the captive bottlenose dolphin, beluga, harbor porpoise, and Yangtze finless porpoise (Finneran, 2015). For pinnipeds in water, data are limited to measurements of TTS in harbor seals, an elephant seal, and California sea lions (Kastak *et al.*, 1999, 2005; Kastelein *et al.*, 2012b).

Lucke *et al.* (2009) found a TS of a harbor porpoise after exposing it to airgun noise with a received sound pressure level (SPL) at 200.2 dB (peak-to-peak) re: 1 micropascal (μPa), which corresponds to a sound exposure level (SEL) of 164.5 dB re: 1 μPa^2 s after integrating exposure. Because the airgun noise is a broadband impulse, one cannot directly determine the equivalent of root mean square (rms) SPL from the reported peak-to-peak SPLs. However, applying a conservative conversion factor of 16 dB for broadband signals from seismic surveys (McCauley, *et al.*, 2000) to correct for the difference between peak-to-peak levels reported in Lucke *et al.* (2009) and rms SPLs, the rms SPL for TTS would be approximately 184 dB re: 1 μPa , and the received levels associated with PTS (Level A harassment) would be higher. Therefore, based on these studies, NMFS recognizes that TTS of harbor porpoises is lower than other cetacean species empirically tested (Finneran & Schlundt, 2010; Finneran *et al.*, 2002; Kastelein and Jennings, 2012).

Marine mammal hearing plays a critical role in communication with conspecifics, and interpretation of environmental cues for purposes such as predator avoidance and prey capture. Depending on the degree (elevation of threshold in dB), duration (*i.e.*, recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious (similar to those discussed in auditory masking, below). For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that occurs during a time where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical for successful mother/calf interactions could have more serious impacts. Also, depending on the degree and frequency range, the effects of PTS on an animal could range in severity,

although it is considered generally more serious because it is a permanent condition. Of note, reduced hearing sensitivity as a simple function of aging has been observed in marine mammals, as well as humans and other taxa (Southall *et al.*, 2007), so one can infer that strategies exist for coping with this condition to some degree, though likely not without cost.

Masking—In addition, chronic exposure to excessive, though not high-intensity, noise could cause masking at particular frequencies for marine mammals, which utilize sound for vital biological functions (Clark *et al.*, 2009). Acoustic masking is when other noises such as from human sources interfere with animal detection of acoustic signals such as communication calls, echolocation sounds, and environmental sounds important to marine mammals. Therefore, under certain circumstances, marine mammals whose acoustical sensors or environment are being severely masked could also be impaired from maximizing their performance fitness in survival and reproduction.

Masking occurs at the frequency band that the animals utilize. Therefore, since noise generated from vibratory pile driving is mostly concentrated at low frequency ranges, it may have less effect on high frequency echolocation sounds by odontocetes (toothed whales). However, lower frequency man-made noises are more likely to affect detection of communication calls and other potentially important natural sounds such as surf and prey noise. It may also affect communication signals when they occur near the noise band and thus reduce the communication space of animals (*e.g.*, Clark *et al.*, 2009) and cause increased stress levels (*e.g.*, Foote *et al.*, 2004; Holt *et al.*, 2009).

Unlike TS, masking, which can occur over large temporal and spatial scales, can potentially affect the species at population, community, or even ecosystem levels, as well as individual levels. Masking affects both senders and receivers of the signals and could have long-term chronic effects on marine mammal species and populations. Recent science suggests that low frequency ambient sound levels have increased by as much as 20 dB (more than three times in terms of SPL) in the world's ocean from pre-industrial periods, and most of these increases are from distant shipping (Hildebrand, 2009). For AGDC's LNG facilities construction project, noises from pile driving contribute to the elevated ambient noise levels in the project area, thus increasing potential for or severity of masking. Baseline ambient noise

levels in the vicinity of project area are high due to ongoing shipping, construction and other activities in Cook Inlet.

Behavioral Disturbance—Finally, marine mammals' exposure to certain sounds could lead to behavioral disturbance (Richardson *et al.*, 1995), such as 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 noise sources are located; and/or flight responses (*e.g.*, pinnipeds flushing into water from haulouts or rookeries).

The onset of behavioral disturbance from anthropogenic noise depends on both external factors (characteristics of noise sources and their paths) and the receiving animals (hearing, motivation, experience, demography) and is also difficult to predict (Southall *et al.*, 2007). Currently NMFS uses a received level of 160 dB re 1 μPa (rms) to predict the onset of behavioral disturbance from impulse noises (such as impact pile driving), and 120 dB re 1 μPa (rms) for continuous noises (such as vibratory pile driving). For the AGDC's LNG facilities construction project, both 160- and 120-dB levels are considered for effects analysis because AGDC plans to conduct both impact and vibratory pile driving.

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, and/or reproduction, which depends on the severity, duration, and context of the effects.

Potential Effects on Marine Mammal Habitat

Project activities that could potentially impact marine mammal habitats by causing acoustical injury to prey resources and disturbing benthic habitat include dredging/trenching, disposal of dredged material, and facility installation, as well as impacting marine mammal prey from noise generated by in-water pile driving.

Approximately 42 hectares (103 acres) would be disturbed directly by dredging of the Marine Terminal MOF and trenching for the Mainline crossing, and another 486 hectares (1,200 acres) would be disturbed by the disposal of dredged material. Approximately 26

hectares (64 acres) of seafloor would be disturbed by installation of the Marine Terminal MOF, Mainline MOF, and Mainline Crossing. Additional area would be indirectly affected by the re-deposition of sediments suspended in the water column by the dredging/trenching and dredge disposal. However, such disturbances are expected to be temporary and mild. Recovery and re-colonization of the benthic habitat are expected to occur as soon as any anthropogenic stressors are removed.

With regard to fish as a prey source for cetaceans and pinnipeds, fish are known to hear and react to sounds and to use sound to communicate (Tavolga *et al.*, 1981) and possibly avoid predators (Wilson and Dill, 2002). Experiments have shown that fish can sense both the strength and direction of sound (Hawkins, 1981). Primary factors determining whether a fish can sense a sound signal, and potentially react to it, are the frequency of the signal and the strength of the signal in relation to the natural background noise level.

The level of sound at which a fish will react or alter its behavior is usually well above the detection level. Fish have been found to react to sounds when the sound level increased to about 20 dB above the detection level of 120 dB (Ona, 1988); however, the response threshold can depend on the time of year and the fish's physiological condition (Engas *et al.*, 1993). In general, fish react more strongly to pulses of sound (such as noise from impact pile driving) rather than continuous signals (such as noise from vibratory pile driving) (Blaxter *et al.*, 1981), and a quicker alarm response is elicited when the sound signal intensity rises rapidly compared to sound rising more slowly to the same level.

During the Alaska LNG facilities construction, only a small fraction of the available habitat would be ensonified at any given time. Disturbance to fish species would be short-term, and fish would return to their pre-disturbance behavior once the pile driving activity ceases. Thus, the proposed construction would have little, if any, impact on marine mammals' prey availability in the area where construction work is planned.

Estimated Take by Incidental Harassment

This section provides an estimate of the number of incidental takes proposed for authorization through this LOA, which will inform both NMFS' consideration of "small numbers" and the negligible impact determination.

Harassment is the only type of take expected to result from these activities. Except with respect to certain activities not pertinent here, section 3(18) of 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).

Authorized takes would primarily be by Level B harassment, as noise generated from in-water pile driving (vibratory and impact) and anchor handling has the potential to result in disruption of behavioral patterns for individual marine mammals. There is also some potential for auditory injury (Level A harassment) to result, primarily for low- and high-frequency species and phocids because predicted auditory injury zones are larger than for mid-frequency species and otariids. Auditory injury is unlikely to occur for mid-frequency species and otariids. The proposed mitigation and monitoring measures are expected to minimize the severity of such taking to the extent practicable.

As described previously, no mortality is anticipated or proposed to be authorized for this activity. Below we describe how the take is estimated.

Generally speaking, we estimate take by considering: (1) Acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally disturbed or incur some degree of permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and, (4) the number of days of activities. We note that while these basic factors can contribute to a basic calculation to provide an initial prediction of takes, additional information that can qualitatively inform take estimates is also sometimes available (*e.g.*, previous monitoring results or average group size). Below, we describe the factors considered here in more detail and present the proposed take estimate.

Acoustic Thresholds

Using the best available science, NMFS has developed acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be

reasonably expected to experience behavioral disturbance (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

Level B Harassment for non-explosive sources—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 what the available science indicates and the practical need to use a threshold based on a factor that is both predictable and measurable for most activities, NMFS uses a generalized acoustic threshold based on received level to estimate the onset of Level B harassment. NMFS predicts that marine mammals are likely to experience behavioral disturbance in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 μ Pa (rms) for continuous (*e.g.*, vibratory pile-driving, drilling) and above 160 dB re 1 μ Pa (rms) for non-explosive impulsive (*e.g.*, seismic airguns) or intermittent (*e.g.*, scientific sonar) sources.

Because AGDC's Alaska LNG facilities project involves the generation of non-impulsive (vibratory pile driving and anchor handling) and impulsive (impact pile driving) sources, both 120 and 160 dB re 1 μ Pa (rms) thresholds are used to evaluate Level B harassment as explained above.

Level A harassment for non-explosive sources—NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). AGDC's Alaska LNG facilities project involves the generation of impulsive (impact pile driving) and non-impulsive (vibratory pile driving and anchor handling) sources.

These thresholds are provided in the Table 4 below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2016 Technical Guidance, which may be accessed at: <http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm>.

TABLE 4—THRESHOLDS IDENTIFYING THE ONSET OF PERMANENT THRESHOLD SHIFT

Hearing group	PTS onset thresholds		Behavioral thresholds	
	Impulsive	Non-impulsive	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	$L_{pk,flat}$: 219 dB; $L_{E,LF,24h}$: 183 dB	$L_{E,LF,24h}$: 199 dB ...	$L_{rms,flat}$: 160 dB ...	$L_{rms,flat}$: 120 dB.
Mid-Frequency (MF) Cetaceans	$L_{pk,flat}$: 230 dB; $L_{E,MF,24h}$: 185 dB	$L_{E,MF,24h}$: 198 dB.		
High-Frequency (HF) Cetaceans	$L_{pk,flat}$: 202 dB; $L_{E,HF,24h}$: 155 dB	$L_{E,HF,24h}$: 173 dB.		
Phocid Pinnipeds (PW); (Underwater)	$L_{pk,flat}$: 218 dB; $L_{E,PW,24h}$: 185 dB	$L_{E,PW,24h}$: 201 dB.		
Otariid Pinnipeds (OW); (Underwater)	$L_{pk,flat}$: 232 dB; $L_{E,OW,24h}$: 203 dB	$L_{E,OW,24h}$: 219 dB.		

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.

Note: Peak sound pressure (L_{pk}) has a reference value of 1 μ Pa, and cumulative sound exposure level (LE) has a reference value of 1 μ Pa²s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript “flat” is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (*i.e.*, varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

Ensonified Area

Here, we describe operational and environmental parameters of the activity that will feed into identifying the area ensonified above the acoustic thresholds, which include source levels and transmission loss coefficient.

Source Levels

The project includes impact pile driving and vibratory pile driving and anchor handling associated with trenching and cable laying activities. Source levels of pile driving activities are based on reviews of measurements of the same or similar types and dimensions of piles available in the literature (Caltrans, 2015). Based on this review, the following source levels are assumed for the underwater noise produced by construction activities:

- Source levels of impact driving of 18- and 24-in steel piles are based on those of 24-inch steel pile impact

driving reported by California Department of Transportation (Caltrans) in a pile driving source level compendium document (Caltrans, 2015);

- Source levels of impact driving of 48- and 60-in steel piles is based on that of 48-in steel pile impact driving reported by Austin *et al.* (2016) on the Anchorage Port Modernization Project Test Pile Program;

- Source level of impact pile driving of steel sheet pile is based on that of 24-in steel AZ sheet pile impact driving reported in the Caltrans compendium (Caltrans, 2015);

- Source levels of vibratory pile driving of 18- and 24-in steel piles are based on that of 36-inch steel pile vibratory driving reported in the Caltrans compendium (Caltrans, 2015);

- Source levels of vibratory pile driving of 48- and 60-in steel piles are based on that of 72-inch steel pile

vibratory driving reported in the Caltrans compendium (Caltrans, 2015);

- Source level of vibratory pile driving of steel sheet pile is based on that of 24-in steel AZ sheet pile vibratory driving reported in the Caltrans compendium (Caltrans, 2015); and

- Underwater sound levels associated with offshore pipelay and trenching operations when engaging thrusters and anchor handling were based on measurements by Blackwell and Greene (2003) of a tug pushing a full barge near the Port of Alaska when engaging thrusters during docking. The levels are calculated from measured 149 dB re 1 μ Pa rms at 100 meters/328 feet applying $15 \cdot \log(r)$, which yield a source level of 179 dB re 1 μ Pa rms at 1 meter.

A summary of source levels from different pile driving activities is provided in Table 5.

TABLE 5—SUMMARY OF IN-WATER PILE DRIVING SOURCE LEVELS

[At 10 m from source]

Method	Pile type/size	SPL _{pk} (dB re 1 μ Pa)	SPL _{rms} (dB re 1 μ Pa)	SEL (dB re 1 μ Pa ² -s)	Reference
Impact driving	18-in steel pipe pile	207	194	178	Caltrans 2015.
Impact driving	24-in steel pipe pile	207	194	178	Caltrans 2015.
Impact driving	48-in steel pipe pile	210	200	185	Austin <i>et al.</i> 2016.
Impact driving	60-in steel pipe pile	210	200	185	Austin <i>et al.</i> 2016.
Impact driving	Sheet pile	205	190	180	Caltrans 2015.
Vibratory driving	18-in steel pipe pile	180	170	170	Caltrans 2015.
Vibratory driving	24-in steel pipe pile	180	170	170	Caltrans 2015.
Vibratory driving	48-in steel pipe pile	183	170	170	Caltrans 2015.
Vibratory driving	60-in steel pipe pile	183	170	170	Caltrans 2015.
Vibratory driving	Sheet pile	175	160	160	Caltrans 2015.
Anchor handling and thruster.	NA	179	179	Blackwell & Greene 2003.

These source levels are used to compute the Level A harassment zones

and to estimate the Level B harassment zones.

Estimating Injury Zones

When the NMFS' Technical Guidance (2016) was published, in recognition of

the fact that ensonified area/volume could be more technically challenging to predict because of the duration component in the new thresholds, we developed a User Spreadsheet that includes tools to help predict a simple isopleth that can be used in conjunction with marine mammal density or occurrence to help predict takes. We note that because of some of the assumptions included in the methods used for these tools, we anticipate that isopleths produced are typically going to be overestimates of some degree, which may result in some degree of overestimate of Level A harassment take. However, these tools offer the best way to predict appropriate isopleths when more sophisticated 3D modeling methods are not available, and NMFS continues to develop ways to quantitatively refine these tools, and will qualitatively address the output where appropriate. For stationary sources such as in-water pile driving activities during the Alaska LNG project, NMFS User Spreadsheet

predicts the closest distance at which, if a marine mammal remained at that distance the whole duration of the activity, it would not incur PTS.

For Level A harassment zones, since the peak source levels for both pile driving methods are below the injury thresholds, cumulative SEL (L_E) were used to do the calculations using the NMFS acoustic guidance (NMFS, 2018).

For cumulative SEL, distances to marine mammal injury thresholds were estimated using NMFS' Optional User Spreadsheet based on the noise exposure guidance. For impact pile driving, the single strike SEL/pulse equivalent was used, and for vibratory pile driving, the rms SPL source level was used. Per the NMFS Spreadsheet, default Weighting Factor Adjustments (WFA) were used for calculating PTS from both vibratory and impact pile driving, using 2.5 kHz and 2.0 kHz, respectively. These WFAs are acknowledged by NMFS as conservative. A transmission loss coefficient of 15 is used with reported source levels measured at 10m.

For dynamic positioning and anchor handling associated with mooring, trenching, and pipelaying, a transmission loss coefficient of 17.8 was used because these activities occur in deeper waters.

Isopleths to Level B behavioral zones are based on rms SPL (SPL_{rms}) that are specific for non-impulse (vibratory pile driving) sources. Distances to marine mammal behavior thresholds were calculated using practical spreading.

A summary of the measured and modeled harassment zones is provided in Table 6. In modeling transmission loss from the project area, the conventional assumption would be made that acoustic propagation from the source is impeded by natural and manmade features that extend into the water, resulting in acoustic shadows behind such features. For modeling ensonified areas, areas of half circles were calculated since the pile driving will occur next to shore, which blocks acoustic propagation in the shoreward direction.

TABLE 6—CALCULATED AREAS OF ZONE OF INFLUENCE AND MAXIMUM DISTANCES

Year	Activity description	Impact only: Strikes/hr	Active piling hr/day	SL 10m SEL (SPL_{rms})	Level A distance (m) (Level A area (km^2))					Level B distance (m) (area (km^2))
					LF	MF	HF	PW	OW	
1	Vibratory drive 18" pile		4.8	170 (170)	77 (0.009)	7 (0.000)	114 (0.020)	47 (0.003)	3 (0.000)	21,544 (728.71)
	Vibratory drive 60" pile		4.8	170 (170)	77 (0.009)	7 (0.000)	114 (0.020)	47 (0.003)	3 (0.000)	21,544 (728.71)
	Vibratory sheet pile		4.8	160 (160)	17 (0.000)	1 (0.000)	25 (0.001)	10 (0.000)	1 (0.000)	4,642 (33.83)
2	Vibratory drive 18" pile		4.8	170 (170)	77 (0.009)	7 (0.000)	114 (0.020)	47 (0.003)	3 (0.000)	21,544 (728.71)
	Impact drive 24" pile	1,560	3	178 (194)	1,297 (2.641)	46 (0.003)	1,545 (3.75)	694 (0.756)	51 (0.004)	1,848 (5.362)
	Impact drive 48" pile	1,560	3	185 (200)	3,798 (22.647)	135 (0.028)	4,524 (32.132)	2,033 (6.489)	148 (0.034)	4,642 (33.831)
	Impact drive 60" pile	1,560	3	185 (200)	3,798 (22.647)	135 (0.028)	4,524 (32.132)	2,033 (6.489)	148 (0.034)	4,642 (33.831)
	Vibratory sheet pile		4.8	160 (160)	17 (0.000)	1 (0.000)	25 (0.001)	10 (0.000)	1 (0.000)	4,642 (33.83)
	Impact drive 48" pile	1,560	3	185 (200)	3,798 (22.647)	135 (0.028)	4,524 (32.132)	2,033 (6.489)	148 (0.034)	4,642 (33.831)
3	Impact drive 60" pile	1,560	3	185 (200)	3,798 (22.647)	135 (0.028)	4,524 (32.132)	2,033 (6.489)	148 (0.034)	4,642 (33.831)
	Mooring & Pipe Trench		6	179 dB @ 1m	0.2 (0.000)	0.0 (0.000)	0.1 (0.000)	0.1 (0.000)	0 (0.000)	2,037 (13.029)
	Impact drive 48" pile	1,560	3	185 (200)	3,798 (22.647)	135 (0.028)	4,524 (32.132)	2,033 (6.489)	148 (0.034)	4,642 (33.831)
4	Impact drive 60" pile	1,560	3	185 (200)	3,798 (22.647)	135 (0.028)	4,524 (32.132)	2,033 (6.489)	148 (0.034)	4,642 (33.831)
	Pipe laying		6	179 dB @ 1m	0.2 (0.000)	0.0 (0.000)	0.1 (0.000)	0.1 (0.000)	0 (0.000)	2,037 (13.029)
5	Impact drive 48" pile	1,560	3	185 (200)	3,798 (22.647)	135 (0.028)	4,524 (32.132)	2,033 (6.489)	148 (0.034)	4,642 (33.831)
	Impact drive 60" pile	1,560	3	185 (200)	3,798 (22.647)	135 (0.028)	4,524 (32.132)	2,033 (6.489)	148 (0.034)	4,642 (33.831)

LF: Low-Frequency Cetaceans; MF: Mid-Frequency Cetaceans; HF: High-Frequency Cetaceans; PW: Phocid Pinnipeds, Underwater; OW: Otariid Pinnipeds, Underwater.

Marine Mammal Occurrence

In this section we provide the information about the presence, density, or group dynamics of marine mammals that will inform the take calculations.

Density estimates were calculated for humpback, fin, gray, whales, and killer whales, harbor and Dall's porpoises, harbor seals, and Steller sea lions using aerial survey data collected by NMFS in Cook Inlet between 2000 and 2016. To estimate the average densities of marine mammals, the total number of animals for each species for each year observed over the 15-year survey period was divided by the total area surveyed each year.

For beluga whale, area-based densities were used based on NMFS aerial survey (Shelden *et al.*, 2017).

No density estimate is available for California sea lions. Therefore, its take number is derived from past observations in the general vicinity of the proposed project area.

Detailed description of the marine mammal density estimation is provided below.

Beluga Whale

To estimate the average density, the maximum number of individual beluga whales was divided by the area covered and the average across all years. The survey area can be separated into Upper, Middle, and Lower Cook Inlet, resulting in different densities for beluga whales in each area. Using these data, the appropriate density for beluga whales for the Mainline crossing and Mainline MOF is 0.00049 whales per square

kilometer (middle Cook Inlet) and 0.00003 whales per square kilometer for the Marine Terminal (Lower Cook Inlet).

Goetz *et al.* (2012) modeled aerial survey data collected by NMFS between 1993 and 2008 and developed beluga whale summer densities for each 1-square-kilometer (0.4-square-mile) cell of Cook Inlet. Given the clumped and distinct distribution of beluga whales in Cook Inlet during the summer months, these results provide a more precise estimate of beluga whale density at a given location than multiplying all aerial observations by the total survey effort. To develop a density estimate associated with planned survey areas, the ensonified area associated with each activity was overlain on a map of the 1-square-kilometer (0.4-square-mile) density cells. The cells falling within

each ensonified area were quantified, and an average cell density was calculated. Figure 9 in the LOA application shows the Goetz *et al.* (2012) distribution with project components.

A summary of beluga whale density estimates in different regions of Cook Inlet is provided in Table 23 of the LOA application.

Marine Mammals Other Than Beluga Whales and California Sea Lions.

Table 7 summarizes the maximum number of marine mammals, other than beluga whales and California sea lions, observed each year during the NMFS Annual Aerial Surveys and the area covered. To estimate the average density, the maximum number of individuals per species was divided by the area covered and the average across all years was used for each species. The

total number of animals observed accounts for the entire Cook Inlet, which is a higher density estimate than anticipated for the Lower Cook Inlet area. The raw densities were not corrected for animals missed during the aerial surveys as no accurate correction factors are currently available for these species; however, observer error may be limited as the NMFS surveyors often circled marine mammal groups to get an accurate count of group size.

TABLE 7—SIGHTING AND DENSITIES OF MARINE MAMMALS OTHER THAN BELUGA WHALE DURING NMFS AERIAL SURVEY BETWEEN 2000 AND 2016

Species	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2014	2016
<i>Humpback whale</i>	11	26	20	20	16	18	14	3	7	5	2	9	1	11	6
<i>Fin whale</i>	0	2	0	16	3	2	0	0	0	0	0	0	0	4	1
<i>Gray whale</i>	2	2	0	0	0	2	0	0	0	1	0	0	0	0	0
<i>Killer whale</i>	0	15	0	0	0	0	0	0	0	0	33	0	9	0	0
<i>Harbor porpoise</i>	29	26	0	0	101	2	0	4	6	42	10	31	11	128	17
<i>Dall's porpoise</i>	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Harbor seal</i>	1,800	672	1,481	974	975	633	887	393	1,219	387	543	1,747	1,772	2,115	1,909
<i>Steller sea lion</i>	10	35	54	77	1	104	83	0	75	39	1	100	65	43	71
Area surveyed (km ²)	6,911	5,445	5,445	5,236	6,492	5,445	6,702	5,236	7,121	5,864	6,074	6,702	6,283	6,702	8,377
Density estimates (x10⁻³ individuals/km²)															
<i>Humpback whale</i>	1.59	4.78	3.67	3.82	2.46	3.31	2.09	0.57	0.98	0.85	0.33	1.34	0.16	1.64	0.72
<i>Fin whale</i>	0.00	0.37	0.00	3.06	0.46	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.12
<i>Gray whale</i>	0.29	0.37	0.00	0.00	0.00	0.37	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00
<i>Killer whale</i>	0.00	2.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.43	0.00	1.43	0.00	0.00
<i>Harbor porpoise</i>	4.20	4.78	0.00	0.00	15.6	3.67	0.00	0.76	0.84	7.16	1.65	4.63	1.75	19.1	2.03
<i>Dall's porpoise</i>	2.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Harbor seal</i>	260	123	272	186	150	116	132	75.1	171	66.0	89.4	261	282	316	228
<i>Steller sea lion</i>	1.45	6.43	9.92	14.7	0.15	19.1	12.4	0.00	10.5	6.65	0.17	14.9	10.3	6.42	8.48

Harbor Seal

The average raw density for harbor seals was originally calculated in the same manner as humpback whales, harbor porpoises, and killer whales in method 1, but resulted in an unrealistically inflated density of 0.18190 seals per square kilometer. This inflated density is due to bias created by the large number of hauled out harbor seals at river mouths in the NMFS aerial survey database relative to offshore densities.

An alternative harbor seal density estimate was developed (method 2) by taking the highest number of hauled out seals recorded during the NMFS aerial survey (650 seals) and dividing it by the area of Upper Cook Inlet (3,833 square kilometers) resulting in a density of 0.1695 seals per square kilometers. This represents the density for the month of June, when the aerial surveys were conducted, the period during which the harbor seal presence (and eulachon run) in Upper Cook Inlet is at its peak. NMFS has recognized that harbor seal density estimates derived from both methods above are inflated, especially given that only about 2.2 seals were observed per 24-hour period by Lomac-MacNair *et al.* (2013, 2014) during seismic surveys in

previous years in Upper Cook Inlet. Density determined using method 2 (Table 8) was considered to be more accurate and thus was used to calculate the number of exposures for the analysis.

A summary of marine mammal densities other than California sea lion is provided in Table 8.

TABLE 8—MARINE MAMMAL DENSITY ESTIMATES FOR COOK INLET

Species	Mean density (animals/km ²)
Beluga whale (Marine Terrestrial) ^a	0.000158
Beluga whale (Mainline Crossing) ^a	0.0107
Beluga whale (Mainline MOF) ^a	0.0368
Killer whale ^{b,c}	0.00064
Humpback whale ^b	0.00189
Fin whale ^b	0.00033
Gray whale ^b	0.00000
Harbor porpoise ^b	0.00419
Dall's porpoise ^b	0.00016
Harbor seal (method 1) ^c	0.18190
Harbor seal (method 2) ^d	0.01695
Steller sea lion ^b	0.00811

^a Beluga densities were based on average density near facility from Goetz *et al.* (2012).

^b Densities calculated by dividing number of animals NMFS observed over 11 years of surveys divided by total area surveyed.

^c Killer whale density is for all killer whales regardless of stock.

^d Density calculated as highest number of hauled out seals recorded during the NMFS aerial survey divided by area of Upper Cook Inlet; this method was selected for use in exposure calculation.

California Sea Lion

California sea lion is uncommon in the Alaska LNG project area. However, at least one California sea lion was observed during Apache's 2012 seismic surveys (Apache, 2012). Thus, the potential encountering of this species is qualitatively assessed, below.

Take Calculation and Estimation

Here we describe how the information provided above is brought together to produce a quantitative take estimate. For all marine mammals except California sea lions, estimated takes are calculated based on ensonified area for a specific pile driving activity multiplied by the marine mammal density in the action area, multiplied by the number of pile driving days. Distances to and areas of different harassment zones are listed in Table 6.

For both Level A and Level B harassment, take calculations and assumptions are as follows:

- Number of takes per activity = density (average number of animals per km²) * area of ZOI (km²) * number of days, rounded to the nearest whole number;

- Marine mammal densities in the project area are provided in Table 8;

- The number of days for each activity component is provided in Table 1; and

- Takes by Level A and Level B harassment are calculated separately based on the respective ZOIs for each type of activity, providing a maximum estimate for each type of take which corresponds to the authorization requested under the MMPA.

Take numbers based on the above calculation are further adjusted upwards for some species to count for group size, historical sighting (Table 7), and larger

Level A harassment zones for such species (Table 6).

Take numbers for California sea lions are based on an observation of at least one animal during Apache's 2012 seismic surveys (Apache, 2012), and adjusted to account for group size.

The estimated numbers of instances of acoustic harassment (takes) by year, species and severity (Level A or Level B) are shown in Table 9.

TABLE 9—ESTIMATED NUMBERS OF MARINE MAMMALS THAT MAY BE EXPOSED TO RECEIVED NOISE LEVELS THAT CAUSE LEVEL A AND LEVEL B HARASSMENT

[Numbers in parentheses are proposed take numbers that are adjusted to count for group size, historical sighting, and larger Level A harassment zones]

Year	Species	Estimated Level A take	Estimated Level B take	Estimated total take	Abundance	Percentage (instances take versus abundance)
1	Humpback whale	0	24	24	10,103	0.24
	Fin whale	0	4 (10)	4 (10)	916	1.09
	Gray whale	0	1 (5)	1 (5)	20,990	0.02
	Killer whale	0	8 (10)	8 (10)	2,347	0.43
	Beluga whale	0	2 (20)	2 (20)	312	6.41
	Harbor porpoise	0 (5)	54	54 (59)	31,046	0.19
	Dall's porpoise	0 (5)	2 (10)	2 (15)	83,400	0.02
	Harbor seal	0 (20)	219	219 (239)	27,386	0.87
	Steller sea lion	0 (10)	105	105 (115)	53,303	0.22
	California sea lion	(10)	(50)	(60)	296,750	0.02
	Humpback whale	1 (2)	16	17 (18)	10,103	0.18
	Fin whale	0	3 (10)	3 (10)	916	1.09
	Gray whale	0	1 (5)	1 (5)	20,990	0.02
	Killer whale	0	5 (10)	5 (10)	2,347	0.43
2	Beluga whale	0	1 (20)	1 (20)	312	6.41
	Harbor porpoise	3 (5)	36	39 (41)	31,046	0.13
	Dall's porpoise	0 (5)	1 (10)	1 (15)	83,400	0.02
	Harbor seal	2 (20)	145	147 (165)	27,386	0.60
	Steller sea lion	0 (10)	70	70 (80)	53,303	0.15
	California sea lion	(10)	(50)	(60)	296,750	0.02
	Humpback whale	1 (2)	1 (10)	2 (12)	10,103	0.12
	Fin whale	0	0 (10)	0 (10)	916	1.09
	Gray whale	0	0 (5)	0 (5)	20,990	0.02
	Killer whale	0	1 (10)	1 (10)	2,347	0.43
	Beluga whale	0	3 (20)	3 (20)	312	6.41
	Harbor porpoise	3 (10)	1 (20)	4 (30)	31,046	0.10
	Dall's porpoise	0 (5)	0 (10)	0 (15)	83,400	0.02
	Harbor seal	2 (20)	14 (50)	16 (70)	27,386	0.26
3	Steller sea lion	0 (10)	8 (50)	8 (60)	53,303	0.11
	California sea lion	(5)	(10)	(15)	296,750	0.01
	Humpback whale	0	2 (10)	2 (10)	10,103	0.10
	Fin whale	0	0 (10)	0 (10)	916	1.09
	Gray whale	0	0 (5)	0 (5)	20,990	0.02
	Killer whale	0	1 (10)	1 (10)	2,347	0.43
	Beluga whale	0	7 (20)	7 (20)	312	6.41
	Harbor porpoise	2 (10)	3 (20)	5 (30)	31,046	0.10
	Dall's porpoise	0 (5)	0 (10)	0 (15)	83,400	0.02
	Harbor seal	2 (20)	19 (50)	21 (70)	27,386	0.26
	Steller sea lion	0 (10)	10 (50)	10 (60)	53,303	0.11
	California sea lion	(5)	(10)	(15)	296,750	0.01
	Humpback whale	0	0 (10)	0 (10)	10,103	0.10
	Fin whale	0	0 (10)	0 (10)	916	1.09
4	Gray whale	0	0 (5)	0 (5)	20,990	0.02
	Killer whale	0	1 (10)	1 (10)	2,347	0.43
	Beluga whale	0	7 (20)	7 (20)	312	6.41
	Harbor porpoise	2 (10)	3 (20)	5 (30)	31,046	0.10
	Dall's porpoise	0 (5)	0 (10)	0 (15)	83,400	0.02
	Harbor seal	2 (20)	19 (50)	21 (70)	27,386	0.26
	Steller sea lion	0 (10)	10 (50)	10 (60)	53,303	0.11
	California sea lion	(5)	(10)	(15)	296,750	0.01
	Humpback whale	0	0 (10)	0 (10)	10,103	0.10
	Fin whale	0	0 (10)	0 (10)	916	1.09
	Gray whale	0	0 (5)	0 (5)	20,990	0.02
	Killer whale	0	0 (10)	0 (10)	2,347	0.43
	Beluga whale	0	0 (20)	0 (20)	312	6.41
	Harbor porpoise	1 (10)	0 (20)	1 (30)	31,046	0.10
5	Dall's porpoise	0 (5)	0 (10)	0 (15)	83,400	0.02
	Harbor seal	1 (10)	5 (20)	6 (30)	27,386	0.11
	Steller sea lion	0 (5)	0 (10)	0 (15)	53,303	0.03
	California sea lion	(5)	(10)	(15)	296,750	0.01

Proposed Mitigation

In order to issue an LOA under Section 101(a)(5)(A) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking for certain subsistence uses (latter not applicable for this action). NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, we carefully consider two primary factors:

(1) The manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as planned) the likelihood

of effective implementation (probability implemented as planned); and

(2) The practicability of the measures for applicant implementation, which may consider such things as cost, impact on operations, and, in the case of a military readiness activity, personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

Time Restriction

For pile driving, work would occur only during daylight hours, when visual monitoring of marine mammals can be conducted. Other construction activities, such as pipelay, anchor handling, and dredging could occur outside of daylight hours or during periods of low visibility.

Establishing and Monitoring Level A and Level B Harassment Zones, and Exclusion Zones

Before the commencement of in-water construction activities, which include impact pile driving and vibratory pile driving, AGDC must establish Level A harassment zones where received underwater SEL_{cum} could cause PTS (see Table 6 above).

AGDC must also establish Level B harassment zones where received underwater SPLs are higher than 160 dB_{rms} re 1 µPa for impulsive noise sources (impact pile driving) and 120 dB_{rms} re 1 µPa for non-impulsive noise sources (vibratory pile driving).

NFMS proposes that AGDC establish exclusion zones for all mid-frequency cetaceans (*i.e.*, beluga and killer whales) based on the Level A harassment distances provided in Table 6, but not less than 10 m. The largest shutdown

zone is 135 m from the source for impact pile driving of 48- and 60-in steel piles.

NFMS proposes that AGDC establish exclusion zones for all low- and high-frequency cetaceans and phocids (*i.e.*, humpback, fin, and gray whales, harbor and Dall's porpoises, and harbor seal) based on the Level A harassment distances (Table 6) that are shorter than 500 m. For Level A harassment distances beyond 500 m, a maximum 500 m exclusion zone should be established.

NFMS proposes that AGDC establish exclusion zones for otariids (*i.e.*, Steller and California sea lions) based on the Level A harassment distances provided in Table 6, but not smaller than 10 m. The largest shutdown zone is 150 m from the source, which corresponds to the Level A harassment distance of 148 m from impact pile driving of 48- and 60-in steel piles.

In all cases, a minimum of 10-m exclusion zone must be established if the actual Level A harassment distances are less than 10 m.

A summary of exclusion zones is provided in Table 10.

If marine mammals are found within the exclusion zone, pile driving of the segment would be delayed until they move out of the area. If a marine mammal is seen above water and then dives below, the contractor would wait 30 minutes for large cetaceans (baleen whales) and 15 minutes for small cetaceans (beluga and killer whales and porpoises) and pinnipeds. If no marine mammals of that species are seen by the observer in that time it can be assumed that the animal has moved beyond the exclusion zone.

TABLE 10—MARINE MAMMAL EXCLUSION ZONES

Pile driving activities	Exclusion distances (m)				
	Low-frequency cetacean	Mid-frequency cetacean	High-frequency cetacean	Pinniped in water	Otariid in water
Vibratory drive 18" pile	80	10	115	50	10
Vibratory drive 60" pile	80	10	115	50	10
Vibratory sheet pile	20	10	25	10	10
Impact drive 24" pile	500	50	500	500	55
Impact drive 48" pile	500	135	500	500	150
Impact drive 60" pile	500	135	500	500	150
Impact sheet pile	500	65	500	500	70

LF: Low-Frequency Cetaceans; MF: Mid-Frequency Cetaceans; HF: High-Frequency Cetaceans; PW: Phocid Pinnipeds, Underwater; OW: Otariid Pinnipeds, Underwater.

If pile driving of a segment ceases for 30 minutes or more and a marine mammal is sighted within the designated exclusion zone prior to commencement of pile driving, the observer(s) must

notify the pile driving operator (or other authorized individual) immediately and continue to monitor the exclusion zone. Operations may not resume until the marine mammal has exited the

exclusion zone or 30 minutes have elapsed for large cetaceans or 15 minutes have elapsed for small cetaceans and pinnipeds since the last sighting.

Shutdown Measures

AGDC must implement shutdown measures if a marine mammal is detected moving towards or entered exclusion zones listed in Table 10.

Further, AGDC must implement shutdown measures if the number of authorized takes for any particular species reaches the limit under the LOA (if issued) and such marine mammals are sighted within the vicinity of the project area and are approaching the Level B harassment zone during in-water construction activities.

Soft Start

AGDC must implement soft start techniques for impact pile driving. AGDC must conduct an initial set of three strikes from the impact hammer at 40 percent energy, followed by a 1-minute waiting period, then two subsequent three strike sets. Soft start must be required for any impact driving, including at the beginning of the day, and at any time following a cessation of impact pile driving of thirty minutes or longer.

Whenever there has been downtime of 30 minutes or more without impact driving, the contractor must initiate impact driving with soft-start procedures described above.

Based on our evaluation of the required measures, NMFS has preliminarily determined that the prescribed mitigation measures provide the means effecting the least practicable adverse impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Proposed Monitoring and Reporting

In order to issue an LOA for an activity, section 101(a)(5)(A) of the MMPA states that NMFS must set forth, "requirements pertaining to the monitoring and reporting of such taking." The MMPA implementing regulations at 50 CFR 216.104(a)(13) state that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the proposed action area. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (e.g., presence, abundance, distribution, density);
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) Action or environment (e.g., source characterization, propagation, ambient noise); (2) affected species (e.g., life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (e.g., age, calving or feeding areas);
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) Long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;
- Effects on marine mammal habitat (e.g., marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and
- Mitigation and monitoring effectiveness.

Proposed Monitoring Measures

AGDC must employ trained protected species observers (PSOs) to conduct marine mammal monitoring for its Alaska LNG facilities construction project. The purposes of marine mammal monitoring are to implement mitigation measures and learn more about impacts to marine mammals from the AGDC's construction activities. The PSOs will observe and collect data on marine mammals in and around the project area for 30 minutes before, during, and for 30 minutes after all construction work.

Protected Species Observer Qualifications

NMFS-approved PSOs must meet the following requirements:

1. Independent observers (*i.e.*, not construction personnel) are required;
2. At least one observer must have prior experience working as an observer;
3. Other observers may substitute education (undergraduate degree in biological science or related field) or training for experience;
4. Where a team of three or more observers are required, one observer should be designated as lead observer or monitoring coordinator. The lead

observer must have prior experience working as an observer; and

5. NMFS will require submission and approval of observer CVs.

Marine Mammal Monitoring Protocols

AGDC must conduct briefings between construction supervisors and crews and the PSO team prior to the start of all pile driving activities, and when new personnel join the work, in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.

A PSO must not work continuously for more than 4 hours without rotation.

PSOs must be able to detect and provide distance and bearing information on marine mammal sightings using the following methods:

- During all observation periods, PSOs will use high-magnification (25X), as well as standard handheld (7X) binoculars, and the naked eye to search continuously for marine mammals;
- Monitoring distances will be measured with range finders. Distances to animals will be based on the best estimate of the PSO, relative to known distances to objects in the vicinity of the PSO;
- Bearings to animals will be determined using a compass;

For marine mammal monitoring during in-water pile driving activities:

- PSOs will be located at appropriate, safe vantage point(s) to be able to observe the entire exclusion zones(s) in order to implement shutdown measures when needed;

- In-water pile driving must only take place when the exclusion and Level A harassment zones are visible and can be adequately monitored. If conditions (e.g., fog) prevent the visual detection of marine mammals, activities with the potential to result in Level A harassment must not be initiated. If such conditions arise after the activity has begun, impact pile driving would be halted but vibratory pile driving or extraction would be allowed to continue;

- Number and locations of PSOs posted for marine mammal monitoring during pile driving must be based on the harassment zone sizes listed in Table 6, as described below:

- For Level A harassment zones with radii less than 150 m, 2 PSOs will be monitoring from land;

- For Level A harassment zones with radii larger than 150 m but smaller than 1,000 m, 4 PSOs will be monitoring from land;

- For Level A harassment zones with radii larger than 1,000 m, 6 PSOs will be monitoring from land; and

- Pre-Activity Monitoring:

The exclusion zone will be monitored for 30 minutes prior to in-water construction/demolition activities. If a marine mammal is present within the exclusion zones specified in Table 10, the activity will be delayed until the animal(s) leave the exclusion zone.

Activity will resume only after the PSO has determined that, through sighting or by waiting 15 or 30 minutes, depending on the marine mammal species as described above, the animal(s) has moved outside the exclusion zone. If a marine mammal is observed approaching the exclusion zone, the PSO who sighted that animal will notify all other PSOs of its presence.

- During Activity Monitoring:

If a marine mammal is observed entering the Level A or Level B harassment zones but remains outside the exclusion zone, the pile segment being worked on will be completed without cessation, unless the animal enters or approaches the exclusion zone, at which point all pile driving activities will be halted. If an animal is observed within the exclusion zone during pile driving, then pile driving will be stopped as soon as it is safe to do so. Pile driving can only resume once the animal has left the exclusion zone of its own volition or has not been re-sighted for a period of 15 or 30 minutes, depending on the marine mammal species as described above.

- Post-Activity Monitoring:

Monitoring of all zones will continue for 30 minutes following the completion of the activity.

For marine mammal monitoring during pipe laying activities:

- At least one PSO will be on the barge and on watch during pipe laying activities.

PSOs must collect the following information during marine mammal monitoring:

- Date and time that monitored activity begins and ends for each day conducted (monitoring period);
- Construction activities occurring during each daily observation period, including how many and what type of piles driven and distances covered during pipe laying;
- Deviation from initial proposal in pile numbers, pile types, average driving times, and pipe laying distances, etc.;
- Weather parameters in each monitoring period (e.g., wind speed, percent cloud cover, visibility);
- Water conditions in each monitoring period (e.g., sea state, tide state);
- For each marine mammal sighting:

- Species, numbers, and, if possible, sex and age class of marine mammals;

- Description of any observable marine mammal behavior patterns, including bearing and direction of travel and distance from pile driving and pipe laying activities, and notable changes in patterns;

- Location and distance from pile driving and pipe laying activities to marine mammals and distance from the marine mammals to the observation point; and

- Estimated amount of time that the animals remained in the Level A and/or Level B harassment zones;

- Description of implementation of mitigation measures within each monitoring period (e.g., shutdown or delay); and

- Other human activity in the area within each monitoring period.

Reporting Measures

AGDC is required to submit an annual report within 90 days after each activity year, starting from the date when the LOA is issued (for the first annual report) or from the date when the previous annual report ended. These reports would detail the monitoring protocol, summarize the data recorded during monitoring, and estimate the number of marine mammals that may have been harassed during the period of the report. NMFS would provide comments within 30 days after receiving these reports, and AGDC should address the comments and submit revisions within 30 days after receiving NMFS comments. If no comment is received from NMFS within 30 days, the annual report is considered completed.

AGDC is also required to submit a draft monitoring report within 90 days after completion of the construction work or the expiration of the final LOA (if issued), whichever comes earlier. This report would synthesize all data recorded during marine mammal monitoring, and estimate the number of marine mammals that may have been harassed through the entire project. NMFS would provide comments within 30 days after receiving this report, and AGDC should address the comments and submit revisions within 30 days after receiving NMFS comments. If no comment is received from NMFS within 30 days, the monitoring report is considered as final.

In addition, NMFS would require AGDC to notify NMFS' Office of Protected Resources and NMFS' Alaska Stranding Coordinator within 24 hours of sighting an injured or dead marine mammal in the construction site. AGDC must provide NMFS and the Stranding Network with the species or description

of the animal(s), the condition of the animal(s) (including carcass condition, if the animal is dead), location, time of first discovery, observed behaviors (if alive), and photo or video (if available).

In the event that AGDC finds an injured or dead marine mammal that is not in the construction area, AGDC would report the same information as listed above to NMFS as soon as operationally feasible.

Negligible Impact Analysis and Determination

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through harassment, NMFS considers other factors, such as the likely nature of any responses (e.g., intensity, duration), the context of any responses (e.g., critical reproductive time or location, migration), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS' implementing regulations (54 FR 40338; September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (e.g., as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

To avoid repetition, this introductory discussion of our analyses applies to the species listed in Table 3, given that the anticipated effects of AGDC's Alaska LNG facilities construction project activities involving pile driving and pipe laying on marine mammals are expected to be relatively similar in nature. There is no information about the nature or severity of the impacts, or the size, status, or structure of any species or stock that would lead to a different analysis by species for this activity, or else species-specific factors would be identified and analyzed.

Cook Inlet beluga whales, humpback whales, fin whales, and the western stock of Steller sea lions are listed as endangered under the ESA. These stocks are also considered depleted under the MMPA. The estimated annual rate of decline for Cook Inlet beluga whales was 0.6 percent between 2002 and 2012. Zerbini *et al.* (2006) estimated rates of increase of fin whales in coastal waters south of the Alaska, and data from Calambokidis *et al.* (2008) suggest the population of humpback whales may also be increasing. Steller sea lion trends for the western stock are variable throughout the region with some decreasing and others remaining stable or even indicating slight increases. The other species that may be taken by harassment during AGDC's LNG facilities construction project are not listed as threatened or endangered under the ESA nor as depleted under the MMPA.

Although a few individual marine mammals (up to 2 humpback whales, 10 harbor porpoises, 5 Dall's porpoises, 20 harbor seals, and 10 Steller and California sea lions) are estimated to experience Level A harassment in the form of PTS if they stay within the Level A harassment zone during the entire pile driving for the day, the degree of injury that might occur would be expected to be mild and not likely to affect the reproduction or survival of the individual animals. It is expected that, if hearing impairments occur, most likely the affected animal would lose a few dB in its hearing sensitivity, which in most cases is not likely to affect its survival and recruitment. Hearing impairment that might occur for these individual animals would be limited to the dominant frequency of the noise sources, *i.e.*, in the low-frequency region below 2 kHz. Nevertheless, as for all marine mammal species, it is known that in general these marine mammals will avoid areas where sound levels could cause hearing impairment. Therefore, it is not likely that an animal would stay in an area with intense noise that could cause severe hearing damage.

Under the majority of the circumstances, anticipated takes are expected to be limited to short-term Level B harassment. Marine mammals present in the vicinity of the action area and taken by Level B harassment would most likely show overt brief disturbance (startle reaction) and avoidance of the area from elevated noise levels during pile driving. Given the limited estimated number of incidents of Level A and Level B harassment and the limited, short-term nature of the responses by the individuals, the impacts of the estimated take cannot be

reasonably expected to, and are not reasonably likely to, rise to the level that they would adversely affect any marine mammal species at the population level, through effects on annual rates of recruitment or survival.

Mitigation measures such as dedicated marine mammal observers, pre-construction exclusion zone clearance, soft-start, and shutdown measures when marine mammals are seen within the exclusion zones reduce short-term reactions and minimize any effects on hearing sensitivity. In all cases, the effects of these activities are expected to be short-term, with no lasting biological consequence. Therefore, the exposure of marine mammals to sounds produced by AGDC's LNG facilities construction activities is not anticipated to have an effect on annual rates of recruitment or survival of the affected species or stocks.

The area where the activities will take place is within the Cook Inlet beluga whale critical habitat. Satellite-tagging studies and aerial survey indicate that seasonal shifts exist in Cook Inlet beluga whale distribution, with the whales spending a great percentage of time in coastal areas during the summer and early fall (June through October or November), and dispersing to larger ranges that extend to the middle of the inlet in winter and spring (November or December through May) (Hansen and Hubbard, 1999; Rugh *et al.*, 2004; Hobbs *et al.*, 2005; Goetz *et al.*, 2012). However, fine scale modeling based on NMFS long-term aerial survey data indicate that the AGDC's proposed LNG facilities construction does not overlap with beluga whale high density areas during the summer and fall (Goetz *et al.*, 2012).

There are no known important habitats, such as rookeries or haulouts, in the vicinity of the AGDC's LNG facilities construction project for other marine mammal species. The project also is not expected to have significant adverse effects on affected marine mammals' habitat, including prey, as analyzed in detail in the "Anticipated Effects on Marine Mammal Habitat" section.

In summary and as described above, the following factors primarily support our preliminary determination that the impacts resulting from this activity are not expected to adversely affect the species or stock through effects on annual rates of recruitment or survival:

- No mortality is anticipated or authorized;
- Injury—a small individuals of humpback whales, harbor porpoises, Dall's porpoises, harbor seals, and

Steller and California sea lions could experience mild level of PTS as a form of injury. However, as mentioned earlier in this section, the level of PTS is expected to be small;

- TTS—a small individuals of marine mammals could experience mild level of TTS before the threshold shifts become permanent. However, most of the TTS effects are expected to be brief in duration, and will not progress into PTS;

- Behavioral disturbance—most of the noise effects on marine mammals are expected to be in the form of behavioral disturbance. However, such effects are expected to be in short duration, within the day during the construction activities when the animal is nearby. As construction activities only occur for a maximum of 12 hours during daylight hours between April and October of the year, marine mammals in the project area will not be subject to chronic exposure of construction noise; and

- Important Areas—the area where the activities will take place is within the Cook Inlet beluga whale critical habitat. However, fine scale modeling based on NMFS long-term aerial survey data indicate that the AGDC's proposed LNG facilities construction does not overlap with beluga whale high density areas during the summer and fall.

Species/Stock scale—based on our analysis, only a small percentage of marine mammals is expected to be harassed during the Alaska LNG facilities construction. The maximum percentage of population that could be affected for all marine mammal species is under 7 percent for the beluga whale. Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS preliminarily finds that the total marine mammal take from the proposed activity will have a negligible impact on all affected marine mammal species or stocks.

Small Numbers

As noted above, only small numbers of incidental take may be authorized under section 101(a)(5)(A) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals.

The estimated takes are below at most seven percent of the population for all marine mammals (Table 9).

Based on the analysis contained herein of the proposed activity (including the prescribed mitigation and monitoring measures) and the anticipated take of marine mammals, NMFS preliminarily finds that small numbers of marine mammals will be taken relative to the population size of the affected species or stocks.

Unmitigable Adverse Impact Analysis and Determination

In order to issue an LOA, NMFS must find that the specified activity will not have an “unmitigable adverse impact” on the subsistence uses of the affected marine mammal species or stocks by Alaskan Natives. NMFS has defined “unmitigable adverse impact” in 50 CFR 216.103 as an impact resulting from the specified activity: (1) That is likely to reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by: (i) Causing the marine mammals to abandon or avoid hunting areas; (ii) Directly displacing subsistence users; or (iii) Placing physical barriers between the marine mammals and the subsistence hunters; and (2) That cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met.

The project is unlikely to affect beluga whale harvests because no beluga harvest will take place in 2019, nor is one likely to occur in the other years that would be covered by the 5-year regulations and associated LOAs. Additionally, the proposed action area is not an important native subsistence site for other subsistence species of marine mammals. Also, because of the relatively small proportion of marine mammals utilizing Cook Inlet, the number harvested is expected to be extremely low. Therefore, because the proposed program would result in only temporary disturbances, the program would not impact the availability of these other marine mammal species for subsistence uses.

The timing and location of subsistence harvest of Cook Inlet harbor seals may coincide with AGDC’s project, but because this subsistence hunt is conducted opportunistically and at such a low level that totals approximately 50 harbor seals and fewer than 10 Steller sea lions in a typical year (NMFS, 2013c), AGDC’s program is not expected to have an impact on the subsistence use of harbor seals.

NMFS anticipates that any effects from AGDC’s proposed activities on marine mammals, especially harbor

seals and Cook Inlet beluga whales, which are or have been taken for subsistence uses, would be short-term, site specific, and limited to inconsequential changes in behavior and mild stress responses. NMFS does not anticipate that the authorized taking of affected species or stocks will reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by: (1) Causing the marine mammals to abandon or avoid hunting areas; (2) directly displacing subsistence users; or (3) placing physical barriers between the marine mammals and the subsistence hunters; and that cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met. Based on the description of the specified activity, the measures described to minimize adverse effects on the availability of marine mammals for subsistence purposes, and the proposed mitigation and monitoring measures, NMFS has preliminarily determined that there will not be an unmitigable adverse impact on subsistence uses from AGDC’s proposed activities.

Adaptive Management

The regulations governing the take of marine mammals incidental to AGDC’s proposed LNG facilities construction activities would contain an adaptive management component.

The reporting requirements associated with this proposed rule are designed to provide NMFS with monitoring data from the previous year to allow consideration of whether any changes are appropriate. The use of adaptive management allows NMFS to consider new information from different sources to determine (with input from AGDC regarding practicability) on an annual basis if mitigation or monitoring measures should be modified (including additions or deletions). Mitigation measures could be modified if new data suggests that such modifications would have a reasonable likelihood of reducing adverse effects to marine mammals and if the measures are practicable.

The following are some of the possible sources of applicable data to be considered through the adaptive management process: (1) Results from monitoring reports, as required by MMPA authorizations; (2) results from general marine mammal and sound research; and (3) any information which reveals that marine mammals may have been taken in a manner, extent, or number not authorized by these regulations or subsequent LOAs.

Endangered Species Act (ESA)

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. 1531 *et seq.*) requires that each Federal agency insure 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 designated critical habitat. To ensure ESA compliance for the issuance of LOAs, NMFS consults internally, in this case with the NMFS Alaska Region Protected Resources Division, whenever we propose to authorize take for endangered or threatened species.

NMFS is proposing to authorize take of Cook Inlet beluga whale, Northeastern Pacific stock of fin whales, Western North Pacific DPS of humpback whales, and western DPS of Steller sea lions, which are listed under the ESA.

The Permit and Conservation Division has requested initiation of Section 7 consultation with the Alaska Region for the promulgation of 5-year regulations and the subsequent issuance of annual LOAs. NMFS will conclude the ESA consultation prior to reaching a determination regarding the proposed issuance of the authorization.

Classification

Pursuant to the procedures established to implement Executive Order 12866, the Office of Management and Budget has determined that this proposed rule is not significant.

Pursuant to section 605(b) of the Regulatory Flexibility Act (RFA), the Chief Counsel for Regulation of the Department of Commerce has certified to the Chief Counsel for Advocacy of the Small Business Administration that this proposed rule, if adopted, would not have a significant economic impact on a substantial number of small entities. The AGDC is the only entity that would be subject to the requirements in these proposed regulations. During construction, AGDC would employ or contract thousands of people and the Alaska LNG Project would generate a market value in the billions of dollars. Therefore, AGDC is not a small governmental jurisdiction, small organization, or small business, as defined by the RFA. Because of this certification, an initial regulatory flexibility analysis is not required and none has been prepared.

Notwithstanding any other provision of law, no person is required to respond to nor must a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork

Reduction Act (PRA) unless that collection of information displays a currently valid OMB control number. This proposed rule contains collection-of-information requirements subject to the provisions of the PRA. These requirements have been approved by OMB under control number 0648–0151 and include applications for regulations, subsequent LOAs, and reports.

List of Subjects in 50 CFR Part 217

Penalties, Reporting and recordkeeping requirements, Seafood, Transportation.

Dated: June 10, 2019.

Samuel D. Rauch III,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

For reasons set forth in the preamble, 50 CFR part 217 is proposed to be amended as follows:

PART 217—REGULATIONS GOVERNING THE TAKE OF MARINE MAMMALS INCIDENTAL TO SPECIFIED ACTIVITIES

■ 1. The authority citation for part 217 continues to read as follows:

Authority: 16 U.S.C. 1361 *et seq.*

■ 2. Add subpart E to part 217 to read as follows:

Subpart E—Taking and Importing Marine Mammals; Alaska Gasline Development Corporation Liquefied Natural Gas Facilities Construction

Sec.

217.40 Specified activity and specified geographical region.

217.41 Effective dates.

217.42 Permissible methods of taking.

217.43 Prohibitions.

217.44 Mitigation requirements.

217.45 Requirements for monitoring and reporting.

217.46 Letters of Authorization.

217.47 Renewals and modifications of Letters of Authorization.

217.48–217.49 [Reserved]

Subpart E—Taking and Importing Marine Mammals; Alaska Gasline Development Corporation Liquefied Natural Gas Facilities Construction

§ 217.40 Specified activity and specified geographical region.

(a) Regulations in this subpart apply only to the Alaska Gasline Development Corporation (AGDC) or successor entities and those persons it authorizes or funds to conduct activities on its behalf for the taking of marine mammals that occurs in the area outlined in paragraph (b) of this section and that occurs incidental to the activities described in paragraph (c) of this section.

(b) The taking of marine mammals by AGDC may be authorized in a Letter of Authorization (LOA) only if it occurs within AGDC's Alaska liquefied natural gas (LNG) facilities' construction areas, which are located between the Beluga Landing shoreline crossing on the north and the Kenai River south of Nikiski on the south in Cook Inlet, Alaska.

(c) The taking of marine mammals during this project is only authorized if it occurs incidental to construction activities associated with the proposed LNG facilities or the Mainline crossing of Cook Inlet.

§ 217.41 Effective dates.

Regulations in this subpart are effective [DATE 30 DAYS AFTER DATE OF PUBLICATION OF THE FINAL RULE] through [DATE 5 YEARS AND 30 DAYS AFTER DATE OF PUBLICATION OF THE FINAL RULE].

§ 217.42 Permissible methods of taking.

Under LOAs issued pursuant to §§ 216.106 of this chapter and 217.46, the Holder of the LOAs (hereinafter "AGDC") may incidentally, but not intentionally, take marine mammals within the area described in § 217.40(b) by Level A harassment and Level B harassment associated with pile driving and pipe laying activities, provided the activity is in compliance with all terms, conditions, and requirements of the regulations in this subpart and the applicable LOAs.

§ 217.43 Prohibitions.

Notwithstanding takings contemplated in § 217.42 and authorized by LOAs issued under §§ 216.106 of this chapter and 217.46, no person in connection with the activities described in § 217.40 may:

(a) Violate, or fail to comply with, the terms, conditions, and requirements of this subpart or a LOA issued under §§ 216.106 of this chapter and 217.46;

(b) Take any marine mammal not specified in such LOAs;

(c) Take any marine mammal specified in such LOAs in any manner other than as specified;

(d) Take a marine mammal specified in such LOAs if NMFS determines such taking results in more than a negligible impact on the species or stocks of such marine mammal; or

(e) Take a marine mammal specified in such LOAs if NMFS determines such taking results in an unmitigable adverse impact on the availability of such species or stock of marine mammal for taking for subsistence uses.

§ 217.44 Mitigation requirements.

When conducting the activities identified in § 217.40(c), the mitigation

measures contained in any LOAs issued under §§ 216.106 of this chapter and 217.46 must be implemented. These mitigation measures must include but are not limited to:

(a) *Time restriction.* In-water pile driving must occur only during daylight hours. Times for other construction activities, such as pipelay, anchor handling, and dredging are not restricted.

(b) *Establishment of monitoring and exclusion zones.* (1) For all relevant in-water construction activity, AGDC must designate Level A harassment zones with radial distances as identified in any LOA issued under §§ 216.106 of this chapter and 217.46.

(2) For all relevant in-water construction activity, AGDC must designate Level B harassment zones with radial distances as identified in any LOA issued under §§ 216.106 of this chapter and 217.46.

(3) For all in-water pile driving work, AGDC must implement a shutdown zone for each specific activity as identified in any LOA issued under §§ 216.106 of this chapter and 217.46. If a marine mammal comes within or enters the shutdown zone, AGDC must cease all operations.

(i) For mid-frequency cetaceans and otariids during in-water pile driving activity, the exclusion zones must be based on the Level A harassment distances, but must not be less than 10 m from the pile.

(ii) For low- and high-frequency cetaceans and phocids during in-water pile driving activity, if the species' Level A harassment distance is less than 500 m, the exclusion zone must match that distance.

(iii) For low- and high-frequency cetaceans and phocids during in-water pile driving activity, if the species' Level A harassment distance is greater than 500 m, the exclusion zone must be 500 m from the pile.

(c) *Monitor of exclusion zones.* Pile driving must only take place when the exclusion zones are visible and can be adequately monitored. If conditions (e.g., fog) prevent the visual detection of marine mammals within the exclusion zones, AGDC must not initiate activities. If such conditions arise after the activity has begun, AGDC must halt impact pile driving, but vibratory pile driving and extraction could continue.

(d) *Shutdown measures.* (1) AGDC must deploy protected species observers (PSOs) to monitor marine mammals during in-water pile driving and pipe laying activities.

(2) Monitoring must take place from 30 minutes prior to initiation of pile driving or pipe laying activities through

30 minutes post-completion of pile driving or pipe laying activities.

(i) For pile driving activity, pre-activity monitoring must be conducted for 30 minutes to confirm that the shutdown zone is clear of marine mammals, and pile driving may commence only if observers have declared the shutdown zone clear of marine mammals for that full duration of time. Monitoring must occur throughout the time required to drive a pile. A determination that the shutdown zone is clear must be made during a period of good visibility (*i.e.*, the entire shutdown zone and surrounding waters must be visible to the naked eye).

(ii) [Reserved]

(3) If a marine mammal authorized to be taken by Level B harassment enters or approaches the shutdown zone, if a marine mammal not specified in the LOAs enters the Level B harassment zone, or if the take of a marine mammal species or stock has reached the take limits specified in any LOA issued under § 216.106 of this chapter and § 217.46 and enters the Level B harassment zone, AGDC must halt all construction activities at that location. If construction is halted or delayed due to the presence of a marine mammal, the activity may not commence or resume until either the animal has voluntarily left and been visually confirmed beyond the shutdown or Level B harassment zone, whichever applicable, or 30 minutes have passed without re-detection of the animal if it is a larger cetacean (humpback, fin, or gray whales), or 15 minutes have passed without re-detection of the animal if it is a small cetacean (beluga and killer whales and porpoises) or pinniped.

(4) AGDC must implement shutdown measures if the number of authorized takes for any particular species reaches the limit under the applicable LOA and if such marine mammals are sighted within the vicinity of the project area and are approaching the Level B harassment zone during in-water construction or demolition activities.

(e) *Soft start.* (1) AGDC must implement soft start techniques for impact pile driving. AGDC must conduct an initial set of three strikes from the impact hammer at 40 percent energy, followed by a 1-minute waiting period, then two subsequent three strike sets.

(2) Soft start must be required for any impact driving, including at the beginning of the day, and at any time following a cessation of impact pile driving of 30 minutes or longer.

§ 217.45 Requirements for monitoring and reporting.

(a) *Marine mammal monitoring.* (1) AGDC must employ trained protected species observers (PSO) to conduct marine mammal monitoring for its LNG facilities construction projects. The PSOs must observe and collect data on marine mammals in and around the project area for 30 minutes before, during, and for 30 minutes after all construction work. PSOs must have no other assigned tasks during monitoring periods, and must be placed at appropriate and safe vantage point(s) practicable to monitor for marine mammals and implement shutdown or delay procedures, when applicable, through communication with the equipment operator.

(2) *Protected species observer qualifications.* AGDC must adhere to the following observer qualifications:

(i) Independent PSOs (*i.e.*, not construction personnel) are required;

(ii) At least one observer must have prior experience working as an observer;

(iii) Other observers may substitute education (undergraduate degree in biological science or related field) or training for experience;

(iv) Where a team of three or more observers are required, one observer should be designated as lead observer or monitoring coordinator. The lead observer must have prior experience working as an observer; and

(v) AGDC must submit observer CVs for NMFS approval.

(3) *Marine mammal monitoring protocols.* (i) AGDC must conduct briefings between construction supervisors, crews and the PSO team prior to the start of all construction activities, and when new personnel join the work, in order to explain responsibilities, communication procedures, marine mammal monitoring protocols, and operational procedures.

(ii) A PSO must not work continuously for more than 4 hours without rotation.

(iii) PSOs must be able to detect and provide distance and bearing information of marine mammal sightings using the following methods:

(A) During all observation periods, PSOs must use high-magnification (25X) binoculars, standard handheld (7X) binoculars, and the naked eye to search continuously for marine mammals.

(B) Monitoring distances must be measured with range finders. Distances to animals must be based on the best estimate of the PSO, relative to known distances to objects in the vicinity of the PSO.

(C) Bearings to animals must be determined using a compass.

(iv) Monitoring for marine mammals during in-water pile driving:

(A) PSOs must be located at appropriate and safe vantage point(s) to be able to observe the entire exclusion zones(s) in order to implement shutdown measures when needed.

(B) In-water pile driving must only take place when the exclusion zones and Level A harassment zones are visible and can be adequately monitored. If conditions (*e.g.*, fog) prevent the visual detection of marine mammals, AGDC must not initiate activities with the potential to result in Level A harassment. If such conditions arise after the activity has begun, AGDC must halt impact pile driving, but vibratory pile driving or extraction could continue.

(C) Number and locations of PSOs posted for marine mammal monitoring during pile driving must be based on the harassment zone sizes as described below:

(1) For Level A harassment zones with radii less than 150 m, 2 PSOs will be monitoring from land.

(2) For Level A harassment zones with radii larger than 150 m but smaller than 1,000 m, 4 PSOs will be monitoring from land.

(3) For Level A harassment zones with radii larger than 1,000 m, 6 PSOs will be monitoring from land.

(D) *Pre-Activity Monitoring.* The exclusion zone must be monitored for 30 minutes prior to in-water construction and demolition activities. If a marine mammal is present within the exclusion zone, AGDC must delay the activity until the animal(s) leave the exclusion zone. Activity must resume only after the PSOs have determined that, through sighting or by waiting 15 minutes for small cetaceans or pinnipeds, or 30 minutes for large cetaceans, the animal(s) has moved outside the exclusion zone. If a marine mammal is observed approaching the exclusion zone, the PSO who sighted that animal must notify all other PSOs of its presence.

(E) *During Activity Monitoring.* If a marine mammal is observed entering the Level A or Level B harassment zones but is outside the exclusion zone, a pile segment being worked on may be completed without cessation, unless the animal enters or approaches the exclusion zone, at which point AGDC must halt all pile driving activities. If an animal is observed within the exclusion zone during pile driving, then AGDC must halt pile driving as soon as it is safe to do so. Pile driving may only resume if the animal has left the

exclusion zone of its own volition or has not been re-sighted for a period of 15 minutes for small cetaceans or pinnipeds, or 30 minutes for large cetaceans.

(F) **Post-Activity Monitoring.**

Monitoring of all zones must continue for 30 minutes following the completion of an activity.

(v) Monitoring for marine mammal monitoring during pipe laying activities:

(A) At least one PSO will be on the barge and on watch during pipe laying activities.

(B) [Reserved]

(4) **Data collection.** PSOs must collect the following information during marine mammal monitoring:

(i) Date and time that monitored activity begins and ends for each day conducted (monitoring period);

(ii) Construction activities occurring during each daily observation period, including how many and what type of piles driven and distances covered during pipe laying;

(iii) Deviation from initial proposal in pile numbers, pile types, average driving times, and pipe laying distances, etc.;

(iv) Weather parameters in each monitoring period (e.g., wind speed, percent cloud cover, visibility);

(v) Water conditions in each monitoring period (e.g., sea state, tide state);

(vi) For each marine mammal sighting:

(A) Species, numbers, and, if possible, sex and age class of marine mammals;

(B) Description of any observable marine mammal behavior patterns, including bearing and direction of travel and distance from pile driving and pipe laying activities;

(C) Location and distance from pile driving and pipe laying activities to marine mammals and distance from the marine mammals to the observation point; and

(D) Estimated amount of time that the animals remained in the Level A and/or Level B harassment zones;

(vii) Description of implementation of mitigation measures within each monitoring period (e.g., shutdown or delay); and

(viii) Other human activity in the area within each monitoring period.

(b) **Reporting measures.** (1) **Annual reports.** (i) AGDC must submit an annual report within 90 days after each activity year, starting from the date when the LOA is issued (for the first annual report) or from the date when the previous annual report ended.

(ii) Annual reports must detail the monitoring protocol, summarize the data recorded during monitoring, and

estimate the number of marine mammals that may have been harassed during the period of the report.

(iii) NMFS must provide comments within 30 days after receiving annual reports, and AGDC must address the comments and submit revisions within 30 days after receiving NMFS comments. If no comment is received from the NMFS within 30 days, the annual report must be considered completed.

(2) **Final report.** (i) AGDC must submit a comprehensive summary report to NMFS within 90 days after completion of the construction work or the expiration of the final LOA (if issued), whichever comes earlier.

(ii) The final report must synthesize all data recorded during marine mammal monitoring, and estimate the number of marine mammals that may have been harassed through the entire project.

(iii) NMFS would provide comments within 30 days after receiving this report, and AGDC must address the comments and submit revisions within 30 days after receiving NMFS comments. If no comment is received from the NMFS within 30 days, the final report must be considered as final.

(3) **Reporting of injured or dead marine mammals.** (i) In the unanticipated event that the construction or demolition activities clearly cause the take of a marine mammal in a prohibited manner, such as an injury, serious injury, or mortality, AGDC must immediately cease operations with the potential to impact marine mammals in the vicinity and immediately report the incident to the NMFS Office of Protected Resources, NMFS Alaska Regional Office, and the Alaska Region Stranding Coordinators. The report must include the following information:

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

(B) Description of the incident;

(C) Status of all sound source use in the 24 hours preceding the incident;

(D) Environmental conditions (e.g., wind speed and direction, sea state, cloud cover, visibility, and water depth);

(E) Description of marine mammal observations in the 24 hours preceding the incident;

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

(G) The fate of the animal(s); and

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

(ii) Activities must not resume until NMFS is able to review the circumstances of the prohibited take. NMFS must work with AGDC to

determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. AGDC may not resume its activities until notified by NMFS via letter, email, or telephone.

(iii) In the event that AGDC discovers an injured or dead marine mammal, and the lead PSO determines that the cause of the injury or death is unknown and the death is relatively recent (i.e., in less than a moderate state of decomposition as described in the next paragraph), AGDC must immediately report the incident to the NMFS Office of Protected Resources, NMFS Alaska Regional Office, and the Alaska Regional Stranding Coordinators. The report must include the same information identified in paragraph (b)(3)(i) of this section. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with AGDC to determine whether modifications in the activities are appropriate.

(iv) In the event that AGDC discovers an injured or dead marine mammal, and the lead PSO determines that the injury or death is not associated with or related to the activities authorized in the LOA (e.g., previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), AGDC must report the incident to the NMFS Office of Protected Resources, NMFS Alaska Regional Office, and the Alaska Regional Stranding Coordinators, within 48 hours of the discovery. AGDC must provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network. AGDC may continue its operations under such a case.

§ 217.46 Letters of Authorization.

(a) To incidentally take marine mammals pursuant to these regulations, AGDC must apply for and obtain (LOAs) in accordance with § 216.106 of this chapter for conducting the activity identified in § 217.40(c).

(b) LOAs, unless suspended or revoked, may be effective for a period of time not to extend beyond the expiration date of these regulations.

(c) If an LOA(s) expires prior to the expiration date of these regulations, AGDC may apply for and obtain a renewal of the LOA(s).

(d) In the event of projected changes to the activity or to mitigation, monitoring, reporting (excluding changes made pursuant to the adaptive management provision of § 217.47(c)(1)) required by an LOA, AGDC must apply

for and obtain a modification of LOAs as described in § 217.47.

(e) Each LOA must set forth:

(1) Permissible methods of incidental taking;

(2) Means of effecting the least practicable adverse impact (*i.e.*, mitigation) on the species, their habitat, and the availability of the species for subsistence uses; and

(3) Requirements for monitoring and reporting.

(f) Issuance of the LOA(s) must be based on a determination that the level of taking must be consistent with the findings made for the total taking allowable under these regulations.

(g) Notice of issuance or denial of the LOA(s) must be published in the **Federal Register** within 30 days of a determination.

§ 217.47 Renewals and modifications of Letters of Authorization.

(a) An LOA issued under §§ 216.106 of this chapter and 217.46 for the activity identified in § 217.40(c) must be renewed or modified upon request by the applicant, provided that:

(1) The proposed specified activity and mitigation, monitoring, and reporting measures, as well as the anticipated impacts, are the same as those described and analyzed for these regulations (excluding changes made pursuant to the adaptive management provision in paragraph (c)(1) of this section), and

(2) NMFS determines that the mitigation, monitoring, and reporting measures required by the previous LOA(s) under these regulations were implemented.

(b) For LOA modification or renewal requests by the applicant that include changes to the activity or the mitigation, monitoring, or reporting measures (excluding changes made pursuant to the adaptive management provision in paragraph (c)(1) of this section) that do not change the findings made for the regulations or result in no more than a minor change in the total estimated number of takes (or distribution by species or years), NMFS may publish a notice of proposed LOA in the **Federal Register**, including the associated analysis of the change, and solicit public comment before issuing the LOA.

(c) An LOA issued under §§ 216.106 of this chapter and 217.46 for the activity identified in § 217.40(c) may be modified by NMFS under the following circumstances:

(1) *Adaptive management.* After consulting with AGDC regarding the practicability of the modifications, NMFS may modify (including by adding or removing measures) the existing mitigation, monitoring, or reporting measures if doing so creates a reasonable likelihood of more effectively accomplishing the goals of the mitigation and monitoring set forth in the preamble for these regulations.

(i) Possible sources of data that could contribute to the decision to modify the mitigation, monitoring, or reporting measures in an LOA:

(A) Results from AGDC's monitoring from the previous year(s);

(B) Results from other marine mammal and/or sound research or studies; or

(C) Any information that reveals marine mammals may have been taken in a manner, extent or number not authorized by these regulations or subsequent LOAs.

(ii) If, through adaptive management, the modifications to the mitigation, monitoring, or reporting measures are substantial, NMFS must publish a notice of proposed LOA in the **Federal Register** and solicit public comment.

(2) *Emergencies.* If NMFS determines that an emergency exists that poses a significant risk to the well-being of the species or stocks of marine mammals specified in LOAs issued pursuant to §§ 216.106 of this chapter and 217.46, an LOA may be modified without prior notice or opportunity for public comment. Notice would be published in the **Federal Register** within 30 days of the action.

§§ 217.48–217.49 [Reserved]

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