DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648–XA660]

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to the Relocation of the Port of Alaska's South Floating Dock, Anchorage, Alaska

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

ACTION: Notice; proposed incidental harassment authorization; request for comments on proposed authorization and possible Renewal.

SUMMARY: NMFS has received a request from the Port of Alaska (POA) for authorization to take marine mammals incidental to pile driving associated with the relocation of the POA's South Floating Dock (SFD) in Knik Arm, Alaska. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an incidental harassment authorization (IHA) to incidentally take marine mammals during the specified activities. NMFS is also requesting comments on a possible one-time, one-year renewal that could be issued under certain circumstances and if all requirements are met, as described in Request for Public Comments at the end of this notice. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorizations and agency responses will be summarized in the final notice of our decision.

DATES: Comments and information must be received no later than July 15, 2021.

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service. Written comments should be submitted via email to *ITP.tyson.moore@noaa.gov.*

Instructions: NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments, including all attachments, must not exceed a 25-megabyte file size. All comments received are a part of the public record and will generally be posted online at *www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act* without change. All personal identifying information (*e.g.,* name, address) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

FOR FURTHER INFORMATION CONTACT: Reny Tyson Moore, 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/permit/incidental-take-authorizations-under-marine-mammal-protection-act.* 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 shall 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 the 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 the takings are set forth. The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

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 IHA) with respect to potential impacts on the human environment.

Accordingly, NMFS is preparing an Environmental Assessment (EA) to consider the environmental impacts associated with the issuance of the proposed IHA. NMFS' EA will be made available at *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act.* We will review all comments submitted in response to this notice prior to concluding our NEPA process or making a final decision on the IHA request.

Summary of Request

On October 2, 2020, NMFS received a request from the POA for an IHA to take marine mammals incidental to pile driving associated with the relocation of the SFD in Knik Arm, Alaska. Revised applications were submitted by POA on December 15, 2020, January 29, 2021, February 5, 2021, and March 5, 2021 that addressed comments provided by NMFS. The application was deemed adequate and complete on March 17, 2021. Additional revised applications were submitted on March 26, 2021 and May 14, 2021. The POA's request is for take of a small number of six species of marine mammals by Level B harassment and Level A harassment. Neither the POA nor NMFS expects serious injury or mortality to result from this activity and, therefore, an IHA is appropriate.

NMFS previously issued IHAs to the POA for pile driving (73 FR 41318, July 18, 2008; 74 FR 35136, July 20, 2009; 81 FR 15048, March 21, 2016; and 85 FR 19294, April 06, 2020). The POA has complied with the requirements (*e.g.,* mitigation, monitoring, and reporting) of all previous IHAs and information regarding their monitoring results may be found in the Effects of the Specified Activity on Marine Mammals and their Habitat and Estimated Take sections.

Description of Proposed Activity

Overview

The POA is modernizing its marine terminals through the Port of Alaska Modernization Program (PAMP). One of the first priorities of the PAMP is to replace the existing Petroleum Oil Lubricants Terminal with a new Petroleum Cement Terminal (PCT). Phase 1 of the PCT project is complete, but for Phase 2 of the project to advance, the existing SFD, a small multipurpose floating dock constructed in 2004, must be relocated south of the PCT near the southern portion of the South Backlands Stabilization project. The existing location of SFD will not allow docking operations at SFD once the PCT is constructed due to the close proximity of one of the PCT mooring dolphins (a structure for berthing and mooring of vessels). Therefore, it must be relocated.

Relocation of the SFD will include the removal of the existing structure, including the access trestle and gangway, and installation of twelve permanent 36-inch steel pipe piles: Ten vertical and two battered. Construction of the SFD will also require the installation and vibratory removal of up to six 24- or 36-inch template piles. All pile installation will take place from a floating work barge and crane with a vibratory hammer to the greatest extent possible. An impact hammer may be used if a pile encounters refusal and cannot be advanced to the necessary tip elevation with the vibratory hammer. An unconfined bubble curtain system will be used to reduce in-water noise levels for the installation of the sixteen vertical piles and removal of the six temporary piles but will not be used during installation of the two battered piles due to the angle of these piles.

Dates and Duration

The POA has requested that the IHA be valid for one year upon issuance. In-water pile installation and removal associated with SFD removal and construction is anticipated to take place on up to 24 nonconsecutive days between the date of issuance and November 2021. Installation of permanent and temporary piles is anticipated to take 45 minutes per pile with 1–3 piles being installed per day over 7–18 days. Removal of six temporary piles is anticipated to take 75 minutes per pile with 1–3 piles being removed per day over 2–6 days. All pile-driving will occur during daylight hours.

Specific Geographic Region

Cook Inlet is a large tidal estuary that exchanges waters at its mouth with the Gulf of Alaska. The inlet is roughly 20,000 square kilometers (km^2; 7,700 square miles (mi^2)) in area, with approximately 1,350 linear km (840 mi) of coastline (Rugh *et al.,* 2000) and an average depth of approximately 100 meters (m) (330 feet (ft)). Cook Inlet is generally divided into upper and lower regions by the East and West Forelands. Freshwater input to Cook Inlet comes from snowmelt and rivers, many of which are glacially fed and carry high sediment loads. Currents throughout Cook Inlet are strong and tidally periodic, with average velocities ranging from three to six knots (Sharma and Burrell, 1970). Extensive tidal mudflats occur throughout Cook Inlet, especially in the upper reaches, and are exposed at low tides.

Cook Inlet is a seismically active region susceptible to earthquakes and has some of the highest tides in North America (NOAA, 2015) that drive surface circulation. Tides in Cook Inlet are semidiurnal, with two unequal high and low tides per tidal day (tidal day = 24 hours, 50 minutes). Due to Knik Arm's predominantly shallow depths and narrow widths, tides near Anchorage are greater than those in the main body of Cook Inlet. The tides at the POA have a mean range of about 8.0 m (26 ft), and the maximum water level has been measured at more than 12.5 m (41 ft) at the Anchorage station (NOAA, 2015). Maximum current speeds in Knik Arm, observed during spring ebb tide, exceed 7 knots (12 feet/second). These tides result in strong currents in alternating directions through Knik Arm and a well-mixed water column. Cook Inlet contains substantial quantities of mineral resources, including coal, oil, and natural gas. During winter, sea, beach, and river ice are dominant physical forces within Cook Inlet. In upper Cook Inlet, sea ice generally forms in October to November and continues to develop through February or March (Moore *et al.,* 2000).

Northern Cook Inlet bifurcates into Knik Arm to the north and Turnagain Arm to the east. The POA is located in the southeastern shoreline of Knik Arm in Anchorage, Alaska (Latitude 61°15′ N, Longitude 149°52′ W; Seward Meridian) (Figure 1). Knik Arm is generally considered to begin at Point Woronzof, 7.4 km (4.6 mi) southwest of the POA. From Point Woronzof, Knik Arm extends about 48 km (30 mi) in a north-northeasterly direction to the mouths of the Matanuska and Knik rivers. At Cairn Point, just northeast of the POA, Knik Arm narrows to about 2.4 km (1.5 mi) before widening to as much as 8 km (5 mi) at the tidal flats northwest of Eagle Bay at the mouth of Eagle River, which are heavily utilized by Cook Inlet Beluga Whales (CIBWs). Approximately 60 percent of Knik Arm is exposed at mean lower low water (MLLW). The intertidal (tidally influenced) areas of Knik Arm, including those at the POA, are mudflats, both vegetated and unvegetated, which consist primarily of fine, silt-sized glacial flour.

The POA's boundaries currently occupy an area of approximately 129 acres. Other commercial and industrial activities related to secure maritime operations are located near the POA on Alaska Railroad Corporation (ARRC) property immediately south of the POA, on approximately 111 acres. The PCT footprint spans approximately 0.87 acre and is approximately 0.74 km (0.46 m) north of Ship Creek, a location of concentrated marine mammal activity during seasonal runs of several salmon species. Ship Creek flows into Knik Arm through the Municipality of Anchorage industrial area. The perpendicular distance to the west bank directly across Knik Arm from the POA is approximately 4.2 km (2.6 mi).

BILLING CODE 3510–22–P

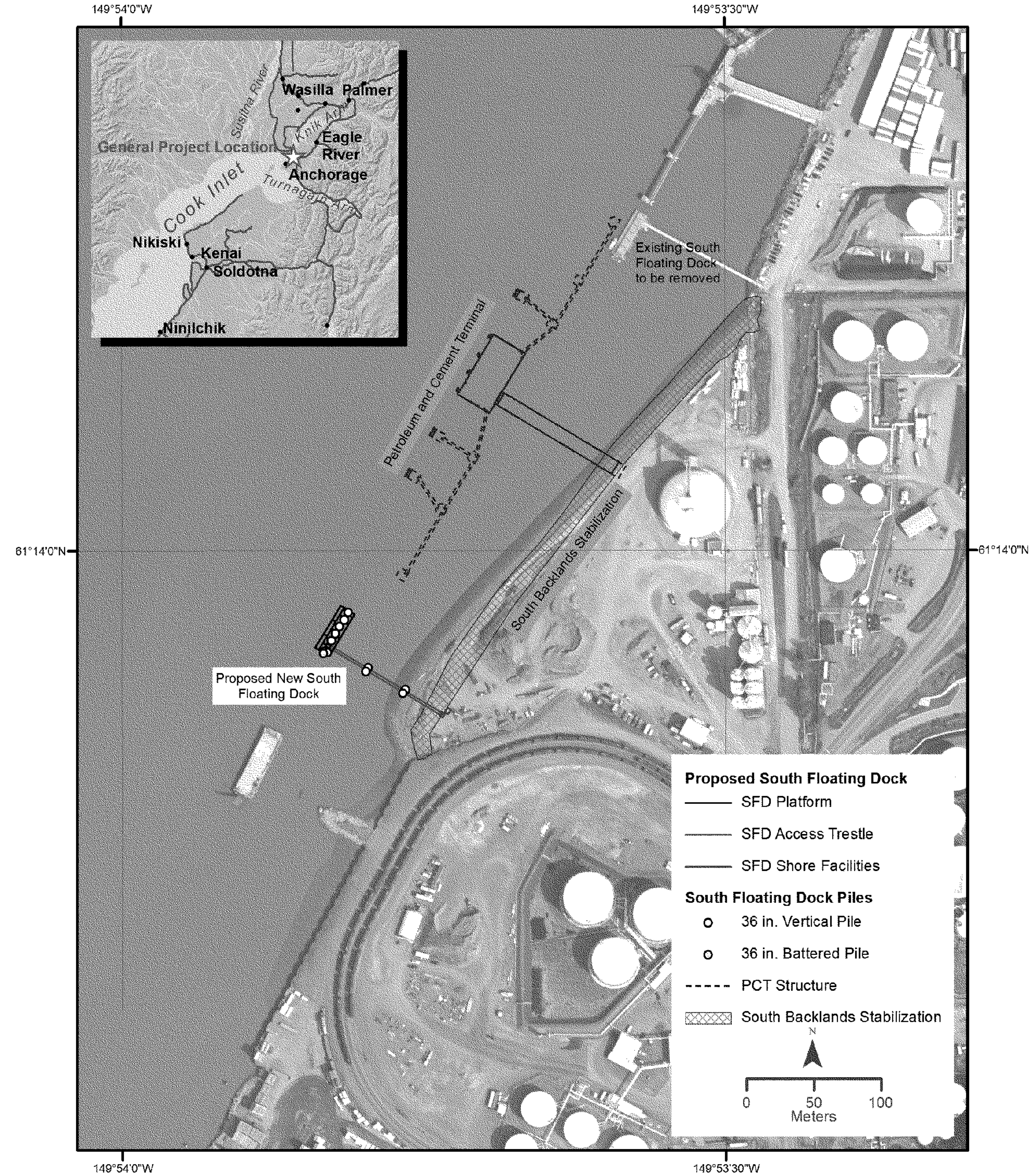

Figure 1. Port of Alaska location within Knik Arm, Alaska. The existing and proposed locations for the SFD are included for reference.

BILLING CODE 3510–22–C

Detailed Description of Specific Activity

Located within the Municipality of Anchorage on Knik Arm in upper Cook Inlet, the POA (Figure 1) provides critical infrastructure for the citizens of Anchorage and a majority of the citizens of Alaska. The POA's existing infrastructure and support facilities were constructed largely in the 1960s. Port facilities are substantially past their design life, have degraded to levels of marginal safety, and are in many cases functionally obsolete, especially in regard to seismic design criteria and condition. To address these deficiencies, the POA is modernizing its marine terminals through the PAMP. Plans for modernization include replacing deteriorated pile-supported infrastructure with new pile-supported infrastructure. One of the first priorities of the PAMP is to replace the existing Petroleum Oil Lubricants Terminal with a new structure that exceeds current seismic standards. For the new PCT Project to advance, the existing SFD, a small multipurpose floating dock constructed in 2004, must be relocated south of the PCT near the southern portion of the South Backlands Stabilization project (Figure 1). The existing location of SFD will not allow docking operations at SFD once the PCT is constructed due to close proximity of one of the PCT mooring dolphins.

The purpose of the SFD is to provide staging, mooring, and docking of small vessels, such as first responder (*e.g.,* Anchorage Fire Department, U.S. Coast Guard) rescue craft, small work skiffs, and occasionally tug boats, in an area close to the daily operations at the Port. Upper Cook Inlet near Anchorage exhibits the largest tide range in the United States and one of the largest tide ranges in the world, with an average daily difference between high and low tide of 26.2 feet and an extreme difference of up to 41 feet (NOAA, 2015). The ability of first responders to conduct response operations during low tide stages requires access to the SFD, as the waterline is inaccessible for vessels at the Anchorage public boat launch at Ship Creek during low tide stages. The planned relocation of the SFD south of the new PCT structure will provide continuous access to the water, and relocation is needed to continue to provide timely, safe access for rescue personnel and vessels in the northern portion of Cook Inlet.

Relocation of the SFD will include the removal of the existing structure, including the float and gangway, and installation of twelve permanent 36-inch steel piles: Four for the gangway and eight for the floating dock (Table 1). Ten of the permanent piles will be plumb (*i.e.,* vertical) piles; but two of these piles, located at the south corner of the floating dock, will be battered piles due to lateral ice flow conditions. Two of the permanent 36-inch gangway piles at Bent B, the bent closest to shore, may be installed when the area is de-watered, but will likely be installed in water. Temporary template piles may be required to assist with permanent pile placement and would consist of up to six 24- or 36-inch steel pipe piles (Table 1): 4 For the gangway and 2 for the float. To allow for flexibility in design, temporary piles may be all of one size or a combination of 24- and 36-inch steel pipe piles. The piles from the existing SFD piles will be left in place and will not be removed.

All piles will be installed with a vibratory hammer to the greatest extent possible, with each pile requiring approximately 45 minutes to install (Table 1), based on an analysis of PCT Phase 1 data. An impact hammer may be required if a pile encounters refusal and cannot be advanced to the necessary tip elevation with the vibratory hammer. Refusal criteria for a vibratory hammer is defined by the hammer manufacturer and is described as the pile not advancing one foot within 30 seconds of vibratory hammer operation at full speed. Three piles have deeper embedment depth than others and may reach refusal before the specified minimum tip elevation. In such a situation, an impact hammer would be needed to drive these piles to their required depth. A small number of total piles, estimated up to five piles, may reach refusal before the tip elevation is reached, requiring up to 20 minutes of impact installation each at one pile per day. POA estimates that each of these piles could require up to 1,000 strikes, which was the mean number of strikes measured for 48-inch production piles during the PCT Phase 1 construction sound source verification (SSV) study (Reyff *et al.,* 2021). It is likely that the number of strikes will be less due to the smaller pile sizes associated with SFD. To be conservative, 1,000 strikes were used to calculate Level A harassment zone sizes. It is assumed that if a pile does require impact installation, the vibratory installation time would be reduced by a commensurate amount (*i.e.,* 15 minutes of impact installation would replace 15 minutes of vibratory installation), and the overall duration of installation would remain the same.

Temporary template piles (n = 6) will be removed with a vibratory hammer (Table 1). Based on an analysis of PCT Phase 1 data, each temporary pile will require approximately 75 minutes of vibratory hammer removal. Knik Arm soils have demonstrated a strong set up and resistance condition on temporary piles due to dense clay composition, making removal lengthier and more difficult than installation. The temporary piles for the SFD will be in place for only approximately three weeks and will not be load-bearing, in contrast to the piles used for the PCT temporary trestle that were in place for approximately five months and subject to loads from the construction crane. The temporary SFD piles will likely require less time for removal than PCT piles at approximately two-thirds duration. Based on this, the estimated removal time is approximately two-thirds of the duration required for vibratory removal of 36-inch temporary trestle piles during PCT Phase 1 construction. All of the existing SFD float and gangway piles will remain in place; a vibratory hammer will not be required for their removal.

TABLE 1—PILE DETAILS AND ESTIMATED EFFORT REQUIRED FOR PILE INSTALLATION AND REMOVAL

Pipe pile diameter	Feature	Number of plumb piles	Number of battered piles	Vibratory installation duration per pile (minutes)	Vibratory removal duration per pile (minutes)	Potential impact strikes per pile, if needed (up to 5 piles; one pile per day)	Production rate (piles/day)		Days of installation	Days of removal
							Installation	Removal		
36-inch	Floating Dock.	6	2	45	n/a	1,000	1–3	n/a	4–12	n/a
	Gangway	4	0		n/a	1,000	1–3	n/a		n/a
24- or 36-inch.	Temporary Template Piles.	6	0	45	75	1,000	1–2	1–3	3–6	2–6
Project Totals		16	2	13.5 hours	7.5 hours				7–18	2–6

The POA will use an unconfined bubble curtain noise attenuation system to mitigate noise propagation during vibratory installation and potential impact installation of the ten permanent plumb piles and six temporary plumb piles and vibratory removal of the six temporary piles when water depth is deep enough to deploy a bubble curtain (approximately 3 m). Pile installation or removal in the dry, which is a completely de-watered state, is unlikely but, if it occurs, will be conducted without a bubble curtain. A bubble curtain will not be used with the two battered piles due to the angle of installation. Use of an unconfined bubble curtain is proposed instead of a confined bubble curtain in order to reduce the need for additional template piles that would be required to stabilize a confined bubble curtain.

All pile installation will take place from a floating work barge and crane. A marine-based operation is required because of the extreme tidal range, which precludes use of a land-based crane in the absence of a temporary support trestle. The floating work barge will require sufficient water depth for support. Opportunities to install piles when the project site is dewatered will be limited. Piles will be installed in water and multiple piles will likely not be driven concurrently.

Proposed mitigation, monitoring, and reporting measures are described in detail later in this document (please see Proposed Mitigation and Proposed Monitoring and Reporting).

Description of Marine Mammals in the Area of Specified Activities

There are six species of marine mammals that may be found in upper Cook Inlet during the proposed pile driving activities. Sections 3 and 4 of the POA's 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 (SARs; *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*), and more general information about these species (*e.g.,* physical and behavioral descriptions) may be found on NMFS's website (*https://www.fisheries.noaa.gov/find-species*). Additional information on CIBWs may be found in NMFS' 2016 Recovery Plan for the CIBW (*Delphinapterus leucas*), available online at *https://www.fisheries.noaa.gov/resource/document/recovery-plan-cook-inlet-beluga-whale-delphinapterus-leucas.*

Table 2 lists all species or stocks for which take is expected and proposed to be authorized for this action and summarizes information related to the population or stock, including regulatory status under the MMPA and Endangered Species Act (ESA) and potential biological removal (PBR), where known. For taxonomy, we follow Committee on Taxonomy (2019). 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's 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.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS' stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS' U.S. 2019 SARs (*e.g.,* Muto *et al.,* 2020a) and 2020 draft SARs (Muto *et al.,* 2020b). All values presented in Table 2 are the most recent available at the time of publication and are available in the 2019 SARs (Muto *et al.,* 2020a) and 2020 draft SARs (Muto *et al.,* 2020b) (available online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/draft-marine-mammal-stock-assessment-reports*).

TABLE 2—MARINE MAMMAL SPECIES POTENTIALLY OCCURRING IN UPPER COOK INLET, ALASKA

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/SI [3]
Order Cetartiodactyla—Cetacea—Superfamily Mysticeti (baleen whales)						
Family Balaenopteridae (rorquals):						
Humpback whale	*Megaptera novaeangliae*	Western North Pacific	E/D; Y	1,107 (0.3, 865, 2006)	3	2.8
		Central North Pacific	-/-; Y	10,103 (0.3, 7890, 2006)	83	26
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Delphinidae:						
Beluga whale	*Delphinapterus leucas*	Cook Inlet	E/D; Y	279 (0.06, 267, 2018)	0.53	0
Killer whale	*Orcinus orca*	Alaska Resident	-/-; N	2,347 (N/A, 1102,347, 2012).	24	1
		Alaska Transient	-/-; N	587 (N/A, 587, 2012)	5.87	0.8
Family Phocoenidae (porpoises):						
Harbor porpoise	*Phocoena*	Gulf of Alaska	-/-; Y	31,046 (0.214, N/A, 1998).	Undet	72
Order Carnivora—Superfamily Pinnipedia						
Family Otariidae (eared seals and sea lions):						
Steller sea lion	*Eumetopias jubatus*	Western	E/D; Y	53,932 (N/A, 52,932 2013).	318	255
Family Phocidae (earless seals):						

TABLE 2—MARINE MAMMAL SPECIES POTENTIALLY OCCURRING IN UPPER COOK INLET, ALASKA—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/SI [3]
Harbor seal	*Phoca vitulina*	Cook Inlet/Shelikof	-/-; N	28,411 (N/A, 26,907, 2018).	807	107

[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: *www.nmfs.noaa.gov/pr/sars/*. CV is coefficient of variation; Nmin is the minimum estimate of stock abundance. In some cases, CV is not applicable because it has not been calculated.
[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.

As indicated above, all six species (with six managed stocks) in Table 2 temporally and spatially co-occur with the activity to the degree that take is reasonably likely to occur, and we have proposed authorizing it. Marine mammals occurring in Cook Inlet that are not expected to be observed in the project area and for which take is not proposed include gray whales (*Eschrichtius robustus*), minke whales (*Balaenoptera acutorostrata*), and Dall's porpoise (*Phocoenoides dalli*). Data from the Alaska Marine Mammal Stranding Network database (NMFS, unpublished data) provide additional support for the determination that these species rarely occur in upper Cook Inlet. Since 2011, only one minke whale and one Dall's porpoise have been documented as stranded in the portion of Cook Inlet north of Point Possession. Both were dead upon discovery; it is unknown if they were alive upon their entry into upper Cook Inlet or drifted into the area with the tides. No gray whales were reported as stranded in upper Cook Inlet during this time period; however, one juvenile gray whale was observed on May 24, 2020 during PCT Phase 1 construction monitoring (61 North Environmental, 2021). This whale was first observed mid-inlet off Port MacKenzie then travelled along the southeastern shore of Knik Arm until it was last sighted near Point Woronzof. On May 27, 2020, there were reports that a juvenile gray whale, believed to be the same whale, was stranded in the Twentymile River, at the eastern end of Turnagain Arm, approximately 50 mi southeast of Knik Arm. The animal remained in the river for a week, before swimming out of the river. The whale later stranded and died about 25 mi away at the mouth of the Theodore River on June 12, 2020. No in water pile installation occurred on 23 to 25 May, and there is no indication that work at the PCT had any effect on the animal. Based on photos and video NMFS collected of the whale, veterinarians determined the whale was in fair to poor condition (see *https://www.fisheries.noaa.gov/feature-story/alaska-gray-whale-ume-update-twentymile-river-whale-likely-one-twelve-dead-gray-whales for more information*). With very few exceptions, minke whales, gray whales, and Dall's porpoises do not occur in upper Cook Inlet; and, therefore, take of these species is not requested in this application.

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

Humpback Whale

Currently, three stocks of humpback whales are recognized in the North Pacific, migrating between their respective summer/fall feeding areas and winter/spring calving and mating areas (Baker *et al.,* 1998; Calambokidis *et al.,* 1997): (1) The California/Oregon/Washington and Mexico stock, (2) the Central North Pacific stock, and (3) the Western North Pacific stock. Humpback whales from the Western North Pacific breeding stock overlap broadly on summer feeding grounds with whales from the Central North Pacific breeding stock, as well as with whales that winter in the Revillagigedo Islands in Mexico (Muto *et al.,* 2020a, 2020b). Despite this overlap, the whales seasonally found in Cook Inlet are probably of the Central North Pacific stock (Muto *et al.,* 2020a, 2020b). The Central North Pacific stock winters in Hawaii (Baker *et al.,* 1986) and summers from British Columbia to the Aleutian Islands (Calambokidis *et al.,* 1997), including Cook Inlet.

The humpback whale ESA listing final rule (81 FR 62259, September 8, 2016) delineated 14 Distinct Population Segments (DPSs) with different listing statuses. The most comprehensive photo-identification data available suggest that approximately 89 percent of all humpback whales in the Gulf of Alaska are members of the Hawaii DPS, 11 percent are from the Mexico DPS, and less than 1 percent are from the western North Pacific DPS (Wade *et al.,* 2016). The Hawaii DPS is not listed under the ESA, the Mexico DPS is listed as threatened, and the Western North Pacific DPS is listed as endangered under the ESA. Members of different DPSs are known to intermix in feeding grounds; therefore, all waters off the coast of Alaska should be considered to have ESA-listed humpback whales. NMFS is in the process of reviewing humpback whale stock structure under the MMPA in light of the 14 DPSs established under the ESA.

Humpback whales are encountered regularly in lower Cook Inlet and occasionally in mid-Cook Inlet; however, sightings are rare in upper Cook Inlet (*e.g.,* Witteveen *et al.,* 2011). There have been few sightings of humpback whales near the project area. Humpback whales were not documented during POA construction or scientific monitoring from 2005 to 2011 or during 2016 (Cornick and Pinney, 2011; Cornick and Saxon-Kendall, 2008, 2009; Cornick and Seagars, 2016; Cornick *et al.,* 2010, 2011; ICRC, 2009, 2010a, 2011a, 2012; Markowitz and McGuire, 2007; Prevel-Ramos *et al.,* 2006). Observers monitoring the Ship Creek Small Boat Launch from August 23 to September 11, 2017, recorded two sightings, each of a single humpback whale, which was presumed to be the same individual. One other humpback whale sighting has been recorded for the immediate vicinity of the project area. This event involved a stranded whale that was sighted near a number of locations in upper Cook Inlet before washing ashore at Kincaid Park in 2017; it is unclear as to whether the humpback whale was alive or deceased upon entering Cook Inlet waters. No humpbacks were observed from April–November 2020 during Phase 1 PCT construction monitoring (61 North Environmental, 2021).

The Central North Pacific stock is the focus of a large whale-watching industry in its wintering grounds (Hawaii) and summering grounds (Alaska). The growth of the whale-watching industry is an ongoing concern as preferred habitats may be abandoned if disturbance levels are too high (Muto *et al.,* 2020a, 2020b). Other potential impacts include elevated levels of sound from anthropogenic sources (*e.g.,* shipping, military sonars), harmful algal blooms (Geraci *et al.,* 1989), possible changes in prey distribution with climate change, entanglement in fishing gear, ship strikes due to increased vessel traffic (*e.g.,* from increased shipping in higher latitudes and through the Bering Sea with changes in sea-ice coverage), and oil and gas activities. An intentional unauthorized take of a humpback whale by Alaska Natives in Toksook Bay was documented in 2016 (Muto *et al.,* 2020a, 2020b); however, no subsistence use of humpback whales occurs in Cook Inlet.

Humpback whale populations were considerably reduced as a result of intensive commercial exploitation during the 20th century. Currently, the overall trend for most humpback whale populations found in U. S. waters is positive and points toward recovery (81 FR 62259; September 8, 2016); however, this may not be uniform for all breeding areas. A sharp decline in observed reproduction and encounter rates of humpback whales from the Central North Pacific stock between 2013 and 2018 has been related to oceanographic anomalies and consequent impacts on prey resources (Cartwright *et al.,* 2019), suggesting that humpback whales are vulnerable to major environmental changes.

Beluga Whale

The CIBW stock is a small, geographically isolated population separated from other beluga whale populations by the Alaska Peninsula. The population is genetically distinct from other Alaska populations, suggesting the peninsula is an effective barrier to genetic exchange (O'Corry-Crowe *et al.,* 1997). The CIBW 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), and to 279 animals in 2018 (Wade *et al.,* 2019). The precipitous decline documented in the mid-1990s was attributed to unsustainable subsistence practices by Alaska Native hunters (harvest of >50 whales per year) (Mahoney and Shelden, 2000). Harvesting of CIBWs has not occurred since 2008 (NMFS, 2008).

Despite protection from hunting and other threats, this stock has not rebounded and continues to decline (Wade *et al.,* 2019, Muto *et al.,* 2020b). The population was declining at the end of the period of unregulated harvest, with the relatively steep decline ending in 1999, coincident with harvest removals dropping from an estimated 42 in 1998 to just 0 to 2 whales per year in 2000 to 2006 (and with no removals after 2006). From 1999 to 2016, the rate of decline of the population was estimated to be 0.4 percent (SE = 0.6 percent) per year, with a 73 percent probability of a population decline. This rate increased from 2006 to 2016 to 0.5 percent per year, (with a 70 percent probability of a population decline) (Shelden et al., 2017). The latest estimates suggest that this rate has further increased to 2.3 percent decline per year from 2008 to 2018, with a 99.7 percent probability of population decline in the future (Wade *et al.,* 2019, Muto *et al.,* 2020b). No human-caused mortality or serious injury of CIBWs has been recently documented.

The current best abundance estimate of the CIBW population from the aerial survey data is 279 (95 percent probability interval 250 to 317). This is based on the estimate of smoothed abundance for 2018, as described in Sheldon and Wade (2019). A comparison of the population estimates over time is presented in Figure 2. While Sheldon and Wade (2019) provides explanations for the differences between model results, including inadequacies and biases, the authors do not postulate on the reason for population decline in general (which was evident using both models); however, recent literature suggests prey reductions may be a critical contributing factor (Norman *et al.,* 2019). This is not unexpected as reduced prey availability has been directly linked to increased mortality and reduced health and survival of other marine mammals populations such as the Southern Resident killer whale (*e.g.,* Ward *et al.,* 2009, Wasser *et al.,* 2017) and California sea lion (*e.g.,* McClatchie *et al.,* 2016). The CIBW stock was designated as depleted under the MMPA in 2000 (65 FR 34590; May 21, 2000) and listed as endangered under the ESA in 2008 (73 FR 62919; October 22, 2008). Therefore, the CIBW stock is considered a strategic stock.

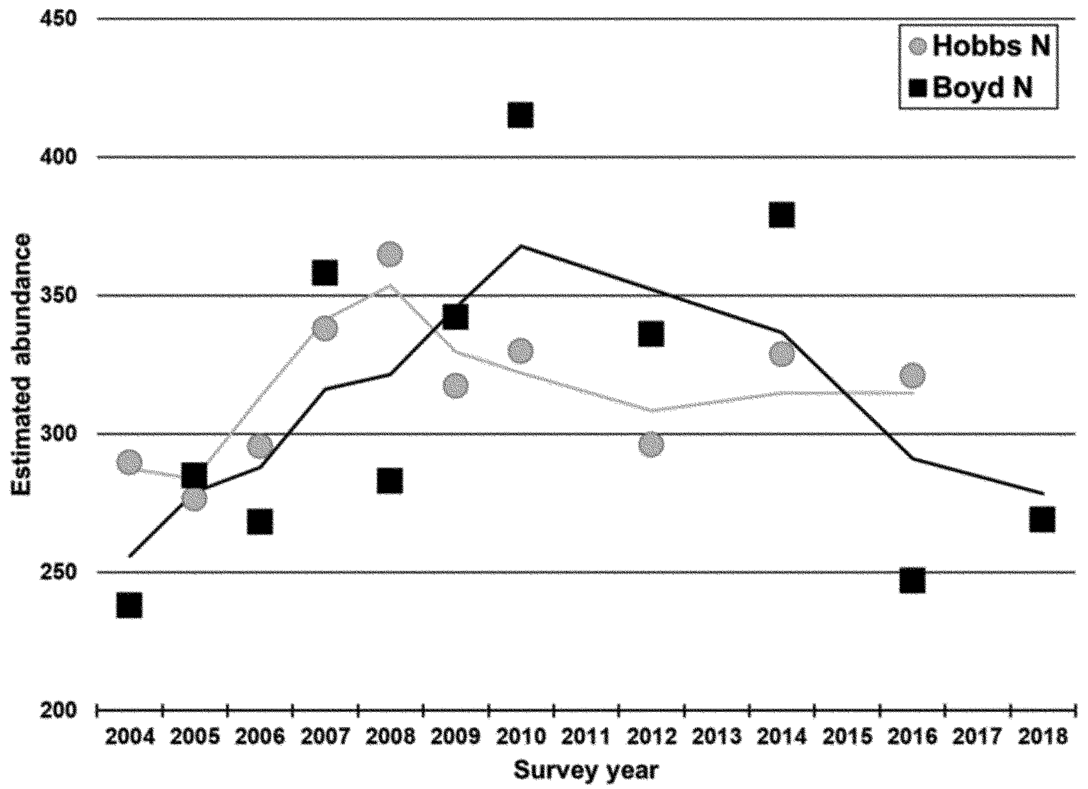

Figure 2. Annual estimates of abundance for both group size estimation methods. The moving average of each set of estimates is also plotted. Taken from Sheldon and Wade (2019).

Mortality related to live stranding events, where a CIBW group strands as the tide recedes, has been regularly observed in upper Cook Inlet. Most whales involved in a live stranding event survive, although some associated deaths may not be observed if the whales die later from live-stranding-related injuries (Vos and Shelden, 2005, Burek-Huntington *et al.,* 2015). Between 2014 and 2018, there were reports of approximately 79 CIBWs involved in three known live stranding events, plus one suspected live stranding event with two associated deaths reported (NMFS, 2016a; NMFS, unpubl. Data, Muto *et al.,* 2020b). In 2014, necropsy results from two whales found in Turnagain Arm suggested that a live stranding event contributed to their deaths as both had aspirated mud and water. No live stranding events were reported prior to the discovery of these dead whales, suggesting that not all live stranding events are observed. A CIBW calf that stranded alive in 2017 was sent to the Alaska SeaLife Center for rehabilitation and then transferred to SeaWorld in San Antonio, Texas, in 2018. Most live strandings occur in Knik Arm and Turnagain Arm, which are shallow and have large tidal ranges, strong currents, and extensive mudflats. Another source of CIBW mortality in Cook Inlet is predation by transient-type (mammal-eating) killer whales (NMFS, 2016a; Sheldon *et al.,* 2003).

In its Recovery Plan (NMFS, 2016a), NMFS identified several threats to CIBWs. Potential threats include: (1) High concern: Catastrophic events (*e.g.,* natural disasters, spills, mass strandings), cumulative effects of multiple stressors, and noise; (2) medium concern: Disease agents (*e.g.,* pathogens, parasites, and harmful algal blooms), habitat loss or degradation, reduction in prey, and unauthorized take; and (3) low concern: Pollution, predation, and subsistence harvest. The recovery plan did not treat climate change as a distinct threat but rather as a consideration in the threats of high and medium concern. Other potential threats most likely to result in direct human-caused mortality or serious injury of this stock include ship strikes.

The CIBW stock remains within Cook Inlet throughout the year, showing only small seasonal shifts in distribution (Goetz *et al.,* 2012a, Lammers *et al.,* 2013, Castallotte *et al.,* 2015; Shelden *et al.,* 2015a, 2018; Lowery *et al.,* 2019). NMFS designated two areas, consisting of 7,809 km^2 (3,016 mi^2) of marine and estuarine environments, considered essential for the species' survival and recovery as critical habitat (76 FR 20180; April 11, 2011). However, in recent years the range of the CIBW whale has contracted to the upper reaches of Cook Inlet because of the decline in the population (Rugh et al., 2010), and almost the entire population can be found in northern Cook Inlet from late spring through the summer and into the fall (Muto et al., 2020b). Area 1 of the CIBW critical habitat encompasses all marine waters of Cook Inlet north of a line connecting Point Possession (61.04° N, 150.37° W) and the mouth of Three Mile Creek (61.08.55° N, 151.04.40° W), including waters of the Susitna, Little Susitna, and Chickaloon Rivers below mean higher high water. This area provides important habitat during ice-free months and is used intensively by CIBWs between April and November (NMFS, 2016a). The POA, the adjacent navigation channel, and the turning basin were excluded from critical habitat designation due to national security reasons (76 FR 20180; April 11, 2011). More information on CIBW critical habitat can be found at *https://www.fisheries.noaa.gov/action/critical-habitat-cook-inlet-beluga-whale.*

Aerial surveys were conducted by NMFS each year during from 1994 to 2012 (Rugh *et al.,* 2000, 2005; Shelden *et al.,* 2013, 2019) to document distribution and abundance of CIBWs. NMFS changed to a biennial survey schedule starting in 2014 after analysis showed there would be little reduction in the ability to detect a trend given the current growth rate of the population (Hobbs, 2013). The collective survey results show that CIBWs have been consistently found near or in river mouths along the northern shores of upper Cook Inlet (*i.e.,* north of East and West Foreland). In particular, CIBW groups are seen in the Susitna River Delta, Knik Arm, and along the shores of Chickaloon Bay. Small groups have also been recorded farther south in Kachemak Bay, Redoubt Bay (Big River), and Trading Bay (McArthur River) prior to 1996 but very rarely thereafter. Since the mid-1990s, most (96 to 100 percent) CIBWs in upper Cook Inlet have been concentrated in shallow areas near river mouths (Sheldon *et al.,* 2015), no longer occurring in the central or southern portions of Cook Inlet (Hobbs *et al.,* 2008). Based on these aerial surveys, the concentration of CIBWs in the northernmost portion of Cook Inlet appears to be consistent from June to October (Rugh *et al.,* 2000, 2004a, 2004b, 2005, 2006, 2007). Research reports generated from the surveys can be found at *https://www.fisheries.noaa.gov/alaska/endangered-species-conservation/research-reports-and-publications-cook-inlet-beluga-whales.*

Though CIBWs can be found throughout the inlet at any time of year, they spend the ice-free months generally in the upper Cook Inlet, shifting into the middle and lower Inlet in winter (Hobbs *et al.,* 2005). In 1999, one CIBW was tagged with a satellite transmitter, and its movements were recorded from June through September of that year. Since 1999, 18 CIBWs in upper Cook Inlet have been captured and fitted with satellite tags to provide information on their movements during late summer, fall, winter, and spring (Goetz *et al.,* 2012a; Shelden *et al.,* 2015a, 2018). All tagged CIBWs remained in Cook Inlet (Shelden *et al.,* 2015a, 2018). Most tagged whales were in the lower to middle inlet (70 to 100 percent of tagged whales) during January through March, near the Susitna River Delta from April to July (60 to 90 percent of tagged whales) and in the Knik and Turnagain Arms from August to December (Ezer *et al.,* 2013). More recently, the Marine Mammal Lab has conducted long-term passive acoustic monitoring demonstrating seasonal shifts in CIBW concentrations throughout Cook Inlet. Castellote *et al.* (2015) conducted long-term acoustic monitoring at 13 locations throughout Cook Inlet between 2008 and 2015: North Eagle Bay, Eagle River Mouth, South Eagle Bay, Six Mile, Point MacKenzie, Cairn Point, Fire Island, Little Susitna, Beluga River, Trading Bay, Kenai River, Tuxedni Bay, and Homer Spit; the former six stations being located within Knik Arm. In general, the observed seasonal distribution is in accordance with descriptions based on aerial surveys and satellite telemetry: CIBW detections are higher in the upper inlet during summer, peaking at Little Susitna, Beluga River, and Eagle Bay, followed by fewer detections at those locations during winter. Higher detections in winter at Trading Bay, Kenai River, and Tuxedni Bay suggest a broader CIBW distribution in the lower inlet during winter.

CIBWs are generally concentrated near the warmer waters of river mouths during the spring and summer because that is where prey availability is high and predator occurrence is low (Moore *et al.,* 2000). Goetz *et al.* (2012b) modeled habitat preferences using NMFS' 1994–2008 June abundance survey data. In large areas, such as the Susitna Delta (Beluga to Little Susitna Rivers) and Knik Arm, there was a high probability that CIBWs were in larger group sizes. CIBW presence also increased closer to rivers with Chinook salmon (*Oncorhynchus tshawytscha*) runs, such as the Susitna River. Movement has been correlated with the peak discharge of seven major rivers emptying into Cook Inlet. Boat-based surveys from 2005 to the present (McGuire and Stephens, 2017) and results from passive acoustic monitoring across the entire inlet (Castellote *et al.,* 2015) also support seasonal patterns observed with other methods. Based on long-term passive acoustic monitoring, seasonally, foraging behavior was more prevalent during summer, particularly at upper inlet rivers, than during winter. Foraging index was highest at Little Susitna, with a peak in July–August and a secondary peak in May, followed by Beluga River and then Eagle Bay; monthly variation in the foraging index indicates CIBWs shift their foraging behavior among these three locations from April through September.

CIBWs in Cook Inlet are believed to mostly calve between mid-May and mid-July, and concurrently breed between late spring and early summer (NMFS, 2016a), primarily in upper Cook Inlet. The only known observed occurrence of calving occurred on July 20, 2015, in the Susitna Delta area (T. McGuire, pers. comm. March 27, 2017). The first neonates encountered during each field season from 2005 through 2015 were always seen in the Susitna River Delta in July. The photographic identification team's documentation of the dates of the first neonate of each year indicate that calving begins in mid-late July/early August, generally coinciding with the observed timing of annual maximum group size. Probable mating behavior of CIBWs was observed in April and May of 2014, in Trading Bay. Young CIBWs are nursed for two years and may continue to associate with their mothers for a considerable time thereafter (Colbeck *et al.,* 2013).

The POA conducted dedicated monitoring during PCT Phase 1 construction between April and November 2020 (61 North Environmental, 2021). In total, protected species observers (PSOs) observed 245 groups of approximately 987 CIBWs near the POA (group sizes ranged from 1 to 53 individuals), with the most number of individuals and groups being seen in August (N = 56 groups of 274 individuals) and September (N = 73 groups of 276 individuals). CIBWs were observed in every month of the project (except during October, which only included three project and monitoring days) with the highest sightings per unit effort, measured as CIBWs per hour of observation, occurring at the end of August and beginning of September.

Killer Whale

Killer whales are found throughout the North Pacific Ocean. Along the west coast of North America, seasonal and year-round occurrence of killer whales occur has been noted along the entire Alaska coast (Braham and Dahlheim, 1982), in British Columbia and Washington inland waterways (Bigg *et al.,* 1990), and along the outer coasts of Washington, Oregon, and California (Green *et al.,* 1992; Barlow 1995, 1997; Forney *et al.,* 1995). Killer whales from these areas have been labeled as "resident," "transient," and "offshore" type killer whales (Bigg *et al.,* 1990, Ford *et al.,* 2000, Dahlheim *et al.,* 2008) based on aspects of morphology, ecology, genetics, and behavior (Ford and Fisher, 1982; Baird and Stacey, 1988; Baird *et al.,* 1992; Hoelzel *et al.,* 1998, 2002; Barrett Lennard, 2000; Dahlheim *et al.,* 2008). Two stocks of killer whales may be present in upper Cook Inlet: The Eastern North Pacific Alaska Resident stock and the Gulf of Alaska, Aleutian Islands, and Bering Sea

Transient stock. Both ecotypes overlap in the same geographic area; however, they maintain social and reproductive isolation and feed on different prey species.

While there have been some anecdotal reports of killer whales feeding on CIBWs in upper Cook Inlet, sightings in this region and near the POA are rare (*e.g.,* NMFS, 2016a; Sheldon *et al.,* 2003). During aerial surveys conducted between 1993 and 2004 in Cook Inlet, killer whales were only observed on three flights, and all sightings were located in the Kachemak and English Bay area, south of the POA (Rugh *et al.,* 2005). Acoustic monitoring carried out by Castellote *et al.* (2016) between 2008 and 2013 only detected one transient killer whale at Beluga River, located along the western shore of Cook Inlet, west of the POA. Surveys conducted by Funk *et al.,* (2005), Ireland *et al.,* (2005), Brueggeman *et al.,* (2007, 2008a, 2008b), and McGuire *et al.,* (2020) did not observe killer whales in the vicinity of or north of the POA. Lastly, killer whales were not observed during POA construction or scientific monitoring from 2005 to 2011, during the 2016 Test Pile Program (TPP), or during Phase 1 of the PCT project carried out between April–November 2020 (61 North Environmental, 2021). Therefore, very few killer whales, if any, are expected to approach or be near the project area during construction of the SFD.

Killer whales are not harvested for subsistence in Alaska. Potential threats most likely to result in direct human-caused mortality or serious injury of killer whales in this region include oil spills, vessel strikes, and interactions with fisheries. Based on currently available data, a minimum estimate of the mean annual mortality and serious injury rate for both the Alaska Residents and Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stocks due to U.S. commercial fisheries is less than 10 percent of the PBR and, therefore, is considered to be insignificant and approaching zero mortality and serious injury rate. Therefore, neither stock is classified as a strategic stock (Muto *et al.,* 2020b).

Harbor Porpoise

Harbor porpoises primarily frequent the coastal waters of the Gulf of Alaska and Southeast Alaska (Dahlheim *et al.,* 2000, 2009), typically occurring in waters less than 100 m deep (Hobbs and Waite, 2010). Harbor porpoise prefer nearshore areas, bays, tidal areas, and river mouths (Dahlheim *et al.,* 2000, 2009, 2015; Hobbs and Waite, 2010). In Alaskan waters, NMFS has designated three stocks of harbor porpoises for management purposes: Southeast Alaska, Gulf of Alaska, and Bering Sea Stocks (Muto *et al.,* 2020b). Porpoises found in Cook Inlet belong to the Gulf of Alaska Stock, which is distributed from Cape Suckling to Unimak Pass.

Although harbor porpoises have been frequently observed during aerial surveys in Cook Inlet (Shelden *et al.,* 2014), most sightings are of single animals and are concentrated at Chinitna and Tuxedni bays on the west side of lower Cook Inlet (Rugh *et al.,* 2005). The occurrence of larger numbers of porpoise in the lower Cook Inlet may be driven by greater availability of preferred prey and possibly less competition with CIBWs, as CIBWs move into upper inlet waters to forage on Pacific salmon during the summer months (Shelden *et al.,* 2014).

There has been an increase in harbor porpoise sightings in upper Cook Inlet over the past two decades (Shelden *et al.,* 2014). Small numbers of harbor porpoises have been consistently reported in upper Cook Inlet between April and October (Prevel-Ramos *et al.,* 2008). Harbor porpoises have been observed within Knik Arm during monitoring efforts since 2005. During POA construction from 2005 through 2011 and in 2016, harbor porpoises were reported in 2009, 2010, and 2011 (Cornick and Saxon-Kendall, 2008, 2009; Cornick and Seagars, 2016; Cornick *et al.,* 2010, 2011; Markowitz and McGuire, 2007; Prevel-Ramos *et al.,* 2006). In 2009, 20 harbor porpoises were observed during construction monitoring, with sightings in June, July, August, October, and November. Harbor porpoises were observed twice in 2010, once in July and again in August. In 2011, POA monitoring efforts documented harbor porpoises five times, with a total of six individuals, in August, October, and November at the POA (Cornick *et al.,* 2011). During other monitoring efforts conducted in Knik Arm, there were four sightings of harbor porpoises in 2005 (Shelden *et al.,* 2014), and a single harbor porpoise was observed within the vicinity of the POA in October 2007. More recent monitoring conducted during Phase 1 PCT construction documented 15 groups (18 individuals) of harbor porpoises near the POA between April and November 2020 (group sizes ranged 1–2 individuals) (61 North Environmental, 2021).

Estimates of human-caused mortality and serious injury from stranding data and fisherman self-reports are underestimates because not all animals strand or are self-reported nor are all stranded animals found, reported, or have the cause of death determined. In addition, the trend of this stock is unknown given existing data is more than eight years old. NMFS considers this stock strategic because the level of mortality and serious injury would likely exceed the PBR level if we had accurate information on stock structure, a newer abundance estimate, and complete fisheries observer coverage. Given their shallow water distribution, harbor porpoise are vulnerable to physical modifications of nearshore habitats resulting from urban and industrial development (including waste management and nonpoint source runoff) and activities such as construction of docks and other over-water structures, filling of shallow areas, dredging, and noise (Linnenschmidt *et al.,* 2013). Subsistence users have not reported any harvest from the Gulf of Alaska harbor porpoise stock since the early 1900s (Shelden *et al.,* 2014).

Steller Sea Lion

Steller sea lions inhabiting Cook Inlet belong to the Western distinct population segment (WDPS), and this is the stock considered in this analysis. NMFS defines the Steller sea lion WDPS as all populations west of longitude 144° W to the western end of the Aleutian Islands. The most recent comprehensive aerial photographic and land-based surveys of WDPS Steller sea lions in Alaska were conducted during the 2018 (Aleutian Islands west of Shumagin Islands) and 2019 (Southeast Alaska and Gulf of Alaska east of Shumagin Islands) breeding seasons (Sweeney *et al.,* 2018, 2019). The WDPS of Steller sea lions is currently listed as endangered under the ESA (55 FR 49204, November 26, 1990) and designated as depleted under the MMPA. NMFS designated critical habitat on August 27, 1993 (58 FR 45269). The critical habitat designation for the WDPS of Steller sea lions was determined to include a 37 km (20 nm) buffer around all major haul-outs and rookeries, and associated terrestrial, atmospheric, and aquatic zones, plus three large offshore foraging areas, none of which occurs in the project area. Steller sea lions feed largely on walleye pollock, salmon, and arrowtooth flounder during the summer, and walleye pollock and Pacific cod during the winter (Sinclair and Zeppelin, 2002). Except for salmon, none of these are found in abundance in upper Cook Inlet (Nemeth *et al.,* 2007).

Within Cook Inlet, Steller sea lions primarily inhabit lower Cook Inlet. However, they occasionally venture to upper Cook Inlet and Knik Arm and may be attracted to salmon runs in the region. Steller sea lions have been observed near the POA in 2009 (ICRC 2009), 2016 (Cornick and Seagars, 2016), and in 2020 during Phase 1 PCT construction monitoring (61 North Environmental, 2021). During POA construction monitoring in June of 2009, a Steller sea lion was documented three times (within the same day) in Knik Arm and was believed to be the same individual (ICRC, 2009). In 2016, Steller sea lions were observed on two separate days. On May 2, 2016, one individual was sighted. On May 25, 2016, there were five Steller sea lion sightings within a 50-minute period, and these sightings occurred in areas relatively close to one another suggesting they were likely the same animal (Cornick and Seagars, 2016). Most recently, up to six Steller sea lions were sighted across four days between May 29 and June 24, 2020 during Phase PCT 1 construction monitoring (61 North Environmental, 2021). At least two of these sightings may have been re-sights on the same individual. An additional seven unidentified pinnipeds were observed that could have been Steller sea lions or harbor seals (61 North Environmental, 2021).

The minimum estimated mean annual level of human-caused mortality and serious injury for Western U.S. Steller sea lions between 2014 and 2018 is 255 sea lions: 38 in U.S. commercial fisheries, 0.8 in unknown (commercial, recreational, or subsistence) fisheries, 3.2 in marine debris, 3.6 due to other causes (arrow strike, entangled in hatchery net, illegal shooting, mortality incidental to Marine Mammal Protection Act (MMPA) authorized research), and 209 in the Alaska Native subsistence harvest (Muto *et al.,* 2020b). However, there are multiple nearshore commercial fisheries which are not observed; thus, there is likely to be unreported fishery-related mortality and serious injury of Steller sea lions.

Several factors may have been important drivers of the decline of the stock. However, there is uncertainty about threats currently impeding their recovery, particularly in the Aleutian Islands. Many factors have been suggested as causes of the steep decline in abundance of western Steller sea lions observed in the 1980s, including competitive effects of fishing, environmental change, disease, contaminants, killer whale predation, incidental take, and illegal and legal shooting (Atkinson *et al.,* 2008; NMFS, 2008a). A number of management actions have been implemented since 1990 to promote the recovery of the Western U.S. stock of Steller sea lions, including 3-nmi no-entry zones around rookeries, prohibition of shooting at or near sea lions, and regulation of fisheries for sea lion prey species (*e.g.,* walleye pollock, Pacific cod, and Atka mackerel) (Sinclair *et al.,* 2013, Tollit *et al.,* 2017). Additionally, potentially deleterious events, such as harmful algal blooms (Lefebvre *et al.,* 2016) and disease transmission across the Arctic (VanWormer *et al.,* 2019) that have been associated with warming waters, could lead to potentially negative population-level impacts on Steller sea lions.

Harbor Seal

Harbor seals inhabit coastal and estuarine waters off Baja California, north along the western coasts of the United States, British Columbia, and Southeast Alaska, west through the Gulf of Alaska and Aleutian Islands, and in the Bering Sea north to Cape Newenham and the Pribilof Islands. They haul out on rocks, reefs, beaches, and drifting glacial ice and feed in marine, estuarine, and occasionally fresh waters. Harbor seals generally are non-migratory, with local movements associated with such factors as tides, weather, season, food availability, and reproduction (Scheffer and Slipp, 1944; Fisher, 1952; Bigg, 1969, 1981; Hastings *et al.,* 2004). NMFS currently identifies twelve stocks of harbor seals based largely on genetic structure (Muto *et al.,* 2020a). Harbor seals from the Cook Inlet/Shelikof Strait stock, which ranges from the southwest tip of Unimak Island east along the southern coast of the Alaska Peninsula to Elizabeth Island off the southwest tip of the Kenai Peninsula, including Cook Inlet, Knik Arm, and Turnagain Arm, are considered in this analysis.

Harbor seals belonging to this stock inhabit the coastal and estuarine waters of Cook Inlet and are observed in both upper and lower Cook Inlet throughout most of the year (Boveng *et al.,* 2012; Shelden *et al.,* 2013). Research on satellite-tagged harbor seals conducted between 2004 and 2006 observed several movement patterns within Cook Inlet (Boveng *et al.,* 2012), including a strong seasonal pattern of more coastal and restricted spatial use during the spring and summer (breeding, pupping, molting) and more wide-ranging movements within and outside of Cook Inlet during the winter months, with some seals ranging as far as Shumigan Islands. During summer months, movements and distribution was mostly confined to the west side of Cook Inlet and Kachemak Bay, and seals captured in lower Cook Inlet generally exhibited site fidelity by remaining south of the Forelands in lower Cook Inlet after release (Boveng *et al.,* 2012).

The presence of harbor seals in upper Cook Inlet is seasonal. Harbor seals are commonly observed along the Susitna River and other tributaries within upper Cook Inlet during eulachon and salmon migrations (NMFS, 2003). The major haulout sites for harbor seals are located in lower Cook Inlet with fewer sites in upper Cook Inlet (Montgomery *et al.,* 2007). In the project area (Knik Arm), harbor seals tend to congregate near the mouth of Ship Creek (Cornick *et al.,* 2011; Shelden *et al.,* 2013), likely foraging on salmon and eulachon runs. Approximately 138 harbor seals were observed during POA monitoring prior to 2020, with sightings ranging from three individuals in 2008 to 59 individuals in 2011. During 2020 PCT Phase 1 construction monitoring, harbor seals were regularly observed in the vicinity of the POA with frequent observations near the mouth of Ship Creek, located approximately 700 m southeast of the SFD location. From 27 April through 24 November 2020, a total of 340 individual harbor seals were observed (61 North Environmental, 2021). An additional seven unidentified pinnipeds were observed that could have been Steller sea lions or harbor seals. Harbor seals were observed almost daily during construction, with 54 individuals documented in July, 66 documented in August, and 44 sighted in September (61North Environmental, 2021).

The most current population trend estimate of the Cook Inlet/Shelikof Strait stock is approximately −111 seals per year, with a probability that the stock is decreasing of 0.609 (Muto *et al.,* 2020a). The estimated level of human-caused mortality and serious injury for this stock is 234 seals, of which 233 seals are taken for subsistence uses. Between 2013 and 2017, there were two reports of Cook Inlet/Shelikof Strait harbor seal mortality and serious injury due to entanglements in fishing gear, including one in a Cook Inlet salmon set gillnet in 2014 and one in an unidentified net in 2017, resulting in a mean annual mortality and serious injury rate of 0.4 harbor seals from this stock due to interactions with unknown (commercial, recreational, or subsistence) fisheries (Muto *et al.,* 2020a). Additional potential threats most likely to result in direct human-caused mortality or serious injury for all stocks of harbor seals in Alaska include unmonitored subsistence harvests, incidental takes in commercial fisheries, illegal shooting, and entanglements in marine debris (Delean *et al.,* 2020, Muto *et al.,* 2020a). Disturbance by cruise vessels is an additional threat for harbor seal stocks that occur in glacial fjords (Jansen *et al.,* 2010, 2015; Matthews *et* *al.,* 2016). The average annual harvest of this stock of harbor seals between 2004 and 2008 was 233 seals per year. The annual harvest in 2014 was 104 seals (Muto *et al.,* 2020a). This stock is not designated as depleted under the MMPA or listed as threatened or endangered under the ESA, and the minimum estimate of the mean annual level of human-caused mortality and serious injury does not exceed PBR; therefore, the Cook Inlet/Shelikof Strait stock of harbor seals is not classified as a strategic stock (Muto *et al.,* 2020a).

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 decibel (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. Marine mammal hearing groups and their associated hearing ranges are provided in Table 3.

TABLE 3—MARINE MAMMAL HEARING GROUPS

[NMFS, 2018]

Hearing group	Generalized hearing range *
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz.
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz.
High-frequency (HF) cetaceans (true porpoises, *Kogia,* river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*).	275 Hz to 160 kHz.
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz.
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz.

* Represents the generalized hearing range for the entire group as a composite (*i.e.,* all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall *et al.,* 2007) and PW pinniped (approximation).

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 (2018) for a review of available information. Six marine mammal species (four cetacean and two pinniped (one otariid and one phocid) species) have the reasonable potential to co-occur with the proposed construction activities. Please refer to Table 2. Of the cetacean species that may be present, one is classified as low-frequency cetaceans (*i.e.,* all mysticete species), two are classified as mid-frequency cetaceans (*i.e.,* all delphinid and ziphiid species and the sperm whale), and one is classified as high-frequency cetaceans (*i.e.,* harbor porpoise and *Kogia spp.*).

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 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 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.

Description of Sound Sources

The primary relevant stressor to marine mammals from the proposed activity is the introduction of noise into the aquatic environment; therefore, we focus our impact analysis on the effects of anthropogenic noise on marine mammals. To better understand the potential impacts of exposure to pile driving noise, we describe sound source characteristics below. Specifically, we look at the following two ways to characterize sound: by its temporal (*i.e.,* continuous or intermittent) and its pulse (*i.e.,* impulsive or non-impulsive) properties. Continuous sounds are those whose sound pressure level remains above that of the ambient sound, with negligibly small fluctuations in level (NIOSH, 1998; ANSI, 2005), while intermittent sounds are defined as sounds with interrupted levels of low or no sound (NIOSH, 1998). Impulsive sounds, such as those generated by impact pile driving, are typically transient, brief (<1 sec), broadband, and consist of a high peak pressure with rapid rise time and rapid decay (ANSI, 1986; NIOSH, 1998). The majority of energy in pile impact pulses is at frequencies below 500 hertz (Hz). Impulsive sounds, by definition, are intermittent. Non-impulsive sounds, such as those generated by vibratory pile driving, can be broadband, narrowband or tonal, brief or prolonged, and typically do not have a high peak sound pressure with rapid rise/decay time that impulsive sounds do (ANSI, 1995; NIOSH, 1998). Non-impulsive sounds can be intermittent or continuous. Similar to impact pile driving, vibratory pile driving generates low frequency sounds. Vibratory pile driving is considered a non-impulsive, continuous source. Discussion on the appropriate harassment threshold associated with these types of sources based on these characteristics can be found in the Estimated Take section.

Potential Effects of Pile Driving—In general, the effects of sounds from pile driving to marine mammals might result in one or more of the following: Temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, and masking (Richardson *et al.,* 1995; Nowacek *et al.,* 2007; Southall *et al.,* 2007). The potential for and magnitude of these effects are dependent on several factors, including receiver characteristics (*e.g.,* age, size, depth of the marine mammal receiving the sound during exposure); the energy needed to drive the pile (usually related to pile size, depth driven, and substrate), the standoff distance between the pile and receiver; and the sound propagation properties of the environment.

Impacts to marine mammals from pile driving activities are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the received level and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The further away from the source, the less intense the exposure should be. The type of pile driving also influences the type of impacts, for example, exposure to impact pile driving may result in temporary or permanent hearing impairment, while auditory impacts are unlikely to result from exposure to vibratory pile driving. The substrate and depth of the habitat affect the sound propagation properties of the environment. Shallow environments are typically more structurally complex, which leads to rapid sound attenuation. In addition, substrates that are soft (*e.g.,* sand) absorb or attenuate the sound more readily than hard substrates (*e.g.,* rock) which may reflect the acoustic wave. Soft porous substrates also likely require less time to drive the pile, and possibly less forceful equipment, which ultimately decrease the intensity of the acoustic source.

Richardson *et al.,* (1995) described zones of increasing intensity of effect that might be expected to occur, in relation to distance from a source and assuming that the signal is within an animal's hearing range. First is the area within which the acoustic signal would be audible (potentially perceived) to the animal, but not strong enough to elicit any overt behavioral or physiological response. The next zone corresponds with the area where the signal is audible to the animal and of sufficient intensity to elicit behavioral or physiological responsiveness. Third is a zone within which, for signals of high intensity, the received level is sufficient to potentially cause discomfort or tissue damage to auditory or other systems. Overlaying these zones to a certain extent is the area within which masking (*i.e.,* when a sound interferes with or masks the ability of an animal to detect a signal of interest that is above the absolute hearing threshold) may occur; the masking zone may be highly variable in size.

We describe the more severe effects (*i.e.,* permanent hearing impairment, certain non-auditory physical or physiological effects) only briefly as we do not expect that there is a reasonable likelihood that POA's activities would result in such effects (see below for further discussion).

NMFS defines a noise-induced threshold shift (TS) as ''a change, usually an increase, in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level'' (NMFS, 2016b). The amount of threshold shift is customarily expressed in dB (ANSI 1995, Yost 2007). A TS can be permanent (PTS) or temporary (TTS). As described in NMFS (2018), there are numerous factors to consider when examining the consequence of TS, including, but not limited to, the signal temporal pattern (*e.g.,* impulsive or non-impulsive), likelihood an individual would be exposed for a long enough duration or to a high enough level to induce a TS, the magnitude of the TS, time to recovery (seconds to minutes or hours to days), the frequency range of the exposure (*i.e.,* spectral content), the hearing and vocalization frequency range of the exposed species relative to the signal's frequency spectrum (*i.e.,* how animal uses sound within the frequency band of the signal; *e.g.,* Kastelein *et al.,* 2014), and the overlap between the animal and the source (*e.g.,* spatial, temporal, and spectral). When analyzing the auditory effects of noise exposure, it is often helpful to broadly categorize sound as either impulsive—noise with high peak sound pressure, short duration, fast rise-time, and broad frequency content—or non-impulsive. When considering auditory effects, vibratory pile driving is considered a non-impulsive source while impact pile driving is treated as an impulsive source.

Permanent Threshold Shift—NMFS defines PTS as a permanent, irreversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2018). Available data from humans and other terrestrial mammals indicate that a 40 dB threshold shift approximates PTS onset (see NMFS 2018 for review).

Temporary Threshold Shift—NMFS defines TTS as a temporary, reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2018). Based on data from cetacean TTS measurements (see Finneran 2015 for a review), a TTS of 6 dB is considered the minimum threshold shift clearly larger than any day-to-day or session-to-session variation in a subject's normal hearing ability (Schlundt *et al.,* 2000; Finneran *et al.,* 2000; Finneran *et al.,* 2002).

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 takes place during a time when the animal is traveling through the open ocean, 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. We note that 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 we can infer that strategies exist for coping with this condition to some degree, though likely not without cost.

Schlundt *et al.* (2000) performed a study exposing five bottlenose dolphins and two beluga whales (same individuals as Finneran's studies) to intense one second tones at different frequencies. The resulting levels of fatiguing stimuli necessary to induce 6 dB or larger masked TTSs were generally between 192 and 201 dB re: 1 microPascal (μPa). Dolphins began to exhibit altered behavior at levels of 178–193 dB re: 1μPa and above; beluga whales displayed altered behavior at 180–196 dB re: 1 μPa and above. At the conclusion of the study, all thresholds were at baseline values.

There are a limited number of studies investigating the potential for cetacean TTS from pile driving and only one has elicited a small amount of TTS in a single harbor porpoise individual (Kastelein *et al.,* 2015). However, captive bottlenose dolphins and beluga whales have exhibited changes in behavior when exposed to pulsed sounds (Finneran *et al.,* 2000, 2002, 2005). The animals tolerated high received levels of sound before exhibiting aversive behaviors. Experiments on a beluga whale showed that exposure to a single watergun impulse at a received level of 207 kiloPascal (kPa) (30 psi) p-p, which is equivalent to 228 dB p-p, resulted in a 7 and 6 dB TTS in the beluga whale at 0.4 and 30 kHz, respectively. Thresholds returned to within 2 dB of the pre-exposure level within four minutes of the exposure (Finneran *et al.,* 2002). Although the source level of pile driving from one hammer strike is expected to be lower than the single watergun impulse cited here, animals being exposed for a prolonged period to repeated hammer strikes could receive more sound exposure in terms of SEL than from the single watergun impulse (estimated at 188 dB re 1 μPa^2-s) in the aforementioned experiment (Finneran *et al.,* 2002). Results of these studies suggest odontocetes are susceptible to TTS from pile driving, but that they seem to recover quickly from at least small amounts of TTS.

Behavioral Responses—Behavioral disturbance may include a variety of effects, including subtle changes in behavior (*e.g.,* minor or brief avoidance of an area or changes in vocalizations), more conspicuous changes in similar behavioral activities, and more sustained and/or potentially severe reactions, such as displacement from or abandonment of high-quality habitat. Disturbance may result in changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where sound sources are located. Pinnipeds may increase their haul-out time, possibly to avoid in-water disturbance (Thorson and Reyff, 2006). Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (*e.g.,* species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g.,* Richardson *et al.,* 1995; Wartzok *et al.,* 2003; Southall *et al.,* 2007; Weilgart, 2007; Archer *et al.,* 2010). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison *et al.,* 2012), and can vary depending on characteristics associated with the sound source (*e.g.,* whether it is moving or stationary, number of sources, distance from the source). In general, pinnipeds seem more tolerant of, or at least habituate more quickly to, potentially disturbing underwater sound than do cetaceans, and generally seem to be less responsive to exposure to industrial sound than most cetaceans. Please see Appendices B–C of Southall *et al.* (2007) for a review of studies involving marine mammal behavioral responses to sound.

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok *et al.,* 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. It is important to note that habituation is appropriately considered as a ''progressive reduction in response to stimuli that are perceived as neither aversive nor beneficial,'' rather than as, more generally, moderation in response to human disturbance (Bejder *et al.,* 2009). The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure.

As noted above, behavioral state may affect the type of response. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson *et al.,* 1995; NRC, 2003; Wartzok *et al.,* 2003). Controlled experiments with captive marine mammals have showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway *et al.,* 1997; Finneran *et al.,* 2003). Observed responses of wild marine mammals to loud pulsed sound sources (typically seismic airguns or acoustic harassment devices) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds 2002; see also Richardson *et al.,* 1995; Nowacek *et al.,* 2007).

Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the stock or population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g.,* Lusseau and Bejder, 2007; Weilgart, 2007; NRC, 2005). However, there are broad categories of potential response, which we describe in greater detail here, that include alteration of dive behavior, alteration of foraging behavior, effects to breathing, interference with or alteration of vocalization, avoidance, and flight.

Changes in dive behavior can vary widely and may consist of increased or decreased dive times and surface intervals as well as changes in the rates of ascent and descent during a dive (*e.g.,* Frankel and Clark, 2000; Costa *et al.,* 2003; Ng and Leung, 2003; Nowacek *et al.,* 2004; Goldbogen *et al.,* 2013a,b). Variations in dive behavior may reflect interruptions in biologically significant activities (*e.g.,* foraging) or they may be of little biological significance. The impact of an alteration to dive behavior resulting from an acoustic exposure depends on what the animal is doing at the time of the exposure and the type and magnitude of the response.

Disruption of feeding behavior can be difficult to correlate with anthropogenic sound exposure, so it is usually inferred by observed displacement from known foraging areas, the appearance of secondary indicators (*e.g.,* bubble nets or sediment plumes), or changes in dive behavior. As for other types of behavioral response, the frequency, duration, and temporal pattern of signal presentation, as well as differences in species sensitivity, are likely contributing factors to differences in response in any given circumstance (*e.g.,* Croll *et al.,* 2001; Nowacek *et al.,* 2004; Madsen *et al.,* 2006; Yazvenko *et al.,* 2007). A determination of whether foraging disruptions incur fitness consequences would require information on or estimates of the energetic requirements of the affected individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal.

Variations in respiration naturally vary with different behaviors and alterations to breathing rate as a function of acoustic exposure can be expected to co-occur with other behavioral reactions, such as a flight response or an alteration in diving. However, respiration rates in and of themselves may be representative of annoyance or an acute stress response. Various studies have shown that respiration rates may either be unaffected or could increase, depending on the species and signal characteristics, again highlighting the importance in understanding species differences in the tolerance of underwater noise when determining the potential for impacts resulting from anthropogenic sound exposure (*e.g.,* Kastelein *et al.,* 2001, 2005b, 2006; Gailey *et al.,* 2007).

Marine mammals vocalize for different purposes and across multiple modes, such as whistling, echolocation click production, calling, and singing. Changes in vocalization behavior in response to anthropogenic noise can occur for any of these modes and may result from a need to compete with an increase in background noise or may reflect increased vigilance or a startle response. For example, in the presence of potentially masking signals, humpback whales and killer whales have been observed to increase the length of their songs (Miller *et al.,* 2000; Fristrup *et al.,* 2003; Foote *et al.,* 2004), while right whales (*Eubalaena glacialis*) have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al.,* 2007). In some cases, animals may cease sound production during production of aversive signals (Bowles *et al.,* 1994).

Avoidance is the displacement of an individual from an area or migration path as a result of the presence of a sound or other stressors, and is one of the most obvious manifestations of disturbance in marine mammals (Richardson *et al.,* 1995). For example, gray whales (*Eschrictius robustus*) are known to change direction—deflecting from customary migratory paths—in order to avoid noise from seismic surveys (Malme *et al.,* 1984). Avoidance may be short-term, with animals returning to the area once the noise has ceased (*e.g.,* Bowles *et al.,* 1994; Goold, 1996; Stone *et al.,* 2000; Morton and Symonds, 2002; Gailey *et al.,* 2007). Longer-term displacement is possible, however, which may lead to changes in abundance or distribution patterns of the affected species in the affected region if habituation to the presence of the sound does not occur (*e.g.,* Blackwell *et al.,* 2004; Bejder *et al.,* 2006; Teilmann *et al.,* 2006).

A flight response is a dramatic change in normal movement to a directed and rapid movement away from the perceived location of a sound source. The flight response differs from other avoidance responses in the intensity of the response (*e.g.,* directed movement, rate of travel). Relatively little information on flight responses of marine mammals to anthropogenic signals exist, although observations of flight responses to the presence of predators have occurred (Connor and Heithaus, 1996). The result of a flight response could range from brief, temporary exertion and displacement from the area where the signal provokes flight to, in extreme cases, marine mammal strandings (Evans and England, 2001). However, it should be noted that response to a perceived predator does not necessarily invoke flight (Ford and Reeves, 2008), and whether individuals are solitary or in groups may influence the response.

Behavioral disturbance can also impact marine mammals in more subtle ways. Increased vigilance may result in costs related to diversion of focus and attention (*i.e.,* when a response consists of increased vigilance, it may come at the cost of decreased attention to other critical behaviors such as foraging or resting). These effects have generally not been demonstrated for marine mammals, but studies involving fish and terrestrial animals have shown that increased vigilance may substantially reduce feeding rates (*e.g.,* Beauchamp and Livoreil 1997; Fritz *et al,* 2002; Purser and Radford, 2011). In addition, chronic disturbance can cause population declines through reduction of fitness (*e.g.,* decline in body condition) and subsequent reduction in reproductive success, survival, or both (*e.g.,* Harrington and Veitch, 1992; Daan *et al.,* 1996; Bradshaw *et al.,* 1998). However, Ridgway *et al.* (2006) reported that increased vigilance in bottlenose dolphins exposed to sound over a five-day period did not cause any sleep deprivation or stress effects.

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (24-hour cycle). Disruption of such functions resulting from reactions to stressors such as sound exposure are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al.,* 2007). Consequently, a behavioral response lasting less than one day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall *et al.,* 2007). Note that there is a difference between multi-day substantive behavioral reactions and multi-day anthropogenic activities. For example, just because an activity lasts for multiple days does not necessarily mean that individual animals are either exposed to activity-related stressors for multiple days or, further, exposed in a manner resulting in sustained multi-day substantive behavioral responses.

Stress responses—An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (*e.g.,* Seyle, 1950; Moberg, 2000). In many cases, an animal's first and sometimes most economical (in terms of energetic costs) response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

Neuroendocrine stress responses often involve the hypothalamus-pituitary-adrenal system. Virtually all neuroendocrine functions that are affected by stress—including immune competence, reproduction, metabolism, and behavior—are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance (*e.g.,* Moberg, 1987; Blecha, 2000). Increases in the circulation of glucocorticoids are also equated with stress (Romano *et al.,* 2004).

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

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments and for both laboratory and free-ranging animals (*e.g.,* Holberton *et al.,* 1996; Hood *et al.,* 1998; Jessop *et al.,* 2003; Krausman *et al.,* 2004; Lankford *et al.,* 2005). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker, 2000; Romano *et al.,* 2002b, Wright *et al.,* 2007) and, more rarely, studied in wild populations (*e.g.,* Romano *et al.,* 2002a). For example, Rolland *et al.,* (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as ''distress.'' In addition, any animal experiencing TTS would likely also experience stress responses (NRC, 2003).

Specific to CIBWs, we have several years of marine mammal monitoring data demonstrating the behavioral responses to pile driving at the POA. Previous pile driving activities range from the installation and removal of sheet pile driving to installation of 48-in pipe piles with both vibratory and impact hammers, and vibratory installation of 72-inch air bubble casings. Kendall and Cornick (2015) provide a comprehensive overview of four years of scientific marine mammal monitoring conducted during the POA's Expansion Project. These were observations made independent of pile driving activities (*i.e.,* not construction based PSOs). The authors investigated CIBWs behavior before and during pile driving activity at the POA. Sighting rates, mean sighting duration, behavior, mean group size, group composition, and group formation were compared between the two periods. A total of about 2,329 h of sampling effort was completed across 349 d from 2005 to 2009. Overall, 687 whales in 177 groups were documented during the 69 days that whales were sighted. A total of 353 and 1,663 hours of pile driving took place in 2008 and 2009, respectively. There was no relationship between monthly CIBW sighting rates and monthly pile driving rates ($r = 0.19$, $p = 0.37$). Sighting rates before ($n = 12$; 0.06 ± 0.01) and during ($n = 13$; 0.01 ± 0.03) pile driving were not significantly different. However, sighting duration of CIBWs decreased significantly during pile driving (39 ± 6 min before and 18 $\pm$ 3 min during). There were also significant differences in behavior before versus during pile driving. CIBWs primarily traveled through the study area both before and during pile driving; however, traveling increased relative to other behaviors during pile driving. Suspected feeding decreased during pile driving although the sample size was low as feeding was observed on only two occasions before pile driving and on zero occasions during pile driving. Documentation of milling began in 2008 and was observed on 21 occasions. No acute behavioral responses were documented. Mean group size decreased during pile driving; however, this difference was not statistically significant. There were significant differences in group composition before and during pile driving between monthly CIBW sighting rates and monthly pile driving rates with more white (*i.e.,* older) animals being present during pile driving.

During PCT construction monitoring, behaviors of CIBWs groups were compared by month and by construction activity (61 North Environmental, 2021). Little variability was evident in the behaviors recorded from month to month, or between sightings that coincided with in-water pile installation and removal and those that did not. One minor difference was a slightly higher incidence of milling behavior during the periods of no pile driving and slightly higher rates of traveling behavior during periods when CIBWs were potential disturbed by pile driving.

Acoustically, Kendall *et al.* (2013) only recorded echolocation clicks and no whistles or noisy vocalizations near construction activity at the POA. CIBWs have been occasionally documented to forage around Ship Creek (south of the POA) but, during pile driving, may choose to move past the POA to other, potentially richer, feeding areas further into Knik Arm (*e.g.,* Six Mile Creek, Eagle River, Eklutna River). These locations contain predictable salmon runs (ADF&G, 2010), an important food source for CIBWs, and the timing of these runs has been correlated with CIBW movements into the upper reaches of Knik Arm (Ezer *et al.,* 2013).

Auditory Masking

Since many marine mammals rely on sound to find prey, moderate social interactions, and facilitate mating (Tyack, 2008), noise from anthropogenic sound sources can interfere with these functions, but only if the noise spectrum overlaps with the hearing sensitivity of the marine mammal (Southall *et al.,* 2007; Clark *et al.,* 2009; Hatch *et al.,* 2012). Chronic exposure to excessive, though not high-intensity, noise could cause masking at particular frequencies for marine mammals that 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, 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. Masking occurs at the frequency band which the animals utilize so the frequency range of the potentially masking sound is important in determining any potential behavioral impacts. Pile driving generates low frequency sounds; therefore, mysticete foraging is likely more affected than odontocetes given very high frequency echolocation clicks (typically associated with odontocete foraging) are likely unmasked to any significant degree. However, lower frequency man-made sounds may affect communication signals when they occur near the sound 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).

Moreover, even within a given species, different types of man-made noises may results in varying degrees of masking. For example, Erbe (1997) and Erbe and Farmer (1998) analyzed the effect of masking of beluga calls by exposing a trained beluga to icebreaker propeller noise, an icebreaker's bubbler system, and ambient Arctic ice cracking noise, and found that the latter was the least problematic for the whale detecting the calls. Sheifele *et al.* (2005) studied a population of belugas in the St. Lawrence River Estuary to determine whether beluga vocalizations showed intensity changes in response to shipping noise. This type of behavior has been observed in humans and is known as the Lombard vocal response (Lombard, 1911). Sheifele *et al.* (2005) demonstrated that shipping noise did cause belugas to vocalize louder. The acoustic behavior of this same population of belugas was studied in the presence of ferry and small boat noise. Lesage *et al.* (1999) described more persistent vocal responses when whales were exposed to the ferry than to the small-boat noise. These included a progressive reduction in calling rate while vessels were approaching, an increase in the repetition of specific calls, and a shift to higher frequency bands used by vocalizing animals when vessels were close to the whales. The authors concluded that these changes, and the reduction in calling rate to almost silence, may reduce communication efficiency which is critical for a species of a gregarious nature. However, the authors also stated that because of the gregarious nature of belugas, this ''would not pose a serious problem for intraherd communication'' of belugas given the short distance between group members, and concluded a noise source would have to be very close to potentially limit any communication within the beluga group (Lesage *et al.,* 1999). However, increasing the intensity or repetition rate, or shifting to higher frequencies when exposed to shipping noise (from merchant, whale watching, ferry and small boats), is indicative of an increase of energy costs (Bradbury and Vehrencamp, 1998).

Marine mammals in Cook Inlet are continuously exposed to anthropogenic noise which may lead to some habituation but is also a source of masking (Castellote *et al.,* 2019, Mooney *et al.,* 2020). A subsample (8756 hours) of the acoustic recordings collected by the Cook Inlet Beluga Acoustics research program in Cook Inlet, Alaska, from July 2008 to May 2013, were analyzed to describe anthropogenic sources of underwater noise, acoustic characteristics, and frequency of occurrence and evaluate the potential for acoustic impact to CIBWs. As described in Castellote *et al.,* (2016), a total of 13 sources of noise were identified: commercial ship, dredging, helicopter, jet aircraft (commercial or non-fighter), jet aircraft (military fighter), outboard engine (small skiffs, rafts), pile driving, propeller aircraft, sub-bottom profiler, unclassified machinery (continuous mechanical sound; *e.g.,* engine), unidentified 'clank' or 'bang' (impulsive mechanical sound; *e.g.,* barge dumping), unidentified (unclassifiable anthropogenic sound), unknown up- or down-sweep (modulated tone of mechanical origin; *e.g.,* hydraulics). A total of 6263 anthropogenic acoustic events were detected and classified, which had a total duration of 1025 hours and represented 11.7 percent of the sound recordings analyzed. There was strong variability in source diversity, loudness, distribution, and seasonal occurrence of noise, which reflects the many different activities within the Cook Inlet. Cairn Point was the location where the loudness and duration of commercial ship noise events were most concentrated, due to activities at the POA. This specific source of anthropogenic noise was present in the recordings from all months analyzed, with highest levels in August. In addition to the concentrated shipping noise at Cairn Point, a combination of unknown noise classes occurred in this area, particularly during summer. Specifically, unknown up or down sweeps, unidentified, unclassed machinery, and unidentified clank or bang noise classes were all documented. In contrast, Eagle River (north of the POA and where CIBWs concentrate to forage) was the quietest of all sampled locations.

Sensitivity in CIBW hearing may make them more susceptible to masking. The first empirical hearing data of a CIBW was recently obtained by Mooney *et al.,* (2020), who used auditory evoked potentials to measure the hearing of a wild, stranded CIBW as part of its rehabilitation assessment. The CIBW exhibited broadband (4–128 kHz) and sensitive hearing (<80 dB) for a wide range of frequencies (16–80 kHz), with the audiogram shape and waveforms generally reflective of a sensitive odontocete's auditory system without substantial hearing loss (Mooney *et al.,* 2020). This sensitivity suggests that CIBWs are susceptible to masking from a variety of anthropogenic sources in Cook Inlet.

Potential Pile Driving Effects on Prey—Pile driving produces continuous, non-impulsive (*i.e.,* vibratory pile driving) sounds and intermittent, pulsed (*i.e.,* impact driving) sounds. Fish react to sounds that are especially strong and/or intermittent low-frequency sounds. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented effects of pile driving on fish, although several are based on studies in support of large, multiyear bridge construction projects (*e.g.,* Scholik and Yan, 2001, 2002; Popper and Hastings, 2009). Sound pressure levels (SPLs) of sufficient strength have been known to cause injury to fish and fish mortality (summarized in Popper *et al.,* 2014). The most likely impact to fish from pile driving activities at the project area would be temporary behavioral avoidance of the area. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated.

As discussed in the Marine Mammal section above, NMFS designated CIBW critical habitat in Knik Arm. Knik Arm is Type 1 habitat for the CIBWs, which means it is the most valuable, used intensively by CIBWs from spring through fall for foraging and nursery habitat. However, the POA, the adjacent navigation channel, and the turning basin were excluded from critical habitat designation due to national security concerns (76 FR 20180; April 11, 2011). Foraging primarily occurs at river mouths (*e.g.,* Susitna Delta, Eagle River flats) which are unlikely to be influenced by pile driving activities. The Susitna Delta is more than 20 km from the POA and Cairn Point is likely to impede any pile driving noise from propagating into northern Knik Arm. Of the 245 CIBW groups observed during PCT construction monitoring, only two groups were suspected to be feeding (61 North Environmental, 2021). One of these groups (n = 4 CIBWs) was observed on May 7, 2020, a non-pile driving day, approximately 142 m away from the PCT. The other group (n = 3 CIBWs) was observed on July 14, 2020 during impact installation of an attenuated 48-inch pile. These CIBWs were suspected to be foraging in Bootleggers Cove, approximately 1,399 m way from the PCT and outside the respective Level B harassment zone (824 m). It was unclear whether or not feeding occurred during pile driving activities (61 North Environmental, 2021).

Acoustic habitat is the soundscape which encompasses all of the sound present in a particular location and time, as a whole, when considered from the perspective of the animals experiencing it. Animals produce sound for, or listen for sounds produced by, conspecifics (communication during feeding, mating, and other social activities), other animals (finding prey or avoiding predators) and the physical environment (finding suitable habitats, navigating). Together, sounds made by animals and the geophysical environment (*e.g.,* produced by earthquakes, lightning, wind, rain, waves) make up the natural contributions to the total acoustics of a place. These acoustic conditions, termed acoustic habitat, are one attribute of an animal's total habitat. Soundscapes are also defined by, and acoustic habitat influenced by, the total contribution of anthropogenic sound. This may include incidental emissions from sources such as vessel traffic or may be intentionally introduced to the marine environment for data acquisition purposes (as in the use of airgun arrays or other sources). Anthropogenic noise varies widely in its frequency content, duration, and loudness and these characteristics greatly influence the potential habitat-mediated effects to marine mammals (please see also the previous discussion on masking under ''Acoustic Effects''), which may range from local effects for brief periods of time to chronic effects over large areas and for long durations. Depending on the extent of effects to habitat, animals may alter their communications signals (thereby potentially expending additional energy) or miss acoustic cues (either conspecific or adventitious). For more detail on these concepts see, *e.g.,* Barber *et al.,* 2010; Pijanowski *et al.,* 2011; Francis and Barber, 2013; Lillis *et al.,* 2014.

CIBW foraging habitat is limited at the POA given the highly industrialized area. However, foraging habitat exists near the POA, including Ship Creek and to the north of Cairn Point. Potential impacts to foraging habitat include increased turbidity and elevation in noise levels during pile driving. While the POA is building a new dock, it is removing the float and gangway of the existing dock and permanent impacts from the presence of the new dock are negligible. Here, we focus on construction impacts such as increased turbidity and reference the section on acoustic habitat impacts above.

Pile installation may temporarily increase turbidity resulting from suspended sediments. Any increases would be temporary, localized, and minimal. POA must comply with state water quality standards during these operations by limiting the extent of turbidity to the immediate project area. In general, turbidity associated with pile installation is localized to about a 25-foot (7.6 m) radius around the pile (Everitt *et al.,* 1980). Cetaceans are not expected to be close enough to the project activity areas to experience effects of turbidity, and any small cetaceans and pinnipeds could avoid localized areas of turbidity. Therefore, the impact from increased turbidity levels is expected to be discountable to marine mammals. No turbidity impacts to Ship Creek or critical CIBW foraging habitats are anticipated.

In summary, activities associated with the proposed SFD project are not likely to have a permanent, adverse effect on marine mammal habitat or populations of fish species or on the quality of acoustic habitat. Marine mammals may choose to not forage in close proximity to the SFD site during pile driving; however, the POA is not a critical foraging location for any marine mammal species. As discussed above, harbor seals primarily use Ship Creek as foraging habitat within Knik Arm. CIBWs utilize Eagle Bay and rivers north of the POA which are not expected to be ensonified by the SFD project. Therefore, no impacts to critical foraging grounds are anticipated.

Estimated Take

This section provides an estimate of the number of incidental takes proposed for authorization through this IHA, 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 pile driving has the potential to result in disruption of behavioral patterns for individual marine mammals, either directly or as a result of TTS. There is also some potential for auditory injury (Level A harassment) to result, primarily for mysticetes, 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 the 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 harassed 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) and 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

NMFS recommends the use of acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (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 behavioral harassment. NMFS predicts that marine mammals are likely to be behaviorally harassed in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 μPa (root mean square; rms) for continuous (*e.g.,* vibratory pile-driving, drilling) and above 160 dB re 1 μPa (rms) for non-explosive impulsive (*e.g.,* seismic airguns) or intermittent (*e.g.,* scientific sonar) sources. This take estimation includes disruption of behavioral patterns resulting directly in response to noise exposure (*e.g.,* avoidance), as well as that resulting indirectly from associated impacts such as TTS or masking. However, ambient noise levels within Knik Arm are above the 120-dB threshold, and therefore, for purposes of this analysis, NMFS considers received levels above those of the measured ambient noise (122.2 dB) to constitute Level B harassment of marine mammals incidental to continuous noise, including vibratory pile driving.

Results from recent acoustic monitoring conducted at the port are presented in Austin *et al.* (2016) and Denes *et al.* (2016) wherein noise levels were measured in absence of pile driving from May 27 through May 30, 2016 at two locations: Ambient-Dock and Ambient-Offshore. NMFS considers the median sound levels to be most appropriate when considering background noise levels for purposes of evaluating the potential impacts of the POA's SFD Project on marine mammals (NMFS, 2012). By using the median value, which is the 50th percentile of the measurements, for ambient noise level, one will be able to eliminate the few transient loud identifiable events that do not represent the true ambient condition of the area. This is relevant because during two of the four days (50 percent) when background measurement data were being collected, the U.S. Army Corps of Engineers was dredging Terminal 3 (located just north of the Ambient-Offshore hydrophone) for 24 hours per day with two 1-hour breaks for crew change. On the last two days of data collection, no dredging was occurring. Therefore, the median provides a better representation of background noise levels when the SFD project would be occurring. With regard to spatial considerations of the measurements, the Ambient-Offshore location is most applicable to this discussion (NMFS, 2012). The median ambient noise level collected over four days at the end of May at the Ambient-Offshore hydrophone was 122.2 dB. We note the Ambient-Dock location was quieter, with a median of 117 dB; however, that hydrophone was placed very close to the dock and not where we would expect Level B harassment to occur given mitigation measures (*e.g.,* shut downs). We also recognize that during Phase 1 PCT acoustic monitoring, noise levels in Knik Arm absent pile driving were collected (Reyff *et al.,* 2021); however, the Phase 1 PCT IHA did not require ambient noise measurements to be collected. These measurements were not collected in accordance to NMFS (2012) guidance for measuring ambient noise and thus cannot be used here for that purpose. If additional data collected in the future warrant revisiting this issue, NMFS may adjust the 122.2 dB rms Level B harassment threshold.

Level A harassment for non-explosive sources—NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (NMFS, 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). The POA's proposed activity includes the use of non-impulsive (vibratory pile driving) sources.

These thresholds are provided in Table 4 below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2018 Technical Guidance, which may be accessed at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance.*

TABLE 4—THRESHOLDS IDENTIFYING THE ONSET OF PERMANENT THRESHOLD SHIFT

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

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

Note: Peak sound pressure (L_{pk}) has a reference value of 1 μPa, and cumulative sound exposure level (L_E) has a reference value of 1μPa^{2}s. 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.

The estimated sound source levels (SSL) proposed by the POA and used in this assessment for vibratory installation of attenuated piles are based on sound levels of 24-inch and 36-inch piles measured during a sound source verification (SSV) study conducted during Phase 1 of the POA's 2020 PCT project (Reyff *et al.,* 2021). For the 24-inch template piles, SSLs measured for 24-inch PCT template piles by Reyff *et al.* (2021) were selected for use as a proxy for 24-inch SFD template piles based on anticipated pile function (Table 5). These piles were driven for 19.2 to 25.6 minutes, using an APE 200–6 vibratory hammer and a confined bubble curtain (Reyff *et al.,* 2021). For the 36-inch template piles, SSLs are assumed to be similar to the SSLs measured for 36-inch trestle piles installed during PCT construction (note no 36-inch template piles were measured in Reyffe *et al.,* 2021) (Table 5). These piles were installed with a confined bubble curtain using an APE 300–6 vibratory hammer; driving times ranged from 22.1 to 36.4 minutes. It is assumed that SLLs during pile installation and removal for both pile sizes will be similar.

No unattenuated 24-inch or 36-inch piles were installed during either the TPP (Austin *et al.,* 2016) or PCT SSV projects (Reyeff *et al.,* 2021). Instead, SSL measurements collected during marine construction projects conducted by the U.S. Navy for the Naval Base Kitsap at Bangor EHW–2 Project (U.S. Navy, 2015), which were installed at similar depths and in a similar marine environment, were used as proxies for vibratory and impact installation of unattenuated piles for the SFD project (Table 5). It is assumed that SSLs during vibratory pile installation and removal will be similar.

SSLs measurements for attenuated 24-inch and 36-inch piles driven with an impact hammer also were not measured during either the TPP (Austin *et al.,* 2016) or PCT SSV projects (Reyeff *et al.,* 2021). SSL measurements for impact installation made by Ryeff *et al.* (2021) were on piles using a confined bubble curtain system with 48-inch piles; whereas, an unconfined system is proposed with smaller piles for the SFD. In a confined bubble curtain system, the bubbles are confined to the area around the pile with a flexible material or rigid pipe; however, in an unconfined bubble curtain system, there is no such system for restraining the bubbles (NAVFAC SW, 2020). Unconfined bubble curtain performance is highly variable and effectiveness depends on the system design and on-site conditions such as water depth, water current velocity, substrate and underlying geology. The unconfined systems typically consist of vertically stacked bubble rings, while the confined systems are a single ring at the bottom placed inside a casing that encompasses the pile. The U.S. Navy (2015) summarized several studies which demonstrated that unconfined bubble curtains performance can be effective in attenuating underwater noise from impact pile installation. They found bubble curtain performance to be highly variable, but based on information from the Bangor Naval Base Test Pile Program, found an average peak SPL reduction of 8 dB to 10 dB at 10 m would be an achievable level of attenuation for steel pipe piles of 36- and 48-inches in diameter. The efficiency of bubble curtains with 24-inch piles was not examined by the U.S. Navy (2015). Based on these analyses, and the effect that local currents may have on the distribution of bubbles and thus effectiveness of an unconfined bubble curtain, NMFS conservatively applies a 7 dB reduction to the U.S. Navy (2015) unattenuated SSLs (Table 5) for attenuated 24-inch and 36-inch piles during impact pile driving (Table 5). These SSLs are consistent with SSLs previously proposed and authorized by NMFS for POA impact pile driving of 24-inch and 36-inch piles (*e.g.,* PCT Final IHA [85 FR 19294]). Rationale for using a 7 dB reduction has further been provided on June 19, 2019, in 84 FR 28474 and on November 25, 2019, in 84 FR 64833. This reduction is more conservative than the confined bubble curtain efficacy reported by Reyff *et al.* (2021), which ranged from 9 to 11 dB for peak, rms, and SEL single strike measurements.

The TL coefficients reported in the PCT SSV are highly variable and are generally lower than values previously reported and used in the region. For example, Reyff *et al.* (2021) reported unweighted transmission loss coefficients ranging from 8.9 to 16.3 dB SEL and 7.0 to 16.7 dB rms for impact driving 48-inch attenuated piles. In the PCT Final IHA (85 FR 19294), the POA proposed, and NMFS applied, a TL rate of 16.85 dB SEL for assessing potential for Level A harassment from impact pile driving and a TL rate of 18.35 dB rms when assessing potential for Level B harassment from impact pile driving for based on Austin *et al.* (2016) measurements recorded during the TPP on 48-in piles. Higher TL rates in Knik Arm are supported by additional studies, such as by Širović and Kendall (2009), who reported a TL of 16.4 dB during impact hammer driving during passive acoustic monitoring of the POA Marine Terminal Redevelopment Project, and by Blackwell (2005) who reported TLs ranging from 16—18 dB SEL and 21.8 dB rms for impact and vibratory installation of 36-inch piles, respectively, during modifications made to the Port MacKenzie dock. After careful inspection of the data presented in the Reyff *et al.,* study (including relevant spectrograms), NMFS is concerned that flow noise in the far field measurements is negatively biasing the regressions derived to infer TL rates. While Reyff *et al.* (2021) discuss attempts they made to remove flow noise from their calculations, NMFS could not conclude that these attempts adequately removed flow noise from their measurements. Relevant to the SFD, the TL calculations of individual vibratory installation of 24-inch template piles and 36-inch trestle piles reported by Reyff *et al.* (2021) were also highly variable ranging from 12.5 to 16.6 dB rms and 14.4 to 17.2 dB rms, respectively. Given this variability and previous data suggesting higher TL rates, NMFS has preliminarily determined that applying a practical spreading loss model (15logR) to ensonified area calculations is most likely the representative scenario in Knik Arm (Table 5). The 15 TL coefficient also falls within the range of TL coefficients reported in Reyff *et al.* (2021). We note the POA will conduct additional acoustic monitoring during Phase II of the PCT in 2021 (prior to when the SFD project will commence) and, if warranted, these assumptions may be adjusted and resulting harassment isopleths modified.

TABLE 5—ESTIMATED SOUND SOURCE LEVELS AND TRANSMISSION LOSS COEFFICIENTS WITH AND WITHOUT A BUBBLE CURTAIN

Method and pile size	Unattenuated					Bubble curtain				
Vibratory	Sound level at 10 m (dB rms)			TL coefficient (dB rms)		Sound level at 10 m (dB rms)			TL coefficient (dB rms)	
36-inch	[a] 166.0			[c] 15.0		[b] 161.4			[c] 15.0	
24-inch	[a] 161.0			[c] 15.0		[b] 158.5			[c] 15.0	
Impact	Unattenuated					Bubble curtain				
	Sound level at 10 m			TL coefficient		Sound level at 10 m			TL coefficient	
	dB rms	dB SEL	dB Peak	dB rms	dB SEL	dB rms	dB SEL	dB peak	dB rms	dB SEL
36-inch	[a] 194.0	[a] 184.0	[a] 211.0	[c] 15.0	[c] 15.0	[a] 187.0	[a] 177.0	[a] 204.0	[c] 15.0	[c] 15.0
24-inch	[a] 193.0	[a] 181.0	[a] 210.0	[c] 15.0	[c] 15.0	[a] 186.0	[a] 174.0	[a] 203.0	[c] 15.0	[c] 15.0

[a] U.S. Navy 2015.
[b] Reyff *et al.,* 2021.
[c] Practical spreading loss model.

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 pile driving), NMFS User Spreadsheet predicts the distance at which, if a marine mammal remained at that distance the whole duration of the activity, it would incur PTS. Inputs used in the User Spreadsheet, and the resulting isopleths are reported below in Table 6.

TABLE 6—NMFS USER SPREADSHEET INPUTS

	24-Inch (unattenuated)	24-Inch (bubble curtain)	36-Inch (unattenuated)	36-Inch (bubble curtain)
User Spreadsheet Input: Vibratory Pile Driving				
Spreadsheet Tab Used	A.1) Non-Impul, Stat, Cont	A.1) Non-Impul, Stat, Cont	A.1) Non-Impul, Stat, Cont	A.1) Non-Impul, Stat, Cont.
Source Level (SPL RMS)	161	158.5	166	161.4.
Transmission Loss Coefficient	15	15	15	15.
Weighting Factor Adjustment (kHz).	2.5	2.5	2.5	2.5.
Time to install/remove single pile (minutes).	45/75	45/75	45/75	45/75.
Piles to install/remove per day	1/1	1–2/1–3	1/1	1–3/1–3.
User Spreadsheet Input: Impact Pile Driving				
Spreadsheet Tab Used	E.1) Impact pile driving	E.1) Impact pile driving	E.1) Impact pile driving	E.1) Impact pile driving.
Source Level (Single Strike/shot SEL).	181	174	184	177.
Transmission Loss Coefficient	15	15	15	15.
Weighting Factor Adjustment (kHz).	2	2	2	2.
Number of strikes pile	1000	1000	1000	1000.
Piles per day	1	1	1	1.

To calculate the Level B harassment isopleths, NMFS considered SPLrms source levels and the corresponding TL coefficients (dB rms; Table 5) for impact and vibratory pile driving, respectively. The resulting Level A harassment and Level B harassment isopleths are presented in Table 7.

TABLE 7—DISTANCES TO LEVEL A HARASSMENT, BY HEARING GROUP, AND LEVEL B HARASSMENT THRESHOLDS PER PILE TYPE AND INSTALLATION METHOD

Pile size	Attenuation	Hammer type (installation/removal)	Piles per day	Level A harassment (m)					Level A harassment areas (km^2) all hearing groups	Level B harassment (m)
				LF	MF	HF	PW	OW		
24-inch	Bubble Curtain	Vibratory (Installation)	1	4	1	6	3	1	<0.01	2,631
			2	7	1	9	4	1		
		Vibratory (Removal)	1	6	1	8	4	1		
			3	12	1	17	7	1		
		Impact (Installation)	1	251	9	299	135	10	<0.19	542
	Unattenuated	Vibratory (Installation)	1	6	1	9	4	1	<0.01	3,861
		Vibratory (Removal)	1	8	1	12	5	1		
		Impact (Installation)	1	735	27	876	394	29	<1.34	1,585
36-inch	Bubble Curtain	Vibratory (Installation)	1	6	1	9	4	1	<0.01	4,106
			2	10	1	15	6	1		
			3	13	2	19	8	1		
		Vibratory (Removal)	1	9	1	13	6	1		
			3	18	2	26	11	1		
		Impact (Installation)	1	398	15	474	213	16	<0.76	631
	Unattenuated	Vibratory (Installation)	1	13	2	18	8	1	<0.01	8,318
		Vibratory (Removal)	1	18	2	26	11	1		
		Impact (Installation)	1	1,165	42	1,387	624	46	<3.14	1,848

Marine Mammal Occurrence and Take Estimation

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

For all species of cetaceans other than CIBWs, density data is not available for upper Cook Inlet. Therefore, the POA relied on marine mammal monitoring data collected during past POA projects. These data cover the POAs construction season (April through November) across multiple years. Calculations used to estimate exposure from pile installation for all marine mammals is described below.

Humpback Whales

Sightings of humpback whales in the project area are rare, and the potential risk of exposure of a humpback whale to sounds exceeding the Level B harassment threshold is low. Few, if any, humpback whales are expected to approach the project area. However, there were two sightings in 2017 of what was likely a single individual at the Ship Creek Boat Launch (ABR Inc., 2017) which is located south of the project area. Based on these data, the POA conservatively estimates that up to two individuals could be behaviorally harassed during the 24 days of pile driving for the SFD. This could include sighting a cow-calf pair on multiple days or multiple sightings of single humpback whales. No Level A harassment take of humpback whales is anticipated or proposed to be authorized.

Killer Whales

Few, if any, killer whales are expected to approach the project area. No killer whales were sighted during previous monitoring programs for the Knik Arm Crossing and POA construction projects, including the 2016 TPP or during Phase 1 of the PCT project in 20202. The infrequent sightings of killer whales that are reported in upper Cook Inlet tend to occur when their primary prey (anadromous fish for resident killer whales and CIBWs for transient killer whales) are also in the area (Shelden *et al.,* 2003). Previous sightings of transient killer whales have documented pod sizes in upper Cook Inlet between one and six individuals (Shelden *et al.,* 2003). The potential for exposure of killer whales within the Level B harassment isopleths is anticipated to be extremely low. Level B harassment take is conservatively estimated at no more than one small pod (6 individuals). No Level A harassment take for killer whales is anticipated or proposed to be authorized due to the small Level A harassment zones (Table 7) and implementation of a 100 m shutdown which is larger than Level A harassment isopleths, and described below in the Proposed Mitigation section.

Harbor Porpoise

Previous monitoring data at the POA were used to evaluate daily sighting rates for harbor porpoises in the project area. During most years of monitoring, no harbor porpoises were observed; however, during Phase 1 of the PCT project (2020), 18 individuals (15 groups) were observed near the POA, with group sizes ranging from 1–2 individuals. The highest daily sighting rate for any recorded year during pile installation and removal associated with the PCT was an average of 0.09 harbor porpoise per day during 2009 construction monitoring, but this value may not account for increased sightings in Upper Cook Inlet or range extensions (Shelden *et al.,* 2014). Therefore, the POA estimates that one harbor porpoise could be observed every 2 days of pile driving. Based on this assumption, the POA has requested, and NMFS is proposing to authorize, twelve Level B harassment exposures during the 24 days of pile driving.

Harbor porpoises are relatively small cetaceans that move at high velocities, which can make their detection and identification at great distances difficult. Despite this, PSOs during Phase 1 PCT construction monitoring (2020) were able to detect harbor porpoises as far as 6,486 m from the PCT, indicating that the monitoring methods detailed in the Final IHAs for Phase 1 and Phase 2 PCT construction (85 FR 19294), (and described below in the Proposed Mitigation section for the SFD) allowed for harbor porpoises to be detected at great distances. Therefore, no Level A harassment take for harbor porpoises is anticipated or proposed to be authorized for the SFD. The POA anticipates that the majority of piles will be driven using vibratory methods. Using the NMFS User Spreadsheet, vibratory driving 24-inch and 36-inch piles results in Level A harassment isopleths that are smaller than the proposed 100 m shutdown zone, described below in the Proposed Mitigation section (≤26 m; Table 7). The Level A harassment isopleths calculated using the NMFS User Spreadsheet for impact driving 24-inch and 36-inch piles are larger than this 100-m shutdown zone (≤1,387 m; Table 7); however, Level A harassment isopleths consider long durations and harbor porpoise are likely moving through the area, if present, not lingering. Further few harbor porpoises are expected to approach the project area and are likely to be sighted prior to entering the Level A harassment zone. During Phase 1 PCT construction monitoring (2020) only five harbor porpoises were observed near the PCT and within the largest Level A harassment zone for SFD (1,387 m; Table 7). Given that the POA anticipates that only a small number of piles (up to five), may be driven with an impact hammer (requiring up to 20 minutes of impact installation each at 1 pile per day), the likelihood that harbor porpoises will be in these larger zones is minimized. Accounting for measures described below in the Proposed Mitigation section below and the low likelihood that individual harbor porpoises would appear undetected within the Level A harassment zones, we agree with the POA and do not authorize any Level A harassment takes of harbor porpoises during the construction of the SFD.

Steller Sea Lion

Steller sea lions are anticipated to be encountered in low numbers, if at all, within the project area. Three sightings of what was likely a single individual occurred in the project area in 2009, two sightings occurred in 2016, one occurred in 2019, and up to six individuals were observed in 2020 (4 in May and 2 in June). Based on observations in 2016, the POA anticipates an exposure rate of two individuals every 19 days during SFD pile installation and removal. Based on this rate, the POA anticipates that there could be up to four harassment exposures of Steller sea lions during the 24 days of SFD pile installation and removal.

Sea lions are known to travel at high speeds, in rapidly changing directions, and have the potential to be counted multiple times. Because of this the POA anticipates that, despite all precautions, sea lions could enter the Level A harassment zone before a shutdown could be fully implemented. For example, in 2016 during the POA Test Pile Program, a Steller sea lion was first sighted next to a work boat and within the Level A harassment zone. Nine PSOs had been monitoring for the presence of marine mammals near the construction activities at this time, but they did not observe the approaching sea lion. Sea lions are known to be curious and willing to approach human activity closely, and they can swim with a low profile. The incident was recorded as a Level A harassment take and raises concern for the POA that a sighting of a Steller sea lion within the Level A harassment zones, while unlikely, could occur. While Level A harassment takes are unlikely given the low likelihood of sea lions in the project area, the small Level A harassment isopleths (<46 m; Table 7), and the proposed mitigation measures, including the implementation of shutdown zones and the use of PSOs, we propose to authorize the POA's request that a small number of Steller sea lions could be exposed to Level A harassment levels. Therefore, we propose that two Steller sea lions could be exposed to Level A harassment levels and 2 Steller sea lions could be exposed to Level B harassment levels.

Harbor Seals

No known harbor seal haulout or pupping sites occur in the vicinity of the POA; therefore, exposure of harbor seals to in-air noise is not considered in this application, and no take for in-air exposure is requested. Harbor seals are not known to reside in the project area, but they are seen regularly near the mouth of Ship Creek when salmon are running, from July through September. With the exception of newborn pups, all ages and sexes of harbor seals could occur in the project area during construction of the SFD. Any harassment of harbor seals during pile installation would involve a limited number of individuals that may potentially swim through the project area or linger near Ship Creek.

Marine mammal monitoring data were used to examine hourly sighting rates for harbor seals in the project area. Sighting rates of harbor seals were highly variable and appeared to have increased during monitoring between 2005 and 2020 (See Table 4–1 in POA's application). It is unknown whether any potential increase was due to local population increases or habituation to ongoing construction activities. The highest monthly hourly sighting rate (rounded) observed during previous monitoring at the POA was used to quantify take of harbor seals for pile installation associated with the SFD. This occurred in 2020 during Phase 1 PCT construction monitoring, when harbor seals were observed from May through September. A total of 340 harbor seals were observed over 1,237.7 hours of monitoring, at a rate of 0.3 harbor seals per hour. The maximum monthly hourly sighting rate occurred in September and was 0.51 harbor seals per hour. Based on these data, the POA estimates that approximately 1 harbor seal may be observed near the project per hour of hammer use. During the 21 hours of anticipated pile installation and removal, the POA estimates that up 21 harbor seals will be exposed to in-water noise levels exceeding harassment thresholds for pile installation and removal during SFD construction.

All efforts will be taken to shut down prior to a harbor seal entering the 100-m shutdown zone and prior to a harbor seal entering the Level A harassment zones. However, harbor seals often are curious of onshore activities, and previous monitoring suggests that this species may mill at the mouth of Ship Creek. It is important to note that the mouth of Ship Creek is about 700 m from the southern end of the SFD and is outside the Level A harassment zones for harbor seals during both unattenuated and attenuated vibratory and impact pile installation and removal (Table 7). While exposure is anticipated to be minimized because pile installation and removal will occur intermittently over the short construction period, the POA is requesting Level A harassment take for a small number of harbor seals, given the potential difficulty of detecting harbor seals and their consistent use of the area. Given that 30 harbor seals (8.6 percent) of all harbor seals and unidentified pinnipeds were detected within 624 m, the largest Level A harassment zone for SFD, during PCT Phase 1 construction monitoring (61 North Environmental, 2021), POA requests and NMFS proposes to authorize that two harbor seals (8.6 percent of 21 exposures rounded up) could be exposed to Level A harassment levels and 19 harbor seals could be exposed to Level B harassment levels.

Beluga Whales

For CIBWs, we looked at several sources of information on marine mammal occurrence in upper Cook Inlet to determine how best to estimate the potential for exposure to pile driving noise from the SFD Project. In their application, the POA estimated Level B harassment take following methods outlined in the PCT final IHA (85 FR 19294), which relies on monitoring data of CIBWs published in Kendall and Cornick (2015). For the SFD application, POA also considered monitoring data of CIBWs collected during Phase 1 of the PCT project (61 North Environmental, 2021). These data sets (Kendall and Cornick, 2015, and 61 North Environmental, 2021) cover all months the POA may be conducting pile driving for the SFD and they are based on all animals observed during scientific monitoring within the proximity of the SFD regardless of distance. Hourly sighting rates for CIBWs for each calendar month were calculated using documented hours of observation and CIBW sightings from April through November for 2005, 2006, 2008 and 2009 (Kendall and Cornick, 2015) and 2020 (61 North Environmental, 2021) (Table 8). The highest calculated monthly hourly sighting rate of 0.94 whales per hour was used to calculate potential CIBW exposures (21 hours of pile installation and removal multiplied by 0.94 whales/hour). Using this method, the POA estimated that 20 CIBWs (rounded from 19.75) could be exposed to the Level B harassment level during pile installation and removal associated with the construction of the SFD. These calculations assume no mitigation and that all animals observed would enter a given Level B harassment zone during pile driving.

TABLE 8—SUMMARY OF CIBWS SIGHTING DATA FROM APRIL–NOVEMBER 2005–2009 AND APRIL–NOVEMBER 2020

Month	Total hours	Total groups	Total whales	Whales/hour
April	52.50	13	35	0.67
May	457.40	53	208	0.45
June	597.77	37	122	0.20
July	552.67	14	27	0.05
August	577.30	120	543	0.94
September	533.03	124	445	0.83
October	450.70	9	22	0.05
November	346.63	52	272	0.78

Data compiled from Kendall and Cornick (2015) and (61 North Environmental, 2021).

To more accurately estimate potential exposures than simply using the monthly sighting rate data, which does not account for any mitigation, POA followed methods described by NMFS for the PCT Final IHA (85 FR 19294), which looked at previous monitoring results at the POA in relation to authorized take numbers. Between 2008 and 2012, NMFS authorized 34 CIBW takes per year to POA, with mitigation measures similar to the measures proposed here. The percent of the authorized takes documented during this time period ranged from 12 to 59 percent with an average of 36 percent (Table 9). In 2020, NMFS authorized 55 CIBW takes in Phase 1 of the PCT project, with mitigation and monitoring measures that are consistent with those proposed for the SFD and described below in the Proposed Mitigation section. The percent of the authorized takes that were documented was 47 percent (26 out of 55 exposures; 61 North Environmental, 2021; Table 9). Given that there was extensive monitoring occurring across all IHAs (with effort intensified in 2020), we believe there is little potential that animals were taken but not observed.

TABLE 9—AUTHORIZED AND REPORTED CIBW TAKES DURING POA ACTIVITIES FROM 2009–2012 AND 2020

ITA effective dates	Reported takes	Authorized takes	Percent of authorized takes
15 July 2008–14 July 2009	12	34	35
15 July 2009–14 July 2010	20	34	59
15 July 2010–14 July 2011	13	34	38
15 July 2011–14 July 2012	4	34	12
1 April 2020–31 March 2021	26	55	47

As described in the POA's application and in more detail in the Proposed Mitigation section, mitigation measures have been designed to reduce Level B harassment take as well avoid Level A harassment take. We recognize that in certain situations, pile driving may not be able to be shut down prior to whales entering the Level B harassment zone due to safety concerns. During previous monitoring, sometimes CIBWs were initially sighted outside of the harassment zone and shutdown was called, but the CIBWs swam into the harassment zone before activities could be halted, and exposure within the harassment zone occurred. For example, on September 14, 2009, a construction observer sighted a CIBW just outside the harassment zone, moving quickly towards the 1,300 m Level B harassment zone during vibratory pile driving. The animal entered the harassment zone before construction activity could be shut down (ICRC, 2010). On other occasions, CIBWs were initially observed when they surfaced within the harassment zone. For example, on November 4, 2009, 15 CIBWs were initially sighted approximately 950 m north of the project site near the shore, and then they surfaced in the Level B harassment zone during vibratory pile driving (ICRC, 2010). Construction activities were immediately shut down, but the 15 CIBWs were nevertheless exposed within the Level B harassment zone. During Phase 1 of the PCT project all of the recorded takes (n = 26) were instances where the whales were first sighted within the Level B harassment zone, prompting shutdown procedures. Most of these exposures (21 of 26) occurred when the CIBWs first appeared near the northern station, just south of Cairn Point (61 North Environmental, 2021). For example, on November 21, 2020 one CIBW was sighted in front of the north PSO station, located just south of Cairn Point, traveling south during vibratory removal of an attenuated 36-inch pile and a shutdown was called immediately (61 North Environmental, 2021). In 2020, the northern station did not have visibility of the near shoreline north of Cairn Point. As a result, CIBWs traveling south during ebb tides around Cairn Point were often inside of the Level B harassment zone upon first sighting (61 North Environmental, 2021). As described below in the Proposed Monitoring and Reporting section, mitigation and monitoring approaches for the SFD project are modeled after the stipulations outlined in the Final IHAs for Phase 1 and Phase 2 PCT construction (85 FR 19294), but one of the PSO stations will be moved to enhance visibility to the north, especially near Cairn point. Therefore, we believe the ability to detect whales and shut down prior to them entering the Level B harassment zones will be better or consistent with previous years.

To account for these mitigation measures, the POA then applied the highest percentage of previous takes (59 percent) to ensure potential impacts to CIBWs are adequately evaluated. After applying this adjustment to account for potential exposures of CIBWs that would be avoided by shutting down, the POA estimated that 12 CIBWs (20 whales * 0.59 = 11.80 whales; 12 rounded up) may be exposed to Level B harassment during pile installation and removal. The POA and NMFS are concerned, however, that this approach does not accurately reflect the reality that CIBWs can travel in large groups. Large groups of CIBWs have been seen swimming through the POA vicinity during POA monitoring efforts. For example, during Phase 1 of the PCT, the mean group size was 4.34 whales; however, 52 percent of observations were of groups greater than the mean group size, with 5 percent of those 119 groups being larger than 12 individuals, the number of exposures proposed by POA (61 North Environmental, 2021).

To ensure that a large group of CIBWs would not result in the POA using the majority or all of their take in one or two sightings, POA buffered the exposure estimate detailed in the preceding by adding the estimated size of a notional large group of CIBWs. The 95th percentile is commonly used in statistics to evaluate risk. Therefore, to determine the most appropriate size of a large group, the POA calculated the 95 percentile group size of CIBWs observed during Kendall and Cornick (2015) and 2020 Phase 1 PCT construction monitoring (61 North Environmental, 2021); the same data used above to derive hourly sighting rates (Table 8 and Figure 3). In this case, the 95th percentile provides a conservative value that reduces the risk to the POA of taking a large group of CIBWs and exceeding authorized take levels. The 95th percentile of group size for the Kendall and Cornick (2015) and the PCT Phase 1 monitoring data (61 North Environmental, 2021) is 12.0. This means that, of the 422 documented CIBW groups in these data sets, 95 percent consisted of fewer than 12.0 whales; 5 percent of the groups consisted of more than 12.0. Considering large group size, the POA requests and we propose to authorize 24 takes (accounting for the 12 takes calculated following the methods outlined for the PCT project that accounts for mitigation plus a group size of 12) of CIBWs incidental to pile driving for the SFD. Incorporation of large groups into the CIBW exposure estimate is intended to reduce risk to the POA of the unintentional take of a larger number of belugas than would be authorized by using the proposed methods alone and thus improve our estimate of exposure. No Level A harassment is expected or proposed given the small Level A harassment zones for CIBWs (Table 7) and the additional mitigation measures described in the Proposed Mitigation section below specific to CIBWs, including the measure that pile driving activities must shut down when any CIBW enters the relevant Level B harassment zone.

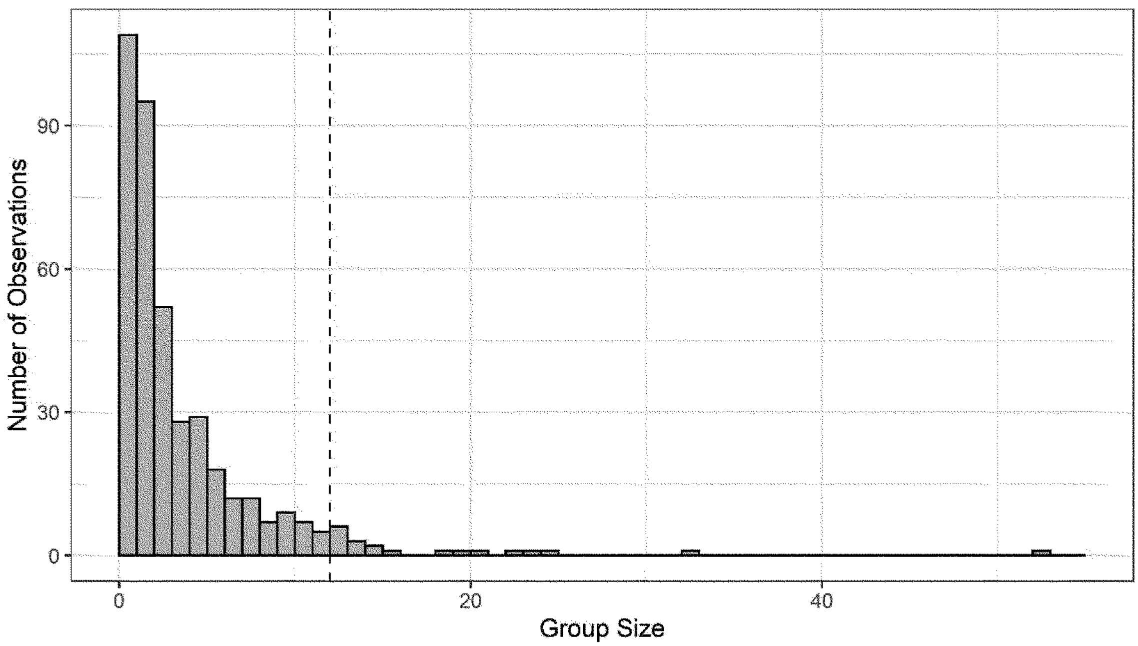

Figure 3. CIBW sighting data from Kendall and Cornick (2015) and Phase 1 of the PCT (61 North Environmental, 2021). The dashed vertical line represents the 95th percentile of group size (*i.e.*, 12 CIBWs)

In summary, the total amount of Level A harassment and Level B harassment proposed to be authorized for each marine mammal stock is presented in Table 10.

TABLE 10—PROPOSED AMOUNT OF TAKE, BY STOCK AND HARASSMENT TYPE

Species	Stock	Proposed authorized take		Percent of stock
		Level A	Level B	
Humpback whale	Western N Pacific	0	2	0.19
Beluga whale	Cook Inlet	0	24	8.60
Killer whale	Transient/Alaska Resident	0	6	1.02/0.26
Harbor porpoise	Gulf of Alaska	0	12	0.04
Steller sea lion	Western	2	2	<0.01
Harbor seal	Cook Inlet/Shelikof	2	19	0.07

Proposed Mitigation

In order to issue an IHA under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of effecting the least practicable impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the 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 the 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.

The POA presented mitigation measures in Section 11 of their application that were modeled after the stipulations outlined in the Final IHAs for Phase 1 and Phase 2 PCT construction (85 FR 19294), which were successful in minimizing the total number and duration of Level B harassment exposures for endangered CIBWs during Phase 1 PCT Construction (61 North Environmental, 2021). These measures both reduce noise into the aquatic environment and reduce the potential for CIBWs to be adversely impacted from any unavoidable noise exposure.

A key mitigation measure NMFS considered for this project is reducing noise levels propagating into the environment. The POA will deploy an unconfined bubble curtain system during installation and removal of plumb (vertical) 24- and 36-inch piles with a vibratory or impact hammer. An unconfined bubble curtain is composed of an air compressor(s), supply lines to deliver the air, distribution manifolds or headers, perforated aeration pipe, and a frame. The frame facilitates transport and placement of the system, keeps the aeration pipes stable, and provides ballast to counteract the buoyancy of the aeration pipes in operation. The air is released through a series of vertically distributed bubble rings that create a cloud of bubbles that act to impede and scatter sound, lowering the sound velocity. A compressor provides a continuous supply of compressed air, which is distributed among the layered bubble rings. Air is released from small holes in the bubble rings to create a curtain of air bubbles surrounding the pile. The curtain of air bubbles floating to the surface inhibits the transmission of pile installation sounds into the surrounding water column. The final design of the bubble curtain will be determined by the Construction Contractor based on factors such as water depth, current velocities, and pile sizes. However, the proposed IHA requires the bubble curtain be operated in a manner consistent with the following performance standards:

- The aeration pipe system will consist of multiple layers of perforated pipe rings, stacked vertically in accordance with the following depths: Two layers for water depths <5 m; four layers for water depths 5 m to <10 m; seven layers for water depths 10 m to <15 m; ten layers for water depths 15 m to <20 m; and thirteen layers for water depths 20 m to <25 m;
- The pipes in all layers will be arranged in a geometric pattern that will allow for the pile being driven to be completely enclosed by bubbles for the full depth of the water column and with a radial dimension such that the rings are no more than 0.5 m from the outside surface of the pile;
- The lowest layer of perforated aeration pipe will be designed to ensure contact with the substrate without burial and will accommodate sloped conditions;
- Air holes will be 1.6 millimeters (1⁄16 inch) in diameter and will be spaced approximately 20 millimeters (3⁄4 inch) apart. Air holes with this size and spacing will be placed in four adjacent rows along the pipe to provide uniform bubble flux;
- The system will provide a bubble flux of 3 cubic meters (m^3) per minute per linear meter of pipe in each layer (32.91 cubic feet (ft^3) per minute per linear foot of pipe in each layer). The total volume of air per layer is the product of the bubble flux and the circumference of the ring using the formula: $Vt = 3.0\ m^3/min/m$ * Circumference of the aeration ring in meters or $Vt = 32.91\ ft^3/min/ft$ * Circumference of the aeration ring in feet; and
- Meters must be provided as follows:
  - Pressure meters must be installed at all inlets to aeration pipelines and at points of lowest pressure in each branch of the aeration pipeline;
  - Flow meters must be installed in the main line at each compressor and at each branch of the aeration pipelines at each inlet. In applications where the feed line from the compressor is continuous from the compressor to the aeration pipe inlet, the flow meter at the compressor can be eliminated; and
  - Flow meters must be installed according to the manufacturer's recommendation based on either laminar flow or non-laminar flow.

The bubble curtain will be used during installation and removal of all plumb piles when water depth is great enough (approximately 3 m) to deploy the bubble curtain. A bubble curtain will not be used with the two battered piles due to the angle of installation. It is important to note that a small number of piles could be installed or removed when the pile location is de-watered (no water present) or when the water is too shallow (≤3 m) to deploy the bubble curtain. The tides at the POA have a mean range of about 8.0 m (26 ft) (NOAA, 2015), and low water levels will prevent proper deployment and function of the bubble curtain system. Piles that are driven at a location that is de-watered will not use a bubble curtain, and marine mammal harassment zones will not be monitored. When piles are installed or removed in water without a bubble curtain because the pile orientation is battered, or if water is too shallow (≤3 m) to deploy the bubble curtain, the unattenuated Level A and Level B harassment zones for that hammer type and pile size will be implemented.

In addition to noise attenuation devices, POA and NMFS considered practicable work restrictions. Given the extensive Level B harassment zone generated from the installation of the two unattenuated battered piles, vibratory driving these large piles during peak CIBW season poses an amount of risk and uncertainty to the degree that it should be minimized. This August and September peak is confirmed through acoustic monitoring (Castellote *et al.,* 2020) and Phase 1 PCT construction monitoring (61 North Environmental, 2021). Castellote *et al.* (2020) for example indicate CIBWs appeared concentrated in the upper inlet year-round, but particularly feeding in river mouths from April-December, shifting their geographical foraging preferences from the Susitna River region towards Knik Arm in mid-August, and dispersing towards the mid inlet throughout the winter. Further, hourly sighting rates calculated from monitoring data from Kendall and Cornick (2015) and Phase 1 of the PCT (61 North Environmental, 2021) were highest in August and September (0.94 and 0.83, respectively; Table 8). Therefore, vibratory driving unattenuated battered piles (which have, by far, the largest Level B harassment zones) will not occur during August or September. Further, to minimize the potential for overlapping sound fields from multiple stressors, the POA will not simultaneously operate two vibratory hammers for either pile installation or removal. This measure is designed to reduce simultaneous in-water noise exposure. Because impact hammers will not likely be dropping at the same time, and to expedite construction of the project to minimize pile driving during peak CIBW abundance periods, NMFS is not proposing to restrict the operation of two impact hammers at the same time. Given the small size of the project and the plan to primarily drive hammers with a vibratory hammer, the POA has indicated that it is highly unlikely that an impact hammer and vibratory hammer or two impact hammers would operate simultaneously during the SFD project.

Additional mitigation measures include the following, modeled after the stipulations outlined in the Final IHAs for Phase 1 and Phase 2 PCT construction (85 FR 19294):

For in-water construction involving heavy machinery activities other than pile driving (*e.g.,* use of barge-mounted excavators), the POA will cease operations and reduce vessel speed to the minimum level required to maintain steerage and safe working conditions if a marine mammal approaches within 10 m of the equipment or vessel.

POA must use soft start techniques when impact pile driving. Soft start requires contractors to provide an initial set of three strikes at reduced energy, followed by a thirty-second waiting period, then two subsequent reduced energy strike sets. A soft start must be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of thirty minutes or longer. Soft starts will not be used for vibratory pile installation and removal. PSOs shall begin observing for marine mammals 30 minutes before ''soft start'' or in-water pile installation or removal begins.

The POA will conduct briefings for construction supervisors and crews, the monitoring team, and POA staff prior to the start of all pile installation and removal, and when new personnel join the work in order to explain responsibilities, communication procedures, the marine mammal monitoring protocol, and operational procedures.

The POA will employ PSOs per the Marine Mammal Monitoring Plan (see Appendix A in the POA's application).

Marine mammal monitoring will take place from 30 minutes prior to initiation of pile installation and removal through 30 minutes post-completion of pile installation and removal. The Level B harassment zone must be fully visible for 30 minutes before the zone can be considered clear. Pile driving will commence when observers have declared the shutdown zone clear of marine mammals or the mitigation measures developed specifically for CIBWs (below) are satisfied. In the event of a delay or shutdown of activity, marine mammal behavior will be monitored and documented until the marine mammals leave the shutdown zone of their own volition, at which point pile installation or removal will begin. Further, NMFS requires that if pile driving has ceased for more than 30 minutes within a day and monitoring is not occurring during this break, another 30-minute pre-pile driving observation period is required before pile driving may commence.

If a marine mammal is entering or is observed within an established Level A harassment zone or shutdown zone, pile installation and removal will be halted or delayed. Pile driving will not commence or resume until either the animal has voluntarily left and been visually confirmed 100 m beyond the shutdown zone and on a path away from such zone, or 15 minutes (non-CIBWs) or 30 minutes (CIBWs) have passed without subsequent detections.

If a species for which authorization has not been granted, or a species for which authorization has been granted but the authorized takes are met, is observed approaching or within the Level B harassment zone, pile installation and removal will shut down immediately. Pile driving will not resume until the animal has been confirmed to have left the area or the 30 minute observation period has elapsed.

In addition to these measures which greatly reduce the potential for harassment of all marine mammals and establish shutdown zones that realistically reflect non-CIBW whale detectability, the following additional mitigation measures have been proposed which would ensure valuable protection and conservation of CIBWs:

Prior to the onset of pile driving, should a CIBW be observed approaching the mouth of Knik Arm, pile driving will be delayed. An in-bound pre-clearance line extends from Point Woronzof to approximately 2.5 kms west of Point McKenzie. Pile driving may commence once the whale(s) moves at least 100 m past the Level B harassment zone or pre-clearance zone (whichever is larger) and on a path away from the zone. A similar pre-pile driving clearance zone will be established to the north of the POA (from Cairn Point to the opposite bank), allowing whales to leave Knik Arm undisturbed. Similar to the in-bound whale clearance zone, pile driving may not commence until a whale(s) moves at least 100 m past the Level B harassment zone or pre-clearance zone (whichever is larger) and on a path away from the zone. If non-CIBW whale species are observed within or likely to enter the Level B harassment zone prior to pile driving, the POA may commence pile driving but only if those animals are outside the 100 m shutdown zone and Level B harassment takes have not been exceeded.

If pile installation or removal has commenced, and a CIBW(s) is observed within or likely to enter the Level B harassment zone, pile installation or removal will shut down and not re-commence until the whale has traveled at least 100 m beyond the Level B harassment zone and is on a path away from such zone or until no CIBW has been observed in the Level B harassment zone for 30 minutes.

There may be situations where it is not possible to monitor the entire Level B harassment zone (*e.g.,* during vibratory hammering of two unattenuated battered piles). In these cases, the pre-clearance zone remains applicable.

If during installation and removal of piles, PSOs can no longer effectively monitor the entirety of the CIBW Level B harassment zone due to environmental conditions (*e.g.,* fog, rain, wind), pile driving may continue only until the current segment of pile is driven; no additional sections of pile or additional piles may be driven until conditions improve such that the Level B harassment zone can be effectively monitored. If the Level B harassment zone cannot be monitored for more than 15 minutes, the entire Level B harassment zone will be cleared again for 30 minutes prior to pile driving.

Based on our evaluation of the applicant's proposed measures, NMFS has preliminarily determined that the proposed mitigation measures provide the means effecting the least practicable 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 IHA for an activity, section 101(a)(5)(D) 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) indicate 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.

The POA will implement a marine mammal monitoring and mitigation strategy intended to avoid and minimize impacts to marine mammals (see Appendix A in the POA's application). The marine mammal monitoring and mitigation program that is planned for SFD construction will be modeled after the stipulations outlined in the Final IHAs for Phase 1 and Phase 2 PCT construction (85 FR 19294). The POA will collect electronic data on marine mammal sightings and any behavioral responses to in-water pile installation or removal for species observed during pile installation and removal associated with the SFD Project. Four PSO teams will work concurrently to provide full coverage for marine mammal monitoring in rotating shifts during in-water pile installation and removal. All PSOs will be trained in marine mammal identification and behaviors. NMFS will review submitted PSO CVs and indicate approval as warranted.

All PSOs will also undergo project-specific training, which will include training in monitoring, data collection, theodolite operation, and mitigation procedures specific to the SFD Project. This training will also include site-specific health and safety procedures, communication protocols, and supplemental training in marine mammal identification and data collection specific to the SFD Project. Training will include hands-on use of required field equipment to ensure that all equipment is working and PSOs know how to use the equipment.

The POA proposes that eleven PSOs will be distributed at four stations: Anchorage Downtown Viewpoint near Point Woronzof, the Anchorage Public Boat Dock at Ship Creek, the SFD Project site, and the north end of POA property. These locations were chosen to maximize CIBW detection outside of Knik Arm and the mouth of Knik Arm. Specifically, PSOs at Port Woronzof will have unencumbered views of the entrance to Knik Arm and can provide information on CIBW group dynamics (*e.g.,* group size, demographics, etc.) and behavior of animals approaching Knik Arm in the absence of and during pile driving. During the time since the POA submitted their final application, observers for the 2020 PCT Phase 1 project have recommended, and NMFS has included in the proposed IHA, that the Ship Creek station be moved about 40 m to the end of the promontory to enhance visibility to the north, especially near Cairn point. The POA also considered moving a station from the POA property to Port MacKenzie for an improved view of CIBWs moving from north to south within Knik Arm. However, Port MacKenzie is not an available option due to logistical reasons; therefore, the northern station will remain located on POA property.

Each of the PSO stations will be outfitted with a cargo container with an observation platform constructed on top. This additional elevation provides better viewing conditions for seeing distant marine mammals than from ground level and provides the PSOs with protection from weather. At least two PSOs will be on watch at any given time at each station; one PSO will be observing, one PSO will be recording data (and observing when there are no data to record). The station at the SFD site will have at least two PSOs. The northern and southern observations stations will have PSOs who will work in three- to four-person teams. Teams of three will include one PSO who will be observing, one PSO who will be recording data (and observing when there are no data to record), and one PSO who will be resting. When available, a fourth PSO will assist with scanning, increasing scan intensity and the likelihood of detecting marine mammals. PSOs will work on a 60 minute rotation cycle and may observe for no more than 4 hours at time and no more than 12 hours per day. In addition, if POA is conducting non-PCT-related in-water work that includes PSOs, the PCT PSOs must be in real-time contact with those PSOs, and both sets of PSOs must share all information regarding marine mammal sightings with each other.

Trained PSOs will have no other construction-related tasks or responsibilities while conducting monitoring for marine mammals. Observations will be carried out using combinations of equipment that include 7 by 50 binoculars, 20x/40x tripod mounted binoculars, 25 by 150 ''big eye'' tripod mounted binoculars (North End, Ship Creek, and Woronzof), and theodolites. PSOs will be responsible for monitoring the 100 m shutdown zone, the Level A harassment zones, the Level B harassment zones, and the pre-clearance zones, as well as effectively documenting Level A and Level B harassment take. They will also (1) report on the frequency at which marine mammals are present in the project area, (2) report on behavior and group composition near the POA, (3) record all construction activities, and (4) report on observed reactions (changes in behavior or movement) of marine mammals during each sighting. Observers will monitor for marine mammals during all in-water pile installation and removal associated with the SFD Project. Once pile installation and removal are completed for the day, marine mammal observations will continue for 30 minutes. Observers will work in collaboration with the POA to immediately communicate the presence of marine mammals prior to or during pile installation or removal.

A draft report, including all electronic data collected and summarized from all monitoring locations, must be submitted to NMFS' MMPA program within 90 days of the completion of monitoring efforts. The report must include: Dates and times (begin and end) of all marine mammal monitoring; a description of daily construction activities, weather parameters and water conditions during each monitoring period; number of marine mammals observed, by species, distances and bearings of each marine mammal observed to the pile being driven or removed, age and sex class, if possible; number of individuals of each species (differentiated by month as appropriate) detected within the Level A harassment zones, the Level B harassment zones, and the shutdown zones, and estimates of number of marine mammals taken, by species (a correction factor may be applied); description of mitigation implemented, and description of attempts to distinguish between the number of individual animals taken and the number of incidences of take. A final marine mammal monitoring report will be prepared and submitted to NMFS within 30 days following receipt of comments on the draft report from NMFS.

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, the discussion of our analyses applies to all the species listed in Table 10 for which we authorized take, other than CIBWs, as the anticipated effects the POAs activities on marine mammals are expected to be relatively similar in nature. For CIBWs, there are meaningful differences in anticipated individual responses to activities, impact of expected take on CIBWs, or impacts on habitat; therefore, we provide a supplemental analysis for CIBWs, independent of the other species for which we authorize take.

NMFS has identified key factors which may be employed to assess the level of analysis necessary to conclude whether potential impacts associated with a specified activity should be considered negligible. These include (but are not limited to) the type and magnitude of taking, the amount and importance of the available habitat for the species or stock that is affected, the duration of the anticipated effect to the species or stock, and the status of the species or stock. The following factors support negligible impact determinations for the affected stocks of humpback whales, killer whales, harbor porpoise, harbor seals, and Steller sea lions. The potential effects of the proposed actions on these species are discussed above. Some of these factors also apply to CIBWs; however, a more detailed analysis for CIBWs is provided below.

- No takes by mortality or serious injury are anticipated or authorized;
- The number of total takes (by Level A and Level B harassment) are less than 2 percent of the best available abundance estimates for all stocks;
- Take would not occur in places and/or times where take would be more likely to accrue to impacts on reproduction or survival, such as within ESA-designated or proposed critical habitat, biologically important areas (BIA), or other habitats critical to recruitment or survival (*e.g.,* rookery);
- Take would occur over a short timeframe (*i.e.,* up to 21 total hours spread over nine to 24 non-consecutive days), and would be limited to the short duration a marine mammal would likely be present within a Level B harassment zone during pile driving. This short timeframe minimizes the probability of multiple exposures on individuals, and any repeated exposures that do occur are not expected to occur on sequential days, decreasing the likelihood of physiological impacts caused by chronic stress or sustained energetic impacts that might affect survival or reproductive success;
- Any impacts to marine mammal habitat from pile driving (including to prey sources as well as acoustic habitat, *e.g.,* from masking) are expected to be temporary and minimal; and
- Take would only occur within upper Cook Inlet—a limited, confined area of any given stock's home range.

For CIBWs, we further discuss our negligible impact findings in the context of potential impacts to this endangered stock. As described in the Recovery Plan for the CIBW (NMFS, 2016a), NMFS determined the following physical or biological features are essential to the conservation of this species: (1) Intertidal and subtidal waters of Cook Inlet with depths less than 30 feet mean lower low water (9.1 m) and within 5 mi (8 km) of high and medium flow anadromous fish streams; (2) Primary prey species consisting of four species of Pacific salmon (Chinook, sockeye, chum, and coho), Pacific eulachon, Pacific cod, walleye pollock, saffron cod, and yellowfin sole, (3) Waters free of toxins or other agents of a type and amount harmful to CIBWs, (4) Unrestricted passage within or between the critical habitat areas, and (5) Waters with in-water noise below levels resulting in the abandonment of critical habitat areas by CIBWs. The SFD would not impact essential features 1–3 listed above. All construction would be done in a manner implementing best management practices to preserve water quality, and no work would occur around creek mouths or river systems leading to prey abundance reductions. In addition, no physical structures would restrict passage; however, impacts to the acoustic habitat are of concern. Previous marine mammal monitoring data at the POA demonstrate CIBWs indeed pass by the POA during pile driving (*e.g.,* 61 North Environmental, 2021). As described above, there was no significant difference in CIBW sighting rate with and in the absence of pile driving (Kendall and Cornick, 2015). However, CIBWs do swim faster and in tighter formation in the presence of pile driving (Kendall and Cornick, 2015).

Previously there has been concern that exposure to pile driving at the POA could result in CIBWs avoiding Knik Arm and thereby not accessing the productive foraging grounds north of POA such as Eagle River flats based on the proposed project and mitigation measures—thus, impacting essential feature number 5 above (85 FR 19294). Although the data previously presented demonstrate whales are not abandoning the area (*i.e.,* no significant difference in sighting rate with and without pile driving), results of a recent expert elicitation (EE) at a 2016 workshop, which predicted the impacts of noise on CIBW survival and reproduction given lost foraging opportunities, helped to inform our assessment of impacts on this stock. The 2016 EE workshop used conceptual models of an interim population consequences of disturbance (PCoD) for marine mammals (NRC, 2005; New *et al.,* 2014, Tollit *et al.,* 2016) to help in understanding how noise-related stressors might affect vital rates (survival, birth rate and growth) for CIBW (King *et al.,* 2015). NMFS (2015, section IX.D—CI Beluga Hearing, Vocalization, and Noise Supplement) suggests that the main direct effects of noise on CIBW are likely to be through masking of vocalizations used for communication and prey location and habitat degradation. The 2016 workshop on CIBWs was specifically designed to provide regulators with a tool to help understand whether chronic and acute anthropogenic noise from various sources and projects are likely to be limiting recovery of the CIBW population. The full report can be found at *http://www.smruconsulting.com/publications/* with a summary of the expert elicitation portion of the workshop below.

For each of the noise effect mechanisms chosen for expert elicitation, the experts provided a set of parameters and values that determined the forms of a relationship between the number of days of disturbance a female CIBW experiences in a particular period and the effect of that disturbance on her energy reserves. Examples included the number of days of disturbance during the period April, May, and June that would be predicted to reduce the energy reserves of a pregnant CIBW to such a level that she is certain to terminate the pregnancy or abandon the calf soon after birth, the number of days of disturbance in the period April–September required to reduce the energy reserves of a lactating CIBW to a level where she is certain to abandon her calf, and the number of days of disturbance where a female fails to gain sufficient energy by the end of summer to maintain themselves and their calves during the subsequent winter. Overall, median values ranged from 16 to 69 days of disturbance depending on the question. However, for this elicitation, a ''day of disturbance'' was defined as any day on which an animal loses the ability to forage for at least one tidal cycle (*i.e.,* it forgoes 50–100 percent of its energy intake on that day). The day of disturbance considered in the context of the report is notably more severe than the Level B harassment expected to result from these activities, which as described is expected be comprised predominantly of temporary modifications in the behavior of individual CIBWs (*e.g.,* faster swim speeds, more cohesive group structure, avoidance, and increased foraging). Also, NMFS anticipates and has proposed to authorized 24 instances of takes, with the instances representing disturbance events within a day—this means that either 24 different individual beluga whales are disturbed on no more than one day each, or some lesser number of individuals may be disturbed on more than one day, but with the product of individuals and days not exceeding 24. Given the overall anticipated take, it is very unlikely that any one beluga would be disturbed on more than a few days. Further, the mitigation measures NMFS has prescribed for the SFD project are designed to avoid the potential that any animal would lose the ability to forage for one or more tidal cycles. While Level B harassment (behavioral disturbance) is authorized, our mitigation measures would limit the severity of the effects of that Level B harassment to behavioral changes such as increased swim speeds, tighter group formations, and cessation of vocalizations, not the loss of foraging capabilities. Regardless, this elicitation recognized that pregnant or lactating females and calves are inherently more at risk than other animals, such as males. NMFS first considered proposing the POA shutdown based on more vulnerable life stages (*e.g.,* calf presence) but ultimately determined all CIBWs warranted pile driving shutdown to be protective of potential vulnerable life stages, such as pregnancy, that could not be determined from observations, and to avoid more severe behavioral reaction.

Monitoring data from the POA suggest pile driving does not discourage CIBWs from entering Knik Arm and travelling to critical foraging grounds such as those around Eagle Bay. As previously described, sighting rates were not different in the presence or absence of pile driving (Kendall and Cornick, 2015). In addition, CIBWs continued to use Knik Arm in 2020 during the duration of the PCT Phase 1 construction project (61 North Environmental, 2021). These findings are not surprising as food is a strong motivation for marine mammals. As described in Forney *et al.* (2017), animals typically favor particular areas because of their importance for survival (*e.g.,* feeding or breeding), and leaving may have significant costs to fitness (reduced foraging success, increased predation risk, increased exposure to other anthropogenic threats). Consequently, animals may be highly motivated to maintain foraging behavior in historical foraging areas despite negative impacts (*e.g.,* Rolland *et al.,* 2012). Previous monitoring data indicates CIBWs are responding to pile driving noise, but not through abandonment of critical habitat, including primary foraging areas north of the port. Instead, they travel faster past the POA, more quietly, and in tighter groups (which may be linked to the decreased communication patterns). During PCT Phase 1 construction monitoring, no definitive behavioral reactions to the in-water activity or avoidance behaviors were documented in CIBW. Little variability was evident in CIBW behaviors recorded by PSOs from month to month, or between sightings that coincided with in-water pile installation or removal and those that did not (61 North Environmental, 2021). Of the 245 CIBWs groups sighted during PCT Phase 1 construction monitoring, seven groups were observed during or within minutes of in-water impact pile installation and 37 groups were observed during or within minutes of vibratory pile installation or removal (61 North Environmental, 2021). During impact installation, three of these groups of CIBWs showed no reaction, three showed a potential reaction, and one group continued moving towards impact pile installation. Of the 37 vibratory events monitored, nine groups of CIBWs displayed a potential reaction, 16 displayed no reaction, and 12 continued a trajectory towards the PCT (61N Environmental 2021). In general, CIBWs were more likely to display no reaction or to continue to move towards the PCT during pile installation and removal. In the situations during which CIBWs showed a possible reaction (three groups during impact driving and nine groups during vibratory driving), CIBWs were observed either moving away immediately after the pile driving activities started or observed increasing their rate of travel. This traveling behavior past the POA has also been verified by acoustic monitoring. Castellote *et al.* (2020) found low echolocation detection rates in lower Knik Arm indicating CIBWs moved through that area relatively quickly when entering or exiting the Arm. We anticipate that disturbance to CIBWs would manifest in the same manner when they are exposed to noise during the SFD project: Whales move quickly and silently through the area in more cohesive groups. We do not believe exposure to elevated noise levels during transit past the POA has adverse effects on reproduction or survival as the whales continue to access critical foraging grounds north of the POA, and tight associations help to mitigate the potential for any contraction of communication space for a group. We also do not anticipate that CIBWs will abandon entering or exiting Knik Arm, as this is not evident based on previous years of monitoring data (*e.g.,* Kendall and Cornick 2015; 61N Environmental 2021), and the pre-pile driving clearance mitigation measure is designed to further avoid any potential abandonment. Finally, as described previously, both telemetry (tagging) and acoustic data suggest CIBWs likely stay in upper Knik Arm for several days or weeks before exiting Knik Arm. Specifically, a CIBW instrumented with a satellite link time/depth recorder entered Knik Arm on August 18th and remained in Eagle Bay until September 12th (Ferrero *et al.,* 2000). Further, a recent detailed re-analysis of the satellite telemetry data confirms how several tagged whales exhibited this same movement pattern: Whales entered Knik Arm and remained there for several days before exiting through lower Knik Arm (Shelden *et al.,* 2018). This longer-term use of upper Knik Arm would avoid repetitive exposures from pile driving noise.

POA proposed and NMFS has prescribed mitigation measures to minimize exposure to CIBWs, specifically, shutting down pile driving if CIBWs are observed approaching the mouth of Knik Arm, shutting down pile driving should a CIBW approach or enter the Level B harassment zone, stationing PSOs at Point Woronzof and Ship Creek, and not vibratory pile driving unattenuated battered piles during August or September (peak CIBW season). These measures are designed to ensure CIBWs will not abandon critical habitat and exposure to pile driving noise will not result in adverse impacts on the reproduction or survival of any individuals. The location of PSOs at Point Woronzof allows for detection of CIBWs and behavioral observations prior to CIBWs entering Knik Arm. Although NMFS does not anticipate CIBWs would abandon entering Knik Arm in the presence of pile driving with the required mitigation measures, these PSOs will be integral to identifying if CIBWs are potentially altering pathways they would otherwise take in the absence of pile driving. Finally, take by mortality, serious injury, or Level A harassment of CIBWs is not anticipated or authorized.

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 CIBWs through effects on annual rates of recruitment or survival:

- No mortality is anticipated or authorized;
- Area of exposure would be limited to travel corridors. Data demonstrates Level B harassment manifests as increased swim speeds past the POA and tight group formations and not through habitat abandonment;
- No critical foraging grounds (*e.g.,* Eagle Bay, Eagle River, Susitna Delta) would be impacted by pile driving; and
- While animals could be harassed more than once, exposures are not likely to exceed more than a few per year for any given individual and are not expected to occur on sequential days; thereby, decreasing the likelihood of physiological impacts caused by chronic stress or masking.

We also considered our negligible impact analysis with respect to NMFS' technical report released in January 2020 regarding the abundance and status of CIBWs (Sheldon and Wade, 2019). As described in the marine mammal section, new analysis indicates the CIBW stock is smaller and declining faster than previously recognized. While this is concerning, NMFS continues to believe the taking authorized (allowed for in the cases where shutdowns cannot occur in time to avoid Level B harassment take) will not impact the reproduction or survival of any individuals, much less the stock, and will thereby have a negligible impact. The monitoring measures (four stations each equipped with two PSOs simultaneously on watch at each station) are extensive, such that we find it unlikely whales would go undetected. The mitigation measures reduce noise entering the water column (a benefit for all marine mammals) through the use of an unconfined bubble curtain. Further, the exposure risk to CIBWs is greatly minimized through the incorporation of in-bound and out-bound whale pre-pile driving clearance zones. Finally, should pile driving be occurring at the same time a whale is detected, pile driving would shut down prior to its entering the Level B harassment zone. All these measures, as well as other required measures such as soft-starts, greatly reduce the risk of animals not accessing important foraging areas north of the POA, which could result in impacts to individual fitness or annual rates of recruitment or survival. For these reasons, the new status of CIBWs does not ultimately change our findings with respect to the specified activities.

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 sections 101(a)(5)(A) and (D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, 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. When the predicted number of individuals to be taken is fewer than one third of the species or stock abundance, the take is considered to be of small numbers. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities. For all stocks, the amount of taking is less than one-third of the best available population abundance estimate (in fact it is less than 9 percent for all stocks considered here; Table 10).

Based on the analysis contained herein of the proposed activity (including the proposed 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 IHA, 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 a specified activity that is likely to reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by either causing the marine mammals to abandon or avoid hunting areas, directly displacing subsistence users, or placing physical barriers between the marine mammals and the subsistence hunters. An ''unmitigable adverse impact'' can also results from a specified activity that cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met.

No subsistence use of CIBWs occurs and subsistence harvest of other marine mammals in upper Cook Inlet is limited to harbor seals. Steller sea lions are rare in upper Cook Inlet; therefore, subsistence use of this species is not common. However, Steller sea lions are taken for subsistence use in lower Cook Inlet. In 2013 and 2014, the Alaska Department of Fish and Game conducted studies to document the harvest and use of wild resources by residents of four tribal communities in Cook Inlet: Tyonek, Nanwalek, Port Graham, and Seldovia (Jones and Kostick, 2016). Tyonek is the community in closest proximity to Knik Arm while the other communities are located lower in Cook Inlet. The only marine mammal species taken by the Tyonek community was harbor seals (from the McArthur River Flats north to the Beluga River (Jones *et al.,* 2015) south of Knik Arm) while communities lower in the inlet relied on harbor seals, Steller sea lions and sea otters (we note the sea otter is under the jurisdiction of the USFWS; therefore, it is not a part of our analysis).

The potential impacts from harassment on stocks that are harvested in Cook Inlet would be limited to minor behavioral changes (*e.g.,* increased swim speeds, changes in dive time, temporary avoidance near the POA, etc.) within the vicinity of the POA. Some PTS may occur; however, the shift is likely to be slight due to the implementation of mitigation measures (*e.g.,* shutdown zones) and the shift would be limited to lower pile driving frequencies which are on the lower end of phocid and otariid hearing ranges. In summary, any impacts to harbor seals would be limited to those seals within Knik Arm (outside of any hunting area) and the very few takes of Steller sea lions in Knik Arm would be far removed in time and space from any hunting in lower Cook Inlet.

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 the POA's proposed activities.

Endangered Species Act

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 IHAs, NMFS consults internally whenever we propose to authorize take for endangered or threatened species, in this case with the Alaska Region Protected Resources Division Office.

NMFS is proposing to authorize take of CIBWs, humpback whales from the Mexico DPS stock or Western North Pacific Stock, and Steller sea lions from the western DPS, which are listed under the ESA. The Permit and Conservation Division has requested initiation of Section 7 consultation with the Alaska Region Protected Resources Division Office for the issuance of this IHA. NMFS will conclude the ESA consultation prior to reaching a determination regarding the proposed issuance of the authorization.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue an IHA to the POA for conducting pile driving associated with the relocation of SFD in Knik Arm, Alaska, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. A draft of the proposed IHA can be found at *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act.*

Request for Public Comments

We request comment on our analyses, the proposed authorization, and any other aspect of this notice of proposed IHA for the proposed pile driving associated with the relocation of the SFD in Knik Arm, Alaska. We also request at this time comment on the potential Renewal of this proposed IHA as described in the paragraph below. Please include with your comments any supporting data or literature citations to help inform decisions on the request for this IHA or a subsequent Renewal IHA.

On a case-by-case basis, NMFS may issue a one-time, one-year Renewal IHA following notice to the public providing an additional 15 days for public comments when (1) up to another year of identical or nearly identical, or nearly identical, activities as described in the Description of Proposed Activities section of this notice is planned or (2) the activities as described in the Description of Proposed Activities section of this notice would not be completed by the time the IHA expires and a Renewal would allow for completion of the activities beyond that described in the *Dates and Duration* section of this notice, provided all of the following conditions are met:

- A request for renewal is received no later than 60 days prior to the needed Renewal IHA effective date (recognizing that the Renewal IHA expiration date cannot extend beyond one year from expiration of the initial IHA);
- The request for renewal must include the following:

(1) An explanation that the activities to be conducted under the requested Renewal IHA are identical to the activities analyzed under the initial IHA, are a subset of the activities, or include changes so minor (*e.g.,* reduction in pile size) that the changes do not affect the previous analyses, mitigation and monitoring requirements, or take estimates (with the exception of reducing the type or amount of take); and

(2) A preliminary monitoring report showing the results of the required monitoring to date and an explanation showing that the monitoring results do not indicate impacts of a scale or nature not previously analyzed or authorized.

Upon review of the request for Renewal, the status of the affected species or stocks, and any other pertinent information, NMFS determines that there are no more than minor changes in the activities, the mitigation and monitoring measures will remain the same and appropriate, and the findings in the initial IHA remain valid.

Dated: June 10, 2021.

Catherine Marzin,

Acting Director, Office of Protected Resources, National Marine Fisheries Service.

[FR Doc. 2021–12551 Filed 6–14–21; 8:45 am]

BILLING CODE 3510–22–P