BILLING CODE 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XF830

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to construction at the city dock and ferry terminal, in Tenakee Springs, Alaska

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

ACTION: Notice; proposed incidental harassment authorization; request for comments.

SUMMARY: NMFS has received a request from the Alaska Department of Transportations and Public Facilities (ADOT&PF) for authorization to take marine mammals incidental to conducting improvements at the Tenakee Springs city dock and ferry terminal, in Tenakee Springs, 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 will consider public comments prior to making any final decision on the issuance of the requested MMPA authorization, and agency responses will be summarized in the final notice of our decision

DATES: Comments and information must be received no later than [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service.

Physical comments should be sent to 1315 East-West Highway, Silver Spring, MD 20910 and electronic comments should be sent to *ITP.molineaux@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 received electronically, including all attachments, must not exceed a 25-megabyte file size. Attachments to electronic comments will be accepted in Microsoft Word or Excel or Adobe PDF file formats only. All comments received are a part of the public record and will generally be posted online at *www.nmfs.noaa.gov/pr/permits/incidental/construction.htm* 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: Jonathan Molineaux, 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: *www.nmfs.noaa.gov/pr/permits/incidental/construction.htm*. In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

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 authorization is provided to the public for review.

An authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s), will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant), and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth.

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

The MMPA states that the term "take" means to harass, hunt, capture, kill or attempt to harass, hunt, capture, or kill any marine mammal.

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

National Environmental Policy Act

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

This action is consistent with categories of activities identified in CE B4 of the Companion Manual for NOAA Administrative Order 216-6A, which do not individually or cumulatively have the potential for significant impacts on the quality of the human environment and for which we have not identified any extraordinary circumstances that would preclude this categorical exclusion. Accordingly, NMFS has preliminarily determined that the issuance of the proposed IHA qualifies to be categorically excluded from further NEPA review.

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 23, 2017, NMFS received a request from ADOT&PF for an IHA to take marine mammals incidental to conducting improvements at the Tenakee Springs city dock and ferry terminal, in Tenakee Springs, Alaska. The application was considered adequate and complete on January 30, 2018. ADOT&PF's request is for take of seven species of marine mammals by Level B harassment only. Neither ADOT&PF nor NMFS expect mortality to result from this activity and, therefore, an IHA is appropriate. The planned activity is not expected to exceed one year, hence, we do not expect subsequent MMPA IHAs to be issued for this particular activity.

Description of Proposed Activity

Overview

The ADOT&PF plans to make improvements to the Tenakee Springs Ferry Terminal located in Tenakee Springs, Alaska, on Chichigof Island in southeast Alaska (Figure 1-1 of the application). The facility is a multi-function dock and active ferry terminal located in the center of town (see Figure 1-2 and Figure 1-3 in application). The project's proposed activities that have the potential to take marine mammals include vibratory and impact pile driving, drilling operations for pile installation (down-hole hammer), and vibratory pile removal.

The purpose of the project is to replace the existing, aging mooring and transfer structures nearing the end of their operational life due to corrosion and wear with modern facilities that provide improved operations for Alaska Marine Highway System (AMHS) ferry vessels, as well as freight and fueling operators, servicing the community of Tenakee Springs. Planned improvements include the installation of new shore side facilities and marine structures and the renovation of existing structures. This will accommodate cargo and baggage handling, vessel mooring, passenger and vehicle access gangways, and re-establish existing electrical and fuel systems. Improvements will enhance public safety and security.

Dates and Duration

In-water project construction activities will begin no sooner than June 1, 2019. Pile installation and removal is expected to be completed in 93 working days within a 4-month window beginning sometime after June 1, 2019. Pile installation will be intermittent and staggered depending on weather, construction and mechanical delays, marine mammal shutdowns, and other potential delays and logistical constraints. Given the possibility of schedule delays and other unforeseen circumstances, an IHA is being requested for a full year, from June 1, 2019 through May 31, 2020.

Specific Geographic Region-The Tenakee Springs Ferry Terminal is located in the City of Tenakee Springs, Alaska, at 57°46’45.6” N, 135°13’09.1” W, on Chichagof Island, on the north shore of Tenakee Inlet, in southeast Alaska (Figure 1-1 and Figure 1-2). Tenakee Springs is part of the Hoonah-Angoon Census Area. In 2016, there were an estimated 130 residents of Tenakee Springs. It is the second largest city on Chichagof Island.

The Tenakee Springs Ferry Terminal is an active ferry terminal located in Tenakee Inlet and provides the primary access point to the city of Tenakee Springs. Improvements and new construction will take place in the same location as the existing dock. A sea plane float is located immediately east of the ferry terminal and a small boat harbor is located approximately 700 meters east of the terminal (see Figure 1-2 of application).

The town of Tenakee Springs is located on the north side of Tenakee Inlet, about 16 kilometers (km) (9.9 miles) west of where the Inlet opens to Chatham Strait. Tenakee Inlet is a long, narrow fjord with steep, rocky sides interspersed with extensive mudflats and intertidal zones. Water depths consistently reach 900 to 1,100 meters (2,950 to 3,600 feet) in the center of the Inlet, with at least one location deeper than 1,280 meters (4,200 feet). The shoreline is complex and meandering, interspersed with numerous coves, islands, and rocky outcroppings. Numerous rivers and creeks feed into the Inlet, contributing to the highly productive marine environment.

The Inlet supports abundant marine resources, including salmon, herring, crab, and shrimp. Marine mammals use the Inlet regularly, attracted to the rich foraging grounds. Humpback whales are seen bubble feeding in summer, and harbor seals haul out on rocky islets around the area.

Baseline background (ambient) sound levels in Tenakee Inlet are unknown. The areas around the existing ferry terminal are frequented by ferries, fishing vessels, and tenders; barges and tugboats; float planes; and other commercial and recreational vessels that use the small-boat harbor, city dock, and other commercial facilities.

Detailed Description of Specific Activity

The proposed action includes pile installation and removal for the various aspects of the project (see Figure 1-4 of application). There will be no dredging or removal of substrate, nor any deposition of fill or armor rock associated with the project. Above-water construction will consist of the installation of concrete platform decking panels, utility lines, and a fuel building. The new facility will continue to serve as the AMHS ferry terminal and will support shipping and receiving of commercial and service-industry goods. Given the lack of road access to Tenakee Springs, the ferry terminal is an essential component of infrastructure, providing critical access between Tenakee Springs and the rest of the region. Planned improvements will not add any additional berths for vessels, and the existing capacity of the facilities will remain the same. The project includes the following components*:*

- Removal and replacement of an existing 12-foot by 240-foot approach dock decking and installation of additional steel pipe support piles;
- Removal of an existing city storage and fuel building and pile-supported dock and timber fender piles;
- Removal of an existing steel gangway float, platform, and associated steel pipe piles; and
- Removal of three, three-pile berthing and mooring dolphins.

The project will also include the installation of:

- A 50-foot by 70-foot pile-supported ferry staging dock;
- A 50-foot by 60-foot pile-supported dock with new fuel building and associated dock mounted fender system;
- An 11-foot by 90-foot steel transfer bridge and pile-supported abutment;

- A steel bridge support float with adjustable intermediate ramp and apron with two, four-pile float restraint dolphins;
- Four, four-pile berthing dolphins; and
- A ferry access skiff float and associated steel pipe pile restraints.

Removal of Old Piles

The project will require the removal of approximately 84 piles of varying sizes and materials (Table 1-1). Not all existing structures and piles will be removed (Figure 1-4). It is anticipated that, when possible, existing piles will be extracted by directly lifting them with a crane. A vibratory hammer will be used only if necessary to extract piles that cannot be directly lifted. Removal of each old pile is estimated to require no more than 15 minutes of vibratory hammer use.

Table 1. Pile details and estimated effort required for pile removal.

Pile Diameters & Material	Project Component	Number of Piles	Total Number of Piles	Vibratory Duration Per Pile (min)	Estimated Total Number of Hours	Number of Piles Per Day (Range)	Days of Removal
12.75-inch Steel Piles	Approach Dock	2	2	15	0.5	2	1
14-inch Timber Piles	City Dock Fender Piles	33	42	15	10.5	5-10	9
	City Storage Building Dock	9					
14-inch Steel Piles	City Dock	14	26	15	6.5	5-10	6
	Berthing Dolphin Fenders	12					
16-inch Steel Piles	Berthing Dolphins	9	9	15	2.25	5-10	2
18-inch Steel Piles	Steel Float	5	5	15	1.25	5	1
Totals			84		21		19

Installation of New Piles

The Project will require the installation of 121 piles of varying sizes and materials (see Tables 2). Tension anchors will be installed in 86 of the 121 total piles. Initial installation of steel piles through the sediment layer may be done using vibratory methods for up to 15 minutes per pile. If the sediment layer is very thin, instead of vibratory methods, a few strikes from an impact hammer may be used to seat some steel piles into the weathered bedrock before drilling begins. It is possible that only an impact hammer and drilling will be used for some piles, and only a vibratory hammer and drilling will be used for other piles, depending on sediment conditions and as decided by the construction contractor. Following initial pile installation, the mud accumulation on the inside of the pile will be augured out (or cleaned through another method), as necessary. Next, a hole (rock socket) will be drilled in the underlying bedrock by using a down-hole hammer (see Figure 1-5 of IHA application). A down-hole hammer is a drill bit that drills through the bedrock and a pulse mechanism that functions at the bottom of the hole, using a pulsing bit to break up the rock to allow removal of the fragments and insertion of the pile. The head extends so that the drilling takes place below the pile. Drill cuttings are expelled from the top of the pile as dust or mud and allowed to settle at the base of the pile. It is estimated that drilling piles through the layered bedrock will take about 2–3 hours per pile.

Drilling will create a 10-foot-deep bedrock socket that holds the pile in place. The bedrock will attenuate noise production from drilling and reduce noise propagation into the water column. Additionally, the casing used during drilling acts like a cofferdam and will block noise, further reducing noise levels (82 Federal Register [FR] 34632; proposed IHA for the Gary Paxton Industrial Park Dock Modification Project in Sitka, Alaska). However, noise levels from drilling the bedrock socket to support piles will likely exceed the 120-decibel (dB) root mean square (rms) threshold for Level B harassment from continuous noise (Section 6.2.2) during at least a portion of the drilling.

If necessary after drilling, no more than 30 blows from an impact hammer will be used to confirm that piles are set into bedrock (proofed). Proofing will require approximately 5–10 minutes per pile.

Tension anchors will be installed on 86 of the 121 steel piles. In general, the farthest seaward piles will utilize tension anchors. To anchor each pile following pile installation, a 10-inch casing will be inserted into the center of the pile and an 8-inch rock anchor drill will be lowered into the casing and used to drill into bedrock. Rock fragments will be removed through the top of the casing as dust or mud. Finally, the drill and casing will be removed, and an anchor attached by an anchor rod will be inserted into the hole. The hole will be filled with grout, which will harden, thereby encapsulating the anchor in the borehole and securing the pile and anchor to bedrock. Once installed, tension anchors are tightened, applying tension to the pile to prevent movement within the rock socket. Eight of the tension anchors will be passive, which means they will not be tightened. This will provide the pile with a small amount of play, which will allow the pile to move until it meets the extent of the tension anchor.

Drilling for anchors takes place below the 10-foot-deep bedrock socket that holds the pile in place, and the bedrock serves to attenuate noise production from drilling activity and reduce noise propagation into the water column. Additionally, the casing acts like a cofferdam and will block noise; therefore, anchor drilling will result in low levels of in-water noise that do not approach injury or harassment levels for marine mammals (82 FR 34632; proposed IHA for the

Gary Paxton Industrial Park Dock Modification Project in Sitka, Alaska). No take for harassment of marine mammals from anchor drilling is requested.

Installation of timber piles will use only an impact hammer, and will require approximately 75 strikes per pile, or approximately 20–30 minutes to install each pile.

Pile installation activities will occur in waters from zero to 36 feet (0 to 11 meters) deep within or immediately adjacent to the existing dock footprint. It is anticipated that an ICE model vibratory driver or equivalent hammer and a Delmag D30 or Vulcan impact hammer, or equivalent hammer will be used to install the piles.

Table 2. Pile details and estimated effort required for pile installation.

Pile Diameters & Material	Project Component	Number of Piles	Total Number of Piles	Vibratory Duration Per Pile (min)	Drilling Duration Per Pile[a] (min)	Impact Strikes Per Pile	Estimated Total Number of Hours	Number of Piles Per day (range)	Days of Installation
24-inch Steel Piles[a]	City Dock	22	46	15	120	30	107	2-3	23
	Ferry Staging Dock	20							
	Transfer Bridge Abutment	4							
30-inch Steel Piles[a]	Float Restraints (Vertical)	4	20	15	180	30	67	2-3	10
	Berthing Dolphins (Battered)	8							
	Berthing Dolphins (Vertical)	8							
20-inch Steel Piles[a]	Float Restraints (Battered)	4	4	15	180	30	13	2-3	2
	Approach Dock	8							

18-inch Steel Piles[a]	Berthing Fenders	10	21	15	120	30	49	2-3	11
	Skiff Float	3							
14-inch Timber Piles	Boat Moorage Fenders	30	30	NA	NA	75	10	5-10	6
8-inch Tension Anchors	Tension Anchors	78	86[b]	NA	60	NA	86	4-8	22
	Passive Tensions Anchors	8							
Totals			121				332		74

[a] All 91 steel piles will require drilling.

[b] Tension anchors will be installed in a subset of piles and therefore are not included in the total number of piles.

Description of Marine Mammals in the Area of Specified Activities

Sections 3 and 4 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history, of the potentially affected species. Additional information regarding population trends and threats may be found in NMFS's Stock Assessment Reports (SARs; *www.nmfs.noaa.gov/pr/sars/*) and more general information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS's website (*www.nmfs.noaa.gov/pr/species/mammals/*).

Table 3 lists all species with expected potential for occurrence in Tenakee Springs, Alaska 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 (2016). PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS'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's 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's U.S. Alaska SARs (Muto 2017a). All values presented in Table 3 are the most recent available at the time of publication and are available in the 2016 SARs (Muto, 2017a), Towers *et al.*, 2015 (solely for northern resident killer whales), and draft 2017 SARs (Muto 2017b).

Two cetacean species have ranges near Tenakee Inlet but are unlikely to occur in the project area: the Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) and gray whale (*Eschrichtius robustus*). The ranges of both the Pacific white-sided dolphin and gray whale are suggested to overlap with Tenakee Inlet (Muto, 2017a), but no sightings have been documented in the project area (Dahlheim *et al.* 2009).

Table 3. Marine mammals that could occur in the project area during the specified activity.

Common name	Scientific name	MMPA Stock	ESA/MMPA status; Strategic (Y/N)[1]	Stock abundance Nbest, (CV, N_{min}, most recent abundance survey)[2]	PBR	Annual M/SI[3]
Order Cetartiodactyla – Cetacea – Superfamily Mysticeti (baleen whales)						
Family Balaenidae						
Humpback whale	*Megaptera novaeangliae*	Central North Pacific	E, D,Y	10,103 (0.3, 7,890, 2006)	83	21
Minke whale	*Balaenoptera acutorostrata*	Alaska	-, N	N.A.	N.A.	N.A.
Order Cetartiodactyla – Cetacea – Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Delphinidae						
Killer whale	*Orcinus orca*	Alaska Resident	-, N	2,347 (N.A., 2,347, 2012)[4]	23.4	1
		West Coast Transient	-, N	243 (N/A, 243, 2009)[4]	2.4	1

		Northern Resident	-, N	290 (N/A, 290, 2014)[6]	1.96	0
Family Phocoenidae						
Harbor porpoise	*Phocoena phocoena*	Southeast Alaska	-, Y	975 (0.10, 896, 2012)[5]	8.9[5]	34[5]
Dall's porpoise	*Phocoenoides dalli*	Alaska	-, N	83,400	N.A.	38
Order Carnivora – Superfamily Pinnipedia						
Family Otariidae (eared seals and sea lions)						
Steller sea lion	*Eumatopia jubatus*	Western U.S.[7]	E, D; Y	50,983 (N.A., 50,983, 2016)	320	241
		Eastern U.S.	-, D, Y	41,638 (N/A, 41,638, 2015)	2,498	108
Family Phocidae (earless seals)						
Harbor seal	*Phoca vitulina richardii*	Glacier Bay/Icy Strait	-, N	7,210 (N.A.; 5,647; 2011)	169	104

[1] 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; N_{min} is the minimum estimate of stock abundance. In some cases, CV is not applicable (N/A).
[3]These values, found in NMFS's SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (*e.g.*, commercial fisheries, ship strike).
[4] N is based on counts of individual animals identified from photo-identification catalogs.
[5] In the SAR for harbor porpoise (NMFS 2017), NMFS identified population estimates and PBR for porpoises within inland Southeast Alaska waters (these abundance estimates have not been corrected for g(0); therefore, they are likely conservative). The calculated PBR is considered unreliable for the entire stock because it is based on estimates from surveys of only a portion (the inside waters of Southeast Alaska) of the range of this stock as currently designated. The Annual M/SI is for the entire stock, including coastal waters.
[6]Abundance estimates obtained from Towers et al 2015.
[7]Abundance, PBR, and Annual M/SI derived from draft 2017 SARs (Muto2017b).

All species that could potentially occur in the proposed survey areas are included in Table 3. As described below, all seven species (with nine managed stocks) temporally and spatially co-occur with the activity to the degree that take is reasonably likely to occur, and we have proposed authorizing it. In addition, sea otters may be found in Tenakee Springs. However, sea otters are managed by the U.S. Fish and Wildlife Service and are not considered further in this document.

Pinnipeds in the Activity Area

Steller Sea Lion

The Steller sea lion is the largest of the eared seals, ranging along the North Pacific Rim from northern Japan to California, with centers of abundance and distribution in the Gulf of Alaska and Aleutian Islands. Steller sea lions were listed as threatened range-wide under the

ESA on November 26, 1990 (55 FR 49204). Subsequently, NMFS published a final rule designating critical habitat for the species as a 20 nautical mile buffer around all major haulouts and rookeries, as well as associated terrestrial, air and aquatic zones, and three large offshore foraging areas (58 FR 45269; August 27, 1993). In 1997, NMFS reclassified Steller sea lions as two distinct population segments (DPS) based on genetic studies and other information (62 FR 24345; May 5, 1997). Steller sea lion populations that primarily occur west of 144° W (Cape Suckling, Alaska) comprise the western DPS (wDPS), while all others comprise the eastern DPS (eDPS); however, there is regular movement of both DPSs across this boundary (Jemison *et al.*, 2013). Upon this reclassification, the wDPS became listed as endangered while the eDPS remained as threatened (62 FR 24345; May 5, 1997) and in November 2013, the eDPS was delisted (78 FR 66140). No critical habitat for this species is designated in Southeast Alaska.

Steller sea lions are known to occur within the project area; however, systematic counts or surveys have not been completed throughout Tenakee Inlet. Therefore, the best information regarding sea lion abundance and distribution comes from anecdotal reports from local residents and extrapolations from nearby haulouts that have been regularly monitored.

Anecdotal reports indicate that sea lions are generally present only in the fall and winter. Reports of these anecdotal observations also suggest that as many as 10–20 may swim by on a winter day, although most feed at night when their herring prey tend to be near the water's surface (Wheeler, K., pers. comm.).

Steller sea lions use terrestrial haulout sites to rest and take refuge. They also gather on well-defined, traditionally used rookeries to pup and breed. These habitats are typically gravel, rocky, or sand beaches; ledges; or rocky reefs. The closest Steller sea lion haulout to the project area is the Tenakee Cannery Point haulout, which is approximately 8.9 km (4.8 nautical miles) east of the project site (Fritz *et al.,* 2016c; see Figure 4-1 of application). Recent summer counts have not recorded any Steller sea lions at this haulout, and historical counts between April and September have not exceeded 12 individuals during any survey (Fritz *et al.*, 2016b). This haulout appears to be most active between October and March (Figure 4-2), which is consistent with anecdotal reports of sea lion abundance in the project area (Rasanen, L., pers. comm.; Wheeler, K., pers. comm.). Non-pup counts conducted between October and March from 2001 to 2004 averaged 106 individuals and ranged from 16 to 251 (Fritz *et al.,* 2016b). Pups have not been counted at this haulout (Fritz *et al.,* 2016a). In addition to those counted at the haulouts, as many as a few hundred more sea lions occur throughout Tenakee Inlet in small hunting groups (Rasanen, L., pers. comm.). The Point Marsden and Emmons haulouts are also located within 20 nautical miles of Tenakee Springs, but it is unlikely that individuals from those haulouts regularly inhabit Tenakee Inlet. Experts with the Alaska Fisheries Science Center of NMFS estimate that roughly 17.8 percent of the Steller sea lions at the Tenakee Cannery Point haulout are members of the western DPS (L. Fritz, pers. comm; L. Fritz, unpublished data) while the rest (82.2 percent) are from the eastern DPS. Steller sea lions are included in Alaska subsistence harvests. Since subsistence harvest surveys began in 1992, the number of households hunting and harvesting sea lions has remained relatively constant at low levels (Wolf *et al.,* 2013).

Harbor Seal

Harbor seals range from Baja California north along the west coasts of Washington, Oregon, California, British Columbia, and Southeast Alaska; west through the Gulf of Alaska, Prince William Sound, and the Aleutian Islands; and north in the Bering Sea 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 are generally non-migratory, with local movements associated with such factors as tides, weather, season, food availability, and reproduction (Muto, 2017a).

Harbor seals in Alaska are partitioned into 12 separate stocks based largely on genetic structure: (1) the Aleutian Islands stock,(2) the Pribilof Islands stock, (3) the Bristol Bay stock, (4) the North Kodiak stock, (5) the South Kodiak stock, (6) the Prince William Sound stock, (7) the Cook Inlet/Shelikof stock, (8) the Glacier Bay/Icy Strait stock, (9) the Lynn Canal/Stephens Passage stock, (10) the Sitka/Chatham stock, (11) the Dixon/Cape Decision stock, and (12) the Clarence Strait stock. Only the Glacier Bay/Icy Strait stock is considered in this proposed IHA. The range of this stock includes Cape Fairweather southeast to Column Point, extending inland to Glacier Bay, Icy Strait, and from Hanus Reef south to Tenakee Inlet (Muto, 2017a).

Survey data from 2003 through 2011 indicate that there are eight harbor seal haulouts in Tenakee Inlet and a number of others nearby in Chatham Strait and Freshwater Bay (Figure 4-3). The nearest haulout to the project site is located on Tenakee Reef, near Tenakee Reef Light (a navigational and warning light for vessels), approximately 1 km south of the ferry terminal. Anecdotal observations indicate that up to 200 harbor seals may haul out on the rocks at and around the Tenakee Reef Light at any time of year (Rasanen, L., pers. comm.). Two additional harbor seal haulouts are located approximately 5.2 and 10.0 km from the ferry terminal, on Strawberry Island and in Crab Bay, respectively.

Aerial haulout surveys conducted in August 2011 divide Tenakee Inlet into four survey units. The survey unit along the north shore of the Inlet, including the project site, had a population estimate of 61 individuals. Other survey units in Tenakee Inlet had between 1 and 64 individuals. This information comes from a single year of surveys, and standard errors on these estimates are very high; therefore, confidence is low (London *et al.*, 2015). Researchers estimate that the total abundance in Tenakee Inlet was approximately 259 seals in 2011, including about 170 in the upper inlet and approximately 89 near the mouth (London, J., pers. comm.).

Because harbor seals are non-migratory, we do not suspect that abundance fluctuates seasonally, but distribution throughout Tenakee Inlet and Chatham Strait likely fluctuates drastically based on numerous environmental factors.

Cetaceans in the Action Area

Humpback whale

The humpback whale is distributed worldwide in all ocean basins. In winter, most humpback whales occur in the subtropical and tropical waters of the Northern and Southern Hemispheres, and migrate to high latitudes in the summer to feed. The historic summer feeding range of humpback whales in the North Pacific encompassed coastal and inland waters around the Pacific Rim from Point Conception, California, north to the Gulf of Alaska and the Bering Sea, and west along the Aleutian Islands to the Kamchatka Peninsula and into the Sea of Okhotsk and north of the Bering Strait (Johnson and Wolman 1984).

Under the MMPA, there are three stocks of humpback whales in the North Pacific: (1) the California/Oregon/Washington and Mexico stock, consisting of winter/spring populations in coastal Central America and coastal Mexico which migrate to the coast of California to southern British Columbia in summer/fall; (2) the central North Pacific stock, consisting of winter/spring populations of the Hawaiian Islands which migrate primarily to northern British Columbia/Southeast Alaska, the Gulf of Alaska, and the Bering Sea/Aleutian Islands; and (3) the western North Pacific stock, consisting of winter/spring populations off Asia which migrate primarily to Russia and the Bering Sea/Aleutian Islands. The central North Pacific stock is the only stock that is found near the project activities.

On September 8, 2016, NMFS published a final rule dividing the globally listed endangered species into 14 DPSs, removing the worldwide species-level listing, and in its place listing four DPSs as endangered and one DPS as threatened (81 FR 62259; effective October 11, 2016). Two DPSs (Hawaii and Mexico) are potentially present within the action area. The Hawaii DPS is not listed and the Mexico DPS is listed as threatened under the ESA. The Hawaii DPS is estimated to contain 11,398 animals where the Mexico DPS is estimated to contain 3,264 animals.

Within the action area, humpback whales are seen most frequently from September through February although sightings may extend into April (Straley and Pendell 2017). Humpback whales are found throughout southeast Alaska in a variety of marine environments, including open-ocean, near-shore waters, and areas with strong tidal currents (Dahlheim *et al.*, 2009). Most humpback whales are migratory and spend winters in the breeding grounds off either Hawaii or Mexico. Humpback whales generally arrive in southeast Alaska in March and return to their wintering grounds in November. Some humpback whales depart late or arrive early to feeding grounds, and therefore the species occurs in southeast Alaska year-round (Straley 1990). Across the region, there have been no recent estimates of humpback whale density, and there have been no systematic surveys of humpback whales in or near the project area. Marine mammal experts in the region have indicated that there are as many as 12 humpbacks present in Tenakee Inlet from spring through fall. During the winter, they are less common, but are regularly present (S. Lewis and M. Dahlheim, pers. comm.).

Minke Whale

Minke whales are found throughout the northern hemisphere in polar, temperate, and tropical waters. In the North Pacific, minke whales occur from the Bering and Chukchi seas south to near the Equator (Leatherwood *et al.*, 1982). In Alaska, the minke whale diet consists primarily of euphausiids and walleye pollock. Minke whales are generally found in shallow, coastal waters within 200 meters of shore (Zerbini *et al.*, 2006) and are usually solitary or in small groups of 2 to 3. Rarely, loose aggregations of up to 400 animals have been associated with feeding areas in arctic latitudes. In Alaska, seasonal movements are associated with feeding areas that are generally located at the edge of the pack ice (NMFS 2014). Surveys in southeast Alaska have consistently identified individuals throughout inland waters in low numbers (Dahlheim *et al.*, 2009).

Little is known about minke whale abundance and distribution in the project area as there have been no systematic studies conducted on the species in or near Tenakee Inlet. Surveys throughout southeast Alaska between 1991 and 2007 recorded minke whales infrequently, but noted a wide variety of habitat types used throughout all inland waters and little seasonal variation. During these surveys, the observation nearest to Tenakee Springs was in Chatham Strait, approximately 10 miles south of the mouth of Tenakee Inlet. Concentrations of minke whales were observed near the entrance to Glacier Bay. Most minke whales observed during the surveys were individual animals (Dahlheim *et al.*, 2009).

Killer Whale

Killer whales have been observed in all the world’s oceans, but the highest densities occur in colder and more productive waters found at high latitudes (NMFS 2016a). Killer whales occur along the entire Alaska coast, in British Columbia and Washington inland waterways, and along the outer coasts of Washington, Oregon, and California (Muto *et al.*, 2017a).

Based on data regarding association patterns, acoustics, movements, and genetic differences, eight killer whale stocks are now recognized within the Pacific U.S. Exclusive

Economic Zone. This proposed IHA considers only the Alaska resident stock, northern resident and the west coast transient, all other stocks occur outside the geographic area under consideration (Muto *et al.*, 2017a).

The Alaska Resident stock occurs from southeastern Alaska to the Aleutian Islands and Bering Sea. Photo-identification studies between 2005 and 2009 identified 2,347 individuals in this stock, including approximately 121 in southeast Alaska (Muto *et al.*, 2017a). The West Coast transient stock occurs from California north through southeast Alaska. Between 1975 and 2012, surveys identified 521 individual West Coast transient killer whales. Dahlheim *et al.* (2009) noted a 5.2 percent annual decline in transient killer whales observed in southeast Alaska. The northern resident stock occurs from Washington State through part of southeastern Alaska. The trend for the Northern resident stock is an increasing population with an average of 2.1 percent annual increase over a 36-year period.

Surveys between 1991 and 2007 encountered resident killer whales during all seasons throughout southeast Alaska. Both residents and transients were common in a variety of habitats and all major waterways, including protected bays and inlets. During this study, strong seasonal variation in abundance or distribution of killer whales was not present, but there was substantial variability between years (Dahlheim *et al.*, 2009). In Tenakee Inlet, systematic surveys of killer whales have not been completed. Nevertheless, local marine mammal experts estimate that approximately one killer whale pod passes by Tenakee Springs each month (Lewis, S., pers. comm.). It is not known whether these are resident or transient whales.

Harbor porpoise

The harbor porpoise inhabits temporal, subarctic, and arctic waters. In the eastern North Pacific, harbor porpoises range from Point Barrow, Alaska, to Point Conception, California.

Harbor porpoise primarily frequent coastal waters and occur most frequently in waters less than 100 m deep (Hobbs and Waite 2010). They may occasionally be found in deeper offshore waters.

In Alaska, harbor porpoises are currently divided into three stocks, based primarily on geography: (1) the Southeast Alaska stock - occurring from the northern border of British Columbia to Cape Suckling, Alaska, (2) the Gulf of Alaska stock - occurring from Cape Suckling to Unimak Pass, and (3) the Bering Sea stock - occurring throughout the Aleutian Islands and all waters north of Unimak Pass. Only the Southeast Alaska stock is considered in this proposed IHA because the other stocks are not found in the geographic area under consideration. The 2016 SAR for this stock further delineated population estimates (Muto *et al.*, 2017a). The total estimated annual level of human-caused mortality and serious injury for Southeast Alaska harbor porpoise (n= 34) exceeds the calculated PBR of 8.9 porpoises. However, the calculated PBR is considered unreliable for the entire stock because it is based on estimates from surveys of only a portion (the inside 7of Southeast Alaska) of the range of this stock as currently designated. Because the total stock abundance estimates are more than eight years old (with the exception of the 2010-2012 abundance estimates provided for the inland waters of Southeast Alaska), and the frequency of incidental mortality and serious injury in U.S. commercial fisheries throughout Southeast Alaska is not known, the Southeast Alaska stock of harbor porpoise is classified as a strategic stock. Population trends and status of this stock relative to its Optimum Sustainable Population are currently unknown.

There are no subsistence use of this species; however, as noted above, entanglement in fishing gear contributes to human-caused mortality and serious injury. Muto *et al.* (2017a) also reports 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).

Information on harbor porpoise abundance and distribution in Tenakee Inlet has not been systematically collected. Anecdotal observations from marine mammal researchers indicate that harbor porpoise are seen a few times per month in groups of 3 to 5 individuals, but there is no seasonal trend to these observations (Dahlheim, M., pers. comm.).

Dall's porpoise

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

There currently is no information on the presence or abundance of Dall's porpoises in Tenakee Inlet. Local marine mammal experts indicate that the species is rarely seen near Tenakee Springs (Lewis, S., pers. comm.). Dall's porpoises likely occur more often in the deeper waters of Chatham Strait, although waters more than 600 feet (182 meters) deep are found within the central portion of Tenakee Inlet between Tenakee Springs and Chatham Strait (Figure 4-4). Average pod size in southeast Alaska ranges from three to six individuals (Dahlheim *et al.*, 2009). Dall's porpoise commonly "bowride," or ride the wake created by large, relatively fast-moving vessels. It is possible that Dall's porpoises may bowride alongside a vessel into the project area, but we would not expect individuals to stay for long periods or congregate in the project area, nor to venture farther up Tenakee Inlet due to shallow water depths.

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 (2016) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibels (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al*. (2007) retained. The functional groups and the associated frequencies are indicated below in Table 4 (note that these frequency ranges correspond to the range for the composite group, with the entire range not necessarily reflecting the capabilities of every species within that group):

Table 4. Marine mammal hearing groups and their generalized hearing range.

Hearing Group	Generalized Hearing Range*
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz (Best Hearing Range: 100 Hz to 8 kHz)
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz (Best Hearing Range: 10 kHz to 100 kHz)
High-frequency (HF) cetaceans (true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* and *L. australis*)	275 Hz to 160 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz (Best Hearing Range: 1 kHz to 50 kHz)
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz (Best Hearing Range: 2 kHz to 48 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 (2016) for a review of available information. As previously discussed, seven marine mammal species (five cetacean and two pinniped (one otariid and one phocid) species) have the reasonable potential to co-occur with the proposed survey activities. Please refer to Table 3. Of the cetacean species that may be present, two are classified as low-frequency cetaceans (*i.e.*, all mysticete species), one is classified as a mid-frequency cetaceans (*i.e.*, killer whale), and two are classified as high-frequency cetaceans (*i.e.*, harbor and Dall's porpoise).

Potential Effects of Specified Activities on Marine Mammals and their Habitat

This section includes a summary and discussion of the ways that components of the specified activity may impact marine mammals and their habitat. The "Estimated Take" section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by this activity. The "Negligible Impact Analysis and Determination" section considers the content of this section, the "Estimated Take by Incidental Harassment" section, and the "Proposed Mitigation" section, to draw conclusions regarding the likely impacts of these activities on the reproductive success or survivorship of individuals and how those impacts on individuals are likely to impact marine mammal species or stocks.

Description of Sound Sources

Sound travels in waves, the basic components of which are frequency, wavelength, velocity, and amplitude. Frequency is the number of pressure waves that pass by a reference point per unit of time and is measured in hertz (Hz) or cycles per second. Wavelength is the distance between two peaks of a sound wave; lower frequency sounds have longer wavelengths than higher frequency sounds. Amplitude is the height of the sound pressure wave or the 'loudness' of a sound and is typically measured using the dB scale. A dB is the ratio between a measured pressure (with sound) and a reference pressure (sound at a constant pressure, established by scientific standards). It is a logarithmic unit that accounts for large variations in amplitude; therefore, relatively small changes in dB ratings correspond to large changes in sound pressure. When referring to sound pressure levels (SPLs; the sound force per unit area), sound is referenced in the context of underwater sound pressure to one microPascal (μPa). One pascal is the pressure resulting from a force of one newton exerted over an area of one square meter. The source level (SL) represents the sound level at a distance of 1 m from the source (referenced to 1 μPa). The received level is the sound level at the listener's position. Note that all underwater sound levels in this document are referenced to a pressure of 1 μPa and all airborne sound levels in this document are referenced to a pressure of 20 μPa.

Root mean square (rms) is the quadratic mean sound pressure over the duration of an impulse. Rms is calculated by squaring all of the sound amplitudes, averaging the squares, and then taking the square root of the average (Urick 1983). Rms accounts for both positive and negative values; squaring the pressures makes all values positive so that they may be accounted for in the summation of pressure levels (Hastings and Popper 2005). This measurement is often used in the context of discussing behavioral effects, in part because behavioral effects, which often result from auditory cues, may be better expressed through averaged units than by peak pressures.

When underwater objects vibrate or activity occurs, sound-pressure waves are created. These waves alternately compress and decompress the water as the sound wave travels. Underwater sound waves radiate in all directions away from the source (similar to ripples on the surface of a pond), except in cases where the source is directional. The compressions and decompressions associated with sound waves are detected as changes in pressure by aquatic life and man-made sound receptors such as hydrophones.

Even in the absence of sound from the specified activity, the underwater environment is typically loud due to ambient sound. Ambient sound is defined as environmental background sound levels lacking a single source or point (Richardson *et al*., 1995), and the sound level of a region is defined by the total acoustical energy being generated by known and unknown sources.

These sources may include physical (*e.g.*, waves, earthquakes, ice, atmospheric sound), biological (*e.g.*, sounds produced by marine mammals, fish, and invertebrates), and anthropogenic sound (*e.g.*, vessels, dredging, aircraft, construction). A number of sources contribute to ambient sound, including the following (Richardson *et al*., 1995):

- Wind and waves: The complex interactions between wind and water surface, including processes such as breaking waves and wave-induced bubble oscillations and cavitation, are a main source of naturally occurring ambient noise for frequencies between 200 Hz and 50 kilohertz (kHz) (Mitson 1995). In general, ambient sound levels tend to increase with increasing wind speed and wave height. Surf noise becomes important near shore, with measurements collected at a distance of 8.5 km from shore showing an increase of 10 dB in the 100 to 700 Hz band during heavy surf conditions.
- Precipitation: Sound from rain and hail impacting the water surface can become an important component of total noise at frequencies above 500 Hz, and possibly down to 100 Hz during quiet times.
- Biological: Marine mammals can contribute significantly to ambient noise levels, as can some fish and shrimp. The frequency band for biological contributions is from approximately 12 Hz to over 100 kHz.
- Anthropogenic: Sources of ambient noise related to human activity include transportation (surface vessels and aircraft), dredging and construction, oil and gas drilling and production, seismic surveys, sonar, explosions, and ocean acoustic studies. Shipping noise typically dominates the total ambient noise for frequencies between 20 and 300 Hz. In general, the frequencies of anthropogenic sounds are below 1 kHz and, if higher frequency sound levels are created, they attenuate rapidly (Richardson *et al*., 1995). Sound from identifiable

anthropogenic sources other than the activity of interest (*e.g.*, a passing vessel) is sometimes termed background sound, as opposed to ambient sound.

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

In-water construction activities associated with the project would include impact pile driving, vibratory pile driving and removal, and drilling. The sounds produced by these activities fall into one of two general sound types: pulsed and non-pulsed (defined in the following). The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (*e.g.*, Ward 1997 in Southall *et al.*, 2007). Please see Southall *et al*. (2007) for an in-depth discussion of these concepts.

Pulsed sound sources (*e.g.*, explosions, gunshots, sonic booms, impact pile driving) produce signals that are brief (typically considered to be less than one second), broadband, atonal transients (ANSI 1986; Harris 1998; NIOSH 1998; ISO 2003; ANSI 2005) and occur either as isolated events or repeated in some succession. Pulsed sounds are all characterized by a relatively rapid rise from ambient pressure to a maximal pressure value followed by a rapid decay period that may include a period of diminishing, oscillating maximal and minimal pressures, and generally have an increased capacity to induce physical injury as compared with sounds that lack these features.

Non-pulsed sounds can be tonal, narrowband, or broadband, brief or prolonged, and may be either continuous or non-continuous (ANSI 1995; NIOSH 1998). Some of these non-pulsed sounds can be transient signals of short duration but without the essential properties of pulses (*e.g.*, rapid rise time). Examples of non-pulsed sounds include those produced by vessels, aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems. The duration of such sounds, as received at a distance, can be greatly extended in a highly reverberant environment.

Impact hammers operate by repeatedly dropping a heavy piston onto a pile to drive the pile into the substrate. Sound generated by impact hammers is characterized by rapid rise times and high peak levels, a potentially injurious combination (Hastings and Popper 2005). Vibratory hammers install piles by vibrating them and allowing the weight of the hammer to push them into the sediment. Vibratory hammers produce significantly less sound than impact hammers. Peak SPLs may be 180 dB or greater, but are generally 10 to 20 dB lower than SPLs generated during impact pile driving of the same-sized pile (Oestman *et al*., 2009). Rise time is slower, reducing the probability and severity of injury, and sound energy is distributed over a greater amount of time (Nedwell and Edwards 2002; Carlson *et al*., 2005). Drilling to insert the steel piles (not for tension anchors) will be operated by a down-hole hammer. A down-hole hammer is a drill bit that drills through the bedrock using a pulse mechanism that functions at the bottom of the hole. This pulsing bit breaks up rock to allow removal of debris and insertion of the pile. The head extends so that the drilling takes place below the pile. The pulsing sounds produced by the hammer method are continuous and reduces sound attenuation because the noise is primarily contained within the steel pile and below ground rather than impact hammer driving methods which occur at the top of the pile (R&M 2016).

Acoustic Impacts

Anthropogenic sounds cover a broad range of frequencies and sound levels and can have a range of highly variable impacts on marine life, from none or minor to potentially severe responses, depending on received levels, duration of exposure, behavioral context, and various other factors. The potential effects of underwater sound from active acoustic sources can potentially result in one or more of the following; temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, stress, and masking (Richardson *et al*., 1995; Gordon *et al*., 2004; Nowacek *et al*., 2007; Southall *et al*., 2007; Gotz *et al*., 2009). The degree of effect is intrinsically related to the signal characteristics, received level, distance from the source, and duration of the sound exposure. In general, sudden, high level sounds can cause hearing loss, as can longer exposures to lower level sounds. Temporary or permanent loss of hearing will occur almost exclusively for noise within an animal's hearing range. We first describe specific manifestations of acoustic effects before providing discussion specific to ADOT&PF's construction activities.

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 ADOT&PF's activities may result in such effects (see below for further discussion). Marine mammals exposed to high-intensity sound, or to lower-intensity sound for prolonged periods, can experience hearing threshold shift (TS), which is the loss of hearing sensitivity at certain frequency ranges (Kastak *et al*., 1999; Schlundt *et al*., 2000; Finneran *et al*., 2002, 2005b). TS can be permanent (PTS), in which case the loss of hearing sensitivity is not fully recoverable, or temporary (TTS), in which case the animal's hearing threshold would recover over time (Southall *et al*., 2007). Repeated sound exposure that leads to TTS could cause PTS. In severe cases of PTS, there can be total or partial deafness, while in most cases the animal has an impaired ability to hear sounds in specific frequency ranges (Kryter 1985).

When PTS occurs, there is physical damage to the sound receptors in the ear (*i.e.*, tissue damage), whereas TTS represents primarily tissue fatigue and is reversible (Southall *et al*., 2007). In addition, other investigators have suggested that TTS is within the normal bounds of physiological variability and tolerance and does not represent physical injury (*e.g.*, Ward 1997). Therefore, NMFS does not consider TTS to constitute auditory injury.

Relationships between TTS and PTS thresholds have not been studied in marine mammals – PTS data exists only for a single harbor seal (Kastak *et al*., 2008) – but are assumed to be similar to those in humans and other terrestrial mammals. PTS typically occurs at exposure levels at least several dB above a 40-dB threshold shift approximates PTS onset; *e.g*., Kryter *et al*., 1966; Miller, 1974 found that inducing mild TTS (a 6-dB threshold shift) approximates TTS onset (*e.g*., Southall *et al*., 2007). Based on data from terrestrial mammals, a precautionary assumption is that the PTS thresholds for impulse sounds (such as impact pile driving pulses as received close to the source) are at least 6 dB higher than the TTS threshold on a peak-pressure basis and PTS cumulative sound exposure level thresholds are 15 to 20 dB higher than TTS cumulative sound exposure level thresholds (Southall *et al*., 2007). Given the higher level of sound or longer exposure duration necessary to cause PTS as compared with TTS, it is considerably less likely that PTS could occur.

TTS is the mildest form of hearing impairment that can occur during exposure to sound (Kryter 1985). While experiencing TTS, the hearing threshold rises, and a sound must be at a higher level in order to be heard. In terrestrial and marine mammals, TTS can last from minutes or hours to days (in cases of strong TTS). In many cases, hearing sensitivity recovers rapidly after exposure to the sound ends. Few data on sound levels and durations necessary to elicit mild TTS have been obtained for marine mammals.

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

Currently, TTS data only exist for four species of cetaceans (bottlenose dolphin (*Tursiops truncatus*), beluga whale (*Delphinapterus leucas)*, harbor porpoise, and Yangtze finless porpoise (*Neophocoena asiaeorientalis)* and three species of pinnipeds (northern elephant seal, harbor seal, and California sea lion) exposed to a limited number of sound sources (*i.e*., mostly tones and octave-band noise) in laboratory settings (*e.g*., Finneran *et al*., 2002; Nachtigall *et al*., 2004; Kastak *et al*., 2005; Lucke *et al*., 2009; Popov *et al*., 2011). In general, harbor seals (Kastak *et al*., 2005; Kastelein *et al*., 2012a) and harbor porpoises (Lucke *et al*., 2009; Kastelein *et al*., 2012b) have a lower TTS onset than other measured pinniped or cetacean species. Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species. There are no data available on noise-induced hearing loss for mysticetes. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Southall *et al*. (2007) and Finneran and Jenkins (2012).

In addition to PTS and TTS, there is a potential for non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to high level underwater sound or as a secondary effect of extreme behavioral reactions (*e.g*., change in dive profile as a result of an avoidance reaction) caused by exposure to sound. These impacts can include neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage (Cox *et al*., 2006; Southall *et al*., 2007; Zimmer and Tyack 2007). The AKOT & PF's activities do not involve the use of devices such as explosives or mid-frequency active sonar that are associated with these types of effects.

When a live or dead marine mammal swims or floats onto shore and is incapable of returning to sea, the event is termed a "stranding" (16 U.S.C. 1421h(3)). Marine mammals are known to strand for a variety of reasons, such as infectious agents, biotoxicosis, starvation, fishery interaction, ship strike, unusual oceanographic or weather events, sound exposure, or combinations of these stressors sustained concurrently or in series (*e.g.*, Geraci *et al*., 1999). However, the cause or causes of most strandings are unknown (*e.g.*, Best 1982). Combinations of dissimilar stressors may combine to kill an animal or dramatically reduce its fitness, even though one exposure without the other would not be expected to produce the same outcome (*e.g.*, Sih *et al*., 2004). For further description of stranding events see, *e.g.*, Southall *et al*., 2006; Jepson *et al*., 2013; Wright *et al*., 2013.

Behavioral effects – 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. 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). 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, 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*., 2007b). 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 because 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) 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).

Auditory masking – Sound can disrupt behavior through masking, or interfering with, an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g*., those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al*., 1995). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may occur whether the sound is natural (*e.g*., snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g*., shipping, sonar, seismic exploration) in origin. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g*., signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g*., sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age or TTS hearing loss), and existing ambient noise and propagation conditions.

Under certain circumstances, marine mammals experiencing significant masking could also be impaired from maximizing their performance fitness in survival and reproduction. Therefore, when the coincident (masking) sound is man-made, it may be considered harassment when disrupting or altering critical behaviors. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs during the sound exposure.

Because masking (without resulting in TS) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

The frequency range of the potentially masking sound is important in determining any potential behavioral impacts. For example, low-frequency signals may have less effect on high-frequency echolocation sounds produced by odontocetes but are more likely to affect detection of mysticete communication calls and other potentially important natural sounds such as those produced by surf and some prey species. The masking of communication signals by anthropogenic noise may be considered as a reduction in the communication space of animals (*e.g*., Clark *et al*., 2009) and may result in energetic or other costs as animals change their vocalization behavior (*e.g*., Miller *et al*., 2000; Foote *et al*., 2004; Parks *et al*., 2007b; Di Iorio and Clark 2009; Holt *et al*., 2009). Masking can be reduced in situations where the signal and noise come from different directions (Richardson *et al*., 1995), through amplitude modulation of the signal, or through other compensatory behaviors (Houser and Moore 2014). Masking can be tested directly in captive species (*e.g*., Erbe 2008), but in wild populations it must be either modeled or inferred from evidence of masking compensation. There are few studies addressing real-world masking sounds likely to be experienced by marine mammals in the wild (*e.g*., Branstetter *et al*., 2013).

Masking affects both senders and receivers of acoustic signals and can potentially have long-term chronic effects on marine mammals at the population level as well as at the individual level. Low-frequency ambient sound levels have increased by as much as 20 dB (more than three times in terms of SPL) in the world's ocean from pre-industrial periods, with most of the increase from distant commercial shipping (Hildebrand 2009). All anthropogenic sound sources, but especially chronic and lower-frequency signals (*e.g.*, from vessel traffic), contribute to elevated ambient sound levels, thus intensifying masking.

Acoustic Effects, Underwater

Potential Effects of DTH drilling and Pile Driving– The effects of sounds from DTH drilling and pile driving might include 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; Gordon *et al*., 2003; Nowacek *et al*., 2007; Southall *et al*., 2007). The effects of pile driving or drilling on marine mammals are dependent on several factors, including the type and depth of the animal; the pile size and type, and the intensity and duration of the pile driving or drilling sound; the substrate; the standoff distance between the pile and the animal; and the sound propagation properties of the environment. Impacts to marine mammals from pile driving and DTH drilling activities are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the frequency, received level, and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The further away from the source, the less intense the exposure should be. The substrate and depth of the habitat affect the sound propagation properties of the environment. In addition, substrates that are soft (*e.g.*, sand) would absorb or attenuate the sound more readily than hard substrates (*e.g.*, rock), which may reflect the acoustic wave. Soft porous substrates would also likely require less time to drive the pile, and possibly less forceful equipment, which would ultimately decrease the intensity of the acoustic source.

In the absence of mitigation, impacts to marine species could be expected to include physiological and behavioral responses to the acoustic signature (Viada *et al*., 2008). Potential effects from impulsive sound sources like pile driving can range in severity from effects such as behavioral disturbance to temporary or permanent hearing impairment (Yelverton *et al*., 1973). Due to the nature of the pile driving sounds in the project, behavioral disturbance is the most likely effect from the proposed activity. Marine mammals exposed to high intensity sound repeatedly or for prolonged periods can experience hearing threshold shifts. PTS constitutes injury, but TTS does not (Southall *et al*., 2007). Based on the best scientific information available, the SPLs for the construction activities in this project are below the thresholds that could cause TTS or the onset of PTS (Table 5 in Estimated Take Section).

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

Disturbance Reactions

Responses to continuous sound, such as vibratory pile installation, have not been documented as well as responses to pulsed sounds. With both types of pile driving, it is likely that the onset of pile driving could result in temporary, short-term changes in an animal's typical behavior and/or avoidance of the affected area. These behavioral changes may include (Richardson *et al.,* 1995): changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where sound sources are located; and/or flight responses (*e.g*., pinnipeds flushing into water from haulouts or rookeries). Pinnipeds may increase their haul-out time, possibly to avoid in-water disturbance (Thorson and Reyff 2006). If a marine mammal responds to a stimulus by changing its behavior (*e.g*., through relatively minor changes in locomotion direction/speed or vocalization behavior), the response may or may not constitute taking at the individual level, and is unlikely to affect the stock or the species as a whole. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on animals, and if so potentially on the stock or species, could potentially be significant (*e.g*., Lusseau and Bejder 2007; Weilgart 2007).

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

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

- Longer-term cessation of feeding or social interaction.

The onset of behavioral disturbance from anthropogenic sound depends on both external factors (characteristics of sound sources and their paths) and the specific characteristics of the receiving animals (hearing, motivation, experience, demography) and is difficult to predict (Southall *et al.*, 2007).

Auditory Masking

Natural and artificial sounds can disrupt behavior by masking. The frequency range of the potentially masking sound is important in determining any potential behavioral impacts. Because sound generated from in-water pile driving and removal and DTH drilling is mostly concentrated at low-frequency ranges, it may have less effect on high frequency echolocation sounds made by porpoises. The most intense underwater sounds in the proposed action are those produced by impact pile driving. Given that the energy distribution of pile driving covers a broad frequency spectrum, sound from these sources would likely be within the audible range of marine mammals present in the project area. Impact pile driving activity is relatively short-term, with rapid pulses occurring for approximately fifteen minutes per pile. The probability for impact pile driving resulting from this proposed action masking acoustic signals important to the behavior and survival of marine mammal species is low. Vibratory pile driving is also relatively short-term, with rapid oscillations occurring for approximately one and a half hours per pile. It is possible that vibratory pile driving resulting from this proposed action may mask acoustic signals important to the behavior and survival of marine mammal species, but the short-term duration and limited affected area would result in insignificant impacts from masking. Any masking event that could possibly rise to Level B harassment under the MMPA would occur concurrently within the zones of behavioral harassment already estimated for DTH drilling and vibratory and impact pile driving, and which have already been taken into account in the exposure analysis.

Acoustic Effects, Airborne - Pinnipeds that occur near the project site could be exposed to airborne sounds associated with pile driving and removal and DTH drilling that have the potential to cause behavioral harassment, depending on their distance from pile driving activities. Cetaceans are not expected to be exposed to airborne sounds that would result in harassment as defined under the MMPA.

Airborne noise will primarily be an issue for pinnipeds that are swimming or hauled out near the project site within the range of noise levels elevated above the acoustic criteria. We recognize that pinnipeds in the water could be exposed to airborne sound that may result in behavioral harassment when looking with their heads above water. Most likely, airborne sound would cause behavioral responses similar to those discussed above in relation to underwater sound. For instance, anthropogenic sound could cause hauled-out pinnipeds to exhibit changes in their normal behavior, such as reduction in vocalizations, or cause them to temporarily abandon the area and move further from the source. However, these animals would previously have been 'taken' because of exposure to underwater sound above the behavioral harassment thresholds, which are in all cases larger than those associated with airborne sound. Thus, the behavioral harassment of these animals is already accounted for in these estimates of potential take. Multiple instances of exposure to sound above NMFS' thresholds for behavioral harassment are not believed to result in increased behavioral disturbance, in either nature or intensity of disturbance reaction. Therefore, we do not believe that authorization of incidental take resulting from airborne sound for pinnipeds is warranted, and airborne sound is not discussed further here.

Anticipated Effects on Habitat

The proposed activities at the project area would not result in permanent negative impacts to habitats used directly by marine mammals, but may have potential short-term impacts to food sources such as forage fish and may affect acoustic habitat (see masking discussion above). There are no known foraging hotspots or other ocean bottom structure of significant biological importance to marine mammals present in the marine waters of the project area during the construction window. Therefore, the main impact issue associated with the proposed activity would be temporarily elevated sound levels and the associated direct effects on marine mammals, as discussed previously in this document. The primary potential acoustic impacts to marine mammal habitat are associated with elevated sound levels produced by vibratory and impact pile driving and removal and DTH drilling in the area. However, other potential impacts to the surrounding habitat from physical disturbance are also possible.

In-water Construction Effects on Potential Prey (Fish)

Construction activities would produce continuous (*i.e*., vibratory pile driving and DTH drilling) and 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 pulses at received levels of 160 dB may cause subtle changes in fish behavior. SPLs of 180 dB may cause noticeable changes in behavior (Pearson *et al.*, 1992; Skalski *et al.*, 1992). SPLs of sufficient strength have been known to cause injury to fish and fish mortality.

The most likely impact to fish from pile driving and drilling activities at the project area would be temporary behavioral avoidance of the area. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. In general, impacts to marine mammal prey species are expected to be minor and temporary due to the short timeframe for the project.

Pile Driving Effects on Potential Foraging Habitat

The area likely impacted by the project is relatively small compared to the available habitat in Tenakee Inlet (*e.g.*, most of the impacted area is limited near the mouth of the inlet. Avoidance by potential prey (*i.e.*, fish) of the immediate area due to the temporary loss of this foraging habitat is also possible. 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. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity in Tenakee Inlet.

The duration of the construction activities is relatively short. The construction window is for a maximum of 93 days and each day, construction activities would only occur for a few hours during the day. Impacts to habitat and prey are expected to be minimal based on the short duration of activities.

In summary, given the short daily duration of sound associated with individual pile driving and drilling events and the relatively small areas being affected, pile driving and drilling activities associated with the proposed action are not likely to have a permanent, adverse effect on any fish habitat, or populations of fish species. Thus, any impacts to marine mammal habitat are not expected to cause significant or long-term consequences for individual marine mammals or their populations.

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 whether the number of takes is "small" 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 be by Level B harassment only, in the form of disruption of behavioral patterns for individual marine mammals resulting from exposure to pile driving and drilling. Based on the nature of the activity and the anticipated effectiveness of the mitigation measures (*i.e.*, shutdowns – discussed in detail below in Proposed Mitigation section), Level A harassment is neither anticipated nor proposed to be authorized. As described previously, no mortality is anticipated or proposed to be authorized for this activity. Below we describe how the take is estimated.

Described in the most basic way, 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.

Below, we describe these components in more detail and present the proposed take estimate.

Acoustic Thresholds

Using the best available science, NMFS has developed acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to 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.*, 2011). 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 (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 and impact pile driving) or intermittent (*e.g*., scientific sonar) sources.

ADOT&PF's proposed activity includes the use of continuous (vibratory pile driving and drilling) and impulsive (impact pile driving) sources, and therefore the 120 and 160 dB re 1 μPa (rms) thresholds are applicable.

Level A harassment for non-explosive sources - NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Technical Guidance, 2016) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) because of exposure to noise from two different types of sources (impulsive or non-impulsive).

These thresholds were developed by compiling and synthesizing the best available science and soliciting input multiple times from both the public and peer reviewers to inform the final product, and are provided in Table 5 below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS' 2016 Technical Guidance, which may be accessed at: *http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm*.

Table 5. Thresholds identifying the onset of Permanent Threshold Shift.

	PTS Onset Acoustic Thresholds[1] (Received Level)	
Hearing Group	Impulsive	Non-impulsive
Low-frequency cetaceans	Lpk,flat: 219 dB LE,LF,24h: 183 dB	LE,LF,24h: 199 dB
Mid-frequency cetaceans	Lpk,flat: 230 dB LE,MF,24h: 185 dB	LE,MF,24h: 198 dB
High-frequency cetaceans	Lpk,flat: 202 dB LE,HF,24h: 155 dB	LE,HF,24h: 173 dB
Phocid Pinnipeds (underwater)	Lpk,flat: 218 dB LE,PW,24h: 185 dB	LE,PW,24h: 201 dB
Otariid Pinnipeds (underwater)	Lpk,flat: 232 dB LE,OW,24h: 203 dB	LE,OW,24h: 219 dB

[1]NMFS 2016

Although ADOT&PF's construction activity includes the use of impulsive (impact pile driving) and non-impulsive (vibratory pile driving and drilling) sources, the shutdown zones set by the applicant are large enough to ensure Level A harassment will be prevented. The level A zones for the proposed project are illustrated in Table 7. The highest level A zone shown (176 meters for high- and low-frequency cetaceans) is roughly 24 meters less than the total distance of the largest shutdown zone (200 meters for high- and low-frequency cetaceans). To assure the largest shutdown zone can be fully monitored, protected species observers (PSOs) will be positioned in the possible best vantage points during all piling/drilling activities to guarantee a shutdown if a high- and/or low-frequency cetacean approaches or enters the 200-meter shutdown zone. These measures are described in full detail below in the Proposed Mitigation and Monitoring Sections.

Ensonified Area

Here, we describe operational and environmental parameters of the activity that will feed into identifying the area ensonified above the acoustic thresholds.

The sound field in the project area is the existing background noise plus additional construction noise from the proposed project. Marine mammals are expected to be affected via sound generated by the primary components of the project, *i.e.*, impact pile driving, vibratory pile driving, and vibratory pile removal. Vibratory hammers produce constant sound when operating, and produce vibrations that liquefy the sediment surrounding the pile, allowing it to penetrate to the required seating depth. An impact hammer would then generally be used to place the pile at its intended depth. The actual durations of each installation method vary depending on the type and size of the pile. An impact hammer is a steel device that works like a piston, producing a series of independent strikes to drive the pile. Impact hammering typically generates the loudest noise associated with pile installation. Factors that could potentially minimize the potential impacts of pile installation associated with the project include:

- The relatively shallow waters in the project area (Taylor *et al.*, 2008);
- Land forms around Tenakee Springs that would block the noise from spreading; and

- Vessel traffic and other commercial and industrial activities in the project area that contribute to elevated background noise levels.

In order to calculate distances to the Level A and Level B sound thresholds for piles of various sizes being used in this project, NMFS used acoustic monitoring data from other locations (see Table 6). Note that piles of differing sizes have different sound source levels.

Empirical data from recent ADOT&PF sound source verification (SSV) studies at Ketchikan, Kodiak, and Auke Bay, Alaska were used to estimate sound source levels (SSLs) for vibratory, impact, and drilling installations of 30-inch steel pipe piles (MacGillivray *et al.*, 2016, Warner and Austin 2016b, Denes *et al.*, 2016a, respectively). These Alaskan construction sites were generally assumed to best represent the environmental conditions found in Tenakee and represent the nearest available source level data for 30-inch steel piles. Similarities among the sites include thin layers of soft sediments overlying a bedrock layer and comparable bedrock depths. However, the use of data from Alaska sites was not appropriate in all instances. Details are described below.

For vibratory driving of 24-inch steel piles, data from two Navy project locations in the state of Washington were reviewed. These include data from proxy sound source values at Navy installations in Puget Sound (Navy, 2015) and along the waterfront at Naval Base Kitsap (NBK), Bangor (Navy 2012). After assessing these two sources, ADOT&PF selected an average source level of 161 dB rms, which NMFS concurs with as an appropriate sound source. In addition, for a fourth project at NBK, Bangor, construction crews drove 16-inch hollow steel piles with measured levels similar to those for the 24-inch piles. Therefore, NMFS elects to use 161 dB rms as a source level for vibratory driving of 18-inch and 16-inch steel piles.

For vibratory driving of 14-inch steel and timber piles and 12.75-inch steel piles, ADOT&PF suggested a source level of 155 dB rms, which NMFS also concurs with. This source level was derived from summary data pertaining to vibratory driving of 18-inch steel piles in Kake, Alaska (MacGillivray 2015).

In their application, ADOT&PF derived source levels for impact driving of 30-inch steel piles by averaging the individual mean values associated with impact driving of the same size and type from Ketchikan (Warner and Austin 2016a). Mean values from Ketchikan were the most conservative dataset for 30-inch impact pile driving in Southeast Alaska. The average mean value from this dataset was 194.7 dB rms and 180.8 dB SEL.

For 24-inch impact pile driving, NMFS used data from a Navy (2015) study of proxy sound source values for use at Puget Sound military installations. The Navy study recommended a value of 193 dB rms and 181 dB SEL, which was derived from data generated by impact driving of 24-inch steel piles at the Bainbridge Island Ferry Terminal Preservation project and the Friday Harbor Restoration Ferry Terminal project. NMFS found this estimated source level to be appropriate.

For impact driving of 20, 18, and 14-inch steel piles, ADOT&PF used source levels of 186.6 dB, 158 dB, and 158 dB respectively. These source levels were derived from Caltrans SSV studies at the Stockton Wastewater Treatment Plant (20-inch) and Caltrans SSV studies at Prichard Lake Pumping Plant in Sacramento, CA (18 and 14-inch) (Caltrans 2015). In regards to the proposed drilling activities, a source level of 165 dB for all pile types originated from ADOT&PF SSV studies for piling operations in Kodiak, Alaska (Warner and Austin 2016b).

Table 6. Estimates of mean underwater sound levels generated during vibratory and impact pile installation, drilling, and vibratory pile removal.

Method and Pile Type	Installation, Removal, or Proofing	Sound Level at 10 meters			Literature Source
Vibratory Hammer		**dB rms**			
30-inch steel piles	Install	165.0			Derived from Warner and Austin 2016a & Denes *et al*. 2016
24-inch steel piles	Install	161.0			Navy 2012, 2015
20-inch steel piles	Install	161.0			Navy 2012, 2015
18-inch steel piles	Remove, Install	161.0			Navy 2012, 2015
16-inch steel piles	Remove	161.0			Navy 2012, 2015
14-inch steel piles	Remove	155.0			MacGillivray *et al.* 2015
14-inch timber piles	Remove, Install	155.0			MacGillivray *et al.* 2015
12.75-inch steel piles	Remove	155.0			MacGillivray *et al.* 2015
Drilling		**dB rms**			
30-inch steel piles	Install	165.0			Derived from Warner and Austin 2016b
24-inch steel piles	Install	165.0			Derived from Warner and Austin 2016b
20-inch steel piles	Install	165.0			Derived from Warner and Austin 2016b
18-inch steel piles	Install	165.0			Derived from Warner and Austin 2016b
Impact Hammer		**dB rms**	**dB SEL**	**dB peak**	
30-inch steel piles	Proofing	194.7	180.8	208.6	Warner and Austin 2016a
24-inch steel piles	Proofing	193.0	181.0	210.0	Navy 2015 (from 82 FR 31400)
20-inch steel piles	Proofing	186.5	175.5	207.0	Caltrans 2015
18-inch steel piles	Proofing	158.0	-	174.0	Caltrans 2015
14-inch timber piles	Install	158.0	-	174.0	Caltrans 2015

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

$TL = B * \log 10 (R^1/R^2)$

[1] the distance of the modeled SPL from the driven pile

Where:

TL = transmission loss in dB

B = transmission loss coefficient; for practical spreading equals 15

NMFS typically recommends a default practical spreading loss of 15 dB tenfold increase in distance. ADOT&PF analyzed the available underwater acoustic data utilizing this metric.

When 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 will result in some degree of overestimate of Level A 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 and drilling, NMFS' User Spreadsheet predicts the closest distance at which, if a marine mammal remained at that distance the whole duration of the activity, it would not incur PTS. Inputs used in the User Spreadsheet and the resulting isopleths are reported in Tables 6 and 7.

Table 7. Calculated distances to Level A and Level B harassment isopleths during pile installation and removal.

Type of Pile	Activity	Piles Installed or Removed per	Level A Harassment Zone (meters)[1]					Level B Harassment Zone (meters), Cetaceans and Pinnipeds[2]
			Cetaceans			Pinnipeds		
			LF	MF	HF	PW	OW	

[2] the distance from the driven pile of the initial measurement.

		day						
Vibratory (120 dB)								
30-inch steel	Install[4]	3	11	1	16	7	1	10,000
24-inch steel, 20-inch steel, 18-inch steel	Install[4]	3	6	1	9	4	1	5,412
18-inch steel, 16-inch steel	Remove[4]	10	13	2	19	8	1	5,412
14-inch steel, 14-inch timber, 12.75-inch steel	Remove[5]	10	5	1	8	3	1	2,154
Drilling (120 dB)								
30-inch steel, 20-inch steel	Install[6]	3	55	5	81	34	3	10,000
24-inch steel, 18-inch steel	Install[7]	3	42	4	62	26	2	10,000
Impact (160 dB)[3]								
30-inch steel	Proofing	1	70	3	82	37	3	2,057
		2	110	4	131	59	5	
		3	144	6	171	77	6	
24-inch steel	Proofing	1	71	3	85	38	3	1,585
		2	113	4	135	61	5	
		3	148	6	176	79	6	
20-inch steel	Proofing	3	64	3	76	34	3	584
18-inch steel	Proofing	3	<1	<1	<1	<1	<1	7
14-inch timber	Install	10	<1	<1	<1	<1	<1	7

[1]Level A Isopleths Calculated Using NMFS' 2016 Acoustic User Spreadsheet. Source level set at a distance of 10 Meters, a weighting factor adjustment of 2kHz for impulse sources and 2.5kHz for continuous sources, and a propagation loss value of 15 LogR.
[2]Level B Isopleths Calculated using Practical Spreading Loss Model. Source level set at a distance of 10 meters and and a propagation loss value of 15 LogR.
[3]30 Strikes per pile.
[4]45 minute activity duration
[5]2.5 hour activity duration
[6]9 hour activity duration
[7]6 hour activity duration

Pulse duration from the SSV studies described above are unknown. However, all necessary parameters were available for the SELcum (cumulative Single Strike Equivalent) method for calculating isopleths for 30-inch, 24-inch, and 20-inch impact piles. Therefore, this method was selected for those piles. To account for potential variations in daily productivity during impact installation, isopleths were calculated for different numbers of piles that could be installed each day (see Table 7). Should the contractor expect to install fewer piles in a day than the maximum anticipated, a smaller Level A shutdown zone would be employed to monitor take.

To derive Level A harassment isopleths associated with impact driving 30-inch steel piles, ADOT&PF utilized a single strike SEL of 180.8 dB and assumed 30 strikes per pile for 1 to 3 piles per day. For 24-inch and 20-inch steel piles, ADOT&PF used a single strike SEL of 181 dB SEL and 175.5 SEL respectively, also assuming 30 strikes at a rate of 1 to 3 piles per day. To calculate Level A harassment isopleths associated with impact piling 18-inch and 14-inch steel/timber piles, a source level (rms SPL) of 158dB was used with a pulse duration of .05 seconds.

To calculate Level A harassment for vibratory driving of 30-inch piles, ADOT&PF utilized a source level (rms SPL) of 165 dB and assumed 45 minutes of driving per day. For installing 24, 20, and 18-inch piles, ADOT&PF used a source level of 161 dB and assumed up to 45 minutes of driving per day. For removal of 18 and 16-inch piles, ADOT&PF assumed use of 18-inch piles and used the same source level of 161 dB for up to 45 minutes. Level A harassment for the installation/removal of piles 14-inches and under in diameter used a source level of 155 dB rms and assumed 2.5 hours of driving/removal a day. In regards to Level A for drilling, a source level of 165 dB rms was used for all pile types with varying levels of activity for each pile type (see Tables 1 & 2 for information on drilling duration and max number of piles drilled each day). Results for all Level A isopleths are shown in Table 7. Isopleths for Level B harassment associated with impact (160 dB) and vibratory harassment (120 dB) were also calculated and are included in Table 7.

It is important to note that the actual area ensonified by pile driving activities is constrained by local topography relative to the total threshold radius (particularly for the Level B ensonified zones). The actual ensonified area was determined using a straight line-of-sight projection from the anticipated pile driving locations. Overall, Level A harassment zones for impact installation are relatively small because of the few strikes required to proof the piles. The maximum aquatic areas ensonified within the Level A harassment isopleths do not exceed 0.1 square km (see Figures 6-1 and Figure 6-2 in application). The corresponding areas of the Level B ensonified zones for impact driving and vibratory installation/removal are shown in Table 8 below.

Table 8. Calculated areas ensonified within Level B harassment isopleths during pile installation and removal.

Type of Pile	Activity	Level B Harassment Zone (km^2), Cetaceans and Pinnipeds
Vibratory (120 dB)		
30-inch steel	Install	78.9
24-, 20-., 18-, and 16-inch steel	Install	45.3
14-, 12.75-inch steel, and 14-inch timber	Remove	7.3
Drilling (120 dB)		
30-, 24-, 20-, and 18-inch steel	Install	78.9
Impact (160 dB)		
30-inch steel	Proofing	6.7
24-inch steel	Proofing	4.0
20-inch steel	Proofing	0.6
18-inch steel	Proofing	<0.1
14-inch timber	Install	<0.1

Marine Mammal Occurrence and Final Take Estimates

In this section we provide the information about the presence, density, or group dynamics of marine mammals that will inform the take calculations. Potential exposures to impact and vibratory pile driving noise for each threshold were estimated using local marine mammal density datasets where available and local observational data. As previously stated, only Level B take will be considered for this action as Level A take will be avoided via mitigation (see Mitigation and Monitoring Sections). As presented in Table 7, the largest Level A zone for the project is 176 meters for high- and low-frequency cetaceans. As a result, the shutdown zone (which is described in detail in the Proposed Mitigation Section) for these activities will be 200 meters for high- and low-frequency cetaceans. Level B take is calculated differently for some species based on differences in density, year-round habitat use, and other contextual factors. See below for specific methodologies by species.

Steller Sea Lions

Steller sea lion abundance in the project area is highly seasonal in nature with sea lions being most active between October and March (Figure 4-2). Level B exposure estimates are conservatively based on the average winter (October to March) abundance of 140 sea lions at the Tenakee Cannery haulout, which is 8.9 km away from the project site (Jemison, 2017, unpublished data). However, it is unlikely that the entire Steller sea lion population from the Tenakee Cannery haulout would forage to the west near the Tenakee Springs ferry terminal. Additionally, Steller sea lions do not generally forage every day, but tend to forage every 1–2 days and return to haulouts to rest between foraging trips (Merrick and Loughlin 1997; Rehburg *et al.*, 2009). Overall, this information indicates that only half of the Steller sea lions at the Tenakee Cannery haulout (*i.e.*, average of 140 during winter) is likely to approach the project site on any given day and be exposed to sound levels that constitute behavioral harassment. As a result, an estimated 70 individuals is a conservative estimate of the number of Steller sea lions likely to forage in the underwater behavioral harassment zone on a given day. Therefore: 70 Steller sea lions per day * 93 days of potential exposure = 6,510 potential exposures.

To assign take to the eDPS and wDPS stocks of Steller sea lions, data from researchers at NMFS' Alaska Fisheries Science Center were used. Researchers at NMFS' Alaska Fisheries Science Center state that roughly 17.8 percent of Steller sea lions at the Tenakee Cannery Point haulout are members of the wDPS whereas 82.2 percent are from the eDPS (L. Fritz, pers. comm; L. Fritz, unpublished data). Therefore, it is estimated that only 1,159 takes (17.8 percent of 6,510) have the potential to occur for wDPS Steller sea lions and 5,351(82.2 percent of 6,510) takes have the potential to occur for eDPS Steller sea lions. In addition, since there is only an average of 140 Steller sea lions located at the Tenakee Cannery haulout, it is predicted that only 115 (82.2 percent of 140) individuals from the eDPS and 25 (17.8 percent of 140) individuals from the wDPS have the potential to be harassed.

Harbor Seals

Harbor seals are non-migratory; therefore, the exposure estimates are not dependent on season. We anticipate Level B harbor seal take to be relatively high, given the presence of three established haulouts within the largest (ten km) Level B harassment zone of the project site. The best available abundance estimate for Tenakee Inlet is 259 individual harbor seals (London, J., pers. comm.).

The number of harbor seals that could potentially be exposed to elevated sound levels for the project was estimated by calculating the percentage of available harbor seal habitat within the largest Level B harassment zone. Of the 233.35 square km of available habitat in Tenakee Inlet, 78.9 square km or 33.82 percent will be within the largest Level B harassment zone. Of the 259 harbor seals that haul out in the Inlet, approximately 87.57 harbor seals (33.82 percent of 259 individuals) could be within the Level B harassment zone and exposed to sound levels that reach the Level B threshold each day. Therefore: 87.57 harbor seals per day * 93 days of potential exposure = 8,144 potential exposures.

Harbor Porpoises

Harbor porpoises are non-migratory; therefore, our exposure estimates are not dependent on season. Harbor porpoise surveys conducted in southeast Alaska during the summers of 1991–1993, 2006, 2007, and 2010–2012 included Chatham Strait (near the action area). The average density estimate for all survey years in Chatham Strait was 0.013 harbor porpoise per square km (Dahlheim *et al.*, 2015). Surveys in 1997, 1998, and 1999 reported an average harbor porpoise density of .033 per square km in Southeast Alaska (Hobbs and Waite 2010). Based on a more conservative density estimate of 0.033 harbor porpoise per square km in Southeast Alaska, we estimate that approximately 2.6(.033*78.9) harbor porpoises could occur daily within the 78.9 square km (Table 8) Level B harassment zone. Therefore: 2.6 harbor porpoises per day * 93 days of potential exposure = 242 potential exposures.

Dall's Porpoises

Dall's porpoise are non-migratory; therefore, our exposure estimates are not dependent on season. Based on anecdotal evidence citing rare occurrences of the species in the action area, we anticipate approximately one observation of a Dall's porpoise pod in the Level B harassment zone each week during construction(Lewis, S., pers. comm.). Based on an average pod size of 3.7 (Wade *et al.*, 2003), we estimate 49 Dall's porpoise could be exposed to Level B harassment noise during the 93 day construction period (*i.e.*, 3.7 individuals per week * 13.2 weeks of potential exposure = 48.84 (rounded up to 49) total potential exposures).

Killer Whales

Local marine mammal experts indicate that approximately one killer whale pod is observed in Tenakee Inlet each month, year-round (Lewis, S., pers. comm.). It is assumed that all three killer whale stocks are equally likely to occur in the area because no data exist on relative abundance of the three stocks in Tenakee Inlet. The exposure estimate is conservatively based on a resident pod size, which has been quantified and is known to be a larger than other stocks. Resident killer whales occur in a mean group size of 19.3 during the fall in southeast Alaska (Dahlheim *et al.*, 2009). Therefore, we assume that a total of approximately 60 killer whales could be exposed to Level B harassment over the course of the project (*i.e*., [19.3 individuals per pod * 1 pods per month] * 3.1 months = 59.83 [rounded up to 60]). Since there are no data that exist for killer stocks in Tenakee Inlet, 60 Level B takes were applied to each stock.

Humpback whales are present in Tenakee Inlet year-round. Local experts indicate that as many as 12 humpback whales are present on some days from spring through fall, with lower numbers during the winter (S. Lewis and M. Dahlheim, pers. comm.). We conservatively estimate that half of those, or six individuals on average, could be exposed to Level B harassment during each day of pile installation and removal, therefore:

6 humpback whales per day * 93 days of exposure = 558 potential exposures.

Minke Whales

Minke whales may be present in Tenakee Inlet year-round. Their abundance throughout southeast Alaska is very low, and anecdotal reports have not included minke whales near the project area. However, minke whales are distributed throughout a wide variety of habitats and could occur near the project area. Therefore, we conservatively estimate that one minke whale could be exposed to Level B harassment each month during construction or a total of three minke whales during the 93-day construction period.

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

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

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

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

In addition to the measures described later in this section, ADOT&PF will employ the following standard mitigation measures:

- Conduct briefings between construction supervisors and crews and the marine mammal monitoring team prior to the start of all pile driving activity, and when new personnel join the work, to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures;
- For in-water heavy machinery work other than pile driving (*e.g.*, standard barges, tug boats), if a marine mammal comes within 10 m, operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions. This type of work could include the following activities: (1) movement of the barge to the pile location; or (2) positioning of the pile on the substrate via a crane (*i.e.*, stabbing the pile);
- Work may only occur during daylight hours, when visual monitoring of marine mammals can be conducted;
- For those marine mammals for which Level B take has not been requested, in-water pile installation/removal and drilling will shut down immediately when the animals are sighted;
- If Level B take reaches the authorized limit for an authorized species, pile installation will be stopped as these species approach the Level B zone to avoid additional take of them.

The following measures would apply to ADOT&PFs mitigation requirements:

Establishment of Shutdown Zone for Level A—For all pile driving/removal and drilling activities, ADOT&PF will establish a shutdown zone. The purpose of a shutdown zone is generally to define an area within which shutdown of activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area). A conservative shutdown zone of 100 meters will be used during monitoring to prevent any form of incidental Level A exposure for most species. However, during impact installation of 24-inch and 30-inch steel piles at a frequency of 2 or 3 piles per day, the Level A harassment zone exceeds the 100-meter shutdown zone for low- and high-frequency cetaceans (*i.e*., humpback whales, harbor porpoises, and Dall's porpoises; see Table 7). During these activities, PSOs will implement a 200-meter shutdown zone to avoid take of harbor porpoises, Dall's porpoises, minke whales, and humpback whales (low- and high-frequency cetaceans). The placement of PSOs during all pile driving and drilling activities (described in detail in the Proposed Monitoring and Reporting Section) will ensure that the 200-meter shutdown zone is visible during impact installation of 24-inch and 30-inch steel piles at a frequency of two or three piles per day. Nonetheless, a 100-meter shutdown will be implemented for Steller sea lions, harbor seals, and killer whales during all activities.

Establishment of Monitoring Zones for Level B—ADOT&PF will establish Level B disturbance zones or zones of influence (ZOI) which are areas where SPLs are equal to or exceed the 160 dB rms threshold for impact driving and the 120 dB rms threshold during vibratory driving and drilling. Monitoring zones provide utility for observing by establishing monitoring protocols for areas adjacent to the shutdown zones. Monitoring zones enable observers to be aware of and communicate the presence of marine mammals in the project area outside the shutdown zone and thus prepare for a potential cease of activity should the animal enter the shutdown zone. The Level B zones are depicted in Table 7. As shown, the largest Level B zone is equal to 78.9 km^2, making it impossible for the PSOs to view the entire harassment area. Due to this, Level B exposures will be recorded and extrapolated based upon the number of observed take and the percentage of the Level B zone that was not visible.

Soft Start - The use of a soft-start procedure are believed to provide additional protection to marine mammals by providing warning and/or giving marine mammals a chance to leave the area prior to the hammer operating at full capacity. For impact pile driving, contractors will be required to provide an initial set of strikes from the hammer at 40 percent energy, each strike followed by no less than a 30-second waiting period. This procedure will be conducted a total of three times before impact pile driving begins. Soft Start is not required during vibratory pile driving and removal activities.

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

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 for 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.

Visual Monitoring

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

PSOs would be land-based observers. A primary PSO would be placed at the terminal where pile driving would occur. A second observer would range the uplands on foot or by ATV via Tenakee Ave., and go from Grave Point east of the harbor up and west of the project site to get a full view of the Level A zone and as much of the Level B zone as possible. PSOs would scan the waters using binoculars, and/or spotting scopes, and would use a handheld GPS or range-finder device to verify the distance to each sighting from the project site. All PSOs would be trained in marine mammal identification and behaviors and are required to have no other project-related tasks while conducting monitoring. In addition, monitoring will be conducted by qualified observers, who will be placed at the best vantage point(s) practicable to monitor for marine mammals and implement shutdown/delay procedures when applicable by calling for the shutdown to the hammer operator. Qualified observers are trained and/or experienced professionals, with the following minimum qualifications:

- Visual acuity in both eyes (correction is permissible) sufficient for discernment of moving targets at the water's surface with ability to estimate target size and distance; use of binoculars may be necessary to correctly identify the target.
- Independent observers (i.e., not construction personnel).
- Observers must have their CVs/resumes submitted to and approved by NMFS
- Advanced education in biological science or related field (i.e., undergraduate degree or higher).Observers may substitute education or training for experience.
- Experience and ability to conduct field observations and collect data according to assigned protocols (this may include academic experience).
- At least one observer must have prior experience working as an observer.
- Experience or training in the field identification of marine mammals, including the identification of behaviors.
- Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations.
- Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates and times when in-water construction activities were suspended to avoid potential incidental injury from construction sound of marine mammals observed within a defined shutdown zone; and marine mammal behavior.

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

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

- Date and time that monitored activity begins or ends;
- Construction activities occurring during each observation period;
- Weather parameters (*e.g.*, percent cover, visibility);
- Water conditions (*e.g.*, sea state, tide state);
- Species, numbers, and, if possible, sex and age class of marine mammals;
- Description of any observable marine mammal behavior patterns, including bearing and direction of travel and distance from pile driving activity;
- Distance from pile driving activities to marine mammals and distance from the marine mammals to the observation point;
- Locations of all marine mammal observations; and
- Other human activity in the area.

If no comments are received from NMFS within 30 days, the draft final report will constitute the final report. If comments are received, a final report addressing NMFS comments must be submitted within 30 days after receipt of comments.

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by the IHA (if issued), such as an injury, serious injury or mortality, ADOT&PF would immediately cease the specified activities and report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the Alaska Regional Stranding Coordinator. The report would include the following information:

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

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

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

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

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's 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).

As stated in the proposed mitigation section, shutdown zones equal to or exceeding Level A isopleths shown in Table 7 will be implemented, and in this case, Level A take is not anticipated nor authorized. Behavioral responses of marine mammals to pile driving and removal at the ferry terminal, if any, are expected to be mild and temporary. Marine mammals within the Level B harassment zone may not show any visual cues they are disturbed by activities (as noted during modification to the Kodiak Ferry Dock) or could become alert, avoid the area, leave the area, or display other mild responses that are not observable such as changes in vocalization patterns. Given the short duration of noise-generating activities per day and that pile driving, removal, and drilling would occur for 93 days, any harassment would be temporary. In addition, the project was designed with relatively small-diameter piles, which will avoid the elevated noise impacts associated with larger piles. In addition, there are no known biologically important areas near the project zone that would be moderately or significantly impacted by the construction activities. The region of Tenakee Inlet where the project will take place is located in a developed area with regular marine vessel traffic. Although there is a harbor seal haulout approximately one kilometer south of the project site, it would not be located within the project's Level B zone.

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

- No mortality is anticipated or authorized.
- There are no known biologically important areas within the project area.

- ADOT&PF would implement mitigation measures such as vibratory driving piles to the maximum extent practicable, soft-starts, and shut downs.
- Monitoring reports from similar work in Alaska have documented little to no effect on individuals of the same species impacted by 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 Section 101(a)(5)(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. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

Overall, ADOT&PF proposes 15,566 total Level B takes of these marine mammals. Table 9 below shows take as a percent of population for each of the species listed above.

Table 9. Summary of the estimated numbers of marine mammals potentially exposed to Level B harassment sound levels.

Species	DPS/Stock	Proposed Number of Exposures to Level B Harassment Total and By Stock	Proposed Number of Individuals Potentially Exposed to Level B Harassment	Stock Abundance	Percent of Population[1]

Steller sea lion	Eastern DPS Western DPS	5,351 1,159	115 individuals 25 individuals	41,638 53,303	<0.3 <0.1
Harbor seal	Glacier Bay/Icy Strait	8,144	259 individuals	7,210	3.6
Harbor porpoise	Southeast Alaska	242	242	975	24.8
Dall's porpoise	Alaska	49	49	83,400	<0.1
Killer whale	West Coast transient Alaska resident Northern Resident	60 60 60	60 60 60	243 2,347 290	24.7 2.6 20.7
Humpback whale	Mexico DPS/Central North Pacific	558	558	10,103	5.5
Minke whale	Alaska	3	3	N/A	N/A
Total		**15,686**	**1,434**	**N/A**	**N/A**

[1]The percent of population is based on the proportion of take that is expected to occur from each stock based on abundance (see Table 3). Killer whale stocks are assumed to be equally likely to occur.
N/A: Not Applicable or no stock population assessment is available.

Table 9 presents the number of animals that could be exposed to received noise levels causing Level B harassment for the proposed work at the Tenakee Springs Ferry Terminal. Our analysis shows that less than 25 percent of each affected stock could be taken by harassment. Therefore, the numbers of animals authorized to be taken for all species would be considered small relative to the relevant stocks or populations even if each estimated taking occurred to a new individual—an extremely unlikely scenario. For pinnipeds, especially harbor seals and Steller sea lions, occurring in the vicinity of the project site, there will almost certainly be some overlap in individuals present day-to-day, and these takes are likely to occur only within some small portion of the overall regional stock. For harbor porpoise, the abundance estimates used in the percentage of population were taken from inland Southeast Alaska waters. These abundance estimates have not been corrected for g(0) and are likely conservative, therefore it is expected for the proposed percentage of population that will be taken to be overestimated. In addition, high percentage totals for northern resident (20.7 percent) and western transient (24.7 percent) killer whales were based on the possibility that all 60 takes for killer whales would occur for each stock, which is a highly unlikely scenario.

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

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated by this action. Therefore, NMFS has preliminarily determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes. The proposed project is not known to occur in an important subsistence hunting area. It is a developed area with regular marine vessel traffic. However, DOT&PF plans to provide advanced public notice of construction activities to reduce construction impacts on local residents, ferry travelers, adjacent businesses, and other users of the Tenakee Springs ferry terminal and nearby areas. This will include notification to local Alaska Native tribes that may have members who hunt marine mammals for subsistence. Of the marine mammals considered in this IHA application, only harbor seals are known to be used for subsistence in the project area. If any tribes express concerns regarding project impacts to subsistence hunting of marine mammals, further communication between will take place, including provision of any project information, and clarification of any mitigation and minimization measures that may reduce potential impacts to marine mammals.

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 ADOT&PF's proposed activities.

Endangered Species Act (ESA)

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. § 1531 *et seq*.) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the issuance of IHAs, NMFS consults internally, in this case with NMFS' Alaska Regional Office, whenever we propose to authorize take for endangered or threatened species.

NMFS is proposing to authorize take of western DPS Steller sea lions and Mexico DPS humpback whales, which are listed under the ESA. The Permit and Conservation Division has requested initiation of Section 7 consultation with NMFS' Alaska Regional 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 ADOT&PF for conducting piling and drilling activities associated with improvements at the Tenakee Springs city dock and ferry terminal, in Tenakee Springs, Alaska provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. This section contains a draft of the IHA itself. The wording contained in this section is proposed for inclusion in the IHA (if issued).

1. This Incidental Harassment Authorization (IHA) is valid from June 1, 2019 to May 31, 2020

2. This IHA is valid only for in-water construction activities associated with improvements at the Tenakee Springs city dock and ferry terminal, in Tenakee Springs, Alaska.

3. General Conditions

(a) A copy of this IHA must be in the possession of the ADOT&PF, its designees, work crew, and marine mammal monitoring personnel operating under the authority of this IHA.

(b) The species authorized for taking are humpback whale (*Megaptera novaeangliae*), killer whale (*Orcinus orca*), Harbor porpoise (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides dalli*), Steller sea lion (*Eumetopias jubatus*), and harbor seal (*Phoca vitulina*) and minke whale (*Balaenoptera acutorostrata*).

(c) The taking, by Level B harassment only, is limited to the species/stocks listed in condition 3(b). See Table 1 for numbers of take authorized.

(d) For those marine mammals for which Level B take has not been requested, in-water pile installation/removal and drilling shall shut down immediately when the animals are sighted.

(e) The taking by injury (Level A harassment), serious injury, or death of any of the species listed in condition 3(b) of the Authorization or any taking of any other species of marine mammal is prohibited and may result in the modification, suspension, or revocation of this IHA.

(f) ADOT&PF shall conduct briefings between construction supervisors and crews, marine mammal monitoring team, acoustical monitoring team, and ADOT&PF staff prior to the start of all piling and drilling activities, and when new personnel join the work, in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.

(g) Work may only occur during daylight hours, when visual monitoring of marine mammals can be conducted.

4. Mitigation Measures

The holder of this Authorization is required to implement the following mitigation measures:

(a) Shutdown Measures.

(i) For all pile driving/removal and drilling activities, ADOT&PF shall implement shutdown measures in which operations shall cease if a marine mammal enters or approaches a shutdown zone for which it is not permitted to be in during piling or drilling operations. Shutdown zones are defined below.

(ii) For all impact pile driving, vibratory pile driving/removal, and drilling the ADOT&PF shall implement a minimum shutdown zone of 100 meters around each pile (undergoing piling/drilling activities) for all species authorized for Level B take.

(iii) ADOT&PF shall implement a 200-meter radius shutdown zone for high- and low-frequency cetaceans (harbor porpoises, Dall's porpoises, minke whales, and humpback whales) during impact installation of 24-inch and 30-inch steel piles at a frequency of two or three piles per day.

(iv) ADOT&PF shall implement shutdown measures if the number of any allotted marine mammal Level B takes reaches the limit under the IHA and if such marine mammals are sighted within the vicinity of the project area and are approaching their respective Level A or Level B harassment zone.

(v) If a marine mammal comes within 10 meters of in-water, heavy machinery work other than pile driving or drilling (*e.g.*, standard barges, tugboats), operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions.

(b) ADOT&PF shall establish Level A and Level B harassment zones as shown in Tables 2 and 3.

(c) Soft Start for Impact Pile Driving

(i) At the start of any pile driving activities or when there has been downtime of 30 minutes or more without impact pile driving, the contractor shall initiate the driving with ramp-up procedures described below.

(ii) Soft start for impact hammers requires contractors to provide an initial set of strikes from the impact hammer at 40 percent energy, followed by no less than a 30-second waiting period. This procedure shall be conducted three times before impact pile driving begins.

(d) Use the minimum hammer energy needed to install piles.

(e) Drive piles with a vibratory hammer to the maximum extent practicable.

5. Monitoring

The holder of this Authorization is required to conduct marine mammal monitoring during pile driving/removal and drilling activities. Monitoring and reporting shall be conducted in accordance with the Monitoring Plan.

(a) Pre-Activity Monitoring

(i) Prior to the start of daily in-water construction activity, or whenever a break in pile driving of 30 minutes or longer occurs, the observer(s) shall observe the shutdown and monitoring zones for a period of 30 minutes.

(ii) The shutdown zone shall be cleared when a marine mammal has not been observed within that zone for that 30-minute period.

(iii) If a marine mammal is observed within the shutdown zone, a soft-start can proceed if the animal is observed leaving the zone or has not been observed for 30 minutes (for cetaceans) or 15 minutes (for pinnipeds), even if visibility of Level B zone is impaired.

(iv) If the Level B harassment zone has been observed for 30 minutes and non-permitted species are not present within the zone, in-water construction can commence and work can continue even if visibility becomes impaired within the Level B zone.

(v)When a marine mammal permitted for Level B take is present in the Level B harassment zone, piling and drilling activities may begin and or continue and Level B take shall be recorded.

(vi) If the entire Level B zone is not visible while work continues, exposures shall be recorded and extrapolated based upon the amount of total observed exposures and the percentage of the Level B zone that was not visible.

(b)Monitoring shall be conducted by qualified protected species observers (PSOs), with minimum qualifications as described previously in the *Monitoring and Reporting* section.

(i) Two observers shall be on site to actively observe the shutdown and disturbance zones during all pile driving, removal, and drilling.

(ii) Observers shall use their naked eye with the aid of binoculars, and/or a spotting scope during all pile driving and extraction activities.

(iii) Monitoring location(s) shall be identified with the following characteristics:

1. Unobstructed view of pile being driven;

2. Unobstructed view of all water within the Level A zone (if applicable) and as much of the Level B harassment zone as possible for piles being driven.

(c) If waters exceed a sea-state, which restricts the PSOs ability to observe within the marine mammal shutdown zone (*e.g*., excessive wind or fog), pile installation and removal shall cease. Pile driving shall not be initiated until the entire shutdown zone is visible.

(d) Marine mammal location shall be determined using a rangefinder and a GPS or compass.

(e) Ongoing in-water pile installation may be continued during periods when conditions such as low light, darkness, high sea state, fog, ice, rain, glare, or other conditions prevent effective marine mammal monitoring of the entire Level B harassment zone. PSOs would continue to monitor the visible portion of the Level B harassment zone throughout the duration of driving activities.

(f) Post-construction monitoring shall be conducted for 30 minutes beyond the cessation of piling and drilling activities at end of day.

6. Reporting

The holder of this Authorization is required to:

(a) Submit a draft report on all monitoring conducted under the IHA within ninety calendar days of the completion of marine mammal monitoring This report shall detail the monitoring protocol, summarize the data recorded during monitoring, and estimate the number of marine mammals that may have been harassed, including the total number extrapolated from observed animals across the entirety of relevant monitoring zones A final report shall be prepared and submitted within thirty days following resolution of comments on the draft report from NMFS. This report must contain the following:

(i) Date and time a monitored activity begins or ends;

(ii) Construction activities occurring during each observation period;

(iii) Record of implementation of shutdowns, including the distance of animals to the pile and description of specific actions that ensued and resulting behavior of the animal, if any;

(iv) Weather parameters (*e.g.*, percent cover, visibility);

(v)Water conditions (*e.g.*, sea state, tide state);

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

(vii)Description of any observable marine mammal behavior patterns,

(viii) Distance from pile driving activities to marine mammals and distance from the marine mammals to the observation point;

(ix) Locations of all marine mammal observations; and

(x)Other human activity in the area.

(b)Reporting injured or dead marine mammals:

(i) In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by this IHA, such as an injury (Level A harassment), serious injury, or mortality, ADOT&PF shall immediately cease the specified activities and report the incident to the Office of Protected Resources (301-427-8401), NMFS, and the Alaska Regional Stranding Coordinator (907-271-1332), NMFS. The report must include the following information:

1. Time and date of the incident;

2. Description of the incident;

3. Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, and visibility);

4. Description of all marine mammal observations and active sound source use in the 24 hours preceding the incident;

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

6. Fate of the animal(s); and

7. Photographs or video footage of the animal(s).

Activities shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS shall work with ADOT&PF to determine what measures are necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. ADOT&PF may not resume their activities until notified by NMFS.

(ii) In the event that ADOT&PF discovers an injured or dead marine mammal, and the lead observer determines that the cause of the injury or death is unknown and the death is relatively recent (e.g., in less than a moderate state of decomposition), ADOT&PF shall immediately report the incident to the Office of Protected Resources, NMFS, and the Alaska Regional Stranding Coordinator, NMFS.

The report must include the same information identified in 6(b)(i) of this IHA. Activities may continue while NMFS reviews the circumstances of the incident. NMFS shall work with ADOT&PF to determine whether additional mitigation measures or modifications to the activities are appropriate.

(iii) In the event that ADOT&PF discovers an injured or dead marine mammal, and the lead observer determines that the injury or death is not associated with or related to the activities authorized in the IHA (e.g., previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), ADOT&PF shall report the incident to the Office of Protected Resources, NMFS, and the Alaska Regional Stranding Coordinator, NMFS, within 24 hours of the discovery. ADOT&PF shall provide photographs, video footage, or other documentation of the stranded animal sighting to NMFS.

7. This Authorization may be modified, suspended or withdrawn if the holder fails to abide by the conditions prescribed herein, or if NMFS determines the authorized taking is having more than a negligible impact on the species or stock of affected marine mammals.

Table 1. Authorized take numbers, by species/stocks.

Species	DPS/Stock	Level A Takes	Level B Takes
Steller sea lion	Eastern DPS Western DPS	0	115 25
Harbor seal	Glacier Bay/Icy Strait	0	259
Harbor porpoise	Southeast Alaska	0	242
Dall's porpoise	Alaska	0	49
Killer whale	West Coast transient Alaska resident Northern Resident	0	60 60 60
Humpback whale	Mexico DPS/Central North Pacific	0	558
Minke whale	Alaska		3
Total		**0**	1,431

Table 2. Calculated distances to Level A and Level B harassment isopleths during pile installation and removal.

Type of Pile	Activity	Piles Installed or Removed per day	Level A Harassment Zone (meters)					Level B Harassment Zone (meters), Cetaceans and Pinnipeds
			Cetaceans			Pinnipeds		
			LF	MF	HF	PW	OW	
Vibratory (120 dB)								
30-inch steel	Install	3	11	1	16	7	1	10,000
24-inch steel, 20-inch steel, 18-inch steel	Install	3	6	1	9	4	1	5,412
18-inch steel, 16-inch steel	Remove	10	13	2	19	8	1	5,412

14-inch steel, 14-inch timber, 12.75-inch steel	Remove	10	5	1	8	3	1	2,154
Drilling (120 dB)								
30-inch steel, 20-inch steel	Install	3	55	5	81	34	3	10,000
24-inch steel, 18-inch steel	Install	3	42	4	62	26	2	10,000
Impact (160 dB)								
30-inch steel	Proofing	1	70	3	82	37	3	2,057
		2	110	4	131	59	5	
		3	144	6	171	77	6	
24-inch steel	Proofing	1	71	3	85	38	3	1,585
		2	113	4	135	61	5	
		3	148	6	176	79	6	
20-inch steel	Proofing	3	64	3	76	34	3	584
18-inch steel	Proofing	3	<1	<1	<1	<1	<1	7
14-inch timber	Install	10	<1	<1	<1	<1	<1	7

Table 3. Calculated areas ensonified within Level B harassment isopleths during pile installation and removal.

Type of Pile	Activity	Level B Harassment Zone (km^2), Cetaceans and Pinnipeds
Vibratory (120 dB)		
30-inch steel	Install	78.9
24-, 20-., 18-, and 16-inch steel	Install	45.3
14-, 12.75-inch steel, and 14-inch timber	Remove	7.3
Drilling (120 dB)		
30-, 24-, 20-, and 18-inch steel	Install	78.9
Impact (160 dB)		
30-inch steel	Proofing	6.7

24-inch steel	Proofing	4.0
20-inch steel	Proofing	0.6
18-inch steel	Proofing	<0.1
14-inch timber	Install	<0.1

Request for Public Comments

We request comment on our analyses, the draft authorization, and any other aspect of this Notice of Proposed IHA for the proposed [action]. Please include with your comments any supporting data or literature citations to help inform our final decision on the request for MMPA authorization.

Dated: March 14, 2018.

Donna S. Wieting,

Director, Office of Protected Resources,

National Marine Fisheries Service.

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