U.S.C. 1852, a copy of the recording is available upon request. Requests for sign language interpretation or other auxiliary aids should be directed to Thomas A. Nies, Executive Director, at (978) 465–0492, at least 5 days prior to the meeting date.

**Authority:** 16 U.S.C. 1801 *et seq.*

Dated: March 7, 2018.

**Tracey L. Thompson,**

*Acting Deputy Director, Office of Sustainable Fisheries, National Marine Fisheries Service.*

[FR Doc. 2018–04862 Filed 3–9–18; 8:45 am]

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## DEPARTMENT OF COMMERCE

### National Oceanic and Atmospheric Administration

RIN 0648–XF870

### Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to the Service Pier Extension Project on Naval Base Kitsap Bangor, Washington

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

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

**SUMMARY:** NMFS has received a request from the U.S. Navy (Navy) for authorization to take marine mammals incidental to vibratory and impact pile driving associated with proposed construction of the Service Pier Extension (SPE) at Naval Base Kitsap Bangor, Washington. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an incidental harassment authorization (IHA) to incidentally take marine mammals during the specified activities. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorizations and agency responses will be summarized in the final notice of our decision.

**DATES:** Comments and information must be received no later than April 11, 2018.

**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.pauline@noaa.gov.*

*Instructions:* NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments received electronically, including all attachments, must not exceed a 25-megabyte file size. Attachments to electronic comments will be accepted in Microsoft Word or Excel or Adobe PDF file formats only. All comments received are a part of the public record and will generally be posted online at *www.nmfs.noaa.gov/pr/permits/incidental/construction.htm* without change. All personal identifying information (*e.g.,* name, address) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

**FOR FURTHER INFORMATION CONTACT:** Rob Pauline, Office of Protected Resources, NMFS, (301) 427–8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *www.nmfs.noaa.gov/pr/permits/incidental/construction.htm.* In case of problems accessing these documents, please call the contact listed above.

**SUPPLEMENTARY INFORMATION:**

### Background

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

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

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

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

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

### National Environmental Policy Act

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

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

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

### Summary of Request

On August 9, 2017 NMFS received a request from the Navy for an IHA to take marine mammals incidental to pile driving and removal associated with proposed construction of the SPE on Naval Base Kitsap Bangor, Washington. The application was deemed adequate and complete by NMFS on November 15, 2017.

The Navy's request is for take by Level B harassment of five marine mammal species and Level A harassment of one species. Neither the Navy nor NMFS expect serious injury or immortality to result from this activity and, therefore, an IHA is appropriate.

**Description of Proposed Activity**

*Overview*

The Navy is proposing to extend the service pier to provide additional berthing capacity and improve associated facilities for existing homeported and visiting submarines at Naval Base Kitsap Bangor. The project includes impact and vibratory pile driving and vibratory pile removal. Sounds resulting from pile driving and removal may result in the incidental take of marine mammals by Level A and Level B harassment in the form of auditory injury or behavioral harassment. Naval Base Kitsap Bangor is located on Hood Canal approximately 20 miles (32 kilometers) west of Seattle, Washington. The in-water construction period for the proposed action will occur over 12 months.

*Dates and Duration*

The proposed IHA would be effective from October 1, 2018, to September 30, 2019 and cover two in-water work windows. Timing restrictions would be complied with to avoid conducting activities when juvenile salmonids are most likely to be present (February–July). To protect Endangered Species Act (ESA)-listed salmonid species, pile driving will only be conducted during the designated in-water work window between July 16 and January 15. A total of 160 days of in-water work will be required during the effective dates of the proposed IHA. Approximately 125 days will be required for installation of steel piles and will use a combination of vibratory (preferred) and impact methods. An estimated 35 days will be required for impact installation of concrete piles. Vibratory pile installation and removal may require a maximum of 5 hours per day while up to 45 minutes of daily impact driving may be required.

*Specific Geographic Region*

Naval Base Kitsap Bangor is located north of the community of Silverdale in Kitsap County on the Hood Canal (Figure 1–1 in application). Hood Canal is a long, narrow, fjord-like basin of western Puget Sound. Throughout its 67 mi (108 km) length, the width of the canal varies from 1 to 2 mi (1.6 to 3.2 km) and exhibits strong depth/elevation gradients. The tides in Hood Canal are mixed semidiurnal, with one flood and one ebb tidal event with a small to moderate range (1 to 6 ft (0.3 to 1.8 m)) and a second flood and second ebb with a larger range (8 to 16 ft (2.4 to 4.9 m)) during a 24-hour and 50-minute tidal day (URS and SAIC, 1994; Morris *et al.,* 2008).

The proposed location for the SPE is just north of Carlson Spit and south of Keyport/Bangor (KB) Dock (Figure 1–2 in application). Two restricted areas are associated with Naval Base Kitsap Bangor, Naval Restricted Areas 1 and 2 (33 CFR 334.1220), which are depicted in Figure 1–2 in the application relative to the project area.

*Detailed Description of Specific Activity*

As part of the proposed action, the Navy proposes to extend the existing Service Pier and construct associated support facilities. This action is needed to accommodate the proposed relocation of two SEAWOLF Class submarines from Naval Base Kitsap Bremerton. The existing Bangor waterfront Service Pier will be extended, and associated support facilities will be constructed, including a Waterfront Support Building, Pier Services and Compressor Building, roadway and utility upgrades, a parking lot, and a laydown area. Construction of upland facilities will not result in harassment of marine mammals; therefore, these activities are not included in the Navy's IHA request and are not discussed further.

The proposed extension of the Service Pier will be approximately 68 by 520 ft (21 by 158 m) and will require installation of approximately 203 36-inch (90-centimeter (cm)) diameter steel piles and 50 24-inch (60 cm) diameter steel pipe support piles. Approximately 103 18-inch (45 cm) square concrete fender piles will also be installed. In addition, 27 36-inch (90 cm) diameter steel falsework piles will be temporarily installed and subsequently removed. The pier extension will extend to the southwest from the south end of the existing Service Pier and will parallel Carlson Spit in water depths of 30 to 50 ft (9 to 15 m) below mean lower low water (MLLW), such that the berthing areas for the new submarines will be in water depths of approximately 50 to 85 ft (15 to 26 m) below MLLW. A concrete float 150 ft (46 m) long and 15 ft (4.6 m) wide will be attached to the south side of the SPE. The existing Port Security Barrier (PSB) system will be reconfigured slightly to attach to the end of the new pier extension, with approximately 540 ft (165 m) removed. Removal and disposal of existing PSBs will be implemented as described for the Land-Water Interface project (Navy, 2016a). Construction is expected to require one barge with a crane, one supply barge, a tugboat, and work skiffs. Concurrent driving of separate piles will not occur.

Construction will be preceded by removal of an existing wave screen (including piles) and other existing piles from the Service Pier (Figure 1–4 in application). A total of 36 creosote timber piles (19 18-inch (45 cm) and 17 15-inch (38 cm) piles) will be removed by wrapping the piles with a cable or chain and pulling them or using vibratory extraction; piles will be cut at the mudline if splitting or breakage occurs and they are not able to be pulled. A new wave screen will be installed under the SPE (Figure 1–4). This screen will be approximately 200 ft (60 m) long and 27 ft (8 m) high (below 20 ft (6 m) MLLW to above 7 ft (2 m) MLLW), made of concrete or steel, and attached to steel support piles for the SPE.

Pile driving for steel piles will use a combination of vibratory and impact driving. Because impact driving of steel piles can produce underwater noise levels that have been known to be harmful to fish and wildlife, including marine mammals, vibratory driving will be the primary method utilized to drive steel piles except when geotechnical conditions require use of an impact hammer. An impact hammer will also be used to ''proof'' load-bearing piles driven by vibratory methods. Driving of the concrete piles will use impact methods only. For impact driving, there will be a maximum of 1,600 pile strikes per day. All types of in-water work will occur only during the in-water work period.

Falsework Piles. It is anticipated that 27 36-inch (90 cm) diameter steel piles will be temporarily installed. Falsework piles are used to temporarily support a construction component in place until construction is sufficiently advanced to where the new construction can support itself. All falsework piles will be installed using a vibratory pile driver only and will be extracted with a vibratory pile driver at the conclusion of construction.

Permanent Piles. As shown in Table 1 permanent piles installed include 203 36-inch (90 cm) diameter steel pipe, 50 24-inch (60 cm) diameter steel fender, and 103 18-inch (45 cm) diameter concrete piles. Driving of the steel support piles will use a combination of vibratory (primary) and impact methods and will require up to 125 days of pile driving. When impact driving steel pipe piles, a bubble curtain or other noise attenuation device would be employed for all pile strikes with the possible exception of short periods when the device is turned off to test the effectiveness of the noise attenuation device. Driving of the concrete piles will use impact methods only, and will require up to 35 days of pile driving and would occur for a maximum of 45 minutes a day. Vibratory pile driving activity in a day will last a maximum of 5 hours, and impact pile driving (if required) will last less than 45 minutes for a total of less than 5 hours and 45 minutes of pile driving activity in a day. All pile driving will be completed in a 12- month period crossing two in-water work periods.

TABLE 1—IN-WATER PILE DRIVING METHODS, PILE CHARACTERISTICS, AND DRIVING DURATIONS

| SPE project feature | Method | Pile size and type | Number | Maximum activity duration within 24-hour period | Maximum days |
|---|---|---|---|---|---|
| Pile Removal from Existing Wave Screen and Pier. | Vibratory | 15-inch (38 cm) to 18-inch (45 cm) creosote- treated timber. | 36 | 5 hours | 125 days. |
| Temporary Falsework | Vibratory installation and removal. | 36-inch (90 cm) steel | 27 | 5 hours. | |
| Small Craft Mooring and Dolphins. | Vibratory, with proofing | 24-inch (60 cm) steel | 50 | 5 hours vibratory and up to 45 minutes impact. | |
| Pier and Wave Screen Attachment. | Vibratory, with proofing | 36-inch (90 cm) steel | 203 | 5 hours vibratory and up to 45 minutes impact. | |
| Fender Piles | Impact | 18-inch (45 cm) concrete. | 103 | 0.75 hour | 35 days (following completion of timber removal and steel pile installation). |

Key: cm = centimeters; SPE = Service Pier Extension.

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 (SAR; *www.nmfs.noaa.gov/pr/sars/*) and more general information about these species (*e.g.,* physical and behavioral descriptions) may be found on NMFS's website (*www.nmfs.noaa.gov/pr/species/mammals/*).

Table 2 lists all species with expected potential for occurrence in Hood Canal and summarizes information related to the population or stock, including regulatory status under the MMPA and ESA and potential biological removal (PBR), where known. An expected potential was defined as species with any regular occurrence in Hood Canal since 1995. Note that while not observed on a consistent basis, west coast transient killer whales have been recorded intermittently in Hood Canal with the most recent sightings occurring in 2016 as described below. They have also been recorded remaining in the area for extended periods. As such, they have been listed as one of the species for which authorized take has been requested. For taxonomy, we follow Committee on Taxonomy (2017). 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. All managed stocks in this region are assessed in NMFS's U.S. Pacific Marine Mammal SARs (Carretta *et al.,* 2016) or Alaska Marine Mammal SARs (Muto *et al.,* 2016). All values presented in Table 2 are the most recent available at the time of publication and are available in the 2016 SARs (Carretta *et al.,* 2016, Muto *et al.,* 2016) (available online at: *http://www.nmfs.noaa.gov/pr/sars/species.htm*).

TABLE 2—SPECIES PROPOSED FOR AUTHORIZED TAKE

| Species | 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 Odontoceti (toothed whales, dolphins, and porpoises)** | | | | | | |
| Family Delphinidae: | | | | | | |
| Killer whale | *Orcinus orca* | West coast transient | -; N | 243 (n/a; 243, 2009) [4] | 2.4 | 0 |
| Family Phocoenidae (porpoises): | | | | | | |
| Harbor porpoise | *Phocoena phocoena vomerina* | Washington inland waters | -; N | 11,233 (0.37; 8,308; 2015) | 66 | ≥7.2 |

TABLE 2—SPECIES PROPOSED FOR AUTHORIZED TAKE—Continued

| Species | 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 Carnivora—Superfamily Pinnipedia** | | | | | | |
| Family Otariidae (eared seals and sea lions): | | | | | | |
| California sea lion | *Zalophus californianus* | U.S. | -; N | 296,750 (n/a; 153,337; 2011) | 9,200 | 389 |
| Steller sea lion | *Eumetopias jubatus monteriensis* | Eastern U.S. | -; N | 41,638 (n/a; 41,638; 2015) | 2,498 | 108 |
| Family Phocidae (earless seals): | | | | | | |
| Harbor seal | *Phoca vitulina richardii* | Hood Canal | -; N | 1,088 (0.15; unk; 1999) [4] | unk | 0.2 |

[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.

[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.

[4] Abundance estimates for these stocks are greater than eight years old and are therefore not considered current. PBR is considered undetermined for these stocks, as there is no current minimum abundance estimate for use in calculation. We nevertheless present the most recent abundance estimates, as these represent the best available information for use in this document.

The following species have been sighted in Hood Canal but are not likely to be found in the activity area and therefore are not analyzed for noise exposure. Humpback whales (*Megaptera novaeangliae*) have been detected year-round in small numbers in Puget Sound; in Hood Canal, after an absence of sightings for over 15 years, an individual was seen over a 1-week period in early 2012, with additional sightings in 2015 and 2016 (Orca Network, 2016). Because these sightings are exceptions to the normal occurrence of the species in Washington inland waters, the species is not included in the analysis in this application. Gray whales (*Eschrichtius robustus*) have been infrequently documented in Hood Canal waters over the past decade. These sightings are an exception to the normal seasonal occurrence of gray whales in Puget Sound feeding areas. Because gray whales are unlikely to be present in Hood Canal, the species is not included in this analysis. The Southern Resident killer whale stock is resident to the inland waters of Washington State and British Columbia; however, it has not been seen in Hood Canal in over 20 years and was therefore excluded from further analysis. Dall's porpoise (*Phocoenoides dalli*) has only been documented once in Hood Canal and is not included in the analysis.

*Killer Whale, West Coast Transient Stock*

Among the genetically distinct assemblages of killer whales in the northeastern Pacific, the West Coast Transient stock, which occurs from California to southeastern Alaska, is one of two stocks that may occur in Puget Sound. The other is the Southern Resident killer whale population, which has not been detected in Hood Canal since 1995.

The geographical range of the West Coast Transient stock of killer whales includes waters from California through southeastern Alaska with a preference for coastal waters of southern Alaska and British Columbia (Krahn *et al.,* 2002). Transient killer whales in the Pacific Northwest spend most of their time along the outer coast of British Columbia and Washington, but visit inland waters in search of harbor seals, sea lions, and other prey. Some studies have shown seasonal trends: Morton (1990) found bimodal peaks in occurrence during the spring (March) and fall (September to November) on the central coast of British Columbia, and Baird and Dill (1995) noted variability in occurrence and behavior seasonally and between pods with an increase in sightings near harbor seal haulouts off southern Vancouver Island during August and September—the peak period for weaning through post-weaning of harbor seal pups. More recently (2004–2010), another bimodal trend was detected with transient killer whales occurring most frequently in Washington inland waters in April–May and August–September (Houghton *et al.,* 2015). However, transient killer whales may occur in inland waters in any month (Orca Network, 2015), with their habitat use from one day to the next being highly unpredictable. These changes in use are likely related to their stealthy predation behaviors and reduce the chances of detection by their various prey species within the inland waters.

There are few data to describe the transient killer whale habitat use within Hood Canal. Killer whales were historically documented in Hood Canal by sound recordings in 1958 (Ford, 1991), a photograph from 1973, sound recordings in 1995 (Unger, 1997), and also anecdotal accounts of historical use. More recently, there have been sightings data ranging from intermittent observations of one or two animals, to the lengthy stays that were recorded in 2003 of 11 transients that remained for nearly 2 months (59 days), and in 2005 of a group of six that were sighted over a nearly 4-month period. In 2005, transients were documented in the region for a total of 172 days between January and July (London, 2006). There is about a 10-year data gap for Hood Canal transient killer whale use with the sightings reported to the Orca Network in March 2016, when there were sightings over 2 days. Following this, there was a report from 1 day in April 2016 and 8 days in May 2016, with whales in Dabob Bay at least one of the days (Orca Network, 2016). As the sightings in early 2016 were discontinuous, it is likely that the whales were using Hood Canal as part of a larger area moving in and out of Hood Canal. It is not known how large an area these animals were using; it is also unknown if these sightings were all of the same group of transient killer whales, or if animals were using the same areas. However, the temporally discontinuous data suggest a high degree of variability in the habitat use and localized relative abundances of transient killer whales in Hood Canal. It is also likely that longer periods of more continuous sightings are anomalous, and that the usual use of Hood Canal reflects the typical transient killer whale behavior of short-term occupancy for foraging in a small localized area, then dispersing to other parts of their range.

West Coast Transient killer whales most often travel in small pods of up to four individuals (Baird and Dill, 1996). From 2004–2010 in the Salish Sea, the most frequently observed group size was four whales (Houghton *et al.,* 2015). The most commonly observed group size in Puget Sound through South Puget Sound and north to Skagit Bay from 2004 to 2010 was six whales (mode = 6, mean = 6.88) (Navy, 2017).

*Harbor Porpoise*

NMFS conservatively recognizes two stocks in Washington waters: The Oregon/Washington Coast stock and the Washington Inland Waters stock (Carretta *et al.,* 2013). Individuals from the Washington Inland Waters stock are expected to occur in Puget Sound.

In Washington Inland waters, harbor porpoise are known to occur in the Strait of Juan de Fuca and the San Juan Island area year-round (Calambokidis and Baird, 1994; Osmek *et al.,* 1996; Carretta *et al.,* 2012). Harbor porpoises were historically one of the most commonly observed marine mammals in Puget Sound (Scheffer and Slipp, 1948); however, there was a significant decline in sightings beginning in the 1940s (Everitt *et al.,* 1979; Calambokidis *et al.,* 1992). Only a few sightings were reported between the 1970s and 1980s (Calambokidis *et al.,* 1992; Osmek *et al.,* 1996; Suryan and Harvey, 1998), and no harbor porpoise sightings were recorded during multiple ship and aerial surveys conducted in Puget Sound (including Hood Canal) in 1991 and 1994 (Calambokidis *et al.,* 1992; Osmek *et al.,* 1996). Incidental sightings of marine mammals during aerial bird surveys conducted as part of the Puget Sound Ambient Monitoring Program (PSAMP) detected few harbor porpoises in Puget Sound between 1992 and 1999 (Nysewander *et al.,* 2005). However, these sightings may have been negatively biased due to the low elevation of the plane, which may have caused an avoidance behavior. Since 1999, PSAMP data, stranding data, and aerial surveys conducted from 2013 to 2015 documented increasing numbers of harbor porpoise in Puget Sound (Nysewander, 2005; WDFW, 2008; Jeffries, 2013; Jefferson *et al.,* 2016).

Sightings in Hood Canal north of the Hood Canal Bridge have increased in recent years (Navy 2017). During line transect vessel surveys conducted in the Hood Canal in 2011 for the TPP near Naval Base Kitsap Bangor and Dabob Bay (HDR Inc., 2012), an average of six harbor porpoises were sighted per day in the deeper waters. Group sizes ranged from 1 to 10 individuals (HDR Inc., 2012). Aerial surveys conducted throughout 2013 to 2015 in Puget Sound indicated density in Puget Sound was 0.91 individuals/square kilometers ($km^2$)) (95% CI = 0.72–1.10, all seasons pooled) and density in Hood Canal was 0.47/$km^2$ (95% CI = 0.29–0.75, all seasons pooled) (Jefferson *et al.,* 2016). Mean group size of harbor porpoises in Puget Sound in the 2013–2015 surveys was 1.7 in Hood Canal.

*Steller Sea Lion*

In the North Pacific, NMFS has designated two Steller sea lion stocks: (1) The western U.S. stock consisting of populations at and west of Cape Suckling, Alaska (144 degrees West longitude); and (2) the Eastern U.S. stock, consisting of populations east of Cape Suckling, Alaska. The western U.S. stock is listed as depleted under the MMPA and endangered under the ESA. Although there is evidence of mixing between the two stocks (Jemison *et al.,* 2013), animals from the western U.S. stock are not present in Puget Sound. Individuals that occur in Puget Sound are of the Eastern Distinct Population Segment (Allen and Angliss, 2013). The Eastern Distinct Population Segment (stock) was removed from listing under the ESA in 2013 because it was stable or increasing throughout the northern portion of its range (Southeast Alaska and British Columbia) and stable or increasing slowly in the central portion of its range (Oregon through northern California) (78 FR 66140; NMFS, 2012a).

The eastern stock of Steller sea lions is found along the coasts of southeast Alaska to northern California where they occur at rookeries and numerous haulout locations along the coastline (Jeffries *et al.,* 2000; Scordino, 2006). Along the northern Washington coast, up to 25 pups are born annually (Jeffries, 2013). Male Steller sea lions often disperse widely outside of the breeding season from breeding rookeries in northern California (St. George Reef) and southern Oregon (Rogue Reef) (Scordino, 2006; Wright *et al.,* 2010). Based on mark recapture sighting studies, males migrate back into these Oregon and California locations from winter feeding areas in Washington, British Columbia, and Alaska (Scordino, 2006).

In Washington, Steller sea lions use haulout sites primarily along the outer coast from the Columbia River to Cape Flattery, as well as along the Vancouver Island side of the Strait of Juan de Fuca (Jeffries *et al.,* 2000). A major winter haulout is located in the Strait of Juan de Fuca at Race Rocks, British Columbia, Canada (Canadian side of the Strait of Juan de Fuca) (Edgell and Demarchi, 2012). Numbers vary seasonally in Washington, with peak numbers present during the fall and winter months and a decline in the summer months that corresponds to the breeding season at coastal rookeries (approximately late May to early June) (Jeffries *et al.,* 2000). In Puget Sound, Jeffries (Navy 2017) identified five winter haulout sites used by adult and subadult (immature or pre-breeding animals) Steller sea lions, ranging from immediately south of Port Townsend (near Admiralty Inlet) to Olympia in southern Puget Sound (Figure 4–1). Numbers of animals observed at these sites ranged from a few to less than 100 (Navy 2017). In addition, Steller sea lions (one to two animals have been observed) opportunistically haul out on various navigational buoys in Admiralty Inlet south through southern Puget Sound near Olympia (Navy 2017).

Surveys at Naval Base Kitsap Bangor indicate Steller sea lions begin arriving in September and depart by the end of May (Navy, 2016b)

*California Sea Lion*

NMFS has defined one stock for California sea lions (U.S. Stock), with five genetically distinct geographic populations: (1) Pacific Temperate, (2) Pacific Subtropical, (3) Southern Gulf of California, (4) Central Gulf of California, and (5) Northern Gulf of California. The Pacific Temperate population includes rookeries within U.S. waters and the Coronados Islands just south of the U.S./Mexico border. Animals from the Pacific Temperate population range north into Canadian waters, and movement of animals between U.S. waters and Baja California waters has been documented (Carretta *et al.,* 2013).

During the summer, California sea lions breed on islands from the Gulf of California to the Channel Islands and seldom travel more than about 31 mi (50 km) from the islands. The primary rookeries are located on the California Channel Islands of San Miguel, San Nicolas, Santa Barbara, and San Clemente. Their distribution shifts to the northwest in fall and to the southeast during winter and spring, probably in response to changes in prey availability. In the nonbreeding season, adult and subadult males migrate northward along the coast to central and northern California, Oregon, Washington, and Vancouver Island, and return south in the spring. They are occasionally sighted hundreds of miles offshore. Primarily male California sea lions migrate into northwest waters with most adult females with pups remaining in waters near their breeding rookeries off the coasts of California and Mexico. Females and juveniles tend to stay closer to the rookeries. California sea lions also enter bays, harbors, and river mouths and often haul out on man-made structures such as piers, jetties, offshore buoys, and oil platforms.

Jeffries *et al.* (2000) and Jeffries (Navy 2017) identified dedicated, regular haulouts used by adult and subadult California sea lions in Washington inland waters (Figure 4–1). Main haulouts occur at Naval Base Kitsap Bangor, Naval Base Kitsap Bremerton, and Naval Station (NAVSTA) Everett, as well as in Rich Passage near Manchester, Seattle (Shilshole Bay), south Puget Sound (Commencement Bay, Budd Inlet), and numerous navigation buoys south of Whidbey Island to Olympia in south Puget Sound (Jeffries *et al.,* 2000) (Figure 4–1). Race Rocks, British Columbia, Canada (Canadian side of the Strait of Juan de Fuca) has been identified as a major winter haulout for California sea lions (Edgell and Demarchi, 2012).

California sea lions are typically present most of the year except for mid-June through July in Washington inland waters, with peak abundance numbers between October and May (NMFS, 1997; Jeffries *et al.,* 2000). California sea lions would be expected to forage within the area, following local prey availability. During summer months and associated breeding periods, the inland waters would not be considered a high-use area by California sea lions, as they would be returning to rookeries in California waters. However, California sea lions have been documented during shore-based surveys at Naval Base Kitsap Bangor in Hood Canal since 2008 in all survey months, with as many as 122 individuals observed at one time (November 2013) hauled out on submarines at Delta Pier and on PSB floats (Navy, 2016b, Appendix A). Relatively few individuals (< nine sighted per survey) were present during these surveys from June through August.

*Harbor Seal*

Three harbor seal stocks occur in Washington's inland waters:

- Hood Canal;
- Northern Inland Waters; and
- Southern Puget Sound stocks.

Based on radiotelemetry results, interchange between inland and coastal stocks is unlikely (Jeffries *et al.,* 2003).

Harbor seals are a coastal species, rarely found more than 12 mi (19 km) from shore, and frequently occupy bays, estuaries, and inlets (Baird, 2001). Individual seals have been observed several miles upstream in coastal rivers (Baird, 2001). Ideal harbor seal habitat includes haulout sites, shelter during the breeding periods, and sufficient food (Bjørge, 2002). Haulout areas can include intertidal and subtidal rock outcrops, sandbars, sandy beaches, peat banks in salt marshes, and man-made structures such as log booms, docks, and recreational floats (Wilson, 1978; Prescott, 1982; Schneider and Payne, 1983, Gilbert and Guldager, 1998; Jeffries *et al.,* 2000; Lambourn *et al.,* 2010). Harbor seals do not make extensive pelagic migrations, though some long distance movement of tagged animals in Alaska (108 mi (174 km)) and along the U.S. west coast (up to 342 mi (550 km)) have been recorded (Brown and Mate, 1983; Womble and Gende, 2013). Harbor seals have also displayed strong fidelity to haulout sites.

Harbor seals are the most common, widely distributed marine mammal found in Washington marine waters and are frequently observed in the nearshore marine environment. They occur year-round and breed in Washington. Numerous harbor seal haulouts occur in Washington inland waters. Numbers of individuals at haulouts range from a few to between 100 and 500 individuals (Jeffries *et al.,* 2000).

Harbor seals are expected to occur year-round at Naval Base Kitsap Bangor. In Hood Canal, where Naval Base Kitsap Bangor is located, known haulouts occur on the west side of Hood Canal at the mouth of the Dosewallips River and on the western and northern shorelines in Dabob Bay, located approximately 8.1 miles away from the Navy's installation (Figure 4–1). Vessel-based surveys conducted from 2007 to 2010 at Naval Base Kitsap Bangor observed harbor seals in every month of surveys (Agness and Tannenbaum, 2009; Tannenbaum *et al.,* 2009, 2011). Harbor seals were routinely seen during marine mammal monitoring for two construction projects, the Test Pile Project and EHW–2 construction projects (HDR Inc., 2012; Hart Crowser, 2013, 2014, 2015). Small numbers of harbor seals have been documented hauling out on the PSB floats, wavescreen at Carderock Pier, buoys, barges, marine vessels, and logs (Agness and Tannenbaum, 2009; Tannenbaum *et al.,* 2009, 2011; Navy, 2016b) and on man-made floating structures near KB Dock and Delta Pier. Incidental surveys by a Navy biologist in August and September 2016 recorded as many as 28 harbor seals hauled out under Marginal Wharf or swimming in adjacent waters. On two occasions, four to six individuals were observed hauled out near Delta Pier. The repeated sightings of harbor seals in this area suggest a high degree of tolerance by these individuals for the anthropogenic activity associated with Naval Base Kitsap Bangor. It is also likely that these are sightings of the same individuals, rather than different animals being observed at the same locations.

Past IHA applications for Naval Base Kitsap Bangor indicated a few observations of harbor seal births or neonates. In 2014, the Navy's knowledge of harbor seal births increased due to increased pinniped surveys on the waterfront and increased contact with waterfront personnel who have had lengthy careers at Bangor (Navy, 2016b). Known harbor seal births include one on the Carderock wave screen in August 2011; at least one on a small 10 x 10 ft (3 x 3 m) floating dock at EHW–2 in fall 2013, as reported by EHW–2 construction crew; and afterbirth on a float at Magnetic Silencing Facility with an unknown date. In addition, Navy biologists learned that harbor seal pupping has occurred on a section of the Service Pier since approximately 2001, according to the Port Operations vessel crews. Harbor seal mother and pup sets were observed in 2014 hauled out on the Carderock wavescreen and swimming in nearby waters, and swimming in the vicinity of Delta Pier (Navy, 2016b).

*Marine Mammal Hearing*

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g.,* Richardson *et al.,* 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.,* low-frequency cetaceans). Subsequently, NMFS (2016) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 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. The functional groups and the associated frequencies are indicated below (note that these frequency ranges correspond to the range for the composite group, with the entire range not necessarily reflecting the capabilities of every species within that group):

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

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

For more detail concerning these groups and associated frequency ranges, please see NMFS (2016) for a review of available information. Five marine mammal species (two cetacean and three pinniped (two otariid and 1 phocid) species) have the reasonable potential to co-occur with the proposed survey activities. Of the cetacean species that may be present, killer whales are classified as mid-frequency cetaceans and harbor porpoises are classified as high-frequency cetaceans.

**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.

*Description of Sound Sources*

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

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

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

Even in the absence of sound from the specified activity, the underwater environment is typically loud due to ambient sound. Ambient sound is defined as environmental background sound levels lacking a single source or point (Richardson *et al.,*1995), and the sound level of a region is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.,* waves, earthquakes, ice, atmospheric sound), biological (*e.g.,* sounds produced by marine mammals, fish, and invertebrates), and anthropogenic sound (*e.g.,* vessels, dredging, aircraft, construction). A number of sources contribute to ambient sound, including the following (Richardson *et al.,* 1995):

- Wind and waves: The complex interactions between wind and water surface, including processes such as breaking waves and wave-induced bubble oscillations and cavitation, are a main source of naturally occurring ambient noise for frequencies between 200 Hz and 50 kHz (Mitson, 1995). In general, ambient sound levels tend to increase with increasing wind speed and wave height. Surf noise becomes important near shore, with measurements collected at a distance of 8.5 km from shore showing an increase of 10 dB in the 100 to 700 Hz band during heavy surf conditions;
- Precipitation: Sound from rain and hail impacting the water surface can become an important component of total noise at frequencies above 500 Hz, and possibly down to 100 Hz during quiet times;
- Biological: Marine mammals can contribute significantly to ambient noise levels, as can some fish and shrimp. The frequency band for biological

contributions is from approximately 12 Hz to over 100 kHz; and

- Anthropogenic: Sources of ambient noise related to human activity include transportation (surface vessels and aircraft), dredging and construction, oil and gas drilling and production, seismic surveys, sonar, explosions, and ocean acoustic studies. Shipping noise typically dominates the total ambient noise for frequencies between 20 and 300 Hz. In general, the frequencies of anthropogenic sounds are below 1 kHz and, if higher frequency sound levels are created, they attenuate rapidly (Richardson *et al.,* 1995). Sound from identifiable anthropogenic sources other than the activity of interest (*e.g.,* a passing vessel) is sometimes termed background sound, as opposed to ambient sound.

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

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

Pulsed sound sources (*e.g.,* explosions, gunshots, sonic booms, impact pile driving) produce signals that are brief (typically considered to be less than one second), broadband, atonal transients (ANSI, 1986; Harris, 1998; 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 non-continuous (ANSI, 1995; NIOSH, 1998). Some of these non-pulsed sounds can be transient signals of short duration but without the essential properties of pulses (*e.g.,* rapid rise time). Examples of non-pulsed sounds include those produced by vessels, aircraft, machinery operations such as drilling, vibratory pile driving, and active sonar systems (such as those used by the U.S. Navy). The duration of such sounds, as received at a distance, can be greatly extended in a highly reverberant environment.

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

*Acoustic Impacts*

Please refer to the information given previously (*Description of Sound Sources*) regarding sound, characteristics of sound types, and metrics used in this document. 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). 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. In this section, we first describe specific manifestations of acoustic effects before providing discussion specific to the proposed construction activities in the next section.

*Permanent 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 (Kastak *et al.,* 1999; Schlundt *et al.,* 2000; Finneran *et al.,* 2002, 2005). TS can be permanent (PTS), in which case the loss of hearing sensitivity is not fully recoverable, or temporary (TTS), in which case the animal's hearing threshold would recover over time (Southall *et al.,* 2007). Repeated sound exposure that leads to TTS could cause PTS. In severe cases of PTS, there can be total or partial deafness, while in most cases the animal has an impaired ability to hear sounds in specific frequency ranges (Kryter 1985).

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

Relationships between TTS and PTS thresholds have not been studied in marine mammals—PTS data exists only for a single harbor seal (Kastak *et al.,* 2008)—but are assumed to be similar to those in humans and other terrestrial mammals. PTS typically occurs at exposure levels at least several dB above (a 40–dB threshold shift approximates PTS onset; *e.g.,* Kryter *et al.,* 1966; Miller 1974) 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 six 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).

*Temporary Threshold Shift*—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.

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 (*Mirounga angustirostris*), harbor seal, and California sea lion exposed to a limited number of sound sources (*i.e.,* mostly tones and octave-band noise) in laboratory settings (*e.g.,* Finneran *et al.,* 2002; Nachtigall *et al.,* 2004; Kastak *et al.,* 2005; Lucke *et al.,* 2009; Popov *et al.,* 2011). In general, harbor seals (Kastak *et al.,* 2005; Kastelein *et al.,* 2012a) and harbor porpoises (Lucke *et al.,* 2009; Kastelein *et al.,* 2012b) have a lower TTS onset than other measured pinniped or cetacean species. Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species. There are no data available on noise-induced hearing loss for mysticetes. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Southall *et al.* (2007), Finneran and Jenkins (2012), and Finneran (2015).

*Behavioral Effects*—Behavioral disturbance may include a variety of effects, including subtle changes in behavior (*e.g.,* minor or brief avoidance of an area or changes in vocalizations), more conspicuous changes in similar behavioral activities, and more sustained and/or potentially severe reactions, such as displacement from or abandonment of high-quality habitat. Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (*e.g.,* species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g.,* Richardson *et al.,* 1995; Wartzok *et al.,* 2003; Southall *et al.,* 2007; Weilgart, 2007; Archer *et al.,* 2010). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison *et al.,* 2012), and can vary depending on characteristics associated with the sound source (*e.g.,* whether it is moving or stationary, number of sources, distance from the source). Please see Appendices B–C of Southall *et al.* (2007) for a review of studies involving marine mammal behavioral responses to sound.

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok *et al.,* 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. It is important to note that habituation is appropriately considered as a ''progressive reduction in response to stimuli that are perceived as neither aversive nor beneficial,'' rather than as, more generally, moderation in response to human disturbance (Bejder *et al.,* 2009). The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure. As noted, behavioral state may affect the type of response. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson *et al.,* 1995; NRC, 2003; Wartzok *et al.,* 2003). Controlled experiments with captive marine mammals have showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway *et al.,* 1997; Finneran *et al.,* 2003). Observed responses of wild marine mammals to loud pulsed sound sources (typically seismic airguns or acoustic harassment devices) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds, 2002; see also Richardson *et al.,* 1995; Nowacek *et al.,* 2007).

Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the stock or population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g.,* Lusseau and Bejder, 2007; Weilgart, 2007; NRC, 2003). However, there are broad categories of potential response, which we describe in greater detail here, that include alteration of dive behavior, alteration of foraging behavior, effects to breathing, interference with or alteration of vocalization, avoidance, and flight.

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

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

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

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

Avoidance is the displacement of an individual from an area or migration path 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 seismic surveys (Malme *et al.,* 1984). Avoidance may be short-term, with animals returning to the area once the noise has ceased (*e.g.,* Bowles *et al.,* 1994; Goold, 1996; Stone *et al.,* 2000; Morton and Symonds, 2002; Gailey *et al.,* 2007). Longer-term displacement is possible, however, which may lead to changes in abundance or distribution patterns of the affected species in the affected region if habituation to the presence of the sound does not occur (*e.g.,* Blackwell *et al.,* 2004; Bejder *et al.,* 2006; Teilmann *et al.,* 2006).

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

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

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

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

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

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

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

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

Under certain circumstances, marine mammals experiencing significant masking could also be impaired from maximizing their performance fitness in survival and reproduction. Therefore, when the coincident (masking) sound is man-made, it may be considered harassment when disrupting or altering critical behaviors. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs during the sound exposure. Because masking (without resulting in TS) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

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

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

*Non-Auditory Physiological Effects*—Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to strong underwater sound include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage (Cox *et al.,* 2006; Southall *et al.,* 2007). Studies examining such effects are limited. In general, little is known about the potential for pile driving to cause auditory impairment or other physical effects in marine mammals. Available data suggest that such effects, if they occur at all, would presumably be limited to short distances from the sound source, where SLs are much higher, and to activities that extend over a prolonged period. The available data do not allow identification of a specific exposure level above which non-auditory effects can be expected (Southall *et al.,* 2007) or any meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in those ways. However, the proposed activities do not involve the use of devices such as explosives or mid-frequency active sonar that are associated with these types of effects. Therefore, non-auditory physiological impacts to marine mammals are considered unlikely.

*Underwater Acoustic Effects From the Proposed Activities*

*Potential Effects of Pile Driving Sound*—The effects of sounds from pile driving might include one or more of the following: Temporary or permanent hearing impairment, non-auditory physical or physiological effects, and behavioral disturbance (Richardson *et al.,* 1995; Gordon *et al.,* 2003; Nowacek *et al.,* 2007; Southall *et al.,* 2007). The effects of pile driving on marine mammals are dependent on several factors, including the type and depth of the animal; the pile size and type, and the intensity and duration of the pile driving sound; the substrate; the standoff distance between the pile and the animal; and the sound propagation properties of the environment. Impacts to marine mammals from pile driving activities are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the frequency, received level, and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The further away from the source, the less intense the exposure should be. The substrate and depth of the habitat affect the sound propagation properties of the environment. In addition, substrates that are soft (*e.g.,* sand) would absorb or attenuate the sound more readily than hard substrates (*e.g.,* rock) which may reflect the acoustic wave. Soft porous substrates would also likely require less time to drive the pile, and possibly less forceful equipment, which would ultimately decrease the intensity of the acoustic source.

*Hearing Impairment and Other Physical Effects*—Marine mammals exposed to high intensity sound repeatedly or for prolonged periods can experience hearing threshold shifts. PTS constitutes injury, but TTS does not (Southall *et al.,* 2007). Based on the best scientific information available, the SPLs for the proposed construction activities may exceed the thresholds that could cause TTS or the onset of PTS based on NMFS' new acoustic guidance (NMFS, 2016).

*Disturbance Reactions*—Responses to continuous sound, such as vibratory pile installation, have not been documented as well as responses to pulsed sounds. With both types of pile driving, it is likely that the onset of pile driving could result in temporary, short term changes in an animal's typical behavior and/or avoidance of the affected area. Specific behavioral changes that may result from this proposed project include changing durations of surfacing and dives, moving direction and/or speed; 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); and avoidance of areas where sound sources are located. If a marine mammal responds to a stimulus by changing its behavior (*e.g.,* through relatively minor changes in locomotion direction/speed or vocalization behavior), the response may or may not constitute taking at the individual level, and is unlikely to affect the stock or the species as a whole. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, potential impacts on the stock or species could potentially be significant if growth, survival and reproduction are affected (*e.g.,* Lusseau and Bejder, 2007; Weilgart, 2007). Note that the significance of many of these behavioral disturbances is difficult to predict, especially if the detected disturbances appear minor.

Local observations of marine mammals at Naval Base Kitsap Bangor during a Test Pile Project (TPP) concluded that pinniped (harbor seal and California sea lion) foraging behaviors decreased slightly during construction periods involving impact and vibratory pile driving, and both pinnipeds and harbor porpoise were more likely to change direction while traveling during construction (HDR Inc., 2012). Pinnipeds were more likely to dive and sink when closer to pile driving activity, and a greater variety of other behaviors were observed with increasing distance from pile driving. Relatively few observations of cetacean behaviors were obtained during pile driving. Most harbor porpoises were observed swimming or traveling through the project area, and no obvious behavioral changes were associated with pile driving.

Three years of marine mammal monitoring were conducted to support vibratory and impact pile driving for the construction of Explosives Handling Wharf #2 (EHW–2) at Kitsap Bangor (Hart Crowser, 2013; 2014; 2015). Over the 3 years of monitoring, harbor seals, California sea lions, and Steller sea lions were detected within the shutdown and behavioral disturbance zones (Primary Surveys). Results from monitoring varied slightly year to year, but in general, it has been found that marine mammals were equally observed moving away from (or swimming parallel to) the pile or having no motion during vibratory pile driving. During impact driving, animals were most frequently observed moving away (or moving parallel to) or having no relative motion to the pile (Hart Crowser, 2013; 2014; 2015). Harbor porpoises' predominant behavior during construction (vibratory pile driving) was swimming or traveling through the project area. During pre-construction monitoring, marine mammal observers also reported harbor porpoise foraging. Marine mammal observers did not detect adverse reactions to TPP or EHW–2 construction activities consistent with distress, injury, or high speed withdrawal from the area, nor did they report obvious changes in less acute behaviors.

*Auditory Masking*—Natural and artificial sounds can disrupt behavior by masking. Given that the energy distribution of pile driving covers a broad frequency spectrum, sound from these sources would likely be within the audible range of marine mammals present in the project area. Impact pile driving activity is relatively short-term, and mostly for proofing, with rapid pulses occurring for only a few minutes per pile. The probability for impact pile driving resulting from this proposed action masking acoustic signals important to the behavior and survival of marine mammal species is low. Vibratory pile driving is also relatively short-term. It is possible that vibratory pile driving resulting from this proposed action may mask acoustic signals important to the behavior and survival of marine mammal species, but the short-term duration and limited affected area would result in insignificant impacts from masking. Any masking event that could possibly rise to Level B harassment under the MMPA would occur concurrently within the zones of behavioral harassment already estimated for vibratory and impact pile driving, and which have already been taken into account in the exposure analysis.

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

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

*Potential Pile Driving Effects on Prey*—Construction activities would produce continuous (*i.e.,* vibratory pile driving) sounds and pulsed (*i.e.,* impact driving) sounds. Fish react to sounds that are especially strong and/or intermittent low-frequency sounds. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented effects of pile driving on fish, although several are based on studies in support of large, multiyear bridge construction projects (*e.g.,* Scholik and Yan, 2001, 2002; Popper and Hastings, 2009). Sound pulses at received levels of 160 dB may cause subtle changes in fish behavior. SPLs of 180 dB may cause noticeable changes in behavior (Pearson *et al.,* 1992; Skalski *et al.,* 1992). SPLs of sufficient strength have been known to cause injury to fish and fish mortality.

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

*Effects to Foraging Habitat*—Pile installation may temporarily impact foraging habitat by increasing turbidity resulting from suspended sediments. Any increases would be temporary, localized, and minimal. The Navy must comply with state water quality standards during these operations by limiting the extent of turbidity to the immediate project area. In general, turbidity associated with pile installation is localized to about a 25-foot radius around the pile (Everitt *et al.* 1980). Cetaceans are not expected to be close enough to the project pile driving areas to experience effects of turbidity, and any pinnipeds will be transiting the area and could avoid localized areas of turbidity. Therefore, the impact from increased turbidity levels is expected to be discountable to marine mammals.

Impacts to salmonid and forage fish populations, including ESA-listed species, will be minimized by adhering to the designated in-water work period. These work periods are designated when out-migrating juvenile salmonids are least likely to occur. Some habitat degradation is expected during construction, but the impacts to fish species and their habitats will be temporary and localized. The presence, shading potential, and associated artificial lighting of the larger Service Pier structure, because it would exist in offshore waters of at least 30 feet below MLLW, is not anticipated to alter the behavior of juvenile salmonids using the nearshore migratory pathway. Adult salmonids would not experience a substantial barrier effect, and there would be little or no overall delay in their movements. The numbers of marine mammals affected by impacts to prey populations will be small; therefore, the impact will be insignificant in the context of marine mammal populations.

It is important to note that pile driving and removal activities at the project site will not obstruct movements or migration of marine mammals.

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

## Estimated Take

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

Harassment is the only type of take expected to result from these activities. Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines ''harassment'' as any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

Authorized takes would primarily be by Level B harassment, as pile driving has the potential to result in disruption of behavioral patterns for individual marine mammals. There is also some potential for auditory injury (Level A harassment) to result for the harbor seal, due to larger predicted auditory injury zones and regular presence around the waterfront area. Auditory injury is unlikely to occur for mid-frequency cetaceans or otariid species due to small predicted zones. The proposed mitigation and monitoring measures are expected to minimize the severity of such taking to the extent practicable.

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

Described in the most basic way, we estimate take by considering: (1) Acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and, (4) and the number of days of activities. Below, we describe these components in more detail and present the proposed take estimate.

### *Acoustic Thresholds*

NMFS uses 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.,* 2011). 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 affected 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 non-explosive impulsive (*e.g.,* impact pile driving).

*Level A Harassment*—NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Technical Guidance, 2016) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). The Navy's proposed activity includes the use of impulsive (impact pile driving) and non-impulsive (vibratory pile driving and extraction) sources.

These thresholds were developed by compiling and synthesizing the best available science and soliciting input multiple times from both the public and peer reviewers to inform the final product, and are provided in Table 3. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2016 Technical Guidance, which may be accessed at: *http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm.*

**Table 3. Thresholds identifying the onset of Permanent Threshold Shift.**

| | 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.

Pile driving will generate underwater noise that potentially could result in disturbance to marine mammals swimming by the project area. Transmission loss (TL) underwater is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source until the source becomes indistinguishable from ambient sound. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. A standard sound propagation model, the Practical Spreading Loss model, was used to estimate the range from pile driving activity to various expected SPLs at potential project structures. This model follows a geometric propagation loss based on the distance from the driven pile, resulting in a 4.5 dB reduction in level for each doubling of distance from the source. In this model, the SPL at some distance away from the source (*e.g.,* driven pile) is governed by a measured source level, minus the TL of the energy as it dissipates with distance. The TL equation is:

$$TL = 15\log10(R_1/R_2)$$

Where:

$TL$ is the transmission loss in dB,
$R_1$ is the distance of the modeled SPL from the driven pile, and
$R_2$ is the distance from the driven pile of the initial measurement.

The degree to which underwater noise propagates away from a noise source is dependent on a variety of factors, most notably by the water bathymetry and presence or absence of reflective or absorptive conditions including the sea surface and sediment type. The TL model described above was used to calculate the expected noise propagation from both impact and vibratory pile driving, using representative source levels to estimate the zone of influence (ZOI) or area exceeding the noise criteria.

*Source Levels*

For the analyses that follow, the TL model described above was used to calculate the expected noise propagation from pile driving, using an appropriate representative source level from Table 4 to estimate the area exceeding the noise criteria. The source levels were derived from the Navy's document titled *Proxy source sound levels and potential bubble curtain attenuation for acoustic modeling of nearshore marine pile driving at Navy installations in Puget Sound* (Navy 2015). In that document the Navy reviewed relevant data available for various types and sizes of piles typically used for pile driving and recommend proxy source values for Navy installations in Puget Sound. This document may be found as Appendix B in the Navy's application. Acoustic monitoring was conducted during previous pile driving projects at this location. Results were used to establish proxy sound source levels for 36-in steel piles.

TABLE 4—UNDERWATER NOISE SOURCE LEVELS MODELED FOR IMPACT AND VIBRATORY PILE DRIVING

| Pile type | Installation method | Pile diameter | RMS (dB re 1 μPa) | Peak (dB re 1 μPa) | SEL (dB re 1 μPa² sec) |
|---|---|---|---|---|---|
| Timber | Vibratory | 15–18 in (38–45 cm) | [1]155 | N/A | N/A |
| Concrete | Impact | 18 in (45 cm) | 170 | 184 | 159 |
| Steel | Impact | 24 in (60 cm) | 193 | 210 | 181 |
| | | 36 (90 cm) | 194 | 211 | 181 |
| | Vibratory | 24 (60 cm) | 161 | N/A | N/A |
| | | 36 (90 cm) | 166 | N/A | N/A |

[1] Navy opted to use conservative value of 155 dB for project.

Key: cm = centimeter; dB re 1 μPa = decibels referenced at 1 micropascal; N/A = not applicable; RMS = root mean square; SEL = sound exposure level.

For vibratory pile driving distances to the PTS thresholds, the TL model described above incorporated the auditory weighting functions for each hearing group using a single frequency as described in the NMFS Optional Spreadsheet (NMFS, 2016b). When NMFS' Technical Guidance (2016) was published, in recognition of the fact that ensonified area/volume could be more technically challenging to predict because of the duration component in the new thresholds, we developed a User Spreadsheet that includes tools to help predict a simple isopleth that can be used in conjunction with marine mammal density or occurrence to help predict takes. We note that because of some of the assumptions included in the methods used for these tools, we anticipate that isopleths produced are typically going to be overestimates of some degree, which may result in some degree of overestimate of Level A take. However, these tools offer the best way to predict appropriate isopleths when more sophisticated 3D modeling methods are not available. NMFS continues to develop ways to quantitatively refine these tools, and will qualitatively address the output where appropriate. For stationary sources, including pile driving, NMFS User Spreadsheet predicts the closest distance at which a marine mammal, if it remained beyond that distance the whole duration of the activity, would not incur PTS.

For impact pile driving distances to the cumulative PTS thresholds for 36-inch (90 cm) and 24-inch (60 cm) steel and concrete pile, the TL model described above incorporated frequency weighting adjustments by applying the auditory weighting function over the entire 1-second SEL spectral data sets from impact pile driving. The Navy believes, and NMFS concurs, that this methodology provides a closer estimate than applying the weighting function at a single frequency as suggested in the NMFS Spreadsheet. The NMFS Spreadsheet is considered to be a conservative method that typically results in higher estimates of the PTS onset distance from the pile driving activity. The Navy analysis focused on the data provided from the Naval Kitsap Bangor Test Pile Program (steel piles) and the Puget Sound Naval Shipyard Intermediate Maintenance Facility Pier 6 Fender Pile Replacement Project (concrete piles) (Grebner *et al.,* 2016). This analysis is described in more detail in Appendix C.

An unconfined bubble curtain will be used during impact driving of steel piles, since the project is located in an area without high currents. While bubble curtain performance is variable, data from the Bangor Naval Base Test Pile Program indicated an average peak SPL reduction of 8 dB to 10 dB at 10 meters was achieved for impact driving of 36- and 48-inch steel pipes (Navy 2015). However, for the SPE project, a reduction of 8 dB was utilized as shown in Table 5.

TABLE 5—INPUTS FOR DETERMINING DISTANCES TO CUMULATIVE PTS THRESHOLDS

| | 36″ Steel impact | 24″ Steel impact | 18″ Concrete impact | 24″ Steel vibratory | 36″ Steel vibratory | Timber |
|---|---|---|---|---|---|---|
| **INPUTS** | | | | | | |
| Spreadsheet Tab Used | (E.1–2) Impact pile driving. | (E.1–2) Impact pile driving. | (E.1–2) Impact pile driving. | (A.1) Vibratory pile driving. | (A.1) Vibratory pile driving. | (A.1) Vibratory pile driving. |
| Source Level (Single Strike/shot SEL) | 173 dB (assumes 8 dB attenuation) *. | 173 dB (assumes 8 dB attenuation) *. | 159 dB. | | | |
| Source Level (RMS SPL) | | | | 161 dB | 166 dB | 155. |
| Weighting Factor Adjustment (kHz) ** | Weighting override (Grebner *et al.* 2016). | Weighting override (Grebner *et al.* 2016). | Weighting override (Grebner *et al.* 2016). | 2.5 | 2.5 | 2.5. |
| Number of strikes per day | 1,600 | 1,600 | 1,600. | | | |
| Number of piles per day within 24-h period | 2 | 1 | 3. | | | |
| Duration of sound Production (minutes) | | | | 300 | 300 | 300. |
| Propagation (xLogR) | 15 | 15 | 15 | 15 | 15 | 15. |

TABLE 5—INPUTS FOR DETERMINING DISTANCES TO CUMULATIVE PTS THRESHOLDS—Continued

| | 36″ Steel impact | 24″ Steel impact | 18″ Concrete impact | 24″ Steel vibratory | 36″ Steel vibratory | Timber |
|---|---|---|---|---|---|---|
| Distance of source level measurement (meters) | 10 | 10 | 10 | 10 | 10 | 10. |

* 8 dB reduction from use of unconfined bubble curtain during steel pipe impact driving.
** For impact driving, the TL model described above incorporated frequency weighting adjustments by applying the auditory weighting function over the entire 1-second SEL spectral data sets.

TABLE 6—CALCULATED RADIAL DISTANCES (METERS) TO UNDERWATER MARINE MAMMAL IMPACT PILE DRIVING NOISE THRESHOLDS—$_{SEL}$CUM ISOPLETHS [1]

| Source type | Level A isopleths—impact driving [2] | | | |
|---|---|---|---|---|
| | Mid-frequency cetaceans | High-frequency cetaceans | Phocid pinnipeds | Otariid pinnipeds |
| 18-in concrete [3] | 2 | 74 | 19 | 1 |
| 24-in steel [4] | 5 | 253 | 34 | 2 |
| 36-in steel [4] | 14 | 740 | 217 | 12 |

**Notes:**
1. Calculations based on $SEL_{CUM}$ threshold criteria shown in Table 3.
Calculated values were rounded up the nearest meter.
2. Representative spectra were used to calculate the distances to the injury (PTS onset) thresholds for each functional hearing group for 24-inch and 36-inch steel pile and 24-inch (60 cm) concrete pile. Distances for 18-inch (45 cm) concrete piles assumed to be the same as 24-inch (60 cm) concrete piles.
3. No bubble curtain proposed for concrete pile.
4. Bubble curtain will be used for 24-inch (60 cm) and 36-inch (90 cm) steel piles, and calculations include 8 dB attenuation.

TABLE 7—CALCULATED RADIAL DISTANCES (METERS) TO LEVEL A UNDERWATER MARINE MAMMAL VIBRATORY PILE DRIVING NOISE ISOPLETHS

| Source type | Level A isopleths—Vibratory driving [1] | | | | |
|---|---|---|---|---|---|
| | Low-frequency cetaceans | Mid-frequency cetaceans | High-frequency cetaceans | Phocid pinnipeds | Otariid pinnipeds |
| 15–18-in timber | 8 | <1 | 12 | 5 | <1 |
| 24-in steel | 20 | 2 | 30 | 12 | 1 |
| 36-in steel | 43 | 4 | 64 | 26 | 1.8 |

**Notes:**
1. Distances to the injury (PTS onset) thresholds calculated using National Marine Fisheries Service calculator with default Weighting Factor Adjustment of 2.5 (NMFS, 2016b).
Calculated values were rounded up the nearest meter.

Tables 6 and 7 show the radial distances to impact and vibratory Level A isopleths. Based on the dual criteria provided in the NMFS Spreadsheet, the cumulative SEL was selected over peak threshold to calculate injury thresholds because the ensonified distances were larger.

Using the same source level and transmission loss inputs discussed above the Level B isopleths were calculated for impact and vibratory driving (Table 8). Note that these attenuation distances are based on sound characteristics in open water. The actual attenuation distances are constrained by numerous land features and islands; these actual distances are reflected in the ensonified areas given below.

TABLE 8—LEVEL B IMPACT AND VIBRATORY PILE DRIVING EXPOSURE DISTANCES AND ENSONIFIED AREAS

| Pile type | Attenuation distance | Area * |
|---|---|---|
| Impact (160 dB) | | |
| 18-in concrete | 46 m | 6.64 m$^2$. |
| 24-in steel | 464 m | 0.62 km$^2$. |
| 36-in steel | 541 m | 0.78 km$^2$. |
| Vibratory (120 dB) | | |
| 15–18-in timber | 2.2 km | 6.8 km$^2$. |
| 24-in steel | 5.4 km | 26.1 km$^2$. |
| 36-in steel | 11.7 km | 49.6 km$^2$. |

* Areas were adjusted wherever land masses are encountered prior to reaching the full extent of the radius around the driven pile.

*Marine Mammal Occurrence*

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

Transient killer whales are rare in Hood Canal and there are few data to describe transient killer whale abundance within Hood Canal. There have been anecdotal accounts of the whales in Hood Canal for decades. There was a report from 1 day in April 2016 and 8 days in May 2016 of whales Dabob Bay (Orca Network, 2016). It is likely that the whales were using Hood Canal as part of a larger area moving in and out of Hood Canal. It is not known how large an area these animals were using; it is also unknown if these sightings were all of the same group of transient killer whales, or if animals were using the same areas. However, the temporally discontinuous data suggest a high degree of variability in the habitat use and localized relative abundances of transient killer whales in Hood Canal. Given that whales were observed on eight days, in May 2016, NMFS will assume that whales could be observed on up to 8 days during the SPE project. The most commonly observed group size in Puget Sound from 2004 to 2010 was 6 whales (Navy 2017).

Harbor porpoises may be present in Puget Sound year-round typically in groups of one to five individuals and are regularly detected in Hood Canal. Aerial surveys conducted throughout 2013 to 2015 in Puget Sound indicated density in Puget Sound was 0.91 individuals/km$^2$) (95% CI = 0.72–1.10, all seasons pooled) and density in Hood Canal was 0.47/km$^2$ (95% CI = 0.29–0.75, all seasons pooled) (Jefferson *et al.,* 2016). However, after reviewing the most recent data the Navy has estimated that harbor porpoise density in Hood Canal is 0.44 animals/km$^2$ (Smultea *et al.,* 2017). Mean group size of harbor porpoises in Puget Sound in the 2013–2015 surveys was 1.7 in Hood Canal.

Steller sea lions are routinely seen hauled out on submarines at Naval Base Kitsap. The Navy relied on monitoring data from 2012 to 2016 to determine the average of the maximum count of hauled out Steller sea lions for each month in the in-water work window (Appendix A). The average of the monthly maximum counts during the in-water work window was 3.14, rounded to 3 exposures per day.

California sea lions can occur at Naval Base Kitsap Bangor in any month, although numbers are low from June through August (Appendix A in the application).

California sea lions peak abundance occurs between October and May (NMFS, 1997; Jeffries *et al.,* 2000) but animals can occur at Naval Base Kitsap Bangor in any month. The Navy relied on monitoring data from 2012 to 2016 to determine the average of the maximum count of hauled out California sea lions for each month (Appendix A). The Navy determined abundance of California sea lions based on the average monthly maximum counts during the in-water work window (Appendix A), respectively, for an average maximum count of 48.85, rounded to 49 exposures per day.

Boat-based surveys and monitoring indicate that harbor seals regularly swim in the waters at Naval Base Kitsap Bangor (Appendix A in Application). Hauled-out adults, mother/pup pairs, and neonates have been documented occasionally, but quantitative data are limited. Incidental surveys in August and September 2016 recorded as many as 28 harbor seals hauled out under Marginal Wharf or swimming in adjacent waters. Additional animals were likely present at other locations during the same time of the surveys. To be conservative, the Navy estimated that an additional 7 animals were present based on typical sightings at the other piers at Bangor. Therefore, the Navy and NMFS assume that up to 35 seals could occur near the SPE project area on any given day.

*Take Calculation and Estimation*

Here we describe how the information provided above is brought together to produce a quantitative take estimate.

To quantitatively assess exposure of marine mammals to noise levels from pile driving over the NMFS threshold guidance, one of three methods was used depending on the species spatial and temporal occurrence. For species with rare or infrequent occurrence during the in-water work window, the likelihood of occurrence was reviewed based on the information in Chapter 3 of the application and the potential maximum duration of work days and total work days. Only one species was in this category, transient killer whale, and it had the potential to linger for multiple days based on historical information. The calculation was:

(1) Exposure estimate = Probable abundance during construction × Probable duration

Where:

Probable abundance = maximum expected group size

Probable duration = probable duration of animal(s) presence at construction sites during in-water work window

For species that regularly occur in Puget Sound, but for which local abundance data are not available, marine mammal density estimates were used when available to determine the number of animals potentially exposed in a ZOI on any one day of pile driving or extraction. Only harbor porpoise was in this category.

The equation for this species with only a density estimate and no site-specific abundance was:

(2) Exposure estimate = N × ZOI × maximum days of pile driving

Where:

N = density estimate used for each species

ZOI = Zone of Influence; the area where noise exceeds the noise threshold value

For species with site-specific surveys available, exposures were estimated by:

(3) Exposure estimate = Abundance × maximum days of pile driving

Where:

Abundance = average monthly maximum over the time period when pile driving will occur for sea lions, and estimated total abundance for harbor seals

All three pinniped species were in this category. Average monthly maximum counts of Steller sea lions and California sea lions (see Appendix A for abundance data of these species) were averaged over the in-water work window. The maximum number of animals observed during the month(s) with the highest number of animals present on a survey day was used in the analysis. For harbor seals, an abundance estimate for the Bangor waterfront was used.

The following assumptions were used to calculate potential exposures to impact and vibratory pile driving noise for each threshold.

- For formulas (2) and (3), each species will be assumed to be present in the project area each day during construction. The timeframe for takings would be one potential take (Level B harassment exposure) per individual, per 24 hours.
- The pile type, size, and installation method that produce the largest ZOI were used to estimate exposure of marine mammals to noise impacts. Vibratory installation of 36-inch (90 cm) steel piles created the largest ZOI, so the exposure analysis calculates marine mammal exposures based on 36- inch steel piles for the 125 days when steel piles would be installed. For the estimated 35 days when concrete fender piles would be installed, impact driving was the only installation method and only 18-inch piles were proposed, so the exposure analysis calculated marine mammal exposures based on impact driving 18-inch concrete piles.

- All pilings will have an underwater noise disturbance distance equal to the pile that causes the greatest noise disturbance (*i.e.,* the piling farthest from shore) installed with the method that has the largest ZOI. If vibratory pile driving would occur, the largest ZOI will be produced by vibratory driving. In this case, the ZOI for an impact hammer will be encompassed by the larger ZOI from the vibratory driver. Vibratory driving was assumed to occur on all 125 days of steel pile driving, but not the 35 days of concrete fender pile installation.
- Days of pile driving were conservatively based on a relatively slow daily production rate, but actual daily production rates may be higher, resulting in fewer actual pile driving days. The pile driving days are used solely to assess the number of days during which pile driving could occur if production was delayed due to equipment failure, safety, etc. In a real construction situation, pile driving production rates would be maximized when possible.

*Transient Killer Whale*

Using the first calculation described in the above section, exposures to underwater pile driving were calculated using the average group size times the 8 days transient killer whales would be anticipated in the Hood Canal during pile driving activities. The Navy assumed that the average pod size was six individuals.

Using this rationale, 48 potential Level B exposures of transient killer whales from vibratory pile driving are estimated (six animals times 8 days of exposure). Based on this analysis, the Navy requests and NMFS proposes 48 Level B incidental takes for behavioral harassment. Concrete and steel ZOIs from impact driving will be fully monitorable (maximum distances to behavioral thresholds of 46 m and 541 m, respectively, and maximum distance to injury thresholds is 14 m), so no killer whale behavioral or injury takes are expected from impact driving.

*Harbor Porpoise*

Applying formula (2) to the animal density (0.44animals/km $^2$), the largest ZOI for Level B exposure (49.6 km $^2$) and the estimated days of steel pile driving (125), the Navy requests and NMFS proposes 2,728 Level B incidental takes of harbor porpoises. The 49.6 km $^2$ ZOI excludes the area behind the PSB because harbor porpoise have never been observed within the barrier. Harbor porpoise can be visually detected to a distance of about 200 m by experienced observers in conditions up to Beaufort 2 (Navy 2017). Therefore, the concrete ZOIs will be fully monitorable (maximum distance of 46 m), so no takes were calculated for the estimated 35 days of concrete fender pile installation.

*Steller Sea Lion*

Concrete ZOIs will be fully monitorable, so no takes were calculated for the estimated 35 days of concrete fender pile installation. Formula (3) as described in the previous section was used with site-specific abundance data to calculate potential exposures of Steller sea lions during steel pile driving for the SPE project. Animals could be exposed when traveling, resting, and foraging. Because a Level A injury shut-down zone will be implemented, Level A harassment is not expected to occur.

The Navy conservatively assumes that any Steller sea lion that hauls out at Bangor could swim into the behavioral harassment zone each day during pile driving because this zone extends across Hood Canal and up to 11.7 km from the driven pile. The Navy estimated 3 animals could be exposed to harassment per day. These values provide a worst case assumption that on all 125 days of pile driving, all animals would be in the water each day during pile driving. Applying formula (3) to this abundance and the 125 steel pile driving days, the Navy requests and NMFS proposes the take of up to 375 Steller sea lions. If project work occurs during months when Steller sea lions are less likely to be present, actual exposures would be less. Additionally, if daily pile driving duration is short, exposure would be expected to be less because some animals would remain hauled out for the duration of pile driving. Any exposure of Steller sea lions to pile driving noise will be minimized to short-term behavioral harassment.

*California Sea Lion*

Concrete ZOIs will be fully monitorable (maximum distance of 46 m), so no takes were calculated for the estimated 35 days of concrete fender pile installation (Figure 6–3 in application). Formula (3) was used with site-specific abundance data to calculate potential exposures of California sea lions during pile driving for the SPE project. Because a Level A injury shut-down zone will be implemented, no exposure to Level A noise levels will occur at any location. Based on site-specific data regarding the average maximum counts, the Navy assumes that 49 exposures per day could occur over 125 planned steel pile driving days. Therefore, NMFS proposes authorizing 6,125 Level B takes.

*Harbor Seal*

The Navy calculated up to 35 harbor seals may be present per day during summer and early fall months. Exposure of harbor seals to pile driving noise will be primarily in the form of short-term behavioral harassment (Level B) during steel pile driving. Concrete ZOIs will be fully monitorable (maximum distance of 46 m), so no takes were calculated for the estimated 35 days of concrete fender pile installation (Figure 6–3 in application). Formula (3) was used with site-specific abundance data to calculate potential exposures of harbor seals due to pile driving for the SPE.

The Navy assumes that any harbor seal that hauls out at Bangor could swim into the behavioral harassment zone each day during impact pile driving. The largest ZOI for behavioral disturbance (Level B) would be 11.7 km for vibratory driving and extraction of 36-inch steel piles. Applying formula (3) to the abundance of this species (35 individuals) and the 125 pile driving days, the Navy requests and NMFS proposes the Level A and Level B take of up to 4,375 harbor seals during pile driving for the SPE. The largest ZOI for Level A injury will be 217 m for impact driving (with bubble curtain) of 36-inch steel piles. A monitors' ability to observe the entire 217 m injury zone may be difficult because construction barges and the current Service Pier structure and associated mooring floats and vessels will interfere with a monitors' ability to observe the entire injury zone. Some individuals could enter, and remain in, the injury zone undetected by monitors, resulting in potential PTS. It is estimated that one of the 35 individuals present on the Bangor waterfront would enter, and remain in, the injury zone without being detected by marine mammal monitors each day during steel impact driving. Therefore, with 125 steel pile driving days and one individual per day being exposed to Level A noise levels, 125 Level A takes of harbor seals are proposed by NMFS. Subtracting 125 Level A takes from the estimated total of 4,375 takes would result in 4,250 Level B takes. It should be noted that Level A takes of harbor seals would likely be multiple exposures of the same individuals, rather than single exposures of unique individuals. This request overestimates the likely Level A exposures because: (1) Seals are unlikely to remain in the Level A zone underwater long enough to accumulate sufficient exposure to noise resulting in PTS, and (2) the estimate assumes that new seals are in the Level A ZOI every day during pile driving. No Level A takes are requested for vibratory pile driving because the maximum harbor seal injury zone is 15 m and is within a practicable shutdown distance. It is important to note that the estimate of potential Level A harassment of harbor seals is expected to be an overestimate, since the planned project is not expected to occur near Marginal Wharf—the location where most harbor seal activity occurs.

Table 9 provides a summary of proposed authorized Level A and Level B takes as well as the percentage of a stock or population proposed for take.

TABLE 9—PROPOSED AUTHORIZED TAKE AND PERCENTAGE OF STOCK OR POPULATION

| Species | Proposed authorized take | | Percent population |
|---|---|---|---|
| | Level A | Level B | |
| Killer whale | 0 | 48 | 19.7 |
| Harbor porpoise | 0 | 2,728 | 24.3 |
| Steller sea lion | 0 | 375 | 0.9 |
| California sea lion | 0 | 6,125 | 2.0 |
| Harbor seal | 125 | 4,250 | n/a |

**Proposed Mitigation**

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

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

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

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

In addition to the specific measures described later in this section, the Navy would conduct briefings between construction supervisors and crews, marine mammal monitoring team, and Navy staff prior to the start of all pile driving activity, and when new personnel join the work, in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.

*Use of Vibratory Installation*—The Navy will employ vibratory installation to the greatest extent possible when driving steel piles to minimize high sound pressure levels associated with impact pile driving. Impact driving of steel piles will only occur when required by geotechnical conditions or to ''proof'' load-bearing piles driven by vibratory methods.

*Timing Restrictions*—To minimize the number of fish exposed to underwater noise and other construction disturbance, in-water work will occur during the in-water work window previously described when ESA-listed salmonids are least likely to be present (USACE, 2015), July 16–January 15.

All in-water construction activities will occur during daylight hours (sunrise to sunset) except from July 16 to September 15, when impact pile driving will only occur starting 2 hours after sunrise and ending 2 hours before sunset, to protect foraging marbled murrelets during the nesting season (April 15–September 23). Sunrise and sunset are to be determined based on National Oceanic and Atmospheric Administration data, which can be found at *http://www.srrb.noaa.gov/highlights/sunrise/sunrise.html.*

*Use of Bubble Curtain*—A bubble curtain or other noise attenuation device that achieves an average of at least 8 dB of noise attenuation will be employed during impact installation or proofing of steel piles where water depths are greater than 0.67 m (2 ft). A noise attenuation device is not required during vibratory pile driving. If a bubble curtain or similar measure is used, it will distribute air bubbles around 100 percent of the piling perimeter for the full depth of the water column. Any other attenuation measure must provide 100 percent coverage in the water column for the full depth of the pile. The lowest bubble ring shall be in contact with the mudline for the full circumference of the ring. The weights attached to the bottom ring shall ensure 100 percent mudline contact. No parts of the ring or other objects shall prevent full mudline contact.

A performance test of the noise attenuation device shall be conducted prior to initial use for impact pile driving. If a bubble curtain or similar measure is utilized, the performance test shall confirm the calculated pressures and flow rates at each manifold ring. The contractor shall also train personnel in the proper balancing of air flow to the bubblers. The contractor shall submit an inspection/performance report to the Navy for approval within 72 hours following the performance test. Corrections to the noise attenuation device to meet the performance stands shall occur prior to use for impact driving.

If the U.S. Fish and Wildlife Service concurs that turning off the noise attenuation will not negatively impact marbled murrelets, baseline sound measurements of steel pile driving will occur prior to the implementation of noise attenuation to evaluate the performance of a noise attenuation device. Impact pile driving without noise attenuation will be limited to the number of piles necessary to obtain an adequate sample size for each project.

*Soft-Start*—The use of a soft start procedure is believed to provide additional protection to marine mammals by warning or providing a chance to leave the area prior to the hammer operating at full capacity, and typically involves a requirement to initiate sound from the hammer at reduced energy followed by a waiting period. A soft-start procedure will be used for impact pile driving at the beginning of each day's in-water pile driving or any time impact pile driving has ceased for more than 30 minutes.

The Navy will start the bubble curtain prior to the initiation of impact pile driving. The contractor will provide an initial set of strikes from the impact hammer at reduced energy, followed by a 30-second waiting period, then two subsequent sets. (The reduced energy of an individual hammer cannot be quantified because it varies by individual drivers. Also, the number of strikes will vary at reduced energy because raising the hammer at less than full power and then releasing it results in the hammer ''bouncing'' as it strikes the pile, resulting in multiple ''strikes.'')

*Establishment of Shutdown Zones and Disturbance Zones*—For all impact and vibratory pile driving of steel piles, shutdown and disturbance zones will be established and monitored. The Navy will focus observations within 1,000 m for all species during these activities but will record all observations. During impact driving of concrete piles the Navy will focus on monitoring within 100 m but will record all observations. The Navy will monitor and record marine mammal observations within zones and extrapolate these values across the entirety of the Level B zone as part of the final monitoring report. To the extent possible, the Navy will record and report on any marine mammal occurrences, including behavioral disturbances, beyond 1,000 m for steel pile installation and 100 m for concrete pile installation.

The shutdown zones are based on the distances from the source predicted for each threshold level. Although different functional hearing groups of cetaceans and pinnipeds were evaluated, the threshold levels used to develop the disturbance zones were selected to be conservative for cetaceans (and therefore at the lowest levels); as such, the disturbance zones for cetaceans were based on the high frequency threshold (harbor porpoise). The shutdown zones are based on the maximum calculated Level A radius for pinnipeds and cetaceans during installation of 36-inch steel and concrete piles with impact techniques, as well as during vibratory pile installation and removal. These actions serve to protect marine mammals, allow for practical implementation of the Navy's marine mammal monitoring plan and reduce the risk of a take. The shutdown zone during any non-pile driving activity will always be a minimum of 10 m (33 ft) to prevent injury from physical interaction of marine mammals with construction equipment.

During all pile driving, the shutdown, Level A, and Level B zones as shown in Tables 10, 11, and 12 will be monitored out to the greatest extent possible with a focus on monitoring within 1,000 m for steel pile and 100 m for concrete pile installation.

For steel pile impact pile driving, monitors would initiate shutdown when harbor seals approach or enter the zone. However, because of the size of the zone and the inherent difficulty in monitoring harbor seals, a highly mobile species, it may not be practical, which is why Level A take is requested.

The isopleths delineating shutdown, Level A, and Level B zones during impact driving of all steel piles are shown in Table 10. Note that the Level A isopleth is larger than the Level B isopleth for harbor porpoises.

TABLE 10—SHUTDOWN, LEVEL A, AND LEVEL B ISOPLETHS DURING IMPACT DRIVING OF STEEL PILES

| Marine mammal group | Level B isopleth (meters) | Level A isopleth (meters) | Shutdown zone (meters) |
|---|---|---|---|
| Cetaceans (Harbor Porpoise) | 541 | 740 | 1,000 |
| Harbor Seal | 541 | 217 | 220 |
| Sea Lions | 541 | 12 | 220 |

The isopleths for the shutdown, Level A, and Level B zones during vibratory driving of all steel piles are shown in Table 11.

TABLE 11—SHUTDOWN, LEVEL A, LEVEL B ISOPLETHS DURING VIBRATORY DRIVING OF STEEL PILES

| Marine mammal group | Level B isopleth (meters) | Level A isopleth (meters) | Shutdown zone (meters) |
|---|---|---|---|
| Cetaceans (Harbor Porpoise) | 11,700 | 64 | 100 |
| Harbor Seal | 11,700 | 26 | 30 |
| Sea Lions | 11,700 | 1.8 | 30 |

The shutdown, Level A, and Level B isopleths for implementation during impact driving of concrete piles are shown in Table 12. Given that the shutdown zone for all authorized species is larger than the Level A and Level B isopleths there should be no take recorded during concrete pile driving.

TABLE 12—SHUTDOWN, LEVEL A, AND LEVEL B ISOPLETHS DURING IMPACT DRIVING OF CONCRETE PILES

| Marine mammal group | Level B isopleth (meters) | Level A isopleth (meters) | Shutdown zone (meters) |
|---|---|---|---|
| Cetaceans (Harbor Porpoise) | 46 | 74 | 100 |
| Harbor Seal | 46 | 19 | 50 |
| Sea Lions | 46 | 1 | 50 |

Note that the radii of the disturbance zones may be adjusted if in-situ acoustic monitoring is conducted by the Navy to establish actual distances to the thresholds for a specific pile type and installation method. However, any proposed acoustical monitoring plan must be pre-approved by NMFS. The results of any acoustic monitoring plan must be reviewed and approved by NMFS before the radii of any disturbance zones may be revised.

The mitigation measures described above should reduce marine mammals' potential exposure to underwater noise levels which could result in injury or behavioral harassment. 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 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: Action or environment (*e.g.,* source characterization, propagation, ambient noise); (2) affected species (*e.g.,* life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.,* age, calving or feeding areas);
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) Long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;
- Effects on marine mammal habitat (*e.g.,* marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and
- Mitigation and monitoring effectiveness.

## Visual Monitoring

Marine mammal monitoring will include the following proposed requirements.

Marine Mammal Observers (MMOs) will be positioned at the best practicable vantage points, taking into consideration security, safety, and space limitations. During pile driving, one MMO will be stationed in a vessel, and at least four will be stationed on the pier, along the shore, or on the pile driving barge to maximize observation coverage. Each MMO location will have a minimum of one dedicated MMO (not including boat operators). The exact number of MMOs and the observation locations are to be determined based upon site accessibility and line of sight for adequate coverage. It is expected that a minimum of four MMOs will be required, with additional MMOs added into the protocol as deemed necessary for effective coverage. Additional standards required for visual monitoring include:

(a) Independent observers (*i.e.,* not construction personal) are required;

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

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

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

(e) We will require submission and approval of observer CVs.

Monitoring will be conducted by qualified observers, who will monitor for marine mammals and implement shutdown/delay procedures when applicable by calling for the shutdown to the hammer operator. Qualified observers are trained biologists, with the following minimum qualifications:

(a) 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;

(b) Advanced education in biological science or related field (undergraduate degree or higher required);

(c) Experience and ability to conduct field observations and collect data according to assigned protocols (this may include academic experience);

(d) Experience or training in the field identification of marine mammals, including the identification of behaviors;

(e) Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations;

(f) Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates and times when in-water construction activities were suspended to avoid potential incidental injury from construction sound of marine mammals observed within a defined shutdown zone; and marine mammal behavior; and

(g) 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.

MMOs will survey the disturbance zone 15 minutes prior to initiation of pile driving through 30 minutes after completion of pile driving to ensure there are no marine mammals present. In case of reduced visibility due to weather or sea state, the MMOs must be able to see the shutdown zones or pile driving will not be initiated until visibility in these zones improves to acceptable levels. Marine Mammal Observation Record forms (Appendix A of the application) will be used to document observations. Survey boats engaged in marine mammal monitoring will maintain speeds equal to or less than 10 knots.

MMOs will use binoculars and the naked eye to search continuously for marine mammals and will have a means to communicate with each other to discuss relevant marine mammal information (*e.g.,* animal sighted but submerged with direction of last sighting). MMOs will have the ability to correctly measure or estimate the animals distance to the pile driving equipment such that records of any takes are accurate relevant to the pile size and type.

Shutdown shall occur if a species for which authorization has not been granted or for which the authorized numbers of takes have been met. The Navy shall then contact NMFS within 24 hours.

If marine mammal(s) are present within or approaching a shutdown zone prior to pile driving, the start of these activities will be delayed until the animal(s) have left the zone voluntarily and have been visually confirmed beyond the shutdown zone, or 15 minutes has elapsed without re-detection of the animal.

If animal is observed within or entering the Level B zone during pile driving, a take would be recorded, behaviors documented. However, that pile segment would be completed without cessation, unless the animal approaches or enters the shutdown Zone, at which point all pile driving activities will be halted. The MMOs shall immediately radio to alert the monitoring coordinator/construction contractor. This action will require an immediate ‘‘all-stop’’ on pile operations. Once a shutdown has been initiated, pile driving will be delayed until the animal has voluntarily left the Shutdown Zone and has been visually confirmed beyond the Shutdown Zone, or 15 minutes have passed without re-detection of the animal (*i.e.,* the zone is deemed clear of marine mammals).

All marine mammals observed within the disturbance zones during pile driving activities will be recorded by MMOs. These animals will be documented as Level A or Level B takes as appropriate. Additionally, all shutdowns shall be recorded. For vibratory driving activities, this data will be extrapolated across the full extent of the Level B ensonified zone (*i.e.* 11.7 km radii) to provide total estimated take numbers.

A draft marine mammal monitoring report would be submitted to NMFS within 90 days after the completion of pile driving and removal activities. It will include an overall description of work completed, a narrative regarding marine mammal sightings, and associated marine mammal observation data sheets. Specifically, the report must include information as described in the Marine Mammal Monitoring Report (Appendix D of the application).

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

In the unanticipated event that: (1) The specified activity clearly causes the take of a marine mammal in a manner prohibited by the IHA (if issued), such as an injury, serious injury or mortality; (2) an injured or dead animal is discovered and cause of death is known; or (3) an injured or dead animal is discovered and cause of death is not related to the authorized activities, the Navy will follow the protocols described in the Section 3 of Marine Mammal Monitoring Report (Appendix D of the application).

## Negligible Impact Analysis and Preliminary 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).

Pile driving and extraction associated with the Navy SPE project as outlined previously have the potential to injure, disturb or displace marine mammals. Specifically, the specified activities may result in Level B harassment (behavioral disturbance) for five marine mammal species authorized for take from underwater sound generated during pile driving operations. Level A harassment in the form of PTS may also occur to limited numbers of one species. Level A harassment was conservatively authorized for harbor seals since seals can occur in high numbers near the project area, can be difficult to spot, and MMO's ability to observe the entire 217 m injury zone may be slightly impaired because of construction barges and vessels. Potential takes could occur if marine mammals are present in the Level A or Level B ensonified zones when pile driving and removal occurs.

No serious injury or mortality is anticipated given the nature of the activities and measures designed to minimize the possibility of injury to marine mammals. The potential for injury is minimized through the construction method and the implementation of the planned mitigation measures. Specifically, vibratory driving will be the primary method of installation. This driving method decreases the potential for injury due to relatively low source levels and lack of potentially injurious source characteristics. Only piles that cannot be driven to their desired depths using the vibratory hammer will be impact driven for the remainder of their required driving depth. Noise attenuating devices (*i.e.,* bubble curtain) will be used during impact hammer operations for steel piles. During impact driving, implementation of soft start and shutdown zones significantly reduces any possibility of injury. Given sufficient ''notice'' through use of soft start (for impact driving), marine mammals are expected to move away from a sound source that is annoying prior to it becoming potentially injurious. Given the number of MMOs that will be employed, observers should have a relatively clear view of the shutdown zones, although under limited circumstances the presence of barges and vessels may impair observation of small portions of shutdown zones. This will enable a high rate of success in implementation of shutdowns to avoid injury.

The Navy's planned activities are highly localized. Only a relatively small portion of Hood Canal may be affected. The project is not expected to have significant adverse effects on marine mammal habitat. No important feeding and/or reproductive areas for marine mammals are known to be near the project area. Impacts to salmonid and forage fish populations, including ESA-listed species, will be minimized by adhering to the designated in-water work period. Project-related activities may cause some fish to leave the area of disturbance, thus temporarily impacting marine mammals' foraging opportunities in a limited portion of the foraging range, but because of the relatively small area of the habitat range utilized by each species that may be affected, the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences.

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. The pile driving activities analyzed here are similar to, or less impactful than, numerous construction activities conducted in other similar locations including Hood Canal, which have taken place with no reported injuries or mortality to marine mammals, and no known long-term adverse consequences from behavioral harassment. Repeated exposures of individuals to levels of sound that may cause Level B harassment are unlikely to result in permanent hearing impairment or to significantly disrupt foraging behavior. Level B harassment will be reduced through use of mitigation measures described herein.

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 stocks through effects on annual rates of recruitment or survival:

- No mortality or serious injury is anticipated or authorized;
- The area of potential impacts is highly localized;
- No adverse impacts to marine mammal habitat;
- The absence of any significant habitat within the project area, including rookeries, or known areas or features of special significance for foraging or reproduction;
- Anticipated incidences of Level A harassment would be in the form of a small degree of PTS to a limited number of animals;
- Anticipated incidents of Level B harassment consist of, at worst, temporary modifications in behavior;
- The anticipated efficacy of the required mitigation measures 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.

Table 9 depicts the number of animals that could be exposed to Level A and Level B harassment from work associated with the SPE project. With the exception of harbor seals, the analysis provided indicates that authorized takes account for no more than 24.3 percent of the populations of the stocks that could be affected. These are small numbers of marine mammals relative to the sizes of the affected species and population stocks under consideration.

For the affected stock of harbor seals, no valid abundance estimate is available. The most recent abundance estimates for harbor seals in Washington inland waters are from 1999, and it is generally believed that harbor seal populations have increased significantly during the intervening years (*e.g.,* Mapes, 2013). However, we anticipate that takes estimated to occur for harbor seals are likely to occur only within some portion of the relevant populations, rather than to animals from the stock as a whole. For example, takes anticipated to occur at NBK Bangor would be expected to accrue to the same individual seals that routinely occur on haulouts at these locations, rather than occurring to new seals on each construction day. In summary, harbor seals taken as a result of the specified activities are expected to comprise only a limited portion of individuals comprising the overall relevant stock abundance. Therefore, we preliminarily find that small numbers of marine mammals will be taken relative to the population size of the Hood Canal stock of harbor seal.

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

## Unmitigable Adverse Impact Analysis and Determination

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated by this action. Therefore, NMFS has 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.

No incidental take of ESA-listed species is proposed for authorization or expected to result from this activity. Therefore, NMFS has determined that formal consultation under section 7 of the ESA is not required for this action.

**Proposed Authorization**

As a result of these preliminary determinations, NMFS proposes to issue an IHA to the Navy for conducting vibratory and impact pile driving associated with the proposed Service Pier Extension (SPE) at Naval Base Kitsap Bangor, Washington from October 1, 2018, to September 30, 2019, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. This section contains a draft of the IHA itself. The wording contained in this section is proposed for inclusion in the IHA (if issued).

1. This Incidental Harassment Authorization (IHA) is valid from October 1, 2018 through September 30, 2019. This IHA is valid only for pile driving and extraction activities associated with the Naval Base Kitsap Bangor SPE project.

2. General Conditions.

(a) A copy of this IHA must be in the possession of the Navy, its designees, and work crew personnel operating under the authority of this IHA.

(b) The species authorized for taking are the killer whale (*Orcinus orca;* transient only), harbor porpoise *(Phocoena phocoena vomerina),* California sea lion (*Zalophus californianus*), Steller sea lion (*Eumetopias jubatus monteriensis*), and harbor seal *(Phoca vitulina richardii).*

(c) The taking, by Level A and Level B harassment, is limited to the species listed in condition 2(b). See Table 11 for numbers of Level A and Level B take authorized.

(d) The take of any other species not listed in condition 2(b) of marine mammal is prohibited and may result in the modification, suspension, or revocation of this IHA.

(e) The Navy shall conduct briefings between construction supervisors and crews, marine mammal monitoring team, acoustical monitoring team prior to the start of all pile driving activities, and when new personnel join the work, in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.

3. Mitigation Measures.

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

(a) Time Restrictions—For all in-water pile driving activities, the Navy shall operate only during daylight hours.

(b) Use of Bubble Curtain.

(i) The Navy shall employ a bubble curtain (or other sound attenuation device with proven typical performance of at least 8 dB effective attenuation) during impact pile driving of steel piles in water depths greater than 2 feet. In addition, the Navy shall implement the following performance standards.

(ii) The bubble curtain must distribute air bubbles around 100 percent of the piling perimeter for the full depth of the water column.

(iii) The lowest bubble ring shall be in contact with the mudline for the full circumference of the ring, and the weights attached to the bottom ring shall ensure 100 percent mudline contact. No parts of the ring or other objects shall prevent full mudline contact.

(iv) The Navy shall require that construction contractors train personnel in the proper balancing of air flow to the bubblers, and shall require that construction contractors submit an inspection/performance report for approval by the Navy within 72 hours following the performance test. Corrections to the attenuation device to meet the performance standards shall occur prior to impact driving.

(c) Use of Soft-Start.

(i) The project shall utilize soft start techniques for impact pile driving.

(ii) The Navy shall conduct an initial set of three strikes from the impact hammer at 40 percent energy, followed by a 1-minute waiting period, then two subsequent three strike sets.

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

(d) Establishment of Shutdown Zones.

(i) The shutdown zones pertaining specific species during impact driving and vibratory driving are shown on Tables 10, 1, and 12.

(ii) If a marine mammal comes within or approaches the shutdown zone, pile driving operations shall cease.

(iii) Pile driving and removal operations shall restart once the marine mammal is visibly seen leaving the zone or after 15 minutes have passed with no sightings.

(iii) For in-water heavy machinery work other than pile driving (using, *e.g.,*standard barges, tug boats), if a marine mammal comes within 10 m, operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions.

(iv) Shutdown shall occur if a species for which authorization has not been granted or for which the authorized numbers of takes have been met approaches or is observed within the pertinent take zone. The Navy shall then contact NMFS within 24 hours.

(d) Establishment of Level A and B Harassment Zones.

(i) The Level A and Level B zones pertaining to specific species during impact driving and vibratory driving are shown on Tables 12, 13, and 14.

(e) Pile driving activities shall not be conducted when weather/observer conditions do not allow for adequate sighting of marine mammals within the disturbance zone (*e.g.* lack of daylight/fog).

(i) In the event of conditions that prevent the visual detection of marine mammals, impact pile driving already underway shall be curtailed, but vibratory driving may continue if driving has already been initiated on a given pile.

4. Monitoring.

The holder of this Authorization is required to conduct visual marine mammal monitoring during pile driving activities.

(a) Visual Marine Mammal Observation—The Navy shall collect sighting data and behavioral responses to pile driving for marine mammal species observed in the region of activity during the period of activity. Visual monitoring shall include the following:

(i) Marine Mammal Observers (MMOs) shall be positioned at the best practicable vantage points, taking into consideration security, safety, and space limitations. The MMOs shall be stationed in a location that shall provide adequate visual coverage for the shutdown zones.

(ii) During pile driving, one MMO shall be stationed in a vessel, and at least four additional MMOs shall be stationed on the pier, along the shore, or on the pile driving barge to maximize observation coverage

(iii) Monitoring shall be conducted by trained observers, who shall have no other assigned tasks during monitoring periods. Trained observers shall be placed at the best vantage point(s) practicable to monitor for marine mammals and implement shutdown or delay procedures when applicable through communication with the equipment operator. The Navy shall adhere to the following additional observer qualifications:

(1) Independent observers (*i.e.,* not construction personnel) are required.

(2) At least one observer must have prior experience working as an observer.

(3) Other observers may substitute education (degree in biological science or related field) or training for experience.

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

(v) The Navy shall submit observer CVs for approval by NMFS.

(vi) Monitoring shall take place from 15 minutes prior to initiation of pile driving activity through 30 minutes post-completion of pile driving activity.

(b) Hydroacoustic Monitoring.

(i) If approved by the U.S. Fish and Wildlife Service, baseline sound measurements of steel pile driving shall occur prior to the implementation of noise attenuation. Impact pile driving without noise attenuation shall be limited to the number of piles necessary to obtain an adequate sample size.

(ii) If the Navy elects to conduct in-situ acoustic monitoring to establish actual distances to the thresholds for a pile type and installation method, the radii of the pertaining zones may be adjusted according to collected data.

(iii) Any proposed acoustical monitoring plan and any proposed revisions to zone radii must be pre-approved by NMFS.

(iv) A final acoustic monitoring report shall be submitted to NMFS within 30 days of completing the monitoring.

5. Reporting.

(a) A draft marine mammal monitoring report shall be submitted to NMFS within 90 days after the completion of pile driving and removal activities or a minimum of 60 days prior to any subsequent IHAs. A final report shall be prepared and submitted to the NMFS within 30 days following receipt of comments on the draft report from the NMFS. A If no comments are received from NMFS within 30 days, the draft final report shall constitute the final report. If comments are received, a final report addressing NMFS comments must be submitted within 30 days after receipt of comments.

(i) The report shall include an overall description of work completed, a narrative regarding marine mammal sightings, and associated marine mammal observation data sheets.

(ii) The report shall include all items identified in information described in Section 4 of the Marine Mammal Monitoring Plan (Appendix D of the application.)

(b) Reporting injured or dead marine mammals:

(i) In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by this IHA, such as serious injury, or mortality, the Navy shall immediately cease the specified activities and report the incident to the Office of Protected Resources, NMFS, and the West Coast Regional Stranding Coordinator, NMFS. The report must include the following information:

(1) Time and date of the incident;

(2) Description of the incident;

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

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

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

(6) Fate of the animal(s); and

(7) Photographs or video footage of the animal(s). Activities shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS shall work with the Navy to determine what measures are necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. The Navy may not resume their activities until notified by NMFS.

(ii) In the event that the Navy discovers an injured or dead marine mammal, and the lead observer determines that the cause of the injury or death is unknown and the death is relatively recent (*e.g.,* in less than a moderate state of decomposition), the Navy shall immediately report the incident to the Office of Protected Resources, NMFS, and the West Coast Regional Stranding Coordinator, NMFS. The report must include the same information identified in 5(b)(i) of this IHA. Activities may continue while NMFS reviews the circumstances of the incident. NMFS shall work with the Navy to determine whether additional mitigation measures or modifications to the activities are appropriate.

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

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

## Request for Public Comments

We request comment on our analyses, the draft authorization, and any other aspect of this Notice of Proposed IHA for the proposed Service Pier Extension project. 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 renewal IHA without additional notice 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 renewal would allow 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; and
- The request for renewal must include the following:

(1) An explanation that the activities to be conducted beyond the initial dates either are identical to the previously analyzed activities or include changes so minor (*e.g.,* reduction in pile size) that the changes do not affect the previous analyses, take estimates, or mitigation and monitoring requirements;

(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 remain the same and appropriate, and the original findings remain valid.

Dated: March 6, 2018.

**Donna S. Wieting,**

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

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