**BILLING CODE 3510-22-P**

**DEPARTMENT OF COMMERCE**

**National Oceanic and Atmospheric Administration**

**RIN 0648-XG874**

# Taking of Marine Mammals Incidental to Specific Activities; Taking of Marine Mammals Incidental to Pile Driving and Removal Activities During Construction of a Cruise Ship Berth, Hoonah, Alaska

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

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

**SUMMARY**: NMFS has received a request Duck Point Development II, LLC. (DPD) for authorization to take marine mammals incidental pile driving and removal activities during construction of a second cruise ship berth and new lightering float at Cannery Point (Icy Strait) on Chichagof Island near Hoonah, Alaska. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an incidental harassment authorization (IHA) to incidentally take marine mammals during the specified activities. NMFS is also requesting comments on a possible one-year renewal that could be issued under certain circumstances and if all requirements are met, as described in *Request for Public Comments* at the end of this notice. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorizations and agency responses will be summarized in the final notice of our decision.

**DATES**: Comments and information must be received no later than [*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.Egger@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 *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection*-act without change. All personal identifying information (*e.g.*, name, address) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

**FOR FURTHER INFORMATION CONTACT**: Stephanie Egger, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act*. In case of problems accessing these documents, please call the contact listed above.

**SUPPLEMENTARY INFORMATION**:

**Background**

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

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

**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 Categorical Exclusion B4 (incidental harassment authorizations with no anticipated serious injury or mortality) 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 December 28, 2018 NMFS received a request DPD for an IHA to take marine mammals incidental to pile driving and removal activities during construction of a second cruise ship berth and new lightering float at Cannery Point (Icy Strait) on Chichagof Island near Hoonah, Alaska. The application was deemed adequate and complete on April 3, 2019. The applicant's request is for take nine species of marine mammals by Level B harassment and three species by Level A harassment. Neither DPD nor NMFS expects serious injury or mortality to result from this activity and, therefore, an IHA is appropriate. NMFS previously issued an IHA to the Huna Totem Corporation for the first cruise ship berth in Hoonah, AK in 2015 (80 FR 31352; June 2, 2015).

**Description of Proposed Activity**

*Overview*

The purpose of this project is to construct a second offshore mooring facility and small-craft lightering float to accommodate the exponential growth in cruise ship traffic Hoonah is currently experiencing. The project is needed because the existing berth configuration does not have the capacity to support multiple cruise ships at the same time. Furthermore, the increase in small vessel traffic generated by the increase in visitor numbers necessitates the addition of a small-boat lightering float for short excursions around Icy Strait Point. Once the project is constructed, Hoonah will be better able to accommodate the increased number of cruise ships and passengers visiting the community. Therefore, Duck Point Development proposes to construct a second cruise ship berth and new lightering float at Cannery Point (Icy Strait) on Chichagof Island near Hoonah, Alaska, in order to accommodate the increase in cruise ship and visitor traffic since completion of the first permanent cruise ship berth completion in 2016 (80 FR 31352; June 2, 2015). The in-water sound from the pile driving and removal activities, may incidentally take nine species of marine mammals by Level B harassment and three species by Level A harassment.

Revenue generated from the tourism industry is a vital part of Hoonah's economy. Since the addition the permanent cruise ship berth in 2016, Hoonah has become a top cruise ship port in Alaska, with growth from 34 ship visits in 2004 to a projected 122 visits in 2019 (Alaska Business Monthly 2018). Prior to placement of the permanent berth, cruise ship passengers were transferred to shore via smaller, "lightering" vessels. Construction of the berth allowed for direct walking access from ships to the shore, and more passengers disembarking in Hoonah. In 2016, an estimated 150,000 passengers visited Hoonah on 78 large-scale cruise ships, with many visiting Hoonah's shops and restaurants (LeMay Engineering & Consulting 2018).

The existing berth can only accommodate one large vessel at a time. Oftentimes a second visiting ship is forced to idle in Port Frederick Inlet near the cannery to wait for mooring space, or return to the traditional methods of lightering passengers to shore via small vessels. In addition to safety concerns stemming from decreased large-ship maneuverability at this location, idling ships and lightering vessels increase fuel consumption, noise, and hydrocarbon pollution within the inlet. A second shore berth is needed to allow multiple cruise ships' pedestrian visitors access directly to shore.

The increase in visitors to Hoonah has concurrently increased demand for offshore day excursions around Port Frederick and Icy Strait for wildlife viewing. An additional lightering float on the west side of the point, nearer to the Icy Strait Cannery, is needed to add mooring capacity for small vessels providing these short- day excursions.

*Dates and Duration*

The applicant is requesting an IHA to conduct pile driving and removal over 75 working days (not necessarily consecutive) beginning June 1, 2019 and extending into November 2019 as needed. Approximately 39 days of vibratory and 8 days of impact hammering will occur. An additional 14 days of socketing and 14 days of anchoring will occur to stabilize the piles. These are discussed in further detail below.

*Specific Geographic Region*

The proposed project is located off Cannery Point, approximately 2.4 kilometers (km) north of Hoonah in Southeast Alaska; T43S, R61E, S20, Copper River Meridian, USGS Quadrangle Juneau A5 NE; latitude 58.1351 and longitude -135.4506 (see Figure 1 of the application). The project is located at the confluence of Icy Strait and Port Frederick Inlet. The proposed cruise ship berth would be installed approximately 0.5 kilometer (km) (0.3 miles) east of the existing permanent cruise ship berth in Icy Strait. A separate small craft lightering float would be installed between two existing docks in Port Frederick Inlet on the west side of Cannery Point (alternatively called Icy Strait Point; see Figure 1 below and Figure 4 of the application).

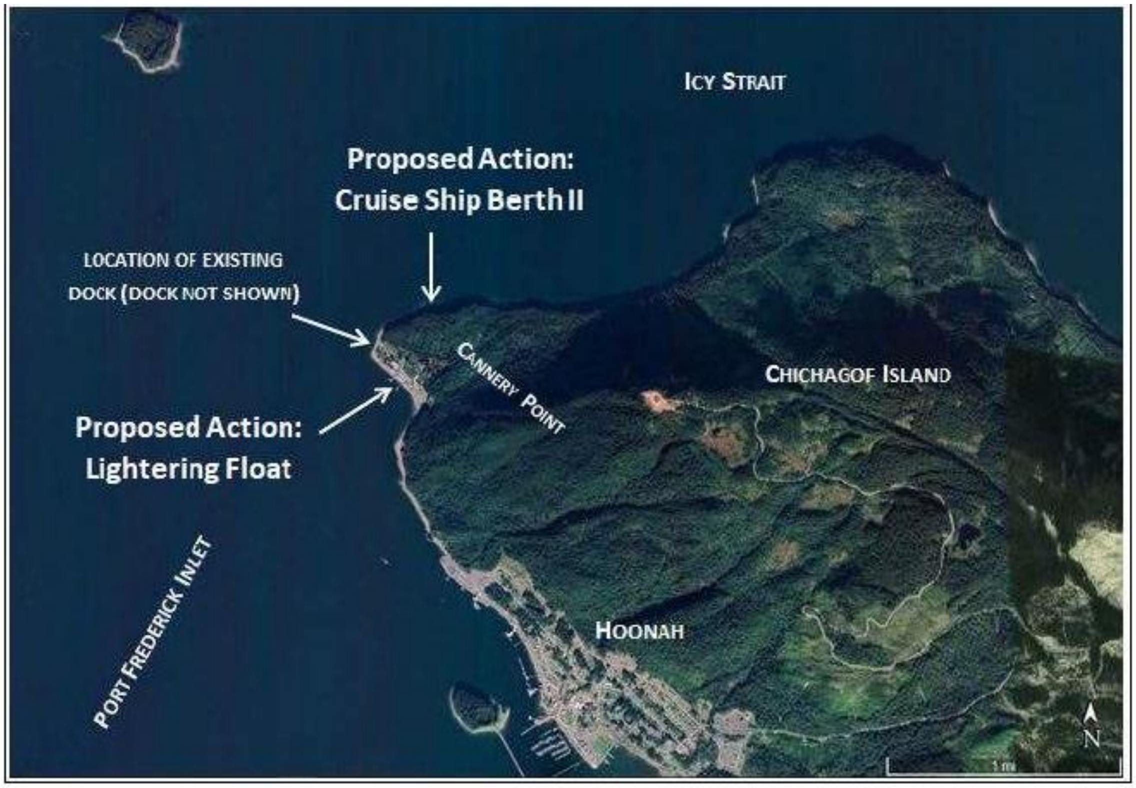


**Figure 1. Project Location of Cruise Ship Berth II and Lightering Float, Hoonah, Alaska.**

Icy Strait is part of Alaska's Inside Passage, a route for ships through Southeast Alaska's network of islands, located between Chichagof Island and the North American mainland. Port Frederick is a 24-km inlet that dips into northeast Chichagof Island from Icy Strait, leading to Neka Bay and Salt Lake Bay. The inlet varies between 4 and almost 6 km wide with a depth of up to 150 meters (m). The inlet near the proposed project is 14 to 35 m deep (Figure 9, NOAA 2016). NMFS's ShoreZone Mapper details the proposed project site as a semi-protected/partially mobile/sediment or rock and sediment habitat class with gravel beaches environmental sensitivity index (NMFS 2018c).

*Detailed Description of Specific Activity*

To construct a new cruise ship berth (Berth II), lightering float, associated support structures, and pedestrian walkway connections to shore, the project would require the following:

- Installation of 62 temporary 30-inch (in) diameter steel piles as templates to guide proper installation of permanent piles (these piles would be removed prior to project completion);
- Installation of 8 permanent 42-in diameter steel piles, 16 permanent 36-in diameter steel piles, and 18 permanent 24-in diameter steel piles to support a new 500 feet (ft) x 50 ft floating pontoon dock, its attached 400 ft x 12 ft small craft float, mooring structures, and shore-access fixed-pier walkway (Figure 6 of the application)
- Installation of three permanent 30-in diameter steel piles to support a 120 ft x 20 ft lightering float, and four permanent 16-in diameter steel piles above the high tide line to construct a 12 ft x 40 ft fixed pier for lightering float shore access (Figure 7 of the application);

- Installation of bull rail, floating fenders, mooring cleats, and mast lights. (Note: these components would be installed out of the water.)
- Socketing and rock anchoring to stabilize the piles.

Construction Sequence

In-water construction of Berth II would begin with installation of an approximately 300-ft-long fixed pier. Temporary 30-in piles would be driven into the bedrock by a vibratory hammer to create a template to guide installation of the permanent piles. A frame would be welded around the temporary piles. Permanent 36-in and 42-in piles would then be driven into the bedrock using vibratory and impact pile driving.

Installation of the lightering float and fixed pier would begin with removal of a single existing wood pile separate from the existing wooden pier by direct-pull methods using a crane. Three 30-in steel piles would then be driven in using a vibratory hammer in to support the new lightering float structure. Additionally, (4) 16-in steel piles would be installed with a vibratory hammer (on land) for the lightering float's fixed pier and placement of a gangway to connect the two components. The 16-in steel piles are not discussed further because they occur on land and are not expected to impact species under water.

Installation and Removal of Temporary (Template) Piles

Temporary 30-in steel piles would be installed and removed using a vibratory hammer (Table 1). If needed for stability, the contractor would socket in up to 10 of these piles if a sufficient quantity of overburden is not present (Table 1). Socketing is also known as down-the-hole drilling or downhole drilling (DTH drilling) to secure a pile to the bedrock. During socketing, the DTH hammer and under-reamer bit drill a hole into the bedrock and then socket the pile into the bedrock. We refer to it as socketing throughout this document to clarify this method from rock anchoring, which also uses a drill.

Installation of Permanent Piles

Eighteen permanent 24-in steel piles would be installed through sand and gravel with a vibratory hammer (Table 1). All of the 18 permanent 24in steel piles will be secured into underlying bedrock with socketing (Table 1). Socket depths are expected to be approximately five ft (as determined by the geotechnical engineer). Two of the 24-in steel piles may also be secured through rock anchoring (Table 1). Rock anchoring is the method of drilling a shaft into the concrete, inside of the existing pile, and filling it with concrete to stabilize the pile. After a pile is impacted, the pile would be anchored using an 8in diameter drilled shaft within the pile. Once the shaft is drilled, a DTH hammer with an 8in diameter bit will be used to drill a shaft (depth as determined by geotechnical engineer) into the bedrock and filled with concrete to install the rock anchors.

Sixteen permanent 36-in steel piles and 8 permanent 42-in steel piles would be driven through sand and gravel with a vibratory hammer and impacted into bedrock (Table 1). After being impacted, all 24 of these piles would be anchored using a smaller 33-in diameter drilled shaft within the pile (Table 1). Once the shaft is drilled, a DTH hammer with a 33-in diameter bit (isolated from the steel casing) will be used to drill a shaft (depth as determined by geotechnical engineer) into the bedrock and filled with concrete to install the rock anchors. During this anchor drilling, the larger diameter piles would not be touched by the drill; therefore, anchoring will not generate steel-on-steel hammering noise (noise that is generated during socketing).

In addition, 3 permanent 30-in steel piles would be driven through sand and gravel with a vibratory hammer only to support the lightering float (Table 1).

**Table 1. Pile driving and removal activities required for the Hoonah Berth II and lightering float.**

| Description | Project Component | | | | | |
|---|---|---|---|---|---|---|
| | **Temporary Pile Installation** | **Temporary Pile Removal** | **Permanent Pile Installation** | **Permanent Pile Installation** | **Permanent Pile Installation** | **Permanent Pile Installation** |
| Diameter of Steel Pile (inches) | 30 | 30 | 24 | 30 | 36 | 42 |
| # of Piles | 62 | 62 | 18 | 3 | 16 | 8 |
| **Vibratory Pile Driving** | | | | | | |
| Total Quantity | 62 | 62 | 18 | 3 | 16 | 8 |
| Max # Piles Vibrated per Day | 6 | 6 | 4 | 2 | 2 | 2 |
| **Impact Pile Driving** | | | | | | |
| Total Quantity | 0 | 0 | 0 | 0 | 16 | 8 |
| Max # Piles Impacted per Day | 0 | 0 | 0 | 0 | 4 | 2 |
| **Socketed Pile Installation (Down-Hole Drilling)** | | | | | | |
| Total Quantity | 10 | 0 | 18 | 0 | 0 | 0 |
| Max # Piles Socketed per Day | 2 | 0 | 2 | 0 | 0 | 0 |
| **Rock Anchor Installation (Drilled Shaft)** | | | | | | |
| Total Quantity | 0 | 0 | 2 | 0 | 16 | 8 |
| Diameter of Anchor | -- | -- | 8 | 0 | 33 | 33 |
| Max # Piles Anchored per Day | 0 | 0 | 1 | 0 | 2 | 2 |

In addition to the activities described above, the proposed action will involve other in-water construction and heavy machinery activities. Other types of in-water work including with heavy machinery will occur using standard barges, tug boats, barge-mounted excavators, or clamshell equipment to place or remove material; and positioning piles on the substrate via a crane (*i.e.*, "stabbing the pile"). Workers will be transported from shore to the barge work platform by a 25-ft skiff with a 125–250 horsepower motor in the morning and at the end of the work day. The travel distance will be less than 300 ft. There could be multiple (up to eight) shore-to-barge trips during the day; however, the area of travel will be relatively small and close to shore. We do not expect any of these other in-water construction and heavy machinery activities to take marine mammals as these activities occur close to the shoreline (less than 300 feet), but as additional mitigation, DPD is proposing a 10 m shutdown zone for these additional in-water activities. Therefore, these other in-water construction and heavy machinery activities will not be discussed further.

For further details on the proposed action and project components, please refer to Section 1.2.4. and 1.2.5 of the application.

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

**Description of Marine Mammals in the Area of Specified Activities**

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; *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*) and more general information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS's website (*https://www.fisheries.noaa.gov/find-species*).

Table 2 lists all species with expected potential for occurrence in the project area and summarizes information related to the population or stock, including regulatory status under the MMPA and ESA and potential biological removal (PBR), where known. For taxonomy, we follow Committee on Taxonomy (2016). PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS'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. Pacific and Alaska SARs (Carretta *et al.*, 2018; Muto *et al.*, 2018). All values presented in Table 2 are the most recent available at the time of publication (draft SARS available online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/draft-marine-mammal-stock-assessment-reports*).

**Table 2. Marine Mammals Occurrence in the Project Area.**

| Common name | Scientific name | Stock | ESA/MMPA status; Strategic (Y/N)[1] | Stock abundance (CV, $N_{min}$, most recent abundance survey)[2] | PBR | Annual M/SI[3] |
|---|---|---|---|---|---|---|
| Order Cetartiodactyla – Cetacea – Superfamily Mysticeti (baleen whales) | | | | | | |
| Family Eschrichtiidae | | | | | | |
| Gray Whale | *Eschrichtius robustus* | Eastern N Pacific | -, -, N | 26,960 (0.05, 25,849, 2016) | 801 | 138 |
| Family Balaenopteridae (rorquals) | | | | | | |
| Minke Whale | *Balaenoptera acutorostrata* | Alaska | -, -, N | N/A (see SAR, N/A, see SAR) | UND | 0 |
| Humpback Whale | *Megaptera novaeangliae* | Central N Pacific (Hawaii and Mexico DPS) | -, -, Y | 10,103 (0.3, 7,890, 2006)<br><br>(Hawaii DPS | 83 | 25 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | 9,487[a] Mexico DPS 606 [a]) | | |
| Superfamily Odontoceti (toothed whales, dolphins, and porpoises) | | | | | | |
| Family Physeteridae | | | | | | |
| Sperm whale | *Physeter macrocephalus* | North Pacific | E, D, Y | N/A (see SAR, N/A, 2015) | See SAR | 4.4 |
| Family Delphinidae | | | | | | |
| Killer Whale | *Orcinus orca* | Alaska Resident | -, -, N | 2,347 c (N/A, 2347, 2012) | 24 | 1 |
| | | Northern Resident | -, -, N | 261 c (N/A, 261, 2011) | 1.96 | 0 |
| | | West Coast Transient | -, -, N | 243 c (N/A, 243, 2009) | 2.4 | 0 |
| Pacific White-Sided Dolphin | *Lagenorhynchus obliquidens* | N Pacific | -, -, N | 26,880 (N/A, N/A, 1990) | UND | 0 |
| Family Phocoenidae (porpoises) | | | | | | |
| Dall's Porpoise | *Phocoenoides dalli* | AK | -, -, N | 83,400 (0.097, N/A, 1991) | UND | 38 |
| Harbor Porpoise | *Phocoena phocoena* | Southeast Alaska | -, -, Y | see SAR (see SAR, see SAR, 2012) | 8.9 | 34 |
| Order Carnivora – Superfamily Pinnipedia | | | | | | |
| Family Otariidae (eared seals and sea lions) | | | | | | |
| Steller Sea Lion | *Eumetopias jubatus* | Western DPS | E, D, Y | 54,267 a (see SAR, 54,267, 2017) | 326 | 252 |
| | | Eastern DPS | T, D, Y | 41,638 a (see SAR, 41,638, 2015) | 2498 | 108 |
| Family Phocidae (earless seals) | | | | | | |
| Harbor Seal | *Phoca vitulina* | Glacier Bay/Icy Strait | -, -, N | 7,210 (see SAR, 5,647, 2011) | 169 | 104 |

1 - Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.
2- NMFS marine mammal stock assessment reports online at: www.nmfs.noaa.gov/pr/sars/. CV is coefficient of variation; Nmin is the minimum estimate of stock abundance. In some cases, CV is not applicable [explain if this is the case]
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). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value or range. A CV associated with estimated mortality due to commercial fisheries is presented in some cases.
NOTE - Italicized species are not expected to be taken or proposed for authorization
[a] Under the MMPA humpback whales are considered a single stock (Central North Pacific); however, we have divided them here to account for distinct population segments (DPSs) listed under the ESA. Using the stock assessment from Muto *et al*. 2018 for the Central North Pacific stock (10,103) and calculations in Wade *et al*. 2016, 93.9% of the humpback whales in Southeast Alaska are expected to be from the Hawaii DPS and 6.1% are expected to be from the Mexico DPS.

All species that could potentially occur in the proposed survey areas are included in Table 2. In addition, the Northern sea otter (*Enhydra lutris kenyoni*) may be found in the project area. However, sea otters are managed by the U.S. Fish and Wildlife Service and are not considered further in this document.

*Minke whale*

In the North Pacific Ocean, minke whales occur from the Bering and Chukchi seas south to near the Equator (Leatherwood *et al.*, 1982). In the northern part of their range, minke whales are believed to be migratory, whereas, they appear to establish home ranges in the inland waters of Washington and along central California (Dorsey *et al*. 1990). Minke whales are observed in Alaska's nearshore waters during the summer months (National Park Service (NPS) 2018). Minke whales are usually sighted individually or in small groups of 2-3, but there are reports of loose aggregations of hundreds of animals (NMFS 2018d). Minke whales are rare in the action area, but they could be encountered. During the construction of the first Icy Strait cruise ship berth, a single minke was observed during the135-day monitoring period (June 2015 through January 2016) (BergerABAM 2016).

No abundance estimates have been made for the number of minke whales in the entire North Pacific. However, some information is available on the numbers of minke whales in some areas of Alaska. Line-transect surveys were conducted in shelf and nearshore waters (within 30-45 nautical miles of land) in 2001-2003 from the Kenai Fjords in the Gulf of Alaska to the central Aleutian Islands. Minke whale abundance was estimated to be 1,233 (CV = 0.34) for this area (Zerbini *et al.*, 2006). This estimate has also not been corrected for animals missed on the trackline. The majority of the sightings were in the Aleutian Islands, rather than in the Gulf of Alaska, and in water shallower than 200 m. So few minke whales were seen during three offshore Gulf of Alaska surveys for cetaceans in 2009, 2013, and 2015 that a population estimate for this species in this area could not be determined (Rone *et al.*, 2017).

*Humpback whale*

The humpback whale is distributed worldwide in all ocean basins and a broad geographical range from tropical to temperate waters in the Northern Hemisphere and from tropical to near-ice-edge waters in the Southern Hemisphere. The humpback whales that forage throughout British Colombia and Southeast Alaska undertake seasonal migrations from their tropical calving and breeding grounds in winter to their high-latitude feeding grounds in summer. They may be seen at any time of year in Alaska, but most animals winter in temperate or tropical waters near Hawaii. In the spring, the animals migrate back to Alaska where food is abundant.

Within Southeast Alaska, humpback whales are found throughout all major waterways and in a variety of habitats, including open-ocean entrances, open-strait environments, near-shore waters, area with strong tidal currents, and secluded bays and inlets. They tend to concentrate in several areas, including northern Southeast Alaska. Patterns of occurrence likely follow the spatial and temporal changes in prey abundance and distribution with humpback whales adjusting their foraging locations to areas of high prey density (Clapham 2000).

Humpback whales may be found in and around Chichagof Island, Icy Strait, and Port Frederick Inlet at any given time. While many humpback whales migrate to tropical calving and breeding grounds in winter, they have been observed in Southeast Alaska in all months of the year (Bettridge *et al.*, 2015). Diet for humpback whales in the Glacier Bay/Icy Strait area mainly consists of small schooling fish (capelin, juvenile walleye pollock, sand lance, and Pacific herring) rather than euphausiids (krill). They migrate to the northern reaches of Southeast Alaska (Glacier Bay) during spring and early summer following these fish and then move south towards

Stephens Passage in early fall to feed on krill, passing the project area on the way (Krieger and Wing 1986). Over 32 years of humpback whale monitoring in the Glacier Bay/Icy Strait area reveals a substantial decline in population since 2014; a total of 164 individual whales were documented in 2016 during surveys conducted from June-August, making it the lowest count since 2008 (Neilson *et al.*, 2017)

During construction of the first Icy Strait cruise ship berth from June 2015 through January 2016, humpback whales were observed in the action area on 84 of the 135 days of monitoring; most often in September and October. Up to 18 humpback sightings were reported on a single day (October 2, 2015), and a total of 226 Level B harassments were recorded during project construction (June 2015 through January 2016) (BergerABAM 2016).

*Gray whale*

Gray whales are found exclusively in the North Pacific Ocean. The Eastern North Pacific stock of gray whales inhabit the Chukchi, Beaufort, and Bering Seas in northern Alaska in the summer and fall and California and Mexico in the winter months, with a migration route along the coastal waters of Southeast Alaska. Gray whales have also been observed feeding in waters off Southeast Alaska during the summer (NMFS 2018e).

The migration pattern of gray whales appears to follow a route along the western coast of Southeast Alaska, traveling northward from British Columbia through Hecate Strait and Dixon Entrance, passing the west coast of Chichagof Island from late March to May (Jones *et al.* 1984, Ford *et al.* 2013). Since the project area is on the east coast of Chichagof Island it is less likely there will be gray whales sighted during project construction; however, the possibility exists.

During the 2016 construction of the first cruise ship terminal at Icy Strait Point, no gray whales were seen during the 135-day monitoring period (June 2015 through January 2016) (BergerABAM 2016).

*Killer whale*

Killer whales have been observed in all oceans and seas of the world, but the highest densities occur in colder and more productive waters found at high latitudes. Killer whales are found throughout the North Pacific and occur along the entire Alaska coast, in British Columbia and Washington inland waterways, and along the outer coasts of Washington, Oregon, and California (NMFS 2018f).

The Alaska Resident stock occurs from Southeast Alaska to the Aleutian Islands and Bering Sea. The Northern Resident stock occurs from Washington State through part of Southeast Alaska; and the West Coast Transient stock occurs from California through Southeast Alaska (Muto *et al.*, 2018) and are thought to occur frequently in Southeast Alaska (Straley 2017).

Transient killer whales can pass through the waters surrounding Chichagof Island, in Icy Strait and Glacier Bay, feeding on marine mammals. Because of their transient nature, it is difficult to predict when they will be present in the area. Whales from the Alaska Resident stock and the Northern Resident stock are thought to primarily feed on fish. Like the transient killer whales, they can pass through Icy Strait at any given time (North Gulf Oceanic Society 2018).

Killer whales were observed on 11 days during construction of the first Icy Strait cruise ship berth during the135-day monitoring period (June 2015 through January 2016). Killer whales were observed a few times a month. Usually a singular animal was observed, but a group containing 8 individuals was seen in the action area on one occasion, for a total of 24 animals observed during in-water work (BergerABAM 2016).

*Pacific white-sided dolphin*

Pacific white-sided dolphins are a pelagic species. They are found throughout the temperate North Pacific Ocean, north of the coasts of Japan and Baja California, Mexico (Muto *et al.*, 2018). They are most common between the latitudes of 38° North and 47° North (from California to Washington). The distribution and abundance of Pacific white-sided dolphins may be affected by large-scale oceanographic occurrences, such as El Niño, and by underwater acoustic deterrent devices (NPS 2018a).

No Pacific white-sided dolphins were observed during construction of the first cruise ship berth during the135-day monitoring period (June 2015 through January 2016) (BergerABAM 2016). They are rare in the action area, likely because they are pelagic and prefer more open water habitats than are found in Icy Strait and Port Frederick Inlet. Pacific white-sided dolphins have been observed in Alaska waters in groups ranging from 20 to 164 animals, with the sighting of 164 animals occurring in Southeast Alaska near Dixon Entrance (Muto *et al.*, 2018).

*Dall's Porpoise*

Dall's porpoises are widely distributed across the entire North Pacific Ocean. They show some migration patterns, inshore and offshore and north and south, based on morphology and type, geography, and seasonality (Muto *et al.*, 2018). They are common in most of the larger, deeper channels in Southeast Alaska and are rare in most narrow waterways, especially those that are relatively shallow and/or with no outlets (Jefferson *et al.*, 2019). In Southeast Alaska, abundance varies with season.

Jefferson *et al.* (2019) recently published a report with survey data spanning from 1991 to 2012 that studied Dall's porpoise density and abundance in Southeast Alaska. They found Dall's porpoise were most abundant in spring, observed with lower numbers in summer, and lowest in fall. Surveys found Dall's porpoise to be common in Icy Strait and sporadic with very low densities in Port Frederick (Jefferson *et al.*, 2019). During a 16-year survey of cetaceans in Southeast Alaska, Dall's porpoises were commonly observed during spring, summer, and fall in the nearshore waters of Icy Strait (Dahlheim *et al.*, 2009). Dall's porpoises were observed on two days during the 135-day monitoring period (June 2015 through January 2016) of the construction of the first cruise ship berth (BergerABAM 2016). Both were single individuals transiting within the waters of Port Frederick in the vicinity of Halibut Island. Dall's porpoises generally occur in groups from 2-12 individuals (NMFS 2018g).

*Harbor Porpoise*

In the eastern North Pacific Ocean, the Bering Sea and Gulf of Alaska harbor porpoise stocks range from Point Barrow, along the Alaska coast, and the west coast of North America to Point Conception, California. The Southeast Alaska stock ranges from Cape Suckling, Alaska to the northern border of British Columbia. Within the inland waters of Southeast Alaska, harbor porpoises' distribution is clustered with greatest densities observed in the Glacier Bay/Icy Strait region and near Zarembo and Wrangell Islands and the adjacent waters of Sumner Strait (Dahlheim *et al.*, 2015). Harbor porpoises also were observed primarily between June and September during construction of the Huna Berth I cruise ship terminal project. Harbor porpoises were observed on 19 days during the 135-day monitoring period (June 2015 through January 2016) (BergerABAM 2016) and seen either singularly or in groups from two to four animals.

There is no official stock abundance associated with the SARS for harbor porpoise. Both aerial and vessel based surveys have been conducted for this species. Aerial surveys of this stock were conducted in June and July 1997 and resulted in an observed abundance estimate of 3,766 harbor porpoise (Hobbs and Waite 2010) and the surveys included a subset of smaller bays and inlets. Correction factors for observer perception bias and porpoise availability at the surface were used to develop an estimated corrected abundance of 11,146 harbor porpoise in the coastal and inside waters of Southeast Alaska (Hobbs and Waite 2010). Vessel based spanning the 22-year study (1991-2012) found the relative abundance of harbor porpoise varied in the inland waters of Southeast Alaska. Abundance estimated in 1991-1993 (N = 1,076; 95% CI = 910-1,272) was higher than the estimate obtained for 2006-2007 (N = 604; 95% CI = 468-780) but comparable to the estimate for 2010-2012 (N = 975; 95% CI = 857-1,109; Dahlheim *et al.*, 2015). These estimates assume the probability of detection directly on the trackline to be unity (g(0) = 1) because estimates of g(0) could not be computed for these surveys. Therefore, these abundance estimates may be biased low to an unknown degree. A range of possible g(0) values for harbor porpoise vessel surveys in other regions is 0.5-0.8 (Barlow 1988, Palka 1995), suggesting that as much as 50 percent of the porpoise can be missed, even by experienced observers.

Further, other vessel based survey data (2010-2012) for the inland waters of Southeast Alaska, calculated abundance estimates for the concentrations of harbor porpoise in the northern and southern regions of the inland waters (Dahlheim *et al.* 2015). The resulting abundance estimates are 398 harbor porpoise (CV = 0.12) in the northern inland waters (including Cross Sound, Icy Strait, Glacier Bay, Lynn Canal, Stephens Passage, and Chatham Strait) and 577 harbor porpoise (CV = 0.14) in the southern inland waters (including Frederick Sound, Sumner

Strait, Wrangell and Zarembo Islands, and Clarence Strait as far south as Ketchikan). Because these abundance estimates have not been corrected for g(0), these estimates are likely underestimates.

The vessel based surveys are not complete coverage of harbor porpoise habitat and not corrected for bias and likely underestimate the abundance. Whereas, the aerial survey in 1997, although outdated, had better coverage of the range and is likely to be more of an accurate representation of the stock abundance (11,146 harbor porpoise) in the coastal and inside waters of Southeast Alaska.

*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 and, with local movements associated with such factors as tide, weather, season, food availability and reproduction.

Distribution of the Glacier Bay/Icy Strait stock, the only stock considered in this application, ranges along the coast from Cape Fairweather and Glacier Bay south through Icy Strait to Tenakee Inlet on Chichagof Island (Muto *et al.*, 2018).

The Glacier Bay/Icy Strait stock of harbor seals are common residents of the action area and can occur on any given day in the area, although they tend to be more abundant during the fall months (Womble and Gende 2013). A total of 63 harbor seals were seen during 19 days of the 135-day monitoring period (June 2015 through January 2016) (BergerABAM 2016), while none were seen during the 2018 test pile program (SolsticeAK 2018). Harbor seals were primarily observed in summer and early fall (June to September). Harbor seals were seen singulary and in groups of two or more, but on one occasion, 22 individuals were observed hauled out on Halibut Rock, across Port Frederick approximately 1.5 miles from the location of pile installation activity (BergerABAM 2016).

There are two known harbor seal haulouts within the project area. According to the AFSC list of harbor seal haulout locations, the closest listed haulout (id 1,349: name CF39A) is located in Port Frederick, approximately 1,850 m west (AFSC 2018). The group of 22 animals was observed using Halibut Rock (approximately 2,000 m from any potential pile-driving activities) as a haulout.

*Steller Sea Lion*

Steller sea lions range along the North Pacific Rim from northern Japan to California, with centers of abundance in the Gulf of Alaska and Aleutian Islands (Loughlin *et al.*, 1984).

Of the two Steller sea lion populations in Alaska, the Eastern DPS includes sea lions born on rookeries from California north through Southeast Alaska and the Western DPS includes those animals born on rookeries from Prince William Sound westward, with an eastern boundary set at 144° W (NMFS 2018h). Both WDPS and EDPS Steller sea lions are considered in this application because the WDPS are common within the geographic area under consideration (north of Summer Strait) (Fritz *et al.*, 2013, NMFS 2013).

Steller sea lions are not known to migrate annually, but individuals may widely disperse outside of the breeding season (late-May to early-July), leading to intermixing of stocks (Jemison *et al.* 2013; Allen and Angliss 2015).

Steller sea lions are common in the inside waters of Southeast Alaska. They are residents of the project vicinity and are common year-round in the action area, moving their haulouts based on seasonal concentrations of prey from exposed rookeries nearer the open Pacific Ocean during the summer to more protected sites in the winter (Alaska Department of Fish & Game (ADF&G) 2018). During the construction of the existing Icy Strait cruise ship berth a total of 180 Steller sea lions were observed on 47 days of the 135 monitoring days, amounting to an average of 1.3 sightings per day (BergerABAM 2016). Steller sea lions were frequently observed in groups of two or more individuals, but lone individuals were also observed regularly (BergerABAM 2016). During a test pile program performed at the project location by the Hoonah Cruise Ship Dock Company in May 2018, a total of 15 Steller sea lions were seen over the course of 7 hours in one day (SolsticeAK 2018). They can occur in groups of 1-10 animals, but may congregate in larger groups near rookeries and haulouts (NMFS 2018h). No documented rookeries or haulouts are near the project area.

Critical habitat has been defined in Southeast Alaska at major haulouts and major rookeries (50 CFR 226.202). The nearest rookery is on the White Sisters Islands near Sitka and the nearest major haulouts are at Benjamin Island, Cape Cross, and Graves Rocks. The White Sisters rookery is located on the west side of Chichagof Island, about 72 km southwest of the project area. Benjamin Island is about 60 km northeast of Hoonah. Cape Cross and Graves Rocks are both about 70 km west of Hoonah. Steller sea lions are known to haul out on land, docks, buoys, and navigational markers. However, during the summer months when the proposed project would be constructed Steller sea lions are less likely to be in the protected waters around the project area, preferring exposed rookeries on the western shores of Southeast Alaska.

*Sperm whales*

Tagged sperm whales have been tracked within the Gulf of Alaska, and multiple whales have been tracked in Chatham Strait, in Icy Strait, and in the action area in 2014 and 2015 (*http://seaswap.info/whaletracker Accessed 4/15/19)*. Tagging studies primarily show that sperm whales use the deep water slope habitat extensively for foraging (Mathias *et al*., 2012). Interaction studies between sperm whales and the longline fishery have been focused along the continental slope of the eastern Gulf of Alaska in water depths between about 1,970 and 3,280 ft (600 and 1,000 m) (Straley *et al*. 2005, Straley *et al*. 2014). The known sperm whale habitat (these shelf-edge/slope waters of the Gulf of Alaska) are far outside of the action area.

Also, more recently in November 2018 (4 whales) and March 2019 (2 whales), sperm whales have been observed in southern Lynn Canal, and on March 20, 2019, NMFS performed a necropsy on a sperm whale that died from trauma consistent with a ship strike. However, NMFS believes is highly unlikely that sperm whales will occur in the action area where pile driving activities will occur because they are generally found in far deeper waters than those in which the project will occur. Therefore, sperm whales are not being proposed for take authorization and not discussed further.

*Marine Mammal Hearing*

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g.*, Richardson *et al*., 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al*. (2007) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.*, low-frequency cetaceans). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibel (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. Marine mammal hearing groups and their associated hearing ranges are provided in Table 2.

**Table 2. Marine Mammal Hearing Groups (NMFS, 2018).**

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

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

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

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information. Nine marine mammal species (7 cetacean and 2 pinniped (1 otariid and 1 phocid) species) have the reasonable potential to occur during the proposed activities. Please refer to Table 2. Of the cetacean species that may be present, three are classified as low-frequency cetaceans (*i.e.*, all mysticete species), two are classified as mid-frequency cetaceans (*i.e.*, all delphinid species), and two are classified as high-frequency cetaceans (*i.e.*, harbor porpoise and Dall's porpoise).

**Potential Effects of Specified Activities on Marine Mammals and their Habitat**

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

Acoustic effects on marine mammals during the specified activity can occur from vibratory and impact pile driving as well as during socketing and anchoring of the piles. The effects of underwater noise from DPD's proposed activities have the potential to result in Level B behavioral harassment of marine mammals in the vicinity of the action area.

*Description of Sound Sources*

This section contains a brief technical background on sound, on the characteristics of certain sound types, and on metrics used in this proposal inasmuch as the information is relevant to the specified activity and to a discussion of the potential effects of the specified activity on marine mammals found later in this document. For general information on sound and its interaction with the marine environment, please see, *e.g.*, Au and Hastings (2008); Richardson *et al.* (1995); Urick (1983).

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 or corresponding points of a sound wave (length of one cycle). Higher frequency sounds have shorter wavelengths than lower frequency sounds, and typically attenuate (decrease) more rapidly, except in certain cases in shallower water. Amplitude is the height of the sound pressure wave or the "loudness" of a sound and is typically described using the relative unit of the decibel (dB). A sound pressure level (SPL) in dB is described as the ratio between a measured pressure and a reference pressure (for underwater sound, this is 1 microPascal (μPa)), and is a logarithmic unit that accounts for large variations in amplitude; therefore, a relatively small change in dB corresponds to large changes in sound pressure. The source level (SL) represents the SPL referenced at a distance of 1 m from the source (referenced to 1 μPa), while the received level is the SPL at the listener's position (referenced to 1 μPa).

Root mean square (rms) is the quadratic mean sound pressure over the duration of an impulse. Root mean square is calculated by squaring all of the sound amplitudes, averaging the squares, and then taking the square root of the average (Urick, 1983). Root mean square 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.

Sound exposure level (SEL; represented as dB re 1 $\mu Pa^2$-s) represents the total energy in a stated frequency band over a stated time interval or event, and considers both intensity and duration of exposure. The per-pulse SEL is calculated over the time window containing the entire pulse (*i.e.*, 100 percent of the acoustic energy). SEL is a cumulative metric; it can be accumulated over a single pulse, or calculated over periods containing multiple pulses. Cumulative SEL represents the total energy accumulated by a receiver over a defined time window or during an event. Peak sound pressure (also referred to as zero-to-peak sound pressure or 0-pk) is the maximum instantaneous sound pressure measurable in the water at a specified distance from the source, and is represented in the same units as the rms sound pressure.

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 a manner similar to ripples on the surface of a pond and may be either directed in a beam or beams or may radiate in all directions (omnidirectional sources), as is the case for sound produced by the pile driving activity considered here. 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, which is defined as environmental background sound levels lacking a single source or point (Richardson *et al.*, 1995). 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.*, wind and waves, earthquakes, ice, atmospheric sound), biological (*e.g.*, sounds produced by marine mammals, fish, and invertebrates), and anthropogenic (*e.g.*, vessels, dredging, construction) sound. A number of sources contribute to ambient sound, including wind and waves, which are a main source of naturally occurring ambient sound for frequencies between 200 hertz (Hz) and 50 kilohertz (kHz) (Mitson, 1995). In general, ambient sound levels tend to increase with increasing wind speed and wave height. Precipitation can become an important component of total sound at frequencies above 500 Hz, and possibly down to 100 Hz during quiet times. Marine mammals can contribute significantly to ambient sound levels, as can some fish and snapping shrimp. The frequency band for biological contributions is from approximately 12 Hz to over 100 kHz. Sources of ambient sound related to human activity include transportation (surface vessels), dredging and construction, oil and gas drilling and production, geophysical surveys, sonar, and explosions. Vessel noise typically dominates the total ambient sound 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.

The sum of the various natural and anthropogenic sound sources that comprise ambient sound at any given location and time depends not only on the source levels (as determined by current weather conditions and levels of biological and human 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 decibels (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.

Sounds are often considered to fall into one of two general 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. The distinction between these two sound types is not always obvious, as certain signals share properties of both pulsed and non-pulsed sounds. A signal near a source could be categorized as a pulse, but due to propagation effects as it moves farther from the source, the signal duration becomes longer (*e.g.*, Greene and Richardson, 1988).

Pulsed sound sources (*e.g.*, airguns, 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, 2005; Harris, 1998; NIOSH, 1998; ISO, 2003) 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 intermittent (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.

The impulsive sound generated by impact hammers is characterized by rapid rise times and high peak levels. Vibratory hammers produce non-impulsive, continuous noise at levels significantly lower than those produced by impact hammers. Rise time is slower, reducing the probability and severity of injury, and sound energy is distributed over a greater amount of time (*e.g.*, Nedwell and Edwards, 2002; Carlson *et al.*, 2005).

*Acoustic Effects on Marine Mammals*

We previously provided general background information on marine mammal hearing (see "Description of Marine Mammals in the Area of the Specified Activity"). Here, we discuss the potential effects of sound on marine mammals.

Note that, in the following discussion, we refer in many cases to a review article concerning studies of noise-induced hearing loss conducted from 1996-2015 (*i.e.*, Finneran, 2015). For study-specific citations, please see that work. 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; Götz *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 pile driving and removal 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.*, certain non-auditory physical or physiological effects) only briefly as we do not expect that there is a reasonable likelihood that pile driving may result in such effects (see below for further discussion). Potential effects from explosive impulsive sound sources can range in severity from effects such as behavioral disturbance or tactile perception to physical discomfort, slight injury of the internal organs and the auditory system, or mortality (Yelverton *et al*., 1973). 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 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; Tal *et al.*, 2015). The construction activities considered here do not involve the use of devices such as explosives or mid-frequency tactical sonar that are associated with these types of effects.

*Threshold Shift* – 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 (Finneran, 2015). 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, and there is no PTS data for cetaceans, but such relationships are assumed to be similar to those in humans and other terrestrial mammals. PTS typically occurs at exposure levels at least several decibels above (a 40-dB threshold shift approximates PTS onset; *e.g.*, Kryter *et al.*, 1966; Miller, 1974) 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 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 (Finneran, 2015). TTS was not observed in trained spotted (*Phoca largha*) and ringed (*Pusa hispida*) seals exposed to impulsive noise at levels matching previous predictions of TTS onset (Reichmuth *et al.*, 2016). In general, harbor seals and harbor porpoises have a lower TTS onset than other measured pinniped or cetacean species (Finneran, 2015). 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), Finneran and Jenkins (2012), Finneran (2015), and NMFS (2018).

*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 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). However, many delphinids approach low-frequency airgun source vessels with no apparent discomfort or obvious behavioral change (*e.g.*, Barkaszi *et al.*, 2012), indicating the importance of frequency output in relation to the species' hearing sensitivity.

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, l*et al*one 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, 2013b). 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, 2005, 2006; Gailey *et al.*, 2007; Gailey *et al.*, 2016).

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 have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al.*, 2007). In some cases, animals may cease sound production during production of aversive signals (Bowles *et al.*, 1994).

Avoidance is the displacement of an individual from an area or migration path as a result of the presence of a sound or other stressors, and is one of the most obvious manifestations of disturbance in marine mammals (Richardson *et al.*, 1995). For example, gray whales are known to change direction—deflecting from customary migratory paths—in order to avoid noise from airgun 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; Erbe *et al*., 2016). 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.*, 2007; 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.

*Potential Effects of DPD's Activity* – As described previously (see "Description of Active Acoustic Sound Sources"), DPD proposes to conduct pile driving, including impact and vibratory driving (inclusive of socketing and anchoring). The effects of pile driving on marine mammals are dependent on several factors, including the size, type, and depth of the animal; the depth, intensity, and duration of the pile driving sound; the depth of the water column; the substrate of the habitat; the standoff distance between the pile and the animal; and the sound propagation properties of the environment. With both types, it is likely that the pile driving could result in temporary, short term changes in an animal's typical behavioral patterns 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.

The biological significance of many of these behavioral disturbances is difficult to predict, especially if the detected disturbances appear minor. However, the consequences of behavioral modification could be expected to be biologically significant if the change affects growth, survival, or reproduction. Significant behavioral modifications that could lead to effects on growth, survival, or reproduction, such as drastic changes in diving/surfacing patterns or significant habitat abandonment are extremely unlikely in this area (*i.e.*, shallow waters in modified industrial areas).

Whether impact or vibratory driving, sound sources would be active for relatively short durations, with relation to potential for masking. The frequencies output by pile driving activity are lower than those used by most species expected to be regularly present for communication or foraging. We expect insignificant impacts from masking, and any masking event that could possibly rise to Level B harassment under the MMPA would occur concurrently within the zones of behavioral harassment already estimated for vibratory and impact pile driving, and which have already been taken into account in the exposure analysis.

*Anticipated Effects on Marine Mammal Habitat*

The proposed activities would not result in permanent impacts to habitats used directly by marine mammals except the actual footprint of the project. The footprint of the project is small, and equal to the area of the cruise ship berth and associated pile placement. The small lightering facility nearer to the cannery would not impact any marine mammal habitat since its proposed location is in between two existing, heavily-traveled docks, and within an active marine commercial and tourist area. Over time, marine mammals may be deterred from using habitat near the project area, due to an increase in vessel traffic and tourist activity in this area. The number of cruise ships traveling to Hoonah is expected to increase. Hoonah's increased traffic as a top Alaskan cruise port-of-call is already occurring. However, this project would decrease small vessel traffic to and from cruise ships unable to dock at the existing berth.

The proposed activities may have potential short-term impacts to food sources such as forage fish. The proposed activities could also affect acoustic habitat (see masking discussion above), but meaningful impacts are unlikely. There are no known foraging hotspots, or other ocean bottom structures of significant biological importance to marine mammals present in the marine waters in the vicinity of the project areas. 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. The most likely impact to marine mammal habitat occurs from pile driving effects on likely marine mammal prey (*i.e.*, fish) near where the piles are installed. Impacts to the immediate substrate during installation and removal of piles are anticipated, but these would be limited to minor, temporary suspension of sediments, which could impact water quality and visibility for a short amount of time, but which would not be expected to have any effects on individual marine mammals. Impacts to substrate are therefore not discussed further.

*Effects to Prey* – Sound may affect marine mammals through impacts on the abundance, behavior, or distribution of prey species (*e.g.*, crustaceans, cephalopods, fish, zooplankton). Marine mammal prey varies by species, season, and location and, for some, is not well documented. Here, we describe studies regarding the effects of noise on known marine mammal prey.

Fish utilize the soundscape and components of sound in their environment to perform important functions such as foraging, predator avoidance, mating, and spawning (*e.g.*, Zelick *et al.*, 1999; Fay, 2009). Depending on their hearing anatomy and peripheral sensory structures, which vary among species, fishes hear sounds using pressure and particle motion sensitivity capabilities and detect the motion of surrounding water (Fay *et al.*, 2008). The potential effects of noise on fishes depends on the overlapping frequency range, distance from the sound source, water depth of exposure, and species-specific hearing sensitivity, anatomy, and physiology. Key impacts to fishes may include behavioral responses, hearing damage, barotrauma (pressure-related injuries), and mortality.

Fish react to sounds which are especially strong and/or intermittent low-frequency sounds, and behavioral responses such as flight or avoidance are the most likely effects. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. The reaction of fish to noise depends on the physiological state of the fish, past exposures, motivation (*e.g.*, feeding, spawning, migration), and other environmental factors. 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). Several studies have demonstrated that impulse sounds might affect the distribution and behavior of some fishes, potentially impacting foraging opportunities or increasing energetic costs (*e.g.*, Fewtrell and McCauley, 2012; Pearson *et al.*, 1992; Skalski *et al.*, 1992; Santulli *et al.*, 1999; Paxton *et al.*, 2017). However, some studies have shown no or slight reaction to impulse sounds (*e.g.*, Pena *et al.*, 2013; Wardle *et al.*, 2001; Jorgenson and Gyselman, 2009; Cott *et al.*, 2012). More commonly, though, the impacts of noise on fish are temporary.

SPLs of sufficient strength have been known to cause injury to fish and fish mortality. However, in most fish species, hair cells in the ear continuously regenerate and loss of auditory function likely is restored when damaged cells are replaced with new cells. Halvorsen *et al.* (2012a) showed that a TTS of 4-6 dB was recoverable within 24 hours for one species. Impacts would be most severe when the individual fish is close to the source and when the duration of exposure is long. Injury caused by barotrauma can range from slight to severe and can cause death, and is most likely for fish with swim bladders. Barotrauma injuries have been documented during controlled exposure to impact pile driving (Halvorsen *et al.*, 2012b; Casper *et al.*, 2013).

The action area supports marine habitat for prey species including large populations of anadromous fish including Pacific salmon (five species), cutthroat and steelhead trout, and Dolly Varden (NMFS 2018i) and other species of marine fish such as halibut, rock sole, sculpins, Pacific cod, herring, and eulachon (NMFS 2018j). The most likely impact to fish from pile driving activities at the project areas would be temporary behavioral avoidance of the area. The duration of fish avoidance of an 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 expected short daily duration of individual pile driving events and the relatively small areas being affected.

The following essential fish habitat (EFH) species may occur in the project area during at least one phase of their lifestage: Chum Salmon (*Oncorhynchus keta*), Pink Salmon (*O. gorbuscha*), Coho Salmon (*O. kisutch*), Sockeye Salmon (*O. nerka*), and Chinook Salmon (*O. tshawytscha*). No habitat areas of particular concern or EFH areas protected from fishing are identified near the project area (NMFS 2018i). There are no documented anadromous fish streams in the project area. The closest documented anadromous fish steam is approximately 2.5 miles southeast of the project area (ADF&G 2018a).

The area impacted by the project is relatively small compared to the available habitat in Port Frederick Inlet and Icy Strait. 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. As described in the preceding, the potential for DPD's construction to affect the availability of prey to marine mammals or to meaningfully impact the quality of physical or acoustic habitat is considered to be insignificant. Effects to habitat will not be discussed further in this document.

**Estimated Take**

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

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).

Take of marine mammals incidental to DPD's pile driving and removal activities (as well as during socketing and anchoring) could occur as a result of Level A and Level B harassment. Below we describe how the potential take is estimated. As described previously, no mortality is anticipated or proposed to be authorized for this activity. Below we describe how the take is estimated.

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

*Acoustic Thresholds*

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

*Level A harassment* - NMFS' *Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing* (Version 2.0) (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise. The technical guidance identifies the received levels, or thresholds, above which individual marine mammals are predicted to experience changes in their hearing sensitivity for all underwater anthropogenic sound sources, and reflects the best available science on the potential for noise to affect auditory sensitivity by:

- Dividing sound sources into two groups (*i.e.*, impulsive and non-impulsive) based on their potential to affect hearing sensitivity;
- Choosing metrics that best address the impacts of noise on hearing sensitivity, *i.e.*, sound pressure level (peak SPL) and sound exposure level (SEL) (also accounts for duration of exposure); and
- Dividing marine mammals into hearing groups and developing auditory weighting functions based on the science supporting that not all marine mammals hear and use sound in the same manner.

These thresholds were developed by compiling and synthesizing the best available science, and are provided in Table 3 below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2018 Technical Guidance, which may be accessed at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance*.

DPD's pile driving and removal activity includes the use of impulsive (impact pile driving) and non-impulsive (vibratory pile driving and removal) sources.

**Table 3. Thresholds identifying the onset of Permanent Threshold Shift (Auditory Injury).**

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

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

Note: Peak sound pressure ($L_{pk}$) has a reference value of 1 μPa, and cumulative sound exposure level ($L_E$) has a reference value of 1μPa²s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (*i.e.*, varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

*Ensonified Area*

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

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:

$TL = B * \log_{10}(R_1/R_2)$, where

B = transmission loss coefficient (assumed to be 15)

$R_1$ = the distance of the modeled SPL from the driven pile, and

$R_2$ = the distance from the driven pile of the initial measurement.

This formula neglects loss due to scattering and absorption, which is assumed to be zero here. The degree to which underwater sound propagates away from a sound source is dependent on a variety of factors, most notably the water bathymetry and presence or absence of reflective or absorptive conditions including in-water structures and sediments. Spherical spreading occurs in a perfectly unobstructed (free-field) environment not limited by depth or water surface, resulting in a 6 dB reduction in sound level for each doubling of distance from the source (20*log(range)). Cylindrical spreading occurs in an environment in which sound propagation is bounded by the water surface and sea bottom, resulting in a reduction of 3 dB in sound level for each doubling of distance from the source (10*log(range)). As is common practice in coastal waters, here we assume practical spreading loss (4.5 dB reduction in sound level for each doubling of distance). Practical spreading is a compromise that is often used under conditions where water depth increases as the receiver moves away from the shoreline, resulting in an expected propagation environment that would lie between spherical and cylindrical spreading loss conditions.

Sound Source Levels

The intensity of pile driving sounds is greatly influenced by factors such as the type of piles, hammers, and the physical environment in which the activity takes place. There are source level measurements available for certain pile types and sizes from the similar environments recorded from underwater pile driving projects in Alaska (*e.g.*, JASCO Reports - Denes *et al.*, 2017 and Austin *et al.*, 2016). ) that were evaluated and used as proxy sound source levels to determine reasonable sound source levels likely result from DPD's pile driving and removal activities (Table 4). Many source levels used were more conservation as the values were from larger pile sizes.

**Table 4. Assumed Sound Source Levels.**

| Activity | Sound Source Level at 10 meters | Sound Source |
|---|---|---|
| **Vibratory Pile Driving/Removal** | | |
| 24-in steel pile permanent | 161.9 SPL | The 24-in-diameter source level for vibratory driving are proxy from median measured source levels from pile driving of 30-in-diameter piles to construct the Ketchikan Ferry Terminal (Denes *et al*. 2016, Table 72). |
| 30-in steel pile temporary installation | 161.9 SPL | |
| 30-in steel pile removal | 161.9 SPL | |
| 30-in steel pile permanent installation | 161.9 SPL | |
| 36-in steel pile permanent | 168.2 SPL | The 36-in And 42-in pile source level is a proxy from median measured source level from vibratory hammering of 48-in piles for the Port of Anchorage test pile project (Austin *et al*., 2016). |
| 42-in steel pile permanent | 168.2 SPL | |
| **Impact Pile Driving**[5,6] | | |
| 36-in steel pile permanent | 186.7 SEL/ 198.6 SPL | The 36-in and 42-in diameter pile source level is a proxy from median measured source level from impact hammering of 48-in piles for the Port of Anchorage test pile project (Austin *et al*., 2016). |
| 42-in steel pile permanent | 186.7 SEL/ 198.6 SPL | |
| **Socketed Pile Installation** | | |
| 24-in steel pile permanent | 166.2 SPL | The socketing and rock anchor source level is a proxy from median measured source level from down-hole drilling of 24-in-diameter piles to construct the Kodiak Ferry Terminal (Denes *et al*., 2016, Table 72). |
| 30-in steel pile temporary | 166.2 SPL | |
| **Rock Anchor Installation** | | |

| | | |
|---|---|---|
| 8-in anchor permanent (for 24-in piles) | 166.2 SPL | The socketing and rock anchor source level is a proxy from median measured source level from down-hole drilling of 24-in-diameter piles to construct the Kodiak Ferry Terminal (Denes *et al*., 2016, Table 72). |
| 33-in anchor permanent (for 36-in piles) | 166.2 SPL | |
| 33-in anchor permanent (for 42-in piles) | 166.2 SPL | |

*Notes:* Denes *et al*., 2016 - *Alaska Department of Transportation's Hydroacoustic Pile Driving Noise Study - Comprehensive Report* and Austin *et al*., 2016 - *Hydroacoustic Monitoring Report: Anchorage Port Modernization Project Test Pile Program. Version 3.0. Technical report by JASCO Applied Sciences for Kiewit Infrastructure West Co*.

Level A Harassment

When the NMFS Technical Guidance (2016) was published, in recognition of the fact that ensonified area/volume could be more technically challenging to predict because of the duration component in the new thresholds, we developed a User Spreadsheet that includes tools to help predict a simple isopleth that can be used in conjunction with marine mammal density or occurrence to help predict takes. We note that because of some of the assumptions included in the methods used for these tools, we anticipate that isopleths produced are typically going to be overestimates of some degree, which may result in some degree of overestimate of Level A harassment take. However, these tools offer the best way to predict appropriate isopleths when more sophisticated 3D modeling methods are not available, and NMFS continues to develop ways to quantitatively refine these tools, and will qualitatively address the output where appropriate. For stationary sources (such as from impact and vibratory pile driving), 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 (Tables 5 and 6), and the resulting isopleths are reported below (Table 7).

**Table 5. NMFS Technical Guidance (2018) User Spreadsheet Input to Calculate PTS Isopleths for Vibratory Pile Driving.**

| **USER SPREADSHEET INPUT – Vibratory Pile Driving/Anchoring and Socketing Spreadsheet Tab A.1 Vibratory Pile Driving Used.** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **24-in piles (permanent)** | **30-in piles (temporary** | **30-in piles (temporary** | **30-in piles (permanent)** | **36-in piles (permanent)** | **42-in piles** | **8-in** | **33-in** | **24-in and 30-in** |

| | | install) | removal) | | | (permanent) | anchoring | anchoring | socketing |
|---|---|---|---|---|---|---|---|---|---|
| Source Level (RMS SPL) | 161.9 | 161.9 | 161.9 | 161.9 | 168.2 | 168.2 | 166.2 | 166.2 | 166.2 |
| Weighting Factor Adjustment (kHz) | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| Number of piles within 24-hr period | 4 | 6 | 6 | 2 | 2 | 2 | 1 | 2 | 2 |
| Duration to drive a single pile (min) | 10 | 20 | 10 | 30 | 30 | 60 | 60 | 240 | 60 |
| Propagation (xLogR) | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Distance of source level measurement (meters)[+] | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |

**Table 6. NMFS Technical Guidance (2018) User Spreadsheet Input to Calculate PTS Isopleths for Impact Pile Driving.**

| USER SPREADSHEET INPUT – Impact Pile Driving<br>Spreadsheet Tab E.1 Impact Pile Driving Used. | | |
|---|---|---|
| | **36-in piles (permanent)** | **42-in piles (permanent)** |
| Source Level (Single Strike/shot SEL) | 186.7 | 186.7 |
| Weighting Factor Adjustment (kHz) | 2 | 2 |
| Number of strikes per pile | 100 | 135 |
| Number of piles per day | 4 | 2 |
| Propagation (xLogR) | 15 | 15 |
| Distance of source level measurement (meters)[+] | 10 | 10 |

**Table 7. NMFS Technical Guidance (2018) User Spreadsheet Outputs to Calculate Level A Harassment PTS Isopleths.**

| **USER SPREADSHEET OUTPUT** | | **PTS isopleths (meters)** | | | | |
|---|---|---|---|---|---|---|
| | | **Level A harassment** | | | | |
| **Activity** | **Sound Source Level at 10 m** | **Low-Frequency Cetaceans** | **Mid-Frequency Cetaceans** | **High-Frequency Cetaceans** | **Phocid** | **Otariid** |
| **Vibratory Pile Driving/Removal** | | | | | | |
| 24-in steel installation | 161.9 SPL[1] | 6.0 | 0.5 | 8.8 | 3.6 | 0.3 |
| 30-in steel temporary installation | 161.9 SPL[1] | 12.4 | 1.1 | 18.4 | 7.6 | 0.5 |
| 30-in steel removal | 161.9 SPL[1] | 7.8 | 0.7 | 11.6 | 4.8 | 0.3 |
| 30-in steel permanent installation | 161.9 SPL[1] | 7.8 | 0.7 | 11.6 | 4.8 | 0.3 |
| 36-in steel permanent installation | 168.2 SPL[2] | 20.6 | 1.8 | 30.5 | 12.5 | 0.9 |
| 42-in steel permanent installation | 168.2 SPL[2] | 32.7 | 2.9 | 48.4 | 19.9 | 1.4 |
| **Impact Pile Driving** | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 36-in steel permanent installation | 186.7 SEL/ 198.6 SPL[2] | 956.7 | 34.0 | 1,139.6 | 512.0 | 37.3 |
| 42-in steel permanent installation | 186.7 SEL/ 198.6 SPL[2] | 736.2 | 26.2 | 876.9 | 394.0 | 28.7 |
| **Socketed Pile Installation** | | | | | | |
| 24-in steel permanent installation | 166.2 SPL[3] | 24.1 | 2.1 | 35.6 | 14.6 | 1.0 |
| 30-in steel temporary installation | 166.2 SPL[3] | 24.1 | 2.1 | 35.6 | 14.6 | 1.0 |
| **Rock Anchor Installation** | | | | | | |
| 8-in anchor permanent installation (for 24-in piles | 166.2 SPL[3] | 15.2 | 1.3 | 22.4 | 9.2 | 0.6 |
| 33-in anchor permanent installation (for 36-in piles) | 166.2 SPL[3] | 60.7 | 5.4 | 89.7 | 36.9 | 2.6 |
| 33-in anchor permanent installation (for 42-in piles) | 166.2 SPL[3] | 60.7 | 5.4 | 89.7 | 36.9 | 2.6 |

[1] The 24-in and 30-in-diameter source levels for vibratory driving are proxy from median measured source levels from pile driving of 30-in-diameter piles to construct the Ketchikan Ferry Terminal (Denes *et al*. 2016, Table 72).
[2] The 36-in and 42-in-diameter pile source levels are proxy from median measured source levels from pile driving (vibratory and impact hammering) of 48-in piles for the Port of Anchorage test pile project (Austin *et al*. 2016, Tables 9 and 16). We calculated the distances to impact pile driving Level A harassment thresholds for 36-in piles assuming 100 strikes per pile and a maximum of 4 piles installed in 24 hours; for 42-in piles we assumed 135 strikes per pile and a maximum of 2 piles installed in 24 hours.
[3] The socketing and rock anchoring source level is proxy from median measured sources levels from down-hole drilling of 24-in-diameter piles to construct the Kodiak Ferry Terminal (Denes *et al*. 2016, Table 72).

Level B Harassment

Utilizing the practical spreading loss model, DPD determined underwater noise will fall below the behavioral effects threshold of 120 dB rms for marine mammals at the distances shown in Table 8 for vibratory pile driving/removal, socketing, and rock anchoring. With these radial distances, and due to the occurrence of landforms (See Figure 8, 12, 13 of IHA Application), the largest Level B Harassment Zone calculated for vibratory pile driving for 36-in and 42-in steel piles equaled 193 km$^2$ and socket and rock anchoring equaled 116 km$^2$. For calculating the Level B Harassment Zone for impact driving, the practical spreading loss model was used with a behavioral threshold of 160 dB rms. The maximum radial distance of the Level B Harassment Zone for impact piling equaled 3,744 meters. At this radial distance, the entire

Level B Harassment Zone for impact piling equaled 19 $km^2$. Table 8 below provides all Level B Harassment radial distances (m) and their corresponding areas ($km^2$) during DPD's proposed activities.

**Table 8. Radial Distances (meters) to Relevant Behavioral Isopleths and Associated Ensonified Areas (square kilometers) Using the Practice Spreading Model.**

| Activity | Received Level at 10 meters | Level B Harassment Zone (m)* | Level B Harassment Zone ($km^2$) |
|---|---|---|---|
| **Vibratory Pile Driving/Removal** | | | |
| 24-in steel installation | 161.9 SPL[3] | 6,215 (calculated 6,213) | 39 $km^2$ |
| 30-in steel temporary installation | 161.9 SPL[3] | 6,215 (calculated 6,213) | |
| 30-in steel removal | 161.9 SPL[3] | 6,215 (calculated 6,213) | |
| 30-in steel permanent installation | 161.9 SPL[3] | 6,215 (calculated 6,213) | |
| 36-in steel permanent installation | 168.2 SPL[4] | 16,345 (calculated 16,343) | 193 $km^2$ |
| 42-in steel permanent installation | 168.2 SPL[4] | 16,345 (calculated 16,343) | |
| **Impact Pile Driving**[5,6] | | | |
| 36-in steel permanent installation | 186.7 SEL/ 198.6 SPL[4] | 3,745 (calculated 3,744) | 19 $km^2$ |
| 42-in steel permanent installation | 186.7 SEL/ 198.6 SPL[4] | 3,745 (calculated 3,744) | |
| **Socketed Pile Installation** | | | |
| 24-in steel permanent installation | 166.2 SPL[7] | 12,025 (calculated 12,023) | 116 $km^2$ |
| 30-in steel temporary installation | 166.2 SPL[7] | 12,025 (calculated 12,023) | |
| **Rock Anchor Installation** | | | |
| 8-in anchor permanent installation (for 24-in piles | 166.2 SPL[7] | 12,025 (calculated 12,023) | 116 $km^2$ |
| 33-in anchor permanent installation (for 36-in piles) | 166.2 SPL[7] | 12,025 (calculated 12,023) | |
| 33-in anchor permanent installation (for 42-in piles) | 166.2 SPL[7] | 12,025 (calculated 12,023) | |

*Numbers rounded up to nearest 5 meters.

*Marine Mammal Occurrence and Take Calculation and Estimation*

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 pile driving, vibratory pile driving/removal and socketing/rock anchoring noises for each acoustic threshold were estimated using group size estimates and local observational data. As previously stated, take by Level B harassment as well as small numbers of take by Level A harassment will be will be considered for this action. Take by Level B and Level A harassment are calculated differently for some species based on monthly or daily sightings data and average group sizes within the action area using the best available data. Take by Level A harassment is being proposed for three species where the Level A harassment isopleths are very large during impact pile driving (harbor porpoise, harbor seal, and Steller sea lion), and is based on average group size multiplied by the number of days of impact pile driving. Distances to Level A harassment thresholds for other project activities (vibratory pile driving/removal, socketing, rock anchoring) are considerably smaller compared to impact pile driving, and mitigation is expected to avoid Level A harassment from these other activities.

Minke whales

There are no density estimates of minke whales available in the project area. These whales are usually sighted individually or in small groups of 2-3, but there are reports of loose aggregations of hundreds of animals (NMFS 2018). There was one sighting of a minke whale during the135 days of monitoring during the Huna Berth I construction project (June 2015 through January 2016) (BergerABAM 2016). To be conservative, we predict that three minke whales in a group could be sighted 3 times over the 6-month project period for a total of 9 minke whales that are proposed to be taken by Level B harassment.

Humpback whales

There are no density estimates of humpback whales available in the project area. Humpback whale presence in the action area is likely steady through the work period until November, when most humpbacks migrate back to Hawaii or Mexico. NMFS has received a few reports of humpback whales over-wintering in Southeast Alaska, but numbers of animals and exact locations are very hard to predict, and NMFS assumes the presence of much fewer humpbacks in the action area in November and later winter months. During the previous Huna Berth I project, humpback whales were observed on 84 of the 135 days of monitoring; most often in September and October (BergerABAM 2016). The best available information on the distribution of humpbacks in the project area was obtained from several sources including: Icy Strait observations from 2015 (BergerABAM 2016), Glacier Bay/Icy Strait NPS Survey data 2014-2018 (provided by NPS, March 2019), Whale Alert opportunistic reported sightings 2016-2018, and reported HB whale bubble-net feeding group to NPS, 2015-2018 (provided by NPS, March 2019).

The National Park Service Glacier Bay/Icy Strait survey is designed to observe humpback whales and has regular effort in June, July, and August. This is the primary data source used to estimate exposures of humpback whales in the action area during those months, except for when a maximum group size reported in Whale Alert data was greater, then the Whale Alert number was used (June and July maximum group size). The on-site marine mammal monitoring data from BergerABAM (2016) was used to estimate takes in September and October and Whale Alert data was the only data source available in November and could represent a minimum number of observations due to fewer opportunistic sightings recorded in that month.

In addition, a single group of bubble-net feeding humpbacks of 10 animals was added to the total estimated exposures for June and October, based on anecdotal data provided by NPS of bubble-net feeding groups of humpbacks in the action area in those months of construction.

To estimate the number of exposures, NMFS looked at the proportion of days of the month when the numbers of animals observed were within one standard deviation of that month's average daily sightings. That proportion was 0.7. The average number of sightings was estimated as exposures on those days. For the remaining 30 percent of work days, the maximum number of observations on any single day were estimated to be exposed on those days.
For example, in June, the average number of daily observations (1.31) was estimated to occur on 70 percent of the 17 work days, which resulted in 15.59 exposures. On the other 30 percent of the 17 work days, the maximum number of observations on any day (10) resulted in 51 estimated exposures. In addition, in June, NMFS estimates that one bubble-net feeding group of 10 individuals could be exposed, due to anecdotal evidence of this feeding activity occurring inside the proposed action area. NMFS estimates a total of 76.59 humpback whales could be exposed in June. Humpback whales could be in larger groups when large amounts of prey are available, but this is difficult to predict with any precision. Although we are not proposing to authorize takes by month, we are demonstrating how the total take was calculated. The total number of exposures per month was calculated to be 76.59 (June), 68.02 (July), 71.93 (August), 132.07 (September), 78.82 (October), and 6.20 (November). The total proposed whales to be taken by Level B harassment from June to November is 434 (433.63) humpback whales with 27 of those whales anticipated being from the Mexico DPS (0.0601 percentage of the total animals).
Gray whales

There are no density estimates of gray whales available in the project area. Gray whales travel alone or in small, unstable groups, although large aggregations may be seen in feeding and breeding grounds (NMFS 2018e). Observations in Glacier Bay and nearby waters recorded two gray whales documented over a 10-year period (Keller *et al.*, 2017). None were observed during Huna Berth I project monitoring (BergerABAM 2016). We conservatively estimate a small group to be 3 gray whales x 1 sighting over the 6-month work period for a total of three gray whale proposed to be taken by Level B harassment.

Killer whales

There are no density estimates of killer whales available in the project area. Killer whales occur commonly in the waters of the project area, and could include members of several designated stocks that may occur in the vicinity of the proposed project area. Whales are known to use the Icy Strait corridor to enter and exit inland waters and are observed in every month of the year, with certain pods being observed inside Port Frederick passing directly in front of Hoonah. Group size of resident killer whale pods in the Icy Strait area ranges from 42 to 79 and occur in every month of the year (Dahlheim pers. comm. to NMFS 2015). As determined during a line-transect survey by Dalheim *et al.* (2008), the greatest number of transient killer whale observed occurred in 1993 with 32 animals seen over two months for an average of 16 sightings per month. NMFS estimates that group size of 79 resident killer whales and 16 transient killer whales could occur each month during the 6-month project period for a total of 570 takes by Level B harassment.

Pacific white-sided dolphin

There are no density estimates of Pacific white-sided dolphins available in the project area. Pacific white-sided dolphins have been observed in Alaska waters in groups ranging from

20 to 164 animals, with the sighting of 164 animals occurring in Southeast Alaska near Dixon Entrance (Muto *et al*., 2018). There were no Pacific white-sided dolphins observed during the 135-day monitoring period during the Huna Berth I project. However, to be conservative NMFS estimates 164 Pacific white-sided dolphins may be seen once over the 6-month project period for a total of 164 takes by Level B harassment.

Dall's porpoise

Little information is available on the abundance of Dall's porpoise in the inland waters of Southeast Alaska. Dall's porpoise are most abundant in spring, observed with lower numbers in the summer, and lowest numbers in fall. Jefferson *et al*., 2019 presents the first abundance estimates for Dall's porpoise in these waters and found the abundance in summer (N = 2,680, CV = 19.6 percent), and lowest in fall (N = 1,637, CV = 23.3 percent). Dall's porpoise are common in Icy Strait and sporadic with very low densities in Port Frederick (Jefferson *et al*., 2019). Dahlheim *et al*. (2008) observed 346 Dall's porpoise in Southeast Alaska (inclusive of Icy Strait) during the summer (June/July) of 2007 for an average of 173 animals per month as part of a 17-year study period. During the previous Huna Berth I project, only two Dall's porpoise were observed, and were transiting within the waters of Port Frederick in the vicinity of Halibut Island. Therefore, NMFS' estimates 173 Dall's porpoise per month may be seen each month of the 6-month project period for a total of 1,038 takes by Level B harassment.

Harbor porpoise

Dahlheim *et al*. (2015) observed 332 resident harbor porpoises occur in the Icy Strait area, and harbor porpoise are known to use the Port Frederick area as part of their core range. During the Huna Berth I project monitoring, a total of 32 harbor porpoise were observed over 19 days during the 4-month project. The harbor porpoises were observed in small groups with the largest group size reported was four individuals and most group sizes consisting of three or fewer animals. NMFS conservatively estimates that 332 harbor porpoises could occur in the project area each month over the 6-month project period for a total of 1,932 takes by Level B harassment. Because the Level A harassment zone is significantly larger than the shutdown zone during impact pile driving, NMFS predicts that some take by Level A harassment may occur. Based on the previous monitoring results, we estimate that a group size of four harbor porpoises multiplied by 1 group per day over 8 days of impact pile driving would yield a total of 32 takes by Level A harassment.

Harbor Seal

There are no density estimates of harbor seals available in the project area. Keller *et al.* (2017) observed an average of 26 harbor seal sightings each month between June and August of 2014 in Glacier Bay and Icy Strait. During the monitoring of the Huna Berth I project, harbor seals typically occur in groups of one to four animals and a total of 63 seals were observed during 19 days of the 135-day monitoring period. NMFS conservatively estimate that 26 harbor seals could occur in the project area each month during the 6-month project period for a total of 156 takes by Level B harassment. Because the Level A harassment zone is significantly larger than the shutdown zone during impact pile driving, NMFS predicts that some take by Level A harassment may occur. Based on the previous monitoring results, we estimate that a group size of two harbor seals multiplied by 1 group per day over 8 days of impact pile driving would yield a total of 16 takes by Level A harassment.

Steller sea lion

There are no density estimates of Steller sea lions available in the project area. NMFS expects that Steller sea lion presence in the action area will vary due to prey resources and the spatial distribution of breeding versus non-breeding season. In April and May, Steller sea lions are likely feeding on herring spawn in the action area. Then, most Steller sea lions likely move to the rookeries along the outside coast (away from the action area) during breeding season, and would be in the action area in greater numbers in August and later months (J. Womble, NPS, pers. comm. to NMFS AK Regional Office, March 2019). However, Steller sea lions are also opportunistic predators and their presence can be hard to predict.

Steller sea lions typically occur in groups of 1-10 animals, but may congregate in larger groups near rookeries and haulouts. The previous Huna Berth I project observed a total of 180 Steller sea lion sightings over 135 days in 2015, amounting to an average of 1.3 sightings per day (BergerABAM 2016). During a test pile program performed at the project location by the Hoonah Cruise Ship Dock Company in May 2018, a total of 15 Steller sea lions were seen over the course of 7 hours in one day (SolsticeAK 2018).

We used the same process to calculate Steller sea lion take as explained above or humpback whales, except that 79 percent of the work days in each month are expected to expose the average number of animals, and 21 percent of the work days would expose the maximum number of animals. For example, in June, the average number of daily observations (1.6) was estimated to occur on 13.43 work days, which would result in 21.48 exposures. On the other 21 percent of the 17 work days, the maximum number of observations on any day (26) could result in 92.82 estimated exposures. NMFS estimates a total of 114.31 Steller sea lions could be exposed in June. Although we are not proposing to authorize takes by month, we are demonstrating how the total take was calculated. The total number of exposures per month was calculated to be 114.31 (June), 57.19 (July), 92.89 (August), 199.23 (September), 79.10 (October), and 16.57 (November). Therefore, the total proposed Steller sea lions that may be taken by Level B harassment from June to November is 559 Steller sea lions with 39 of those sea lions anticipated being from the Western DPS (0.0702 percentage of the total animals (L. Jemison draft unpublished Steller sea lion data, 2019). Because the Level A harassment zone is significantly larger than the shutdown zone during impact pile driving, NMFS predicts that some take by Level A harassment may occur. Based on the previous monitoring results, we estimate that a group size of two Steller sea lions multiplied by 1 group per day over 8 days of impact pile driving would yield a total of 16 takes by Level A harassment.

Table 9 below summarizes the proposed estimated take for all the species described above as a percentage of stock abundance.

**Table 9. Proposed Take Estimates as a Percentage of Stock Abundance.**

| Species | Stock ($N_{EST}$) | Level A Harassment | Level B Harassment | Percent of Stock |
|---|---|---|---|---|
| Minke Whale | N/A | 0 | 9 | N/A |
| Humpback Whale | Hawaii DPS (9,487) [a]<br>Mexico DPS (606) [a] | 0 | 406<br>27<br>(Total 433) | 4.3<br>4.5 |
| Gray Whale | Eastern North Pacific (26,960) | 0 | 3 | Less than 1 percent |
| Killer Whale | Alaska Resident (2,347)<br>Northern Resident (261)<br>West Coast Transient (243) | 0 | 469<br>52<br>49<br>(Total 570) | 19.9 [b]<br>19.9 [b]<br>20.2 [b] |
| Pacific White-Sided Dolphin | North Pacific (26,880) | 0 | 164 | Less than 1 percent |
| Dall's Porpoise | Alaska (83,400) [c] | 0 | 1,038 | 1.2 |
| Harbor Porpoise | NA | 32 | 1,932 | NA |
| Harbor Seal | Glacier Bay/Icy Strait (7,210) | 16 | 156 | 2.16 |
| Steller Sea Lion | Eastern U.S. (41,638)<br>Western U.S. (53,303) | 15<br>1<br>(Total 16) | 520<br>39<br>(Total 559) | 1.25<br>Less |

| | | | | |
|---|---|---|---|---|
| | | | | than 1 percent |

[a] Under the MMPA humpback whales are considered a single stock (Central North Pacific); however, we have divided them here to account for DPSs listed under the ESA. Using the stock assessment from Muto *et al*. 2018 for the Central North Pacific stock (10,103 whales) and calculations in Wade *et al*. 2016; 9,487 whales are expected to be from the Hawaii DPS and 606 from the Mexico DPS.

[b] Take estimates are weighted based on calculated percentages of population for each distinct stock, assuming animals present would follow same probability of presence in project area.

[c] Jefferson *et al*. 2019 presents the first abundance estimates for Dall's porpoise in the waters of Southeast Alaska with highest abundance recorded in spring (N=5,381, CV= 25.4%), lower numbers in summer (N=2,680, CV=19.6%), and lowest in fall (N=1,637, CV=23.3%). However, NMFS currently recognizes a single stock of Dall's porpoise in Alaskan waters and an estimate of 83,400 Dall's porpoises is used by NMFS for the entire stock (Muto *et al*., 2018).

**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.

The following mitigation measures are proposed in the IHA:

*Timing Restrictions*

All work will be conducted during daylight hours. If poor environmental conditions restrict visibility full visibility of the shutdown zone, pile installation would be delayed.

*Sound Attenuation*

To minimize noise during impact pile driving, pile caps (pile softening material) will be used. DPD will use high-density polyethylene (HDPE) or ultra-high-molecular-weight polyethylene (UHMW) softening material on all templates to eliminate steel on steel noise generation.

*Shutdown Zone for in-water Heavy Machinery Work*

For in-water heavy machinery work (using, *e.g.*, movement of the barge to the pile location; positioning of the pile on the substrate via a crane (*i.e.*, stabling the pile), removal of the pile from the water column/substrate via a crane (*i.e.*, deadpull); or placement of sound attenuation devices around the piles.) If a marine mammal comes within 10 m of such operations, operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions.

*Shutdown Zones*

For all pile driving/removal and drilling activities, DPD will establish a shutdown zone for a marine mammal species that is greater than its corresponding Level A harassment zone; except for a few circumstances during impact pile driving, over the course of 8 days, where the shutdown zone is smaller than the Level A harassment zone for high frequency cetaceans and phocids due to the practicability of shutdowns on the applicant and to the potential difficulty of observing these animals in the large Level A harassment zones. The calculated PTS isopleths were rounded up to a whole number to determine the actual shutdown zones that the applicant will operate under (Table 10). The purpose of a shutdown zone is generally to define an area within which shutdown of the activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area).

**Table 10. Pile Driving Shutdown Zones during Project Activities.**

| **Source** | **Shutdown Zones (radial distance in meters, area in km$^2$)** | | | | |
|---|---|---|---|---|---|
| | Low-Frequency Cetaceans | Mid-Frequency Cetaceans | High-Frequency Cetaceans | Phocids | Otariids |
| **In-Water Construction Activities** | | | | | |
| Barge movements, pile positioning, sound attenuation placement* | 10 m (0.00093 km$^2$) | 10 m (0.00093 km$^2$) | 10 m (0.00093 km$^2$) | 10 m (0.00093 km$^2$) | 10 m (0.00093 km$^2$) |
| **Vibratory Pile Driving/Removal** | | | | | |
| 24-in steel installation (18 piles; ~40 min per day on 4.5 days) | 25 m (0.005763 km$^2$) | 10 m (0.00093 km$^2$) | 25 m (0.005763 km$^2$) | 10 m (0.00093 km$^2$) | 10 m (0.00093 km$^2$) |
| 30-in steel temporary installation (62 piles; ~2 hours per day on 10.5 days) | 25 m (0.005763 km$^2$) | 10 m (0.00093 km$^2$) | 25 m (0.005763 km$^2$) | 10 m (0.00093 km$^2$) | 10 m (0.00093 km$^2$) |
| 30-in steel removal (62 piles; ~1 hour per day on 10.5 days) | 25 m (0.005763 km$^2$) | 10 m (0.00093 km$^2$) | 25 m (0.005763 km$^2$) | 10 m (0.00093 km$^2$) | 10 m (0.00093 km$^2$) |

| | | | | | |
|---|---|---|---|---|---|
| 30-in steel permanent installation (3 piles; ~1 hour per day on 1.5 days) | 25 m (0.005763 $km^2$) | 10 m (0.00093 $km^2$) | 25 m (0.005763 $km^2$) | 10 m (0.00093 $km^2$) | 10 m (0.00093 $km^2$) |
| 36-in steel permanent installation (16 piles; ~1 hour per day on 8 days) | 25 m (0.005763 $km^2$) | 10 m (0.00093 $km^2$) | 50 m (0.02307 $km^2$) | 25 m (0.005763 $km^2$) | 10 m (0.00093 $km^2$) |
| 42-in steel permanent installation (8 piles; ~2 hours per day on 4 days) | 50 m (0.02307 $km^2$) | 10 m (0.00093 $km^2$) | 50 m (0.02307 $km^2$) | 25 m (0.005763 $km^2$) | 10 m (0.00093 $km^2$) |
| **Impact Pile Driving** | | | | | |
| 36-in steel permanent installation (16 piles; ~10 minutes per day on 4 days) | 1,000 m (2.31 $km^2$) | 50 m (0.02307 $km^2$) | 100 m* (0.0875 $km^2$) | 50 m* (0.02307 $km^2$) | 50 m (0.02307 $km^2$) |
| 42-in steel permanent installation (8 piles; ~6 minutes per day on 4 days) | 750 m (1.44 $km^2$) | 50 m (0.02307 $km^2$) | 100 m* (0.0875 $km^2$) | 50 m* (0.02307 $km^2$) | 50 m (0.02307 $km^2$) |
| **Socketed Pile Installation** | | | | | |
| 24-in steel permanent installation (18 piles; ~2 hours per day on 9 days) | 25 m (0.005763 $km^2$) | 10 m (0.00093 $km^2$) | 50 m (0.02307 $km^2$) | 15 m (0.0021 $km^2$) | 10 m (0.00093 $km^2$) |
| 30-in steel temporary installation (up to 10 piles; ~2 hours per day on 5 days) | 25 m (0.005763 $km^2$) | 10 m (0.00093 $km^2$) | 50 m (0.02307 $km^2$) | 15 m (0.0021 $km^2$) | 10 m (0.00093 $km^2$) |
| **Rock Anchor Installation** | | | | | |
| 8-in anchor permanent installation (for 24-in piles, 2 anchors; ~1 hour per day on 2 days) | 25 m (0.005763 $km^2$) | 10 m (0.00093 $km^2$) | 25 m (0.005763 $km^2$) | 10 m (0.00093 $km^2$) | 10 m (0.00093 $km^2$) |
| 33-in anchor permanent installation (for 36- and 42-in piles, 24 anchors; ~8 hours per day on 12 days) | 100 m (0.0875 $km^2$) | 10 m (0.00093 $km^2$) | 100 m (0.0875 $km^2$) | 50 m (0.02307 $km^2$) | 10 m (0.00093 $km^2$) |

*Due to practicability of the applicant to shutdown and the difficulty of observing some species and low occurrence of some species in the project area, such as high frequency cetaceans or pinnipeds out to this distance, the shutdown zones were reduced and Level A harassment takes were requested.

*Non-authorized Take Prohibited*

If a species enters or approaches the Level B zone and that species is either not authorized for take or its authorized takes are met, pile driving and removal activities must shut down immediately using delay and shut-down procedures. Activities must not resume until the animal has been confirmed to have left the area or an observation time period of 15 minutes has elapsed for pinnipeds and small cetaceans and 30 minutes for large whales.

*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 impact hammer operating at full capacity. For impact pile driving, contractors will be required to provide an initial set of three strikes from the hammer at 40 percent energy, followed by a one-minute waiting period. Then two subsequent three strike sets would occur. Soft Start is not required during vibratory pile driving and removal activities.

Based on our evaluation of the applicant's proposed measures, as well as other measures considered by NMFS, NMFS has preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

**Proposed Monitoring and Reporting**

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

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

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

*DPD Briefings*

DPD is will conduct briefings between construction supervisors and crews, marine mammal monitoring team, and DPD staff prior to the start of all pile driving activities and when new personnel join the work, in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures. The crew will be requested to alert the PSO when a marine mammal is spotted in the action area.

*Protected Species Observer Check-in with Construction Crew*

Each day prior to commencing pile driving activities, the lead NMFS approved Protected Species Observer (PSO) will conduct a radio check with the construction foreman or superintendent to confirm the activities and zones to be monitored that day. The construction foreman and lead PSO will maintain radio communications throughout the day so that the PSOs may be alerted to any changes in the planned construction activities and zones to be monitored.

*Pre-Activity Monitoring*

Prior to the start of daily in-water construction activity, or whenever a break in pile driving of 30 min or longer occurs, PSOs will observe the shutdown and monitoring zones for a period of 30 min. The shutdown zone will be cleared when a marine mammal has not been observed within the zone for that 30-min period. If a marine mammal is observed within the shutdown zone, pile driving activities will not begin until the animal has left the shutdown zone or has not been observed for 15 min. If the Level B Harassment Monitoring Zone has been observed for 30 min and no marine mammals (for which take has not been authorized) are present within the zone, work can continue even if visibility becomes impaired within the Monitoring Zone. When a marine mammal permitted for Level B harassment take has been permitted is present in the Monitoring zone, piling activities may begin and Level B harassment take will be recorded.

*Monitoring Zones*

DPD will establish and observe monitoring zones for Level B harassment as presented in Table 8. The monitoring zones for this project are areas where SPLs are equal to or exceed 120 dB rms (for vibratory pile driving/removal and socketing/rock anchoring) and 160 dB rms (for impact pile driving). These zones provide utility for monitoring conducted for mitigation purposes (*i.e.*, shutdown zone monitoring) by establishing monitoring protocols for areas adjacent to the shutdown zones. Monitoring of the Level B harassment zones enables observers to be aware of and communicate the presence of marine mammals in the project area, but outside the shutdown zone, and thus prepare for potential shutdowns of activity.

*Visual Monitoring*

Monitoring would be conducted 30 minutes before, during, and 30 minutes after all pile driving/removal and socking/rock anchoring activities. In addition, PSO 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/removed or during socketing and rock anchoring. Pile driving/removal and socketing/anchoring activities include the time to install, remove, or socket/rock anchor 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.

Monitoring will be conducted by PSOs from on land and from a vessel. The number of PSOs will vary from three to four, depending on the type of pile driving, method of pile driving and size of pile, all of which determines the size of the harassment zones. Monitoring locations will be selected to provide an unobstructed view of all water within the shutdown zone and as much of the Level B harassment zone as possible for pile driving activities. Three PSOs will monitor during all impact pile driving activity at the lightering float project site. Three PSOs will monitor during all impact pile driving activities at the Berth II project site. Three PSOs will monitor during vibratory pile driving of 24-in and 30-in steel piles. Four PSOs will monitor during vibratory pile driving of 36-in and 42-in steel piles piles and during all socketing/rock anchoring activities.

Three PSOs will monitor during all pile driving activities at the lightering float project site, with locations as follows: PSO #1: stationed at or near the site of pile driving; PSO #2:

stationed on Long Island (southwest of Hoonah in Port Frederick Inlet) and positioned to be able to view west into Port Frederick Inlet and north towards the project area; and PSO #3: stationed on a vessel traveling a circuitous route through the Level B monitoring zone.

Three PSOs will monitor during all impact pile driving activities at the Berth II project site, with locations as follows: PSO #1: stationed at or near the site of pile driving; PSO #2: stationed on Halibut Island (northwest of the project site in Port Frederick Inlet) and positioned to be able to view east towards Icy Strait and southeast towards the project area; and PSO #3: stationed on a vessel traveling a circuitous route through the Level B monitoring zone.

Three PSOs will monitoring during vibratory pile driving of 24- and 30-in steel piles at the Berth II project site, with locations as follows PSO #1: stationed at or near the site of pile driving; PSO #2: stationed on Scraggy Island (northwest of the project site in Port Frederick Inlet) an positioned to be able to view south towards the project area; and PSO#3: stationed on a vessel traveling a circuitous route through the Level B monitoring zone.

Four PSOs will monitor during vibratory pile driving of 36-in and 42-in steel piles and during all socketing/rock anchoring activities with locations as follows: PSO #1: stationed at or near the site of pile driving; PSO #2: stationed on Hoonah Island (northwest of the project site in Port Frederick Inlet) and positioned to be able to view south towards the project site; PSO #3: stationed across Icy Strait north of the project site (on the mainland or the Porpoise Islands) and positioned to be able to view west into Icy Strait and southwest towards the project site; and PSO #4: stationed on a vessel traveling a circuitous route through the Level B monitoring zone.

In addition, PSOs will work in shifts lasting no longer than 4 hours with at least a 1-hour break between shifts, and will not perform duties as a PSO for more than 12 hours in a 24- hour period (to reduce PSO fatigue).

Monitoring of pile driving shall be conducted by qualified, NMFS-approved PSOs, who shall have no other assigned tasks during monitoring periods. DPD shall adhere to the following conditions when selecting PSOs:

- Independent PSOs shall be used (*i.e.*, not construction personnel);
- At least one PSO must have prior experience working as a marine mammal observer during construction activities;
- Other PSOs may substitute education (degree in biological science or related field) or training for experience;
- Where a team of three or more PSOs are required, a lead observer or monitoring coordinator shall be designated. The lead observer must have prior experience working as a marine mammal observer during construction;
- DPD shall submit PSO CVs for approval by NMFS for all observers prior to monitoring.

DPD shall ensure that the PSOs have the following additional 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;
- Experience and ability to conduct field observations and collect data according to assigned protocols;
- Experience or training in the field identification of marine mammals, including the identification of behaviors;
- Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations;

- Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates, times, and reason for implementation of mitigation (or why mitigation was not implemented when required); and marine mammal behavior;
- Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary; and
- Sufficient training, orientation, or experience with the construction operations to provide for personal safety during observations.

*Notification of intent to commence construction*

DPD shall inform NMFS OPR and the NMFS Alaska Region Protected Resources Division one week prior to commencing construction activities.

*Interim monthly reports*

During construction, DPD will submit brief, monthly reports to the NMFS Alaska Region Protected Resources Division that summarize PSO observations and recorded takes. Monthly reporting will allow NMFS to track the amount of take (including extrapolated takes), to allow reinitiation of consultation in a timely manner, if necessary. The monthly reports will be submitted by email to a NMFS representative. The reporting period for each monthly PSO report will be the entire calendar month, and reports will be submitted by close of business on the fifth day of the month following the end of the reporting period (*e.g.*, the monthly report covering September 1–30, 2019, would be submitted to the NMFS by close of business on October 5, 2019).

*Final report*

DPD shall submit a draft report to NMFS no later than 90 days following the end of construction activities or 60 days prior to the issuance of any subsequent IHA for the project. DPD shall provide a final report within 30 days following resolution of NMFS' comments on the draft report. Reports shall contain, at minimum, the following:

- Date and time that monitored activity begins and ends for each day conducted (monitoring period);
- Construction activities occurring during each daily observation period, including how many and what type of piles driven;
- Deviation from initial proposal in pile numbers, pile types, average driving times, etc.;
- Weather parameters in each monitoring period (*e.g.*, wind speed, percent cloud cover, visibility);
- Water conditions in each monitoring period (*e.g.*, sea state, tide state);
- For each marine mammal sighting:
  - Species, numbers, and, if possible, sex and age class of marine mammals;
  - Description of any observable marine mammal behavior patterns, including bearing and direction of travel and distance from pile driving activity;
  - Type of construction activity that was taking place at the time of sighting;
  - Location and distance from pile driving activities to marine mammals and distance from the marine mammals to the observation point;
  - If shutdown was implemented, behavioral reactions noted and if they occurred before or after shutdown.

- o Estimated amount of time that the animals remained in the Level A or B Harassment Zone.
- ▪ Description of implementation of mitigation measures within each monitoring period (*e.g.*, shutdown or delay);
- ▪ Other human activity in the area within each monitoring period
- ▪ A summary of the following:
- o Total number of individuals of each species detected within the Level B Harassment Zone, and estimated as taken if correction factor appropriate.
- o Total number of individuals of each species detected within the Level A Harassment Zone and the average amount of time that they remained in that zone.
- o Daily average number of individuals of each species (differentiated by month as appropriate) detected within the Level B Harassment Zone, and estimated as taken, if appropriate.

**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 that are larger than the Level A harassment zones will be implemented in the majority of construction days, which, in combination with the fact that the zones are so small to begin with, is expected avoid the likelihood of Level A harassment for six of the nine species. For the other three species (Steller sea lions, harbor seals, and harbor porpoises), a small amount of Level A harassment has been conservatively proposed because the Level A harassment zones are larger than the proposed shutdown zones. However, given the nature of the activities and sound source and the unlikelihood that animals would stay in the vicinity of the pile-driving for long, any PTS incurred would be expected to be of a low degree and unlikely to have any effects on individual fitness.

Exposures to elevated sound levels produced during pile driving activities may cause behavioral responses by an animal, but they are expected to be mild and temporary. Effects on individuals that are taken by Level B harassment, on the basis of reports in the literature as well as monitoring from other similar activities, will likely be limited to reactions such as increased swimming speeds, increased surfacing time, or decreased foraging (if such activity were occurring) (*e.g.*, Thorson and Reyff, 2006; Lerma, 2014). Most likely, individuals will simply move away from the sound source and be temporarily displaced from the areas of pile driving, although even this reaction has been observed primarily only in association with impact pile driving. These reactions and behavioral changes are expected to subside quickly when the exposures cease.

To minimize noise during pile driving, DPC will use pile caps (pile softening material). Much of the noise generated during pile installation comes from contact between the pile being driven and the steel template used to hold the pile in place. The contractor will use high-density polyethylene (HDPE) or ultra-high-molecular- weight polyethylene (UHMW) softening material on all templates to eliminate steel on steel noise generation.

During all impact driving, implementation of soft start procedures and monitoring of established shutdown zones will be required, significantly reducing the possibility of injury. Given sufficient notice through use of soft start (for impact driving), marine mammals are expected to move away from an irritating sound source prior to it becoming potentially injurious. In addition, PSOs will be stationed within the action area whenever pile driving/removal and socketing/rock anchoring activities are underway. Depending on the activity, DDP will employ the use of three to four PSOs to ensure all monitoring and shutdown zones are properly observed. Although the expansion of Berth facilities would have some permanent removal of habitat available to marine mammals, the area lost would be small, approximately equal to the area of the cruise ship berth and associated pile placements. These impacts have been minimized by use of a floating, pile-supported design rather than a design requiring dredging or fill. The proposed design would not impede migration of marine mammals through the proposed action area. The small lightering facility nearer to the cannery would likely not impact any marine mammal habitat since its proposed location is in between two existing, heavily-traveled docks, and within an active marine commercial and tourist area. There are no known pinniped haulouts or other biologically important areas for marine mammals near the action area.

In addition, impacts to marine mammal prey species are expected to be minor and temporary. Overall, the area impacted by the project is very small compared to the available habitat around Hoonah. The most likely impact to prey will be temporary behavioral avoidance of the immediate area. During pile driving/removal and socketing/rock anchoring activities, it is expected that fish and marine mammals would temporarily move to nearby locations and return to the area following cessation of in-water construction activities. Therefore, indirect effects on marine mammal prey during the construction are not expected to be substantial.

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;
- Minimal impacts to marine mammal habitat are expected;
- The action area is located and within an active marine commercial and tourist area;
- There are no rookeries, or other known areas or features of special significance for foraging or reproduction in the project area;
- Anticipated incidents of Level B harassment consist of, at worst, temporary modifications in behavior; and
- The required mitigation measures (*i.e.* shutdown zones and pile caps) are expected to be effective in reducing the effects of the specified activity.

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.

Six of the nine marine mammal stocks proposed for take is less than five percent of the stock abundance. For Alaska resident, northern resident and transient killer whales, the number of proposed instances of take as compared to the stock abundance are 19.9 percent, 19.9, and 20.2 percent, respectively. However, since three stocks of killer whales could occur in the action area, the 570 total killer whale takes are likely split among the three stocks. Nonetheless, since NMFS does not have a good way to predict exactly how take will be split, NMFS looked at the most conservative scenario, which is that all 570 takes could potentially be distributed to each of the three stocks. This is a highly unlikely scenario to occur and the percentages of each stock taken are predicted to be significantly lower than values presented in Table 9 for killer whales. Further, these percentages do not take into consideration that some number of these take instances are likely repeat takes incurred by the same individuals, thereby lowering the number of individuals.

There are no official stock abundances for harbor porpoise and minke whales; however, as discussed in greater detail in the "Description of Marine Mammals in the Area of Specified Activities," we believe for the abundance information that is available, the estimated takes are likely small percentages of the stock abundance. For harbor porpoise, the abundance for the Southeast Alaska stock is likely more represented by the aerial surveys that were conducted as these surveys had better coverage and were corrected for observer bias. Based on this data, the estimated take could potentially be approximately 17 percent of the stock abundance. However, this is unlikely and the percentage of the stock taken is likely lower as the proposed take estimates are conservative and the project occurs in a small footprint compared to the available habitat in Southeast Alaska. For minke whales, in the northern part of their range they are believed to be migratory and so few minke whales have been seen during three offshore Gulf of Alaska surveys that a population estimate could not be determined. With only nine proposed takes for this species, the percentage of take in relation to the stock abundance is likely to be very small.

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

**Unmitigable Adverse Impact Analysis and Determination**

In September 2018, DPD contacted the Indigenous People's Council for Marine Mammals (IPCoMM), the Alaska Sea Otter and Steller Sea Lion Commission, and the Hoonah

Indian Association (HIA) to determine potential project impacts on local subsistence activities. No comments were received from IPCoMM or the Alaska Sea Otter and Steller Sea Lion Commission. On October 23, 2018, a conference call between representatives from DPD, Turnagain Marine Construction, SolsticeAK, and the HIA were held to discuss tribal concerns regarding subsistence impacts. The tribe confirmed that Steller sea lions and harbor seals are harvested in and around the project area. The HIA referenced the 2012 subsistence technical paper by Wolf *et al*. (2013) as the most recent information available on marine mammal harvesting in Hoonah and agreed that the proposed construction activities are unlikely to have significant impacts to marine mammals as they are used in subsistence applications. Information on the timing of the IHA issuance was provided by DPD via email to the tribe on October 23, 2018. There have been no further comments on this project.

Therefore, we believe there are no relevant subsistence uses of the affected marine mammal stocks or species implicated by this action. 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.

**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 the Alaska Regional Office (AKRO) whenever we propose to authorize take for endangered or threatened species.

NMFS is proposing to authorize take of Mexico DPS humpback whales, which are listed and Western DPS Steller sea lions under the ESA. The Permit and Conservation Division has requested initiation of Section 7 consultation with the 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 DPD's for conducting for the proposed pile driving and removal activities for construction of the Hoonah Berth II cruise ship terminal and lightering float, Icy Strait, Hoonah Alaska for one year, beginning June 2019, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. A draft of the proposed IHA can be found at *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act*.

**Request for Public Comments**

We request comment on our analyses, the proposed authorization, and any other aspect of this Notice of Proposed IHA for the proposed pile driving and removal activities for construction of the Hoonah Berth II cruise ship terminal and lightering float. We also request comment on the potential for renewal of this proposed IHA as described in the paragraph below. Please include with your comments any supporting data or literature citations to help inform our final decision on the request for MMPA authorization.

On a case-by-case basis, NMFS may issue a one-year IHA renewal with an expedited public comment period (15 days) when (1) another year of identical or nearly identical activities as described in the Specified Activities section is planned or (2) the activities would not be completed by the time the IHA expires and a second IHA would allow for completion of the activities beyond that described in the Dates and Duration section, provided all of the following conditions are met:

- A request for renewal is received no later than 60 days prior to expiration of the current IHA.

- The request for renewal must include the following:

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

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

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

Dated: April 26, 2019.

Catherine G. Marzin,

Deputy Director,

Office of Protected Resources,

National Marine Fisheries Service.

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