FEDERAL REGISTER

Vol. 81 Monday,
No. 64 April 4, 2016

Part III

Department of Commerce

National Oceanic and Atmospheric Administration

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to a Pier Construction and Support Facilities Project, Port Angeles, WA; Notice

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648–XE297

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to a Pier Construction and Support Facilities Project, Port Angeles, WA

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 construction activities as part of a pier construction and support facilities project. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an incidental harassment authorization (IHA) to the Navy to incidentally take marine mammals, by Level B Harassment only, during the specified activity.

DATES: Comments and information must be received no later than May 4, 2016.

ADDRESSES: Comments on the application should be addressed to Jolie Harrison, Supervisor, Incidental Take Program, 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.McCue@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 to the Internet at *www.nmfs.noaa.gov/pr/permits/incidental.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: Laura McCue, Office of Protected Resources, NMFS, (301) 427–8401.

SUPPLEMENTARY INFORMATION:

Availability

An electronic copy of the Navy's application and supporting documents, as well as a list of the references cited in this document, may be obtained by visiting the Internet at: *www.nmfs.noaa.gov/pr/permits/incidental.htm.* In case of problems accessing these documents, please call the contact listed above (see **FOR FURTHER INFORMATION CONTACT**).

National Environmental Policy Act (NEPA)

The Navy has prepared a draft Environmental Assessment (*Pier and Support Facilities for Transit Protection System at U.S. Coast Guard Air Station/Sector Field Office Port Angeles, WA*) in accordance with the National Environmental Policy Act (NEPA) and the regulations published by the Council on Environmental Quality. It is posted at the aforementioned site. NMFS will independently evaluate the EA and determine whether or not to adopt it. We may prepare a separate NEPA analysis and incorporate relevant portions of Navy's EA by reference. Information in the Navy's application, EA, and this notice collectively provide the environmental information related to proposed issuance of this IHA for public review and comment. We will review all comments submitted in response to this notice as we complete the NEPA process, including a decision of whether to sign a Finding of No Significant Impact (FONSI), prior to a final decision on the incidental take authorization request.

Background

Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce to allow, upon request by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified area, the incidental, but not intentional, taking of small numbers of marine mammals, providing that certain findings are made and the necessary prescriptions are established.

The incidental taking of small numbers of marine mammals may be allowed only if NMFS (through authority delegated by the Secretary) finds that the total taking by the specified activity during the specified time period will (i) have a negligible impact on the species or stock(s) and (ii) not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). Further, the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such taking must be set forth, either in specific regulations or in an authorization.

The allowance of such incidental taking under section 101(a)(5)(A), by harassment, serious injury, death, or a combination thereof, requires that regulations be established. Subsequently, a Letter of Authorization may be issued pursuant to the prescriptions established in such regulations, providing that the level of taking will be consistent with the findings made for the total taking allowable under the specific regulations. Under section 101(a)(5)(D), NMFS may authorize such incidental taking by harassment only, for periods of not more than one year, pursuant to requirements and conditions contained within an IHA. The establishment of prescriptions through either specific regulations or an authorization requires notice and opportunity for public comment.

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.'' 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; 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.'' The former is termed Level A harassment and the latter is termed Level B harassment.

Summary of Request

On September 11, 2015, we received a request from the Navy for authorization to take marine mammals incidental to pile driving associated with the construction of a pier and support facilities at the U.S. Coast Guard (USCG) Air Station/Sector Field Office Port Angeles (AIRSTA/SFO Port Angeles), located in Port Angeles Harbor on the Ediz Hook peninsula, Port Angeles. The Navy submitted a revised version of the request on February 19, 2016, which we deemed adequate and complete on February 22, 2016.

The Navy proposes to initiate this multi-year project, involving impact and vibratory pile driving conducted within the approved in-water work windows. The proposed activity would occur from November 1, 2016 to October 31, 2017. In water work is expected to begin on November 1, 2016 in order to minimize impacts to an Atlantic Salmon net pen farm located in close proximity to the project area. In water work will conclude on February 15, 2017, and begin again from July 16 to October 31, 2017.

The use of both vibratory and impact pile driving is expected to produce underwater sound at levels that have the potential to result in behavioral harassment of marine mammals. Take, by Level B Harassment only, has been requested for individuals of five species of marine mammals (harbor porpoise [*Phocoena phocoena*], harbor seal [*Phoca vitulina*], Northern elephant seal [*Mirounga angustirostris*], Steller sea lion [*Eumatopias jubatus*], and California sea lion [*Zalophus californianus*]).

Description of the Specified Activity

Overview

The Navy has increased security for in-transit Fleet Ballistic Missile Submarines (SSBNs) in inland marine waters of northern Washington by establishing a Transit Protection System (TPS) that relies on the use of multiple escort vessels. The purpose of the Pier and Support Facilities for TPS project is to provide a staging location for TPS vessels and crews that escort incoming and outgoing SSBNs between dive/surface points in the Strait of Juan de Fuca and Naval Base (NAVBASE) Kitsap Bangor.

Specific activities that can be expected to result in the incidental taking of marine mammals are limited to the driving of steel piles used for installation of the trestle/fixed pier/floating docks, and the removal of existing piles.

Vibratory pile driving is the preferred method for production piles and would be the initial starting point for each installation; however, impact pile driving methods may be necessary based on substrate conditions. Once a pile hits ''refusal,'' which is where hard solid or dense substrate (*e.g.,* gravel, boulders) prevents further pile movement by vibratory methods, impact pile driving is used to drive the pile to depth.

All piles would be driven with a vibratory hammer for their initial embedment depths, while select piles may be finished with an impact hammer for proofing, as necessary. There would be no concurrent pile driving or multiple hammers operating simultaneously. Proofing involves striking a driven pile with an impact hammer to verify that it provides the required load-bearing capacity, as indicated by the number of hammer blows per foot of pile advancement. Sound attenuation measures (*i.e.,* bubble curtain) would be used during all impact hammer operations.

Dates and Duration

Under the proposed action, in-water construction is anticipated to begin in 2016 and require two in-water work window seasons. The allowable season for in-water work, including pile driving, at AIRSTA/SFO Port Angeles is November 1, 2016 through February 15, 2017, and July 16, 2017 through October 31, 2017, a window established by the Washington Department of Fish and Wildlife in coordination with NMFS and the U.S. Fish and Wildlife Service (USFWS) to protect juvenile salmon (*Oncorhynchus spp.*) and bull trout (*Salvelinus confluentus*). Overall, a maximum of 75 days of pile driving are anticipated within these in-water work windows. All in-water construction activities will occur during daylight hours (sunrise to sunset) except from July 16 to February 15 when impact pile driving/removal will only occur starting 2 hours after sunrise and ending 2 hours before sunset, to protect foraging marbled murrelets (an Endangered Species Act [ESA]-listed bird under the jurisdiction of USFWS) during nesting season (April 1–September 23). Other construction (not in-water) may occur between 7 a.m. and 10 p.m., year-round.

Specific Geographic Region

AIRSTA/SFO Port Angeles is located in the Strait of Juan de Fuca, approximately 62 miles (100 km) east of Cape Flattery, and 63 miles (102 km) northwest of Seattle, Washington on the Olympic Peninsula (see Figure 1–1 in the Navy's application). The Strait of Juan de Fuca is a wide waterway stretching from the Pacific Ocean to the Salish Sea. The strait is 95 miles (153-km) long, 15.5 miles (25 km) wide, and has depths ranging from 180 m to 250 m on the pacific coast and 55 m at the sill. Please see Section 2 of the Navy's application for detailed information about the specific geographic region, including physical and oceanographic characteristics.

Detailed Description of Activities

The purpose of the Pier and Support Facilities for TPS project (the project) is to provide a staging location for TPS vessels and crews that escort incoming and outgoing SSBNs between dive/surface points in the Strait of Juan de Fuca and Naval Base (NAVBASE) Kitsap Bangor. The Navy has increased security for in-transit Fleet Ballistic Missile Submarines (SSBNs) in inland marine waters of northern Washington by establishing a Transit Protection System (TPS) that relies on the use of multiple escort vessels. Construction of the pier and support facilities is grouped into three broad categories: (1) Site Work Activities (2) Construction of Upland Facilities (Alert Forces Facility [AFF] and Ready Service Armory [RSA]), and (3) Construction of Trestle/Fixed Pier/Floating Docks.

The trestle, fixed pier, and floating docks would result in a permanent increase in overwater coverage of 25,465 square-feet (ft^2) (2,366 square meters [m^2]). An estimated 745 ft^2 (69 m^2) of benthic seafloor would be displaced from the installation of the 144 permanent steel piles. The fixed pier will lie approximately 354 ft (108 m) offshore at water depths between −40 ft (−12 m) and −63 ft (19 m) mean lower low water (MLLW). It would be constructed of precast concrete and be approximately 160 feet long and 42 feet wide (49 m by 13 m). The fixed pier would have two mooring dolphins that connect to the fixed pier via a catwalk, and would be supported by 87 steel piles and result in 10,025 ft^2 (931 m^2) of permanent overwater coverage. The floating docks including brows would be supported by 21 steel piles and result in 5,380 ft^2 (500 m^2) of permanent overwater coverage. The trestle would provide vehicle and pedestrian access to the pier and convey utilities to the pier. It would be installed between +7 ft (2 m) MLLW and −45 ft (−14 m) MLLW. The trestle would be approximately 355 feet long (108 m) long and 24 feet (7 m) wide and constructed of precast concrete. The trestle would be designed to support a 50 pound per square foot (psf) (244 kilograms [kg] per square m) live load or a utility trailer with a total load of 3,000 pounds (1,360 kg), and would be supported by 36 steel piles and result in 10,060 ft^2 (935 m^2) of permanent overwater coverage.

For the entire project, pile installation would include the installation and removal of 80 temporary indicator piles, installation of 60 permanent sheet piles, and installation of 144 permanent steel piles (Table 1). The indicator piles are required to determine if required bearing capacities will be achieved with the production piles, and to assess whether the correct vibratory and impact hammers are being used. The process will be to vibrate the piles to within 5 ft (1.5 m) of the target embedment depth required for the project, let the piles rest in place for a day, and then impact drive the piles the final 5 ft (1.5 m). If the indicator piles cannot be successfully vibrated in, then a larger hammer will be used for the production piles. The impact driving will also provide an indication of bearing capacity via proofing. Each indicator pile would then be vibratory extracted (removed) using a vibratory hammer.

A maximum of 75 days of pile driving may occur. Table 1 summarizes the number and nature of piles required for the entire project.

TABLE 1—SUMMARY OF PILES REQUIRED FOR PIER CONSTRUCTION

[In total]

Feature	Quantity and size
Total number of in-water piles.	Up to 284.*
Indicator temporary ...	24-in: 80.
Sheet pile wall	PZC13 Steel sheet piles: 60.
Trestle	18-in: 16, 24-in: 12, 36-in: 8.
Fixed pier piles	24-in: 28, 30-in: 49, 36-in: 10.
Floating docks	24-in: 3, 30-in: 6, 36-in: 12.
Maximum pile driving duration.	75 days (under one-year IHA).

* Pile installation would include the installation and removal of 80 temporary indicator piles, installation of 60 permanent sheet piles, and installation of 144 permanent steel piles.

Pile installation will utilize vibratory pile drivers to the greatest extent possible, and the Navy anticipates that most piles will be able to be vibratory driven to within several feet of the required depth. Pile drivability is, to a large degree, a function of soil conditions and the type of pile hammer. Most piles should be able to be driven with a vibratory hammer to proper embedment depth. However, difficulties during pile driving may be encountered as a result of obstructions, such as rocks or boulders, which may exist throughout the project area. If difficult driving conditions occur, increased usage of an impact hammer will occur.

Pile production rates are dependent upon required embedment depths, the potential for encountering difficult driving conditions, and the ability to drive multiple piles without a need to relocate the driving rig. If difficult subsurface driving conditions (*e.g.,* cobble/boulder zones) are encountered that cause refusal with the vibratory equipment, it may be necessary to use an impact hammer to drive some piles for the remaining portion of their required depth. The worst-case scenario is that a pile would be driven for its entire length using an impact hammer. Given the uncertainty regarding the types and quantities of boulders or cobbles that may be encountered, and the depth at which they may be encountered, the number of strikes necessary to drive a pile its entire length would vary. All piles driven or struck with an impact hammer would be surrounded by a bubble curtain over the full water column to minimize in-water sound. Pile production rate (number of piles driven per day) is affected by many factors: Size, type (vertical versus angled), and location of piles; weather; number of driver rigs operating; equipment reliability; geotechnical (subsurface) conditions; and work stoppages for security or environmental reasons (such as presence of marine mammals).

Description of Marine Mammals in the Area of the Specified Activity

There are eleven marine mammal species with recorded occurrence in the Strait of Juan de Fuca, including seven cetaceans and four pinnipeds. Of these eleven species, only five are expected to have a reasonable potential to be in the vicinity of the project site. These species are harbor porpoise (*Phocoena phocoena*), harbor seal (*Phoca vitulina*), Northern elephant seal (*Mirounga angustirostris*), Steller sea lion (*Eumatopias jubatus*), and California sea lion (*Zalophus californianus*). Harbor seals occur year round throughout the nearshore inland waters of Washington. Harbor seals are expected to occur year round in Port Angeles Harbor, with a nearby haul-out site on a log boom located approximately 1.7 miles (2.7 km) west of the project site and another haul-out site 1.3 miles (2.1 km) south of the project. Steller sea lions and California sea lions may occur in the area, but there are no site-specific surveys on these species. Harbor porpoises and Northern elephant seal are rare through the project area. The Dall's porpoise (*Phocoenoides dalli dalli*), humpback whale (*Megaptera novaeangliae*), minke whale (*Balaenoptera acutorostrata*), gray whale (*Eschrichtius robustus*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), and killer whales (*Orcinus orca*) are extremely rare in Port Angeles Harbor, and we do not believe there is a reasonable likelihood of their occurrence in the project area during the proposed period of validity for this IHA.

We have reviewed the Navy's detailed species descriptions, including life history information, for accuracy and completeness and refer the reader to Sections 3 and 4 of the Navy's application instead of reprinting the information here. Please also refer to NMFS' Web site (*www.nmfs.noaa.gov/pr/species/mammals*) for generalized species accounts and to the Navy's Marine Resource Assessment for the Pacific Northwest, which documents and describes the marine resources that occur in Navy operating areas of the Pacific Northwest, including Strait of Juan de Fuca (DoN, 2006). The document is publicly available at *www.navfac.navy.mil/products_and_services/ev/products_and_services/marine_resources/marine_resource_assessments.html* (accessed February 1, 2016).

Table 2 lists the eleven marine mammal species with expected potential for occurrence in the vicinity of AIRSTA/SFO Port Angeles during the project timeframe, and summarizes key information regarding stock status and abundance. Taxonomically, we follow Committee on Taxonomy (2014). Please see NMFS' Stock Assessment Reports (SAR), available at *www.nmfs.noaa.gov/pr/sars,* for more detailed accounts of these stocks' status and abundance. The harbor seal, California sea lion, Northern elephant seal, Dall's porpoise, Pacific white-sided dolphins, harbor porpoise, southern resident killer whale, humpback whale, minke whale, and gray whale are addressed in the Pacific SARs (*e.g.,* Carretta *et al.,* 2015), while the Steller sea lion and West coast transient killer whale are treated in the Alaska SARs (*e.g.,* Muto and Angliss, 2015).

In the species accounts provided here, we offer a brief introduction to the species and relevant stock as well as available information regarding population trends and threats, and describe any information regarding local occurrence.

TABLE 2—MARINE MAMMALS POTENTIALLY PRESENT IN THE VICINITY OF AIRSTA/SFO PORT ANGELES

Species	Stock	ESA/MMPA status; Strategic (Y/N) [1]	Stock abundance (CV, N_{min}, most recent abundance survey) [2]	PBR [3]	Annual M/SI [4]	Relative occurrence in Strait of Juan de Fuca; season of occurrence
Order Cetartiodactyla—Cetacea—Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Phocoenidae (porpoises)						
Harbor porpoise	Washington inland waters [5].	-; N	10,682 (0.38; 7,841; 2003).	63	≥2.2	Possible regular presence in the Strait of Juan de Fuca, but unlikely near PAH; year-round.
Dall's porpoise	CA/OR/WA	-; N	42,000 (0.33; 32,106; 2008).	257	>0.4	Rare.
Order Cetartiodactyla—Cetacea—Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Delphinidae (dolphins)						
Pacific white-sided dolphin.	CA/OR/WA	-; N	26,930 (0.28; 21,406; 2008).	171	17.8	Rare.
Killer whale	West coast transient	-; N	243 (n/a; 243; 2009)	2.4	0	Unlikely.
	Southern resident	E; S	78 (n/a; 78; 2014)	0.14	0	
Order Cetartiodactyla—Cetacea—Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Balaenopteridae						
Humpback whale	CA/OR/WA	E; S	1,918 (0.03; 1,855; 2011).	11	>5.5	Unlikely.
Minke whale	CA/OR/WA	-; N	478 (1.36; 202; 2008)	2	0	Unlikely.
Order Cetartiodactyla—Cetacea—Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Eschrichtiidae						
Gray whale	Eastern N. Pacific	-; N	20,990 (0.05; 20,125; 2011).	624	132	Unlikely.
Order Carnivora—Superfamily Pinnipedia						
Family Otariidae (eared seals and sea lions)						
California sea lion	U.S.	-; N	296,750 (n/a; 153,337; 2011).	9,200	389	Seasonal/common; Fall to late spring (Aug to Jun).
Steller sea lion	Eastern U.S.	-; S	60,131- 74,448 (n/a; 36,551; 2013) [6].	[7] 1,645	92.3	Seasonal/occasional; Fall to late spring (Sep to May).
Family Phocidae (earless seals)						
Harbor seal [8]	Washington inland waters [5].	-; N	11,036 (0.15; n/a; 1999)	n/a	9.8	Common; Year-round resident.
Northern elephant seal	California breeding stock.	-; N	179,000 (n/a; 81,368; 2010).	4,882	8.8	Seasonal/rare: Spring to late fall (Apr to Nov).

[1] ESA status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR (see footnote 3) 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] CV is coefficient of variation; N_{min} is the minimum estimate of stock abundance. In some cases, CV is not applicable. For certain stocks of pinnipeds, abundance estimates are based upon observations of animals (often pups) ashore multiplied by some correction factor derived from knowledge of the specie's (or similar species') life history to arrive at a best abundance estimate; therefore, there is no associated CV. In these cases, the minimum abundance may represent actual counts of all animals ashore.

[3] Potential biological removal, 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 size (OSP).

[4] These values, found in NMFS' SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (*e.g.,* commercial fisheries, subsistence hunting, ship strike). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value. All values presented here are from the draft 2015 SARs (*www.nmfs.noaa.gov/pr/sars/draft.htm*) except harbor seals. See comment 8.

[5] 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 and PBR values, as these represent the best available information for use in this document.

[6] Best abundance is calculated as the product of pup counts and a factor based on the birth rate, sex and age structure, and growth rate of the population. A range is presented because the extrapolation factor varies depending on the vital rate parameter resulting in the growth rate (*i.e.,* high fecundity or low juvenile mortality).

[7] PBR is calculated for the U.S. portion of the stock only (excluding animals in British Columbia) and assumes that the stock is not within its OSP. If we assume that the stock is within its OSP, PBR for the U.S. portion increases to 2,069.

[8] Values for harbor seal presented here are from the 2013 SAR.

Although the humpback whale (*Megaptera novaeangliae*), minke whale (*Balaenoptera acutorostrata*), gray whale (*Eschrichtius robustus*), killer whale (*Orcinus orca*), Dall's porpoise (*Phocoenoides dalli*), and Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) occur in the Strait of Juan de Fuca, these marine mammals species are an extremely rare occurrence in Port Angeles Harbor. Characteristics of Port Angeles Harbor that inhibit or deter use by these marine mammals include the semi-enclosed embayment with no through access and high volume of vessel traffic that include tankers, dry bulk cargo carriers, barges, tugs, fishing boats, leisure craft, Puget Sound Pilots craft, and ferry service, as well as USCG and Navy vessels. The smaller Dall's porpoise and Pacific white-sided dolphin are considered offshore, deep water species and would likely avoid the embayment of Port Angeles Harbor. This species also exhibit fidelity to foraging areas, and there are no known foraging areas in the behavioral harassment zone. In addition, the larger sized whales are highly visible and more likely to be detected outside of behavioral harassment zones (see Section 6.3.1 *Underwater Sound Propagation*) by marine mammal observers (protected species observers [PSOs]); therefore, exposure, and possibly behavioral harassment could be avoided. These six species are not carried forward for further analysis beyond this section. The five species for which occurrence in/near Port Angeles harbor is likely are described further below.

Harbor Porpoise

Harbor porpoises are found primarily in inshore and relatively shallow coastal waters (<100 m) from Point Barrow (Alaska) to Point Conception (California). Various genetic analyses and investigation of pollutant loads indicate a low mixing rate for harbor porpoises along the west coast of North America and likely fine-scale geographic structure along an almost continuous distribution from California to Alaska (*e.g.,* Osmek *et al.,* 1994; Chivers *et al.,* 2002, 2007). However, stock boundaries are difficult to draw because any rigid line is generally arbitrary from a biological perspective. On the basis of genetic data and density discontinuities identified from aerial surveys, eight stocks have been identified in the eastern North Pacific, including northern Oregon/Washington coastal and inland Washington stocks (Carretta *et al.,* 2013a). The Washington inland waters stock includes individuals found east of Cape Flattery and is the only stock that may occur in the project area.

The Washington inland waters stock has a population estimate of 10,682 animals (Caretta *et al.,* 2015). A recent aerial survey from April, 2015 provided an estimate of harbor porpoise in the Strait of Juan de Fuca of 647 individuals (Smultsea, *et al.,* 2015). The status of this stock relative to its Optimum Sustainable Population (OSP) level and population trends is unknown (Caretta *et al.,* 2015). The stock is not considered ''depleted'' or listed as a ''strategic stock'' under the MMPA and is not listed as ''threatened'' or ''endangered'' under the ESA.

Within the Exclusive Economic Zone (EEZ) boundaries of the coastal waters of northern Oregon and Washington, harbor porpoise deaths are known to occur in the northern Washington marine set gillnet tribal fishery. Fishing effort in the coastal marine set gillnet tribal fishery has declined since 2004. A mean annual mortality of 3.0 harbor porpoise was calculated in 2007–2011 from stranding data. Since these deaths could not be attributed to a particular fishery, and were the only confirmed fishery-related deaths in this area in 2007–2011, they are noted in unknown West Coast fisheries (Caretta *et al.,* 2013). In 2006, a UME was declared for harbor porpoises throughout Oregon and Washington, and a total of 114 strandings were reported in 2006–07. The cause of the UME has not been determined and several factors, including contaminants, genetics, and environmental conditions, are still being investigated (Carretta *et al.,* 2013a).

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.,* 1998; Carretta *et al.,* 2012). Recent aerial surveys from April, 2015 reported that harbor porpoise was the most commonly sighted species in the Strait of Juan de Fuca, with 154 groups sighted over 4 days (Smultsea *et al.,* 2015). In the Strait of Juan de Fuca, harbor porpoise are seasonally localized in relatively small areas during the reproductive season (April–October). More densely localized aggregations and increased seasonal densities have been reported in the Strait of Juan de Fuca, near Victoria (Hall *et al.,* 2002). A photo-identification study in the San Juan Islands also provides evidence for local, discrete subpopulations (Flaherty and Stark 1982) with a high degree of site fidelity (Hall 2009). Harbor porpoise tend to occupy an ecological niche consisting of relatively shallow water, generally less than 650 ft (200 m) deep (Hall 1996; Lockyer *et al.* 2001; Hall 2004). No site-specific information is available for Port Angeles Harbor. Harbor porpoise could forage within Port Angeles Harbor, following local prey availability, but because of the strong site fidelity and lack of sightings in the harbor, use of the project area would be rare.

Northern Elephant Seal

Northern elephant seals that may occur in the activity area would belong to the California breeding stock. The current best abundance estimate for the California breeding stock of Northern elephant seal is 179,000 individuals (Caretta *et al.,* 2015). This stock of Northern elephant seal is not designated as ''depleted'' under the MMPA nor are they listed as ''threatened'' or ''endangered'' under the ESA. The level of human-caused mortality and serious injury is not known to exceed the PBR, which is 4,882. This stock of Northern elephant seals is not classified as a strategic stock (Allen and Angliss 2014). The population continues to grow, with most births occurring at southern California rookeries (Lowry *et al.* 2014). There are no known habitat issues that are of concern for this stock. However, expanding pinniped populations in general have resulted in increased human-caused serious injury and mortality, due to shootings, entrainment in power plants, interactions with recreational hook and line fisheries, separation of mothers and pups due to human disturbance, dog bites, and vessel and vehicle strikes (Carretta *et al.* 2014).

The northern elephant seal occurs almost exclusively in the eastern and central North Pacific. Rookeries are located from central Baja California, Mexico, to northern California (Stewart and Huber 1993). Recent aerial surveys from April, 2015 reported no sighting of elephant seals in the Strait of Juan de Fuca (Smultsea *et al.,* 2015). Adult elephant seals engage in two long migrations per year, one following the breeding season, and another following the annual molt (Stewart and DeLong 1995; Robinson *et al.,* 2012). Between the two foraging periods, they return to land to molt, with females returning earlier than males (March through April versus July through August). After the molt, adults return to their northern feeding areas until the next winter breeding season. Breeding occurs from December to March (Stewart and Huber 1993). Juvenile elephant seals typically leave the rookeries in April or May and head north, traveling an average of 559 to 621 miles (900 to 1,000 km). Most elephant seals return to their natal rookeries when they start breeding (Huber *et al.* 1991). Their foraging range extends thousands of miles offshore into the central North Pacific. Adults tend to stay offshore, but juveniles and subadults are often seen along the coasts of Oregon, Washington, and British Columbia (Condit and Le Boeuf 1984; Stewart and Huber 1993).

Small numbers of juvenile elephant seals haul out and go through their molting process in Washington State. Molting is a natural condition that takes 4 to 5 weeks to complete. In Washington inland waters, there are regular haul-out sites at Smith and Minor Islands, Dungeness Spit, and Protection Island in the Strait of Juan de Fuca that are thought to be used year round (Jeffries *et al.,* 2000). Juvenile elephant seals haul out along the shoreline for several weeks, occasionally entering the water and returning to the same area again. Hauling out allows the skin to warm up and help speed up the molting process. WDFW surveys in 2013 reported two haul-out sites with two individuals present (WDFW 2015). The closest documented haul-out is at Dungeness Spit, 11 miles (18 km) east of the project where one elephant seal was last reported in 2006 (WDFW 2015). Northern elephant seals are not expected to occur within Port Angeles Harbor because there are no known haul-outs and they typically use the same sites repeatedly; however, it is possible a juvenile could haul out near the project site and once on shore would likely stay for the duration of the project. In addition, elephant seals could forage within Port Angeles Harbor, following local prey availability.

Steller Sea Lion

Steller sea lions are distributed mainly around the coasts to the outer continental shelf along the North Pacific rim from northern Hokkaido, Japan through the Kuril Islands and Okhotsk Sea, Aleutian Islands and central Bering Sea, southern coast of Alaska and south to California (Loughlin *et al.,* 1984). Based on distribution, population response, and phenotypic and genotypic data, two separate stocks of Steller sea lions are recognized within U. S. waters, with the population divided into western and eastern distinct population segments (DPS) at 144° W. (Cape Suckling, Alaska) (Loughlin, 1997). The eastern DPS extends from California to Alaska, including the Gulf of Alaska, and is the only stock that may occur near Port Angeles Harbor.

According to NMFS' recent status review (NMFS, 2013), the best available information indicates that the overall abundance of eastern DPS Steller sea lions has increased for a sustained period of at least three decades while pup production has also increased significantly, especially since the mid-1990s. Johnson and Gelatt (2012) provided an analysis of growth trends of the entire eastern DPS from 1979–2010, indicating that the stock increased during this period at an annual rate of 4.2 percent (90 percent CI 3.7–4.6). Most of the overall increase occurred in the northern portion of the range (southeast Alaska and British Columbia), but pup counts in Oregon and California also increased significantly (*e.g.,* Merrick *et al.,* 1992; Sease *et al.,* 2001; Olesiuk and Trites, 2003; Fritz *et al.* 2008; Olesiuk, 2008; NMFS, 2008, 2013). Because the counts of eastern Steller sea lions have steadily increased over a 30+ year period, this stock is likely within its OSP; however, no determination of its status relative to OSP has been made (Allen and Angliss, 2014).

Between 2008 and 2012, a minimum total of 64 animals from the eastern Steller sea lion stock were reported taken. The annual average take for subsistence harvest in Alaska was 11 individuals in 2004–08 (Muto and Angliss, 2015). Data on community subsistence harvests is no longer being collected, and this average is retained as an estimate for current and future subsistence harvest. Sea lion deaths are also known to occur because of illegal shooting, vessel strikes, or capture in research gear and other traps (Muto and Angliss, 2015). The mean average human-caused mortality and serious injury of eastern Steller sea lions for 2008–2012 from sources other than fisheries and Alaska Native harvest is 29.4.

The population is estimated to be within the range of 60,131 and 74,448 animals. This stock is not listed as ''depleted'' under the MMPA, and is not listed as ''threatened'' or ''endangered'' under the ESA (Alaska SAR). It is considered a strategic stock under the MMPA.

The eastern stock breeds in rookeries located in southeast Alaska, British Columbia, Oregon, and California. There are no known breeding rookeries in Washington (Allen and Angliss, 2014) but eastern stock Steller sea lions are present year-round along the outer coast of Washington, including immature animals or non-breeding adults of both sexes. In Washington, Steller sea lions primarily occur at haul-out sites along the outer coast from the Columbia River to Cape Flattery and in inland waters sites along the Vancouver Island coastline of the Strait of Juan de Fuca (Jeffries *et al.,* 2000; Olesiuk and Trites, 2003; Olesiuk, 2008). Numbers vary seasonally in Washington waters with peak numbers present during the fall and winter months (Jeffries *et al.,* 2000). Recent aerial surveys from April, 2015 reported seven groups of Steller sea lions sighted in the Strait of Juan de Fuca (Smultsea *et al.,* 2015).

There are no known Steller sea lions haul-outs in Port Angeles Harbor (WDFW, 2015). The nearest haul-out to the project site is approximately 12.5 miles (20 kilometers) across the Strait of Juan de Fuca at Race Rocks and identified to have an annual maximum number of greater than 100 animals (Wiles, 2015). Animal censuses at the Race Rocks Ecological Reserve between January 2014 and January 2016 indicated a peak abundance in September to December, with numbers that ranged from 200 to 500 individuals (Race Rocks Ecological Reserve Web site 2016). The Steller sea lions at Race Rocks are mainly bachelor bulls or juvenile yearlings. This is not a breeding colony, and mature females are not usually present (Race Rocks Ecological Reserve Web site 2016). In contrast, a haul-out about 30 miles (48 km) east of the project at Point Wilson was surveyed November 2013 with one Steller sea lion (WDFW, 2015). Steller sea lions could forage within Port Angeles Harbor, following local prey availability, but because haul-outs are far away, use of the area is likely limited.

Harbor Seal

Harbor seals inhabit coastal and estuarine waters and shoreline areas of the northern hemisphere from temperate to polar regions. The eastern North Pacific subspecies is found from Baja California north to the Aleutian Islands and into the Bering Sea. Multiple lines of evidence support the existence of geographic structure among harbor seal populations from California to Alaska (*e.g.,* O'Corry-Crowe *et al.,* 2003; Temte, 1986; Calambokidis *et al.,* 1985; Kelly, 1981; Brown, 1988; Lamont *et al.,* 1996; Burg, 1996). Harbor seals are generally non-migratory, and analysis of genetic information suggests that genetic differences increase with geographic distance (Westlake and O'Corry-Crowe, 2002). However, because stock boundaries are difficult to meaningfully draw from a biological perspective, three separate harbor seal stocks are recognized for management purposes along the west coast of the continental U.S.: (1) Inland waters of Washington (including Hood Canal, Puget Sound, and the Strait of Juan de Fuca out to Cape Flattery), (2) outer coast of Oregon and Washington, and (3) California (Carretta *et al.,* 2013a). Multiple stocks are recognized in Alaska. Samples from Washington, Oregon, and California demonstrate a high level of genetic diversity and indicate that the harbor seals of Washington inland waters possess unique haplotypes not found in seals from the coasts of Washington, Oregon, and California (Lamont *et al.,* 1996). Only the Washington inland waters stock may be found in the project area.

Recent genetic evidence suggests that harbor seals of Washington inland waters may have sufficient population structure to warrant division into multiple distinct stocks (Huber *et al.,* 2010, 2012). Within U.S. west coast waters, five stocks of harbor seals are recognized: (1) Southern Puget Sound (south of the Tacoma Narrows Bridge); (2) Washington Northern Inland Waters (including Puget Sound north of the Tacoma Narrows Bridge, the San Juan Islands, and the Strait of Juan de Fuca); (3) Hood Canal; (4) Oregon/Washington Coast; and (5) California. Until this stock structure is accepted, we consider a single Washington inland waters stock.

In 1999, the mean count of harbor seals occurring in Washington's inland waters was 7,213 (CV = 0.14) in Washington Northern Inland Waters (Caretta, *et al.,* 2015). The most recent population estimate available for the Washington inland waters stock comes from the 2013 SAR, which reported 11,036 animals. The draft 2015 SAR (Caretta *et al.,* 2015) currently lists the population size as unknown and PBR as undetermined. Harbor seal counts in Washington State increased at an annual rate of six percent from 1983–96, increasing to ten percent for the period 1991–96 (Jeffries *et al.,* 1997).

Harbor seals occur year round throughout the nearshore inland waters of Washington. Harbor seals are expected to occur year round in Port Angeles Harbor, with a nearby haul-out site on a log boom located approximately 1.7 miles (2.7 km) west of the project site that was last surveyed in March 2013 and had a total count of 73 harbor seals (WDFW 2015). Another haulout site is 1.3 miles (2.1 km) south of the project but is across the harbor that was last surveyed in July 2010 and had a total count of 87 harbor seals (WDFW 2015). The level of use of these haul-outs during the fall and winter is unknown, but is expected to be much less as air temperatures become colder than water temperatures, resulting in seals in general hauling out less (Pauli and Terhune 1987). Harbor seals may also use other undocumented haul-out sites near the project site. Recent aerial surveys from April, 2015 reported that harbor seals were the most commonly sighted pinniped in the Strait of Juan de Fuca, with nearly 1400 individuals sighted in 286 groups (Smultsea *et al.,* 2015).

California Sea Lion

California sea lions range from the Gulf of California north to the Gulf of Alaska, with breeding areas located in the Gulf of California, western Baja California, and southern California. Five genetically distinct geographic populations have been identified: (1) Pacific temperate, (2) Pacific subtropical, and (3–5) southern, central, and northern Gulf of California (Schramm *et al.,* 2009). Rookeries for the Pacific temperate population are found within U.S. waters and just south of the U.S.-Mexico border, and animals belonging to this population may be found from the Gulf of Alaska to Mexican waters off Baja California. For management purposes, a stock of California sea lions comprising those animals at rookeries within the U.S. is defined (*i.e.,* the U.S. stock of California sea lions) (Carretta *et al.,* 2014). Pup production at the Coronado Islands rookery in Mexican waters is considered an insignificant contribution to the overall size of the Pacific temperate population (Lowry and Maravilla-Chavez, 2005).

Trends in pup counts from 1975 through 2008 have been assessed for four rookeries in southern California and for haul-outs in central and northern California. During this time period counts of pups increased at an annual rate of 5.4 percent, excluding six El Nino years when pup production declined dramatically before quickly rebounding (Carretta *et al.,* 2013a). The maximum population growth rate was 9.2 percent when pup counts from the El Niño years were removed. This stock has an estimated population abundance of 296,750 animals. California sea lions in the U.S. are not listed as ''endangered'' or ''threatened'' under the Endangered Species Act or as ''depleted'' under the MMPA (Caretta *et al.,* 2015).

The average annual commercial fishery mortality is 331 animals per year. Total human-caused mortality of this stock is at least 389 animals per year. In addition, a summary of stranding database records for 2005–09 shows an annual average of 65 such events, which is likely a gross underestimate because most carcasses are not recovered. California sea lions may also be removed because of predation on endangered salmonids (seventeen per year, 2008–10) or incidentally captured during scientific research (three per year, 2005–09) (Carretta *et al.,* 2013a). Sea lion mortality has also been linked to the algal-produced neurotoxin domoic acid (Scholin *et al.,* 2000). Future mortality may be expected to occur, due to the sporadic occurrence of such harmful algal blooms. There was an Unusual Mortality Event (UME) declaration in effect for California sea lions from 2013–2015. Beginning in January 2013, elevated strandings of California sea lion pups have been observed in southern California, with live sea lion strandings nearly three times higher than the historical average. Findings to date indicate that a likely contributor to the large number of stranded, malnourished pups was a change in the availability of sea lion prey for nursing mothers, especially sardines. The causes and mechanisms of this UME remain under investigation (*www.nmfs.noaa.gov/pr/health/mmume/californiasealions2013.htm;* accessed January 29, 2016).

An estimated 3,000 to 5,000 California sea lions migrate northward along the coast to central and northern California, Oregon, Washington, and Vancouver Island during the non-breeding season from September to May (Jeffries *et al.,* 2000) and return south the following spring (Mate, 1975; Bonnell *et al.,* 1983). Peak numbers of up to 1,000 California sea lions occur in Puget Sound (including Hood Canal) during this time period (Jeffries *et al.,* 2000).

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 miles (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, probably in response to changes in prey availability. In the nonbreeding season, adult and subadult males migrate north along the coast to central and northern California, Oregon, Washington, and Vancouver Island, and return south in the spring. Their distribution shifts to the northwest in fall and to the southeast during winter and spring. Recent aerial surveys from April, 2015 reported 12 sightings of California sea lions in the Strait of Juan de Fuca representing 13 individuals (Smultsea *et al.,* 2015). California sea lions are occasionally sighted hundreds of miles offshore. The animals found in northwest waters are typically males; most adult females with pups remain 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.

Dedicated, regular haul-outs used by adult and subadult California sea lions in Washington inland waters have been identified (Jeffries *et al.,* 2000). There are no known California sea lion haul-outs in Port Angeles Harbor (WDFW 2015). The nearest haul-out is about 40 miles (64 km) east of the project site near Admiralty Inlet (Jeffries *et al.,* 2000). California sea lions are typically present between August and June in Washington inland waters, with peak abundance numbers occurring between October and May (NMFS 1997; Jeffries *et al.,* 2000). California sea lions could forage within Port Angeles Harbor, following local prey availability, but because haul-outs are far away, use of the project area is likely limited. During the summer months and associated breeding periods, the inland waters would not be considered a high-use area by California sea lions, because they would be returning to rookeries in California waters. However, surveys at Navy facilities, primarily located in Hood Canal, indicate that a few individuals are present through mid-June to July, with some arrivals in August and in some cases individuals present year round (U.S. Department of the Navy 2015). The limited number of California sea lions observed during these surveys suggests that a few individual animals could be moving through the Strait Juan de Fuca and may use the activity area before heading to established haul-out sites to the east within the inland waters of Puget Sound.

Potential Effects of the Specified Activity on Marine Mammals and Their Habitat

This section includes a summary and discussion of the ways that components of the specified activity (*e.g.* sound produced by pile driving), including mitigation, may impact marine mammals and their habitat. The ''Estimated Take by Incidental Harassment'' section later in this document will include a quantitative analysis of the number of individuals that are expected to be taken by this activity. The ''Negligible Impact Analysis'' section will include the analysis of how this specific activity will impact marine mammals and will consider 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 this activity on the reproductive success or survivorship of individuals and from that on the affected marine mammal populations or stocks.

In the following discussion, we provide general background information on sound and marine mammal hearing before considering potential effects to marine mammals from sound produced by vibratory and impact pile driving.

Description of Sound Sources

Sound travels in waves, the basic components of which are frequency, wavelength, velocity, and amplitude. Frequency is the number of pressure waves that pass by a reference point per unit of time and is measured in hertz (Hz) or cycles per second. Wavelength is the distance between two peaks of a sound wave; lower frequency sounds have longer wavelengths than higher frequency sounds 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 decibel (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 microPascal (μPa). One pascal is the pressure resulting from a force of one newton exerted over an area of one square meter. The source level (SL) represents the sound level at a distance of 1 m from the source (referenced to 1 μPa). The received level is the sound level at the listener's position. Note that all underwater sound levels in this document are referenced to a pressure of 1 μPa and all airborne sound levels in this document are referenced to a pressure of 20 μPa.

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

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

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

• Wind and waves: The complex interactions between wind and water surface, including processes such as breaking waves and wave-induced bubble oscillations and cavitation, are a main source of naturally occurring ambient noise for frequencies between 200 Hz and 50 kHz (Mitson, 1995). In general, ambient sound levels tend to increase with increasing wind speed and wave height. Surf noise becomes important near shore, with measurements collected at a distance of 8.5 km from shore showing an increase of 10 dB in the 100 to 700 Hz band during heavy surf conditions.

• Precipitation: Sound from rain and hail impacting the water surface can become an important component of total noise at frequencies above 500 Hz, and possibly down to 100 Hz during quiet times.

• Biological: Marine mammals can contribute significantly to ambient noise levels, as can some fish and shrimp. The frequency band for biological contributions is from approximately 12 Hz to over 100 kHz.

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

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

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

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

Non-pulsed sounds can be tonal, narrowband, or broadband, brief or prolonged, and may be either continuous or non-continuous (ANSI, 1995; NIOSH, 1998). Some of these non-pulsed sounds can be transient signals of short duration but without the essential properties of pulses (*e.g.,* rapid rise time). Examples of non-pulsed sounds include those produced by vessels, aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems (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 lower levels of sound than impact hammers. Peak SPLs may be 180 dB or greater, but are generally 10 to 20 dB lower than SPLs generated during impact pile driving of the same-sized pile (Oestman *et al.,* 2009). Rise time is slower, reducing the probability and severity of injury, and sound energy is distributed over a greater amount of time (Nedwell and Edwards, 2002; Carlson *et al.,* 2005).

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals, and exposure to intense sound can have deleterious effects. To appropriately assess these potential effects, 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 measured or estimated hearing ranges on the basis of available behavioral data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. The lower and/or upper frequencies for some of these functional hearing groups have been modified from those designated by Southall *et al.* (2007). Note that no direct measurements of hearing ability have been successfully completed for low-frequency cetaceans. The functional groups and the associated frequencies are indicated below (note that these frequency ranges correspond to the range for the composite group, with the entire range not necessarily reflecting the capabilities of every species within that group):

- Low-frequency cetaceans (mysticetes): Functional hearing is estimated to occur between approximately 7 Hz and 25 kHz (up to 30 kHz in some species), with best hearing estimated to be from 100 Hz to 8 kHz (Watkins, 1986; Ketten, 1998; Houser *et al.,* 2001; Au *et al.,* 2006; Lucifredi and Stein, 2007; Ketten *et al.,* 2007; Parks *et al.,* 2007a; Ketten and Mountain, 2009; Tubelli *et al.,* 2012);
- Mid-frequency cetaceans (larger toothed whales, beaked whales, and most delphinids): Functional hearing is estimated to occur between approximately 150 Hz and 160 kHz, with best hearing from 10 to less than 100 kHz (Johnson, 1967; White, 1977; Richardson *et al.,* 1995; Szymanski *et al.,* 1999; Kastelein *et al.,* 2003; Finneran *et al.,* 2005a, 2009; Nachtigall *et al.,* 2005, 2008; Yuen *et al.,* 2005; Popov *et al.,* 2007; Au and Hastings, 2008; Houser *et al.,* 2008; Pacini *et al.,* 2010, 2011; Schlundt *et al.,* 2011);
- High-frequency cetaceans (porpoises, river dolphins, and members of the genera *Kogia* and *Cephalorhynchus;* including two members of the genus *Lagenorhynchus,* including the hourglass dolphin, on the basis of recent echolocation data and genetic data [May-Collado and Agnarsson, 2006; Kyhn *et al.* 2009, 2010; Tougaard *et al.* 2010]): Functional hearing is estimated to occur between approximately 200 Hz and 180 kHz (Popov and Supin, 1990a,b; Kastelein *et al.,* 2002; Popov *et al.,* 2005); and
- Pinnipeds in water; Phocidae (true seals): Functional hearing is estimated to occur between approximately 75 Hz to 100 kHz, with best hearing between 1–50 kHz (Møhl, 1968; Terhune and Ronald, 1971, 1972; Richardson *et al.,* 1995; Kastak and Schusterman, 1999; Reichmuth, 2008; Kastelein *et al.,* 2009);
- Pinnipeds in water; Otariidae (eared seals): Functional hearing is estimated to occur between 100 Hz and 48 kHz for Otariidae, with best hearing between 2–48 kHz (Schusterman *et al.,* 1972; Moore and Schusterman, 1987; Babushina *et al.,* 1991; Richardson *et al.,* 1995; Kastak and Schusterman, 1998; Kastelein *et al.,* 2005a; Mulsow and Reichmuth, 2007; Mulsow *et al.,* 2011a, b).

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).

There are five marine mammal species (one cetacean and four pinniped [two otariid and two phocid] species) with expected potential to co-occur with Navy construction activities. Please refer to Table 2. The harbor porpoise is classified as a high-frequency cetacean.

Potential effects of underwater sound—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; Gotz *et al.,* 2009). The degree of effect is intrinsically related to the signal characteristics, received level, distance from the source, and duration of the sound exposure. In general, sudden, high level sounds can cause hearing loss, as can longer exposures to lower level sounds. Temporary or permanent loss of hearing will occur almost exclusively for noise within an animal's hearing range. We first describe specific manifestations of acoustic effects before providing discussion specific to the Navy's construction activities.

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

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

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

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

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

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

1. *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. Few data on sound levels and durations necessary to elicit mild TTS have been obtained for marine mammals, and none of the data published at the time of this writing concern TTS elicited by exposure to multiple pulses of sound.

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

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

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

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

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

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

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

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

Marine mammals vocalize for different purposes and across multiple modes, such as whistling, echolocation click production, calling, and singing. Changes in vocalization behavior in response to anthropogenic noise can occur for any of these modes and may result from a need to compete with an increase in background noise or may reflect increased vigilance or a startle response. For example, in the presence of potentially masking signals, humpback whales and killer whales have been observed to increase the length of their songs (Miller *et al.,* 2000; Fristrup *et al.,* 2003; Foote *et al.,* 2004), while right whales 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.

3. *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).

4. *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.

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, behavioral disturbance, and masking (Richardson *et al.,* 1995; Gordon *et al.,* 2003; Nowacek *et al.,* 2007; Southall *et al.,* 2007). The effects of pile driving 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 depth of the water column; 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.

In the absence of mitigation, impacts to marine species could be expected to include physiological and behavioral responses to the acoustic signature (Viada *et al.,* 2008). Potential effects from impulsive sound sources like pile driving can range in severity from effects such as behavioral disturbance to temporary or permanent hearing impairment (Yelverton *et al.,* 1973).

Hearing Impairment and Other Physical Effects—Marine mammals exposed to high intensity sound repeatedly or for prolonged periods can experience hearing threshold shifts. Marine mammals depend on acoustic cues for vital biological functions, (*e.g.,* orientation, communication, finding prey, avoiding predators); thus, TTS may result in reduced fitness in survival and reproduction. However, this depends on the frequency and duration of TTS, as well as the biological context in which it occurs. PTS constitutes injury, but TTS does not (Southall *et al.,* 2007). Based on the best scientific information available, the SPLs for the construction activities in this project are far below the thresholds that could cause TTS or the onset of PTS: 180 dB re 1 μPa rms for odontocetes and 190 dB re 1 μPa rms for pinnipeds (Table 3).

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 and to activities that extend over a prolonged period. The available data do not allow identification of a specific exposure level above which non-auditory effects can be expected (Southall *et al.,* 2007) or any meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in those ways. Marine mammals that show behavioral avoidance of pile driving, including some odontocetes and some pinnipeds, are especially unlikely to incur auditory impairment or non-auditory physical effects.

Disturbance Reactions—Disturbance includes a variety of effects, including subtle changes in behavior, more conspicuous changes in activities, and displacement. Behavioral thresholds are 160 dB for impulsive sources is 120 dB for continuous sources (Table 3). Behavioral responses to sound are highly variable and context-specific and reactions, if any, depend on species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day, and many other factors (Richardson *et al.,* 1995; Wartzok *et al.,* 2003; Southall *et al.,* 2007). Behavioral state may affect the type of response as well. 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).

Responses to continuous sound, such as vibratory pile installation, have not been documented as well as responses to pulsed sounds. With both types of pile driving, it is likely that the onset of pile driving could result in temporary, short term changes in an animal's typical behavior and/or avoidance of the affected area. These behavioral changes may include (Richardson *et al.,* 1995): Changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where sound sources are located; and/or flight responses (*e.g.,* pinnipeds flushing into water from haul-outs or rookeries). Pinnipeds may increase their haul-out time, possibly to avoid in-water disturbance (Thorson and Reyff, 2006).

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

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

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

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

Acoustic Effects, Airborne—Marine mammals that occur in the project area could be exposed to airborne sounds associated with pile driving that have the potential to cause harassment, depending on their distance from pile driving activities. Airborne behavioral thresholds are 90 dB for harbor seals, and 100 dB for all other pinnipeds (Table 3). Airborne pile driving sound would have less impact on cetaceans than pinnipeds because sound from atmospheric sources does not transmit well underwater (Richardson *et al.,* 1995); thus, airborne sound would only be an issue for pinnipeds either hauled-out or looking with heads above water in the project area. Most likely, airborne sound would cause behavioral responses similar to those discussed above in relation to underwater sound. For instance, anthropogenic sound could cause hauled-out pinnipeds to exhibit changes in their normal behavior, such as reduction in vocalizations, or cause them to temporarily abandon the area and move further from the source.

Anticipated Effects on Marine Mammal Habitat

The proposed activities at AIRSTA/SFO Port Angeles would not result in permanent impacts to habitats used directly by marine mammals, such as haul-out sites, but may have potential short-term impacts to food sources such as forage fish and salmonids. The only rookeries or major haul-out sites in close proximity to the project site are harbor seal haul-outs located approximately 1.7 miles (2.7 km) west, and another 1.3 miles (2.1 km) south of the project site. The next closest rookery or major haul-out site is 11.2 miles (18 km) away. The nearest Steller sea lion haul-out to the project site is approximately 12.5 miles (20 km) across the Strait of Juan de Fuca at Race Rocks. There are no ocean bottom structures of significant biological importance to marine mammals that may be present in the marine waters in the vicinity of the project area. Therefore, the main impact associated with the proposed activity would be temporarily elevated sound levels and the associated direct effects on marine mammals, as discussed previously in this document. The most likely impact to marine mammal habitat occurs from pile driving effects on likely marine mammal prey (*i.e.,* fish) near AIRSTA/SFO Port Angeles and minor impacts to the immediate substrate during installation and removal of piles during the wharf construction project. Temporary and localized reduction in water quality could occur as a result of in-water construction activities during the installation and removal of piles when bottom sediments are disturbed. Effects on turbidity and sedimentation are expected to be short-term and not result in any measurable effects on marine mammals and their habitat.

Pile Driving Effects on Potential Prey

Construction activities would produce both pulsed (*i.e.,* impact pile driving) and continuous (*i.e.,* vibratory pile driving) sounds. Fish react to sounds which 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 of the area. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. In general, impacts to marine mammal prey species are expected to be minor and temporary due to the short timeframe for the wharf construction project. However, adverse impacts may occur to a few species of rockfish and salmon, which may still be present in the project area despite operating in a reduced work window in an attempt to avoid important fish spawning time periods. Impacts to these species could result from potential impacts to their eggs and larvae; however, impacts are not anticipated to be permanent or significant.

Pile Driving Effects on Potential Foraging Habitat

The area likely impacted by the project is relatively small compared to the available habitat in the Port Angeles Harbor. Avoidance by potential prey (*i.e.,* fish) of the immediate area due to the temporary loss of this foraging habitat is also possible. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the Port Angeles Harbor and nearby vicinity.

In summary, given the short daily duration of sound associated with individual pile driving events and the relatively small areas being 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.

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.

Measurements from similar pile driving events were coupled with practical spreading loss to estimate zones of influence (ZOI; see Estimated Take by Incidental Harassment); these values were used to develop mitigation measures for pile driving activities at Port Angeles harbor. The ZOIs effectively represent the mitigation zone that would be established around each pile to prevent Level A harassment to marine mammals, while providing estimates of the areas within which Level B harassment might occur. 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.

Mitigation Monitoring and Shutdown for Pile Driving

The following measures would apply to the Navy's mitigation through shutdown and disturbance zones:

Shutdown Zone—For all pile driving activities, the Navy will establish a shutdown zone intended to contain the area in which SPLs equal or exceed the 180/190 dB rms acoustic injury criteria. The purpose of a shutdown zone is to define an area within which shutdown of activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area), thus preventing injury of marine mammals. Modeled distances for shutdown zones (the area in which SPLs equal or exceed the 180/190 dB rms) are shown in Table 6. However, during impact pile driving, the Navy would implement a minimum shutdown zone of 30 m radius for cetaceans and 10 m radius for pinnipeds around all pile driving activity. The modeled injury threshold distances are approximately 29 m and 6 m, respectively. During vibratory driving, the shutdown zone would be 10 m distance from the source for all animals. These precautionary measures are intended to further reduce any possibility of acoustic injury, as well as to account for any undue reduction in the modeled zones stemming from the assumption of 6 dB attenuation from use of a bubble curtain (see discussion later in this section).

Disturbance Zone—Disturbance zones are the areas in which SPLs equal or exceed 160 and 120 dB rms (for pulsed and non-pulsed continuous sound, respectively). Disturbance zones provide utility for monitoring conducted for mitigation purposes (*i.e.,* shutdown zone monitoring) by establishing monitoring protocols for areas adjacent to the shutdown zones. Monitoring of disturbance zones enables observers to be aware of and communicate the presence of marine mammals in the project area but outside the shutdown zone and thus prepare for potential shutdowns of activity. However, the primary purpose of disturbance zone monitoring is for documenting incidents of Level B harassment; disturbance zone monitoring is discussed in greater detail later (see ''Proposed Monitoring and Reporting''). Nominal radial distances for disturbance zones are shown in Table 6. Given the size of the disturbance zone for vibratory pile driving, it is impossible to guarantee that all animals would be observed or to make comprehensive observations of fine-scale behavioral reactions to sound, and only a portion of the zone will be monitored.

In order to document observed incidents of harassment, monitors record all marine mammal observations, regardless of location. The observer's location, as well as the location of the pile being driven, is known from a GPS. The location of the animal is estimated as a distance from the observer, which is then compared to the location from the pile. The received level may be estimated on the basis of past or subsequent acoustic monitoring. It may then be determined whether the animal was exposed to sound levels constituting incidental harassment in post-processing of observational data, and a precise accounting of observed incidents of harassment created. Therefore, although the predicted distances to behavioral harassment thresholds are useful for estimating harassment for purposes of authorizing levels of incidental take, actual take may be determined in part through the use of empirical data. That information may then be used to extrapolate observed takes to reach an approximate understanding of actual total takes.

Monitoring Protocols—Monitoring would be conducted before, during, and after pile driving activities. In addition, observers shall record all incidents of marine mammal occurrence, regardless of distance from activity, and shall document any behavioral reactions in concert with distance from piles being driven. Observations made outside the shutdown zone will not result in shutdown; that pile segment would be completed without cessation, unless the animal approaches or enters the shutdown zone, at which point all pile driving activities would be halted. Monitoring will take place from fifteen minutes prior to initiation through thirty minutes post-completion of pile driving activities. Pile driving activities include the time to remove a single pile or series of piles, as long as the time elapsed between uses of the pile driving equipment is no more than thirty minutes. Please see the Marine Mammal Monitoring Plan (available at *www.nmfs.noaa.gov/pr/permits/incidental.htm*), developed by the Navy with our approval, for full details of the monitoring protocols.

The following additional measures apply to visual monitoring:

(1) Monitoring will be conducted by qualified observers, who will be placed at the best vantage point(s) practicable to monitor for marine mammals and implement shutdown/delay procedures when applicable by calling for the shutdown to the hammer operator. Qualified observers are trained biologists, with the following minimum qualifications:

• Visual acuity in both eyes (correction is permissible) sufficient for discernment of moving targets at the water's surface with ability to estimate target size and distance; use of binoculars may be necessary to correctly identify the target;

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

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

• Experience or training in the field identification of marine mammals, including the identification of behaviors;

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

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

• 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.

(2) Prior to the start of pile driving activity, the shutdown zone will be monitored for fifteen minutes to ensure that it is clear of marine mammals. Pile driving will only commence once observers have declared the shutdown zone clear of marine mammals; animals will be allowed to remain in the shutdown zone (*i.e.,* must leave of their own volition) and their behavior will be monitored and documented. The shutdown zone may only be declared clear, and pile driving started, when the entire shutdown zone is visible (*i.e.,* when not obscured by dark, rain, fog, etc.). In addition, if such conditions should arise during impact pile driving that is already underway, the activity would be halted.

(3) If a marine mammal approaches or enters the shutdown zone during the course of pile driving operations, activity will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or fifteen minutes have passed without re-detection of the animal. Monitoring will be conducted throughout the time required to drive a pile.

Sound Attenuation Devices

Sound levels can be greatly reduced during impact pile driving using sound attenuation devices. There are several types of sound attenuation devices including bubble curtains, cofferdams, and isolation casings (also called temporary noise attenuation piles [TNAP]), and cushion blocks. The Navy proposes to use bubble curtains, which create a column of air bubbles rising around a pile from the substrate to the water surface. The air bubbles absorb and scatter sound waves emanating from the pile, thereby reducing the sound energy. Bubble curtains may be confined or unconfined. An unconfined bubble curtain may consist of a ring seated on the substrate and emitting air bubbles from the bottom. An unconfined bubble curtain may also consist of a stacked system, that is, a series of multiple rings placed at the bottom and at various elevations around the pile. Stacked systems may be more effective than non-stacked systems in areas with high current and deep water (Oestman *et al.,* 2009).

A confined bubble curtain contains the air bubbles within a flexible or rigid sleeve made from plastic, cloth, or pipe. Confined bubble curtains generally offer higher attenuation levels than unconfined curtains because they may physically block sound waves and they prevent air bubbles from migrating away from the pile. For this reason, the confined bubble curtain is commonly used in areas with high current velocity (Oestman *et al.,* 2009).

Both environmental conditions and the characteristics of the sound attenuation device may influence the effectiveness of the device. According to Oestman *et al.* (2009):

• In general, confined bubble curtains attain better sound attenuation levels in areas of high current than unconfined bubble curtains. If an unconfined device is used, high current velocity may sweep bubbles away from the pile, resulting in reduced levels of sound attenuation.

• Softer substrates may allow for a better seal for the device, preventing leakage of air bubbles and escape of sound waves. This increases the effectiveness of the device. Softer substrates also provide additional attenuation of sound traveling through the substrate.

• Flat bottom topography provides a better seal, enhancing effectiveness of the sound attenuation device, whereas sloped or undulating terrain reduces or eliminates its effectiveness.

• Air bubbles must be close to the pile; otherwise, sound may propagate into the water, reducing the effectiveness of the device.

• Harder substrates may transmit ground-borne sound and propagate it into the water column.

The literature presents a wide array of observed attenuation results for bubble curtains (*e.g.,* Oestman *et al.,* 2009; Coleman, 2011; see Table 3–2 in

Appendix A of the Navy's application). The variability in attenuation levels is due to variation in design, as well as differences in site conditions and difficulty in properly installing and operating in-water attenuation devices. As a general rule, reductions of greater than 10 dB cannot be reliably predicted. For 36-in piles the average rms reduction with use of the bubble curtain was nine dB, where the averages of all bubble-on and bubble-off data were compared. For 48-in piles, the average SPL reduction with use of a bubble curtain was seven dB for average rms values (see Table 3–1 in Appendix A of the Navy's application).

To avoid loss of attenuation from design and implementation errors, the Navy has required specific bubble curtain design specifications, including testing requirements for air pressure and flow prior to initial impact hammer use, and a requirement for placement on the substrate. Bubble curtains shall be used during all impact pile driving. The device will distribute air bubbles around 100 percent of the piling perimeter for the full depth of the water column, and the lowest bubble ring shall be in contact with the mudline for the full circumference of the ring. We considered eight dB as potentially the best estimate of average SPL (rms) reduction, assuming appropriate deployment and no problems with the equipment. Therefore, an eight dB reduction was used in the Navy's analysis of pile driving noise in the environmental analyses.

Timing Restrictions

In Port Angeles Harbor, designated timing restrictions exist for pile driving activities to avoid in-water work when salmonids and other spawning forage fish are likely to be present. The in-water work window is November 1, 2016–February 15, 2017, and July 16–October 31, 2017. All in-water construction activities will occur during daylight hours (sunrise to sunset) except from July 16 to February 15 when impact pile driving/removal will only occur starting 2 hours after sunrise and ending 2 hours before sunset, to protect foraging marbled murrelets during nesting season (April 1–September 23). Other construction (not in-water) may occur between 7 a.m. and 10 p.m., year-round.

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 vibratory hammers for fifteen seconds at reduced energy followed by a thirty-second waiting period. This procedure is repeated two additional times.

Implementation of soft start for vibratory pile driving during previous pile driving work for the Explosives Handling Wharf at Fort Hood Navy Base Kitsap Bangor led to equipment failure and serious human safety concerns, which resulted in discontinuation of the soft-start procedure for vibratory pile driving. The Marine Mammal Commission has stated that the soft-start is a viable, effective component of a mitigation plan designed to effect the least practicable impact on marine mammals. In response to this concern, NMFS formed a working group with the Navy in April 2014 to address the soft-start procedures. At this time, the EHW–2 project is the only project where the procedure has been waived.

For this proposed IHA, as a result of this potential low risk to human safety, we have determined vibratory soft start to be practicable, but if unsafe working conditions during soft-starts are reported by the contractor and verified by an independent safety inspection, the Navy may elect to discontinue vibratory soft-starts.

For impact driving, soft start will be required, and contractors will provide an initial set of strikes from the impact hammer at reduced energy, followed by a thirty-second waiting period, then two subsequent reduced energy strike sets. The reduced energy of an individual hammer cannot be quantified because of variation in individual drivers. The actual number of strikes at reduced energy will vary because operating the hammer at less than full power results in ''bouncing'' of the hammer as it strikes the pile, resulting in multiple ''strikes.'' Soft start for impact driving will be required at the beginning of each day's pile driving work and at any time following a cessation of impact pile driving of thirty minutes or longer.

We have carefully evaluated the Navy's proposed mitigation measures and considered their effectiveness in past implementation to preliminarily determine whether they are likely to effect the least practicable impact on the affected marine mammal species and stocks and their habitat. Our evaluation of potential measures included consideration of the following factors in relation to one another: (1) The manner in which, and the degree to which, the successful implementation of the measure is expected to minimize adverse impacts to marine mammals, (2) the proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and (3) the practicability of the measure for applicant implementation.

Any mitigation measure(s) we prescribe should be able to accomplish, have a reasonable likelihood of accomplishing (based on current science), or contribute to the accomplishment of one or more of the general goals listed below:

(1) Avoidance or minimization of injury or death of marine mammals wherever possible (goals 2, 3, and 4 may contribute to this goal).

(2) A reduction in the number (total number or number at biologically important time or location) of individual marine mammals exposed to stimuli expected to result in incidental take (this goal may contribute to 1, above, or to reducing takes by behavioral harassment only).

(3) A reduction in the number (total number or number at biologically important time or location) of times any individual marine mammal would be exposed to stimuli expected to result in incidental take (this goal may contribute to 1, above, or to reducing takes by behavioral harassment only).

(4) A reduction in the intensity of exposure to stimuli expected to result in incidental take (this goal may contribute to 1, above, or to reducing the severity of behavioral harassment only).

(5) Avoidance or minimization of adverse effects to marine mammal habitat, paying particular attention to the prey base, blockage or limitation of passage to or from biologically important areas, permanent destruction of habitat, or temporary disturbance of habitat during a biologically important time.

(6) For monitoring directly related to mitigation, an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

Based on our evaluation of the Navy's proposed measures, we have preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable impact on marine mammal 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 incidental take 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.

Any monitoring requirement we prescribe should accomplish one or more of the following general goals:

1. An increase in the probability of detecting marine mammals, both within defined zones of effect (thus allowing for more effective implementation of the mitigation) and in general to generate more data to contribute to the analyses mentioned below;

2. An increase in our understanding of how many marine mammals are likely to be exposed to stimuli that we associate with specific adverse effects, such as behavioral harassment or hearing threshold shifts;

3. An increase in our understanding of how marine mammals respond to stimuli expected to result in incidental take and how anticipated adverse effects on individuals may impact the population, stock, or species (specifically through effects on annual rates of recruitment or survival) through any of the following methods:

- Behavioral observations in the presence of stimuli compared to observations in the absence of stimuli (need to be able to accurately predict pertinent information, *e.g.,* received level, distance from source);
- Physiological measurements in the presence of stimuli compared to observations in the absence of stimuli (need to be able to accurately predict pertinent information, *e.g.,* received level, distance from source);
- Distribution and/or abundance comparisons in times or areas with concentrated stimuli versus times or areas without stimuli;

4. An increased knowledge of the affected species; or

5. An increase in our understanding of the effectiveness of certain mitigation and monitoring measures.

The Navy submitted a marine mammal monitoring plan as part of the IHA application for this project. It can be found on the Internet at *www.nmfs.noaa.gov/pr/permits/incidental.htm.* The plan may be modified or supplemented based on comments or new information received from the public during the public comment period.

Visual Marine Mammal Observations

The Navy will collect sighting data and behavioral responses to construction for marine mammal species observed in the region of activity during the period of activity. All observers will be trained in marine mammal identification and behaviors and are required to have no other construction-related tasks while conducting monitoring. The Navy will monitor the shutdown zone and disturbance zone before, during, and after pile driving, with observers located at the best practicable vantage points. Based on our requirements, the Marine Mammal Monitoring Plan would implement the following procedures for pile driving:

- A minimum of three Marine Mammal Observers (protected species observers [PSOs]) would be present during both impact and vibratory pile driving/removal and would be located at the best vantage point(s) in order to properly see the entire shutdown zone and as much of the disturbance zone as possible.
- During all observation periods, observers will use binoculars and the naked eye to search continuously for marine mammals.
- If the shutdown zones are obscured by fog or poor lighting conditions, pile driving at that location will not be initiated until that zone is visible. Should such conditions arise while impact driving is underway, the activity would be halted.
- The shutdown and disturbance zones around the pile will be monitored for the presence of marine mammals before, during, and after any pile driving or removal activity.

Individuals implementing the monitoring protocol will assess its effectiveness using an adaptive approach. Monitoring biologists will use their best professional judgment throughout implementation and seek improvements to these methods when deemed appropriate. Any modifications to protocol will be coordinated between NMFS and the Navy.

Data Collection

We require that observers use approved data forms. Among other pieces of information, the Navy will record detailed information about any implementation of shutdowns, including the distance of animals to the pile and description of specific actions that ensued and resulting behavior of the animal, if any. In addition, the Navy will attempt to distinguish between the number of individual animals taken and the number of incidents of take. We require that, at a minimum, the following information be collected on the sighting forms:

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

Reporting

A draft report would be submitted within ninety calendar days of the completion of the in-water work window. The report will include marine mammal observations pre-activity, during-activity, and post-activity during pile driving days, and will also provide descriptions of any problems encountered in deploying sound attenuating devices, any behavioral responses to construction activities by marine mammals and a complete description of all mitigation shutdowns and the results of those actions and an extrapolated total take estimate based on the number of marine mammals observed during the course of construction. A final report must be submitted within thirty days following resolution of comments on the draft report.

Estimated Take by Incidental Harassment

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].''

All anticipated takes would be by Level B harassment resulting from vibratory and impact pile driving and involving temporary changes in behavior. The proposed mitigation and monitoring measures are expected to minimize the possibility of injurious or lethal takes such that take by Level A harassment, serious injury, or mortality is considered discountable. However, it is unlikely that injurious or lethal takes would occur even in the absence of the planned mitigation and monitoring measures.

Low level responses to sound (*e.g.,* short-term avoidance of an area, short-term changes in locomotion or vocalization) are less likely to result in fitness effects on individuals that would ultimately affect the stock or the species as a whole. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individual animals could potentially be significant and could potentially translate to affects on annual rates of recruitment or survival (*e.g.,* Lusseau and Bejder, 2007; Weilgart, 2007). Specific understanding of the activity and the effected species are necessary to predict the severity of impacts and the likelihood of fitness impacts, however, we start with the estimated number of takes, understanding that additional analysis is needed to understand what those takes mean. Given the many uncertainties in predicting the quantity and types of impacts of sound on marine mammals, it is common practice to estimate how many animals are likely to be present within a particular distance of a given activity, or exposed to a particular level of sound, taking the duration of the activity into consideration. This practice provides a good sense of the number of instances of take, but potentially overestimates the numbers of individual marine mammals taken. In particular, for stationary activities, it is more likely that some smaller number of individuals may accrue a number of incidences of harassment per individual than for each incidence to accrue to a new individual, especially if those individuals display some degree of residency or site fidelity and the impetus to use the site (*e.g.,* because of foraging opportunities) is stronger than the deterrence presented by the harassing activity.

The project area is not believed to be particularly important habitat for marine mammals, nor is it considered an area frequented by marine mammals. Therefore, behavioral disturbances that could result from anthropogenic sound associated with these activities are expected to affect only a relatively small number of individual marine mammals, although those effects could be recurring over the life of the project if the same individuals remain in the project vicinity.

The Navy has requested authorization for the incidental taking of small numbers of Steller sea lions, California sea lions, harbor seals, Northern elephant seals, and harbor porpoises in Port Angeles Harbor that may result from pile driving during construction activities associated with the pier construction and support facilities project described previously in this document. In order to estimate the potential incidents of take that may occur incidental to the specified activity, we must first estimate the extent of the sound field that may be produced by the activity and then consider in combination with information about marine mammal density or abundance in the project area. We first provide information on applicable sound thresholds for determining effects to marine mammals before describing the information used in estimating the sound fields, the available marine mammal density or abundance information, and the method of estimating potential incidences of take.

Sound Thresholds

We use generic sound exposure thresholds to determine when an activity that produces sound might result in impacts to a marine mammal such that a take by harassment might occur (Table 3). To date, no studies have been conducted that explicitly examine impacts to marine mammals from pile driving sounds or from which empirical sound thresholds have been established. These thresholds should be considered guidelines for estimating when harassment may occur (*i.e.,* when an animal is exposed to levels equal to or exceeding the relevant criterion) in specific contexts; however, useful contextual information that may inform our assessment of effects is typically lacking and we consider these thresholds as step functions. NMFS is currently revising these acoustic guidelines; for more information on that process, please visit *www.nmfs.noaa.gov/pr/acoustics/guidelines.htm.* Vibratory pile driving produces continuous noise and impact pile driving produces impulsive noise.

TABLE 3—CURRENT ACOUSTIC EXPOSURE CRITERIA

Criterion	Definition	Threshold
Level A harassment (underwater)	Injury (PTS—any level above that which is known to cause TTS).	180 dB (cetaceans)/190 dB (pinnipeds) (rms).
Level B harassment (underwater)	Behavioral disruption	160 dB (impulsive source)/120 dB (continuous source) (rms).
Level B harassment (airborne) *	Behavioral disruption	90 dB (harbor seals)/100 dB (other pinnipeds) (unweighted).

* NMFS has not established any formal criteria for harassment resulting from exposure to airborne sound. However, these thresholds represent the best available information regarding the effects of pinniped exposure to such sound and NMFS' practice is to associate exposure at these levels with Level B harassment.

Distance to Sound Thresholds

Underwater Sound Propagation Formula—Pile driving generates underwater noise that can potentially result in disturbance to marine mammals in the project area. Transmission loss (TL) is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. The general formula for underwater TL is:

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

where

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

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

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

Underwater Sound—The intensity of pile driving sounds is greatly influenced by factors such as the type of piles, hammers, and the physical environment in which the activity takes place. A large quantity of literature regarding SPLs recorded from pile driving projects is available for consideration. In order to determine reasonable SPLs and their associated effects on marine mammals that are likely to result from pile driving at AIRSTA/SFO Port Angeles, studies with similar properties to the specified activity were evaluated. SPLs from driving of 12-, 18-, 24-, 30-, and 36-in piles by impact and vibratory hammers were measured (Tables 4 and 5). All projects were located in California, Oregon, and Washington, but projects in marine waters of Puget Sound including the San Juan Islands were favored over those in the San Francisco Bay area, the mouth of the Columbia River, or coastal bays because they were more similar to the conditions at Port Angeles harbor. Overall, studies which met the following parameters were considered: (1) Pile size and materials: Steel pipe piles (24- to 36-in diameter), concrete piles (18- to 24-in diameter), timber piles (12-in diameter), steel sheet piles (24-in); (2) Hammer machinery: Vibratory and impact hammer; and (3) Physical environment: Shallow depth (less than 5 m to 15 m), similar substrate type to project area (sand/silt to sand/silt/cobbles overlying glacial till or hard clay layers).

TABLE 4—UNDERWATER SPLs FROM MONITORED CONSTRUCTION ACTIVITIES USING IMPACT HAMMERS

Pile size	Number of projects considered	Range of average rms (n-weighted pile average) dB re 1 μPa
Steel		
24-inch	2	181–198 (193)
30-inch	3	192–196 (195)
36-inch (all projects)	3	185–196 (192)
36-inch (Bangor only)	1	185–196 (194)
All 24/30/36-inch	7	181–198 (193)
Concrete		
<18-inch	3	158–173 (170)
24-inch	7	167–179 (174)

The tables presented here detail representative pile driving SPLs that have been recorded from similar construction activities in recent years. Due to the similarity of these actions and the Navy's proposed action, these values represent reasonable SPLs which could be anticipated, and which were used in the acoustic modeling and analysis. Table 4 displays SPLs measured during pile installation using an impact hammer and Table 5 displays SPLs measured during pile installation using a vibratory hammer. For impact driving, average RMS values over 24-, 30-, and 36-in piles ranged from 181 dB to 198 dB. A source value of 193 dB rms at 10 m was the average value reported from the listed studies. For vibratory pile driving, source levels ranged depending on pile type and size. At 10 m, source values of 161 dB (16- to 24-in steel pipe pile), 167 dB (30- to 36-in steel pipe pile), were used.

TABLE 5—UNDERWATER SPLs FROM MONITORED CONSTRUCTION ACTIVITIES USING VIBRATORY HAMMERS

Project and location	Pile size and type	Water depth	Measured SPLs
Vashon Terminal, WA [1]	30-in steel pipe	6 m	165 dB (rms) at 11 m.
Keystone Terminal, WA [2]	30-in steel pipe	8 m	165 dB (rms) at 10 m.
Edmonds Ferry Terminal, WA [3]	36-in steel pipe	5.8 m	162–163 dB (rms) at 10 m.
Anacortes Ferry Terminal, WA [4]	36-in steel pipe	12.7 m	168–170 dB (rms) at 10 m.
California [5]	36-in steel pipe	5 m	170 dB/175 dB (rms) at 10 m.[8]
Test Pile Program, NBKB [6]	36-in steel pipe	13.7–26.8 m	154–169 dB (rms) at 10 m.
EHW–2, Year 1, NBKB [7]	36-in steel pipe	Avg of mid- and deep-depth	169 dB (rms) at 10 m.
Test Pile Program, NBKB [6]	48-in steel pipe	13.7–26.8 m	172 dB (rms) at 10 m.
California [3]	72-in steel pipe	5 m	170 dB/180 dB (rms) at 10 m.[8]

Sources: [1] Laughlin, 2010a; [2] Laughlin, 2010b; [3] Loughlin, 2011; [4] Loughlin, 2012; [5] Caltrans, 2012; [6] Illingworth & Rodkin, 2012; [7] Illingworth & Rodkin, 2013 (See Navy application).

[8] Specific location/project unknown. Summary value possibly comprising multiple events rather than a single event. Average and maximum values presented.

All calculated distances to, and the total area encompassed by, the marine mammal sound thresholds are provided in Table 6. Although radial distance and area associated with the zone ensonified to 160 dB (the behavioral harassment threshold for pulsed sounds, such as those produced by impact driving) are presented in Table 6, this zone would be subsumed by the 120-dB zone produced by vibratory driving. Thus, behavioral harassment of marine mammals associated with impact driving is not considered further here. Since the 160-dB threshold and the 120-dB threshold both indicate behavioral harassment, pile driving effects in the two zones are equivalent. Although not considered as a likely construction scenario, if only the impact driver was operated on a given day incidental take on that day would likely be lower because the area ensonified to levels producing Level B harassment would be smaller (although actual take would be determined by the numbers of marine mammals in the area on that day).

TABLE 6—CALCULATED DISTANCE(S) TO AND AREA ENCOMPASSED BY UNDERWATER MARINE MAMMAL SOUND THRESHOLDS DURING PILE INSTALLATION

Threshold	Steel pile size	Distance	Area (km^2)
Impact driving, pinniped injury (190 dB)	24-inch	5 m	0.000078
	30-inch	6 m	0.00011
	36-inch	4 m	0.00005
Impact driving, cetacean injury (180 dB)	24-inch	22 m	0.0015
	30-inch	29 m	0.0026
	36-inch	18 m	0.001
Impact driving, disturbance (160 dB)	24-inch	464 m	0.43
	30-inch	631 m	0.75
	36-inch	398 m	0.33
Vibratory driving, disturbance (120 dB)	24-inch	6,310 m	20.4
	30-inch	13,594 m	29.9
	36-inch	13,594 m	29.9

Port Angeles Harbor does not represent open water, or free field, conditions. Therefore, sounds would attenuate as they encounter land masses or bends in the canal. As a result, the calculated distance and areas of impact for the 120-dB threshold cannot actually be attained at the project area. See Figure 6–1 of the Navy's application for a depiction of the size of areas in which each underwater sound threshold is predicted to occur at the project area due to pile driving.

Airborne Sound—Pile driving can generate airborne sound that could potentially result in disturbance to marine mammals (specifically, pinnipeds) which are hauled out or at the water's surface. As a result, the Navy analyzed the potential for pinnipeds hauled out or swimming at the surface near AIRSTA/SFO Port Angeles to be exposed to airborne SPLs that could result in Level B behavioral harassment. A spherical spreading loss model (*i.e.,* 6 dB reduction in sound level for each doubling of distance from the source), in which there is a perfectly unobstructed (free-field) environment not limited by depth or water surface, is appropriate for use with airborne sound and was used to estimate the distance to the airborne thresholds.

As was discussed for underwater sound from pile driving, the intensity of pile driving sounds is greatly influenced by factors such as the type of piles, hammers, and the physical environment in which the activity takes place. In order to determine reasonable airborne SPLs and their associated effects on marine mammals that are likely to result from pile driving at AIRSTA/SFO Port Angeles, studies with similar properties to the proposed action, as described previously, were evaluated. Table 7 details representative pile driving activities that have occurred in recent years. Due to the similarity of these actions and the Navy's proposed action, they represent reasonable SPLs which could be anticipated.

TABLE 7—AIRBORNE SPLS FROM SIMILAR CONSTRUCTION ACTIVITIES

Project and location	Pile size and type	Method	Measured SPLs [5]
Cape Disappointment Boat Launch Facility, Wave Barrier Project [1].	12-in steel pipe	Impact	89 A-weighted.
Bangor Test Pile Program	24-in steel pipe	Impact	110 dB Lmax at 15 m 95 dB Lmax at 122 m.
SR 520 Bridge Replacement Test Pile [2]	24-in steel pipe	Impact	95–100 dB Lmax at 11–15 m.
SR 520 Bridge Replacement Test Pile [2]	30-in steel pipe	Impact	103–106 dB Lmax at 11–15 m.
Bangor Test Pile Program [3]	36-in steel pipe	Impact	109 dB Lmax at 15 m.
Wahkiakum Ferry Terminal [4]	18-in steel pipe	Vibratory	87.5 dB Lmax at 15 m.
Bangor Test Pile Program	24-in steel pipe	Vibratory	92 dB Leq at 15 m 78 dB Leq at 122 m.
SR 520 Bridge Replacement Test Pile [2]	24-in steel pipe	Vibratory	88 dB Leq at 11 m.
Keystone Ferry Terminal, WA [4]	30-in steel pipe	Vibratory	95 dB rms at 15 m.
Vashon Ferry Terminal Test Pile Project [4 5]	30-in steel pipe	Vibratory	83–85 ** dB Leq at 15 m*.
Bangor Test Pile Program [3]	36-in steel pipe	Vibratory	93 dB Leq at 15 m.

Sources: [1] WSDOT, 2006; [2] WSDOT, 2010f; [3] Navy, 2012; [4] WSDOT, 2010g; [5] WSDOT, 2010d.
* Sound pressure levels standardized to 50 ft range. Measurements made at 11 meters.
** Converted to C-weighted from A-weighted measurements to approximate unweighted sound level, reported at a distance of 26 to 36 feet.

Based on these values and the assumption of spherical spreading loss, distances to relevant thresholds and associated areas of ensonification are presented in Table 8. See Figure 6–6 of the Navy's application for a depiction of the size of areas in which each airborne sound threshold is predicted to occur at the project area due to pile driving.

TABLE 8—DISTANCES TO RELEVANT SOUND THRESHOLDS AND AREAS OF ENSONIFICATION FOR AIRBORNE SOUND, USING 36-INCH STEEL PILES

Group	Threshold	Distance to threshold (m) and associated area of ensonification (km²)	
		Vibratory	Impact
Harbor seals	90 dB	27, 0.11	192, 0.11
Other pinnipeds	100 dB	9, 0.01	61, 0.01

Marine Mammal Densities

The Navy has developed, with input from regional marine mammal experts, estimates of marine mammal densities in Washington inland waters for the Navy Marine Species Density Database (NMSDD). A technical report (Hanser *et al.,* 2015) describes methodologies and available information used to derive these densities, which are generally considered the best available information for Washington inland waters, except where specific local abundance information is available. Here, we rely on NMSDD density information for the Steller sea lions and California see lions, and use local abundance data for harbor seals. For species without a predictable occurrence, like the harbor porpoise and Northern elephant seal, estimates are based on historical likelihood of encounter. Please see Appendix A of the Navy's application for more information on the NMSDD information.

For all species, the most appropriate information available was used to estimate the number of potential incidences of take. For harbor porpoise and Northern elephant seals, this involved reviewing historical occurrence and numbers, as well as group size to develop a realistic estimate of potential exposure. For Steller sea lion and California sea lions, this involved NMSDD data. For harbor seals, this involved site-specific data from published literature describing harbor seal research conducted in Washington and Oregon, including counts from haul-outs near Port Angeles Harbor (WDFW, 2015). Therefore, density was calculated as the maximum number of individuals expected to be present at a given time (Houghton *et al.,* 2015) divided by the area of Port Angeles Harbor.

Description of Take Calculation

The take calculations presented here rely on the best data currently available for marine mammal populations in the Port Angeles Harbor. The formula was developed for calculating take due to pile driving activity and applied to each group-specific sound impact threshold. The formula is founded on the following assumptions:

- All marine mammal individuals potentially available are assumed to be present within the relevant area, and thus incidentally taken;
- An individual can only be taken once during a 24-h period;
- There were will be 75 total days of in-water activity and the largest ZOI equals 29.9 km²;
- Exposure modeling assumes that one impact pile driver and three vibratory pile drivers are operating concurrently; and,
- Exposures to sound levels above the relevant thresholds equate to take, as defined by the MMPA.

The calculation for marine mammal takes is estimated by:

Exposure estimate = (n * ZOI) * days of total activity

Where:

n = density estimate used for each species/season

ZOI = sound threshold ZOI area; the area encompassed by all locations where the SPLs equal or exceed the threshold being evaluated

n * ZOI produces an estimate of the abundance of animals that could be present in the area for exposure, and is rounded to the nearest whole number before multiplying by days of total activity.

The ZOI impact area is the estimated range of impact to the sound criteria. The relevant distances specified in Table 6 were used to calculate ZOIs around each pile. The ZOI impact area took into consideration the possible affected area of Port Angeles harbor from the pile driving site furthest from shore with attenuation due to land shadowing from bends in the shoreline. Because of the close proximity of some of the piles to the shore, the narrowness of the harbor at the project area, and the maximum fetch, the ZOIs for each threshold are not necessarily spherical and may be truncated.

While pile driving can occur any day throughout the in-water work window, and the analysis is conducted on a per day basis, only a fraction of that time (typically a matter of hours on any given day) is actually spent pile driving. Acoustic monitoring has demonstrated that Level B harassment zones for vibratory pile driving are likely to be smaller than the zones estimated through modeling based on measured source levels and practical spreading loss. Also of note is the fact that the effectiveness of mitigation measures in reducing takes is typically not quantified in the take estimation process. See Table 9 for total estimated incidents of take.

Airborne Sound

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 in Table 7. 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. 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 incidents 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.

Harbor Porpoise—In Washington inland waters, harbor porpoises are most abundant in the Strait of Juan de Fuca, San Juan Island area, and Admiralty Inlet. Although harbor porpoise occur year round in the Strait of Juan de Fuca, harbor porpoises are a rare occurrence in Port Angeles Harbor, and density-based analysis does not adequately account for their unique temporal and spatial distributions. Estimates are based on historical likelihood of encounter. Based on the assumption that 3 harbor porpoise may be present intermittently in the ZOI (Hall, 2004), a total of 225 harbor porpoise exposures were estimated over 75 days of construction. These exposures would be a temporary behavioral harassment and would not impact the long-term health of individuals; the viability of the population, species, or stocks would remain stable.

California Sea Lion—The California sea lion is most common in the Strait of Juan de Fuca from fall to late spring. California sea lion haul-outs are greater than 30 miles (48 km) away. Animals could be exposed when traveling, resting, or foraging. Primarily only male California sea lions migrate through the Strait of Juan de Fuca (Jeffries *et al.,* 2000). Based on the NMSDD data showing that 0.676 California sea lions per km^2 may be present intermittently in the ZOI, 1,516 exposures were estimated for this species. These exposures would be a temporary behavioral harassment. It is assumed that this number would include multiple behavioral harassments of the same individual(s).

Steller Sea Lion—Steller sea lions occur seasonally in the Strait of Juan de Fuca from September through May. Steller sea lion haul-outs are 13 miles (21 km) away. Based on the NMSDD data showing that 0.935 Steller sea lion per km^2 may be present intermittently in the ZOI, 2,097 exposures were estimated for this species. These exposures would be a temporary behavioral harassment. It is assumed that this number would include multiple behavioral harassments of the same individual(s).

Harbor Seal—Harbor seals are present year round with haul-outs in Port Angeles Harbor. Prior Navy IHAs have successfully used density-based estimates; however, in this case, density estimates were not appropriate because there is a haul-out nearby on a log boom approximately 1.7 miles (2.7 km) west of the project site that was last surveyed in March 2013 and had a total count of 73 harbor seals (WDFW 2015). Another haul-out site is 1.3 miles (2.1 km) south of the project but is across the harbor that was last surveyed in July 2010 and had a total count of 87 harbor seals (WDFW 2015). Density was calculated as the maximum number of individuals expected to be present at a given time (160 animals), times the number of days of pile activity. Based on the assumption that there could be 160 harbors seals hauled out in proximity to the ZOI, 12,000 exposures were estimated for this stock over 75 days of construction.

We recognize that over the course of the day, while the proportion of animals in the water may not vary significantly, different individuals may enter and exit the water. Therefore, an instantaneous estimate of animals in the water at a given time may not produce an accurate assessment of the number of individuals that enter the water over the daily duration of the activity. However, no data exist regarding fine-scale harbor seal movements within the project area on time durations of less than a day, thus precluding an assessment of ingress or egress of different animals through the action area. As such, it is impossible, given available data, to determine exactly what number of individuals may potentially be exposed to underwater sound.

A typical pile driving day (in terms of the actual time spent driving) is somewhat shorter than may be assumed (*i.e.,* 8–15 hours) as a representative pile driving day based on daylight hours. Construction scheduling and notional production rates in concert with typical delays mean that hammers are active for only some fraction of time on pile driving ''days.''

Harbor seals are not likely to have a uniform distribution as is assumed through use of a density estimate, but are likely to be relatively concentrated near areas of interest such as the haul-outs or foraging areas. The estimated 160 harbor seals is the maximum number of animals at haul-outs outside of the airborne Level B behavioral harassment zone; the number of exposures to individual harbor seals foraging in the underwater behavioral harassment zone would likely be much lower.

This tells us that (1) there are likely to be significantly fewer harbor seals in the majority of the action area than the take estimate suggests; and (2) pile driving actually occurs over a limited timeframe on any given day (*i.e.,* less total time per day than would be assumed based on daylight hours and non-continuously), reducing the amount of time over which new individuals might enter the action area within a given day. These factors lead us to believe that the approximate number of seals that may be found in the action area (160) is more representative of the number of animals exposed than the number of takes requested for this species, and only represents 1.5 percent of the most recent estimate of this stock of harbor seals. Moreover, because the Navy is typically unable to determine from field observations whether the same or different individuals are being exposed, each observation is recorded as a new take, although an individual theoretically would only be considered as taken once in a given day.

Northern elephant seal—Northern elephant seals are rare visitors to the Strait of Juan de Fuca. However, individuals, primarily juveniles, have been known to sporadically haul out to molt on Dungeness Spit about 12 miles (19 km) from Port Angeles. One elephant seal was observed hauled-out at Dungeness Spit in each of the following years: 2000, 2002, 2004, 2005, and 2006 (WDFW 2015). Elephant seals are primarily present during spring and summer months. If a northern elephant seal was in the ZOI, it would likely be a solitary juvenile. Northern elephant seals are a rare occurrence in Port Angeles Harbor, and density-based analysis does not adequately account for their unique temporal and spatial distributions; therefore, estimates are based on historical likelihood of encounter. Based on the assumption that one elephant seal may be present intermittently in the ZOI, 75 exposures were calculated for this species. These exposures would be a temporary behavioral harassment.

TABLE 9—NUMBER OF POTENTIAL INCIDENTAL INSTANCES OF TAKE OF MARINE MAMMALS WITHIN VARIOUS ACOUSTIC THRESHOLD ZONES

Species	Density	Underwater		% of stock
		Level A	Level B (120 dB) [1]	
California sea lion	0.676 animal/sq. km*	0	1,516	0.5
Steller sea lion	0.935 animals/sq. km*	0	2,097	4
Harbor seal	160 [2]	0	[4] 12,000/160	100/1.5
Northern elephant seal	1 [3]	0	75	0.04
Harbor porpoise	3 [3]	0	225	2

[1] The 160-dB acoustic harassment zone associated with impact pile driving would always be subsumed by the 120-dB harassment zone produced by vibratory driving. Therefore, takes are not calculated separately for the two zones.

* For species with associated density, density was multiplied by largest ZOI (*i.e.,* 29.9 km^2). The resulting value was rounded to the nearest whole number and multiplied by the 75 days of activity. For species with abundance only, that value was multiplied directly by the 75 days of activity. We assume for reasons described earlier that no takes would result from airborne noise.

[2] For this species, site-specific data was used from published literature describing research conducted in Washington and Oregon, including counts from haul-outs near Port Angeles Harbor. Therefore, density was calculated as the maximum number of individuals expected to be present at a given time.

[3] Figures presented are abundance numbers, not density, and are calculated as the average of average daily maximum numbers per month (see Section 6.6 in application). Abundance numbers are rounded to the nearest whole number for take estimation.

[4] The maximum number of harbor seal anticipated to be in the vicinity to be exposed to the sound levels is 160 animals based on counts from the two nearby haul out sites. This small number of individuals is expected to be the same animals exposed repeatedly, instead of new individuals being exposed each day. These animals, to which any incidental take would accrue, represent 1.5 percent of the most recent estimate of the stock abundance from the 2013 SAR.

Analyses and Preliminary Determinations

Negligible Impact Analysis

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.'' 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 Level B harassment 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 behavioral harassment, we consider 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 the number and nature of estimated Level A harassment takes, the number of estimated mortalities, and effects on habitat. To avoid repetition, the discussion of our analyses applies to all the species listed in Table 9, given that the anticipated effects of this activity on these different marine mammal stocks are expected to be similar. There is no information about the nature or severity of the impacts, or the size, status, or structure of any of these species or stocks that would lead to a different analysis for this activity.

Pile driving activities associated with the pier construction project, as outlined previously, have the potential to disturb or displace marine mammals. Specifically, the specified activities may result in take, in the form of Level B harassment (behavioral disturbance) only, from underwater sounds generated from pile driving. Potential takes could occur if individuals of these species are present in the ensonified zone when pile driving is happening, which is likely to occur because (1) harbor seals are frequently observed in Port Angeles harbor in two known haul-out locations; or (2) cetaceans or pinnipeds transit the outer edges of the larger Level B harassment zone outside of the harbor.

No injury, serious injury, or mortality is anticipated given the methods of installation and measures designed to minimize the possibility of injury to marine mammals. The potential for these outcomes is minimized through the construction method and the implementation of the planned mitigation measures. Specifically, vibratory hammers will be the primary method of installation, and this activity does not have significant potential to cause injury to marine mammals due to the relatively low source levels produced (likely less than 180 dB rms) and the lack of potentially injurious source characteristics. Impact pile driving produces short, sharp pulses with higher peak levels and much sharper rise time to reach those peaks. When impact driving is necessary, required measures (use of a sound attenuation system, which reduces overall source levels as well as dampening the sharp, potentially injurious peaks, and implementation of shutdown zones) significantly reduce any possibility of injury. Given sufficient ''notice'' through use of soft start, marine mammals are expected to move away from a sound source that is annoying prior to it becoming potentially injurious. The likelihood that marine mammal detection ability by trained observers is high under the environmental conditions described for Port Angeles harbor further enables the implementation of shutdowns to avoid injury, serious injury, or mortality.

Effects on individuals that are taken by Level B harassment, on the basis of reports in the literature, will likely be limited to reactions such as increased swimming speeds, increased surfacing time, or decreased foraging (if such activity were occurring). 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. Repeated exposures of individuals to levels of sound that may cause Level B harassment are unlikely to result in hearing impairment or to significantly disrupt foraging behavior. Thus, even repeated Level B harassment of some small subset of the overall stock is unlikely to result in any significant realized decrease in fitness to those individuals, and thus would not result in any adverse impact to the stock as a whole. Level B harassment will be reduced to the level of least practicable impact through use of mitigation measures described herein and, if sound produced by project activities is sufficiently disturbing, animals are likely to simply avoid the project area while the activity is occurring.

For pinnipeds, no rookeries are present in the project area, but there are two haul-outs within 2.5 mi (4 km) of the project site. However, the project area is not known to provide foraging habitat of any special importance (other than is afforded by the known migration of salmonids). No cetaceans are expected within the harbor.

In summary, this negligible impact analysis is founded on the following factors: (1) The possibility of injury, serious injury, or mortality may reasonably be considered discountable; (2) the anticipated incidences of Level B harassment consist of, at worst, temporary modifications in behavior; (3) the absence of any major rookeries and only a few haul-out areas near or adjacent to the project site; (4) the absence of cetaceans within the harbor and generally sporadic occurrence outside of the ensonified area; (5) the absence of any other known areas or features of special significance for foraging or reproduction within the project area; and (6) the presumed efficacy of the planned mitigation measures in reducing the effects of the specified activity to the level of least practicable impact. In addition, none of these stocks are listed under the ESA or designated as depleted under the MMPA. In combination, we believe that these factors, as well as the available body of evidence from other similar activities, including those conducted in nearby locations, demonstrate that the potential effects of the specified activity will have only short-term effects on individuals. The specified activity is not expected to impact rates of recruitment or survival and will therefore not result in population-level impacts. 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, we preliminarily find that the total marine mammal take from Navy's pier construction activities will have a negligible impact on the affected marine mammal species or stocks.

Small Numbers Analysis

The numbers of animals authorized to be taken for harbor porpoise, Northern elephant seal, and Steller and California sea lions would be considered small relative to the relevant stocks or populations (less than one percent for Northern elephant seal and California sea lion, less than four percent for Steller sea lion, and less than two percent for harbor porpoise) even if each estimated taking occurred to a new individual—an extremely unlikely scenario. For pinnipeds occurring in the nearshore areas, there will almost certainly be some overlap in individuals present day-to-day. Further, for the pinniped species, these takes could potentially occur only within some small portion of the overall regional stock. For example, of the estimated 296,750 California sea lions, only certain adult and subadult males—believed to number approximately 3,000–5,000 by Jeffries *et al.* (2000)—travel north during the non-breeding season. That number has almost certainly increased with the population of California sea lions—the 2000 SAR for California sea lions reported an estimated population size of 204,000–214,000 animals—but likely remains a relatively small portion of the overall population.

For harbor seals, takes are likely to occur only within some portion of the population, rather than to animals from the Washington inland waters stock as a whole. It is estimated that, based on counts from the two nearby haul out sites, 160 harbor seals could potentially be in the vicinity to be exposed to the sound levels. This small number of individuals is expected to be the same animals exposed repeatedly, instead of new individuals being exposed each day. These animals, to which any incidental take would accrue, represent 1.5 percent of the most recent estimate of the stock abundance from the 2013 SAR.

As summarized here, the estimated numbers of potential incidents of harassment for these species are likely much higher than will realistically occur. This is because (1) we use the maximum possible number of days (75) in estimating take, despite the fact that multiple delays and work stoppages are likely to result in a lower number of actual pile driving days; and (2) sea lion estimates rely on the averaged maximum daily abundances per month, rather than simply an overall average which would provide a much lower abundance figure. In addition, potential efficacy of mitigation measures in terms of reduction in numbers and/or intensity of incidents of take has not been quantified. Therefore, these estimated take numbers are likely to be overestimates of individuals. 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 mitigation and monitoring measures, we preliminarily find that small numbers of marine mammals will be taken relative to the populations of the affected species or stocks.

Impact on Availability of Affected Species for Taking for Subsistence Uses

There are no relevant subsistence uses of marine mammals implicated by this action. Therefore, we have 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)

No marine mammal species listed under the ESA are expected to be affected by these activities. Therefore, we have determined that a section 7 consultation under the ESA is not required.

National Environmental Policy Act (NEPA)

In compliance with the NEPA of 1969 (42 U.S.C. 4321 *et seq.*), as implemented by the regulations published by the Council on Environmental Quality (CEQ; 40 CFR parts 1500–1508), the Navy prepared an Environmental Assessment (EA) for this project. In compliance with NEPA, the CEQ regulations, and NOAA Administrative Order 216–6, we will independently evaluate the Navy's EA and determine whether or not to adopt it. We may prepare a separate NEPA analysis and incorporate relevant portions of Navy's EA by reference. We will review all comments submitted in response to this notice as we complete the NEPA process, including a decision of whether to sign a Finding of No Significant Impact (FONSI), prior to a final decision on the incidental take authorization request. The 2015 NEPA documents are available for review at *http://www.nmfs.noaa.gov/pr/permits/incidental.htm.*

Proposed Authorization

As a result of these preliminary determinations, we propose to issue an IHA to the Navy for conducting the described pier and support facilities for the transit protection system U.S. Coast Guard Air Station/Sector Field Office Port Angeles, Washington from November 1, 2016 through February 15, 2017, and July 16 through October 31, 2017 provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. The proposed IHA language is provided next.

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 for one year from the date of issuance.

2. This IHA is valid only for pile driving and removal activities associated with construction of pier and support facilities for the transit protection system U.S. Coast Guard Air Station/Sector Field Office Port Angeles, Washington.

3. 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 harbor seal (*Phoca vitulina*), Northern elephant seal (*Mirounga angustirostris*), California sea lion (*Zalophus californianus*), Steller sea lion (*Eumetopias jubatus*), and harbor porpoise (*Phocoena phocoena*).

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

TABLE 1—AUTHORIZED TAKE NUMBERS

Species	Authorized take	
	Level A	Level B
Harbor seal	0	12,000
Northern elephant seal	0	75
California sea lion	0	1,516
Steller sea lion	0	2,097
Harbor porpoise	0	225
Total	0	15,913

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

(e) The Navy shall 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.

(f) Prior to the start of pile driving or removal, the Navy will contact the Orca Network and/or Center for Whale Research to determine the location of the nearest marine mammal sightings. Daily sighting information reported on the Orca Network Twitter site (*https://twitter.com/orcanetwork*) will be checked several times a day. In addition, the SeaSound Remote Sensing Network will be monitored for real-time information on the presence or absence of whales before starting any pile driving or removal.

4. Mitigation Measures

In order to ensure the least practicable impact on the species listed in condition 3(b), the holder of this Authorization is required to implement the following mitigation measures:

(a) During impact pile driving, the Navy shall implement a minimum shutdown zone of 10 m radius around the pile, to be effective for all species of pinniped, and a minimum shutdown zone of 30 m radius around the pile, to be effective for all species of cetacean. If a marine mammal comes within the relevant zone, operations shall cease.

(b) During vibratory pile driving and removal, the Navy shall implement a minimum shutdown zone of 10 m radius around the pile for marine mammals. If a marine mammal comes within this zone, such operations shall cease.

(c) The Navy shall similarly avoid direct interaction with marine mammals during in-water heavy machinery work other than pile driving that may occur in association with the wharf construction project. If a marine mammal comes within 10 m of such activity, operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions, as appropriate.

(d) The Navy shall establish monitoring locations as described in the Marine Mammal Monitoring Plan. For all pile driving activities, a minimum of three PSOs will be present during all impact and vibratory pile driving/removal. PSOs would be positioned at the best practicable vantage points, taking into consideration security, safety, and space limitations at USCG AIRSTA/SFO Port Angeles. A minimum of three PSOs would be present during both impact and vibratory pile driving/removal. Both the injury and behavioral harassment zones would be monitored in order to remain in compliance with the MMPA. These observers shall record all observations of marine mammals, regardless of distance from the pile being driven, as well as behavior and potential behavioral reactions of the animals.

(e) Monitoring shall take place from 15 minutes prior to initiation of pile driving activity through 30 minutes post-completion of pile driving activity. Pre-activity monitoring shall be conducted for 15 minutes to ensure that the shutdown zone is clear of marine mammals, and pile driving may commence when observers have declared the shutdown zone clear of marine mammals. In the event of a delay or shutdown of activity resulting from marine mammals in the shutdown zone, animals shall be allowed to remain in the shutdown zone (*i.e.,* must leave of their own volition) and their behavior shall be monitored and documented. Monitoring shall occur throughout the time required to drive a pile. The shutdown zone must be determined to be clear during periods of good visibility.

(f) If a marine mammal approaches or enters the shutdown zone, all pile driving activities at that location shall be halted. If pile driving is halted or delayed at a specific location due to the presence of a marine mammal, the activity may not commence or resume until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or 15 minutes have passed without re-detection of the animal.

(g) Monitoring shall be conducted by qualified observers, as described in the Monitoring Plan. Trained observers shall be placed from 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.

(h) Approved sound attenuation devices shall be used during impact pile driving operations. The Navy shall implement the necessary contractual requirements to ensure that such devices are capable of achieving optimal performance, and that deployment of the device is implemented properly such that no reduction in performance may be attributable to faulty deployment.

(i) The Navy shall use soft start techniques recommended by NMFS for pile driving.

i. For impact pile driving, the soft start requires contractors to provide an initial set of strikes from the impact hammer at reduced energy, followed by a 30-second waiting period, then two subsequent reduced energy strike sets. Soft start shall be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of 30 minutes or longer.

ii. For vibratory pile driving, if a variable moment driver can be used, the contractor will initiate noise from vibratory drivers for 15 seconds at reduced energy, followed by a 30-second waiting period. The procedure shall be repeated two additional times. However, if a variable moment hammer proves infeasible for use with this project, or if unsafe working conditions during soft starts are reported by the contractor, the Navy may discontinue use of the vibratory soft start measure. The Navy will inform NMFS Office of Protected Resources if the soft-start procedure is discontinued.

(j) Pile driving shall only be conducted during daylight hours.

5. Monitoring

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

(a) 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. All observers shall be trained in marine mammal identification and behaviors, and shall have no other construction related tasks while conducting monitoring.

(b) For all marine mammal monitoring, the information shall be recorded as described in the Monitoring Plan.

6. Reporting

The holder of this Authorization is required to:

(a) Submit a draft report on all marine mammal monitoring conducted under the IHA within 90 calendar days of the end of the in-water work period. A final report shall be prepared and submitted within 30 days following resolution of comments on the draft report from NMFS. This report must contain the informational elements described in the Monitoring Plan, at minimum (see *www.nmfs.noaa.gov/pr/permits/incidental/construction.htm*).

(b) Reporting injured or dead marine mammals:

i. In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by this IHA, such as an injury (Level A harassment), serious injury, or mortality, 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:

A. Time and date of the incident;

B. Description of the incident;

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

D. Description of all marine mammal observations in the 24 hours preceding the incident;

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

F. Fate of the animal(s); and

G. 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 will work with Navy to determine what measures are necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. Navy may not resume their activities until notified by NMFS.

i. In the event that 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), 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 6(b)(i) of this IHA. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with Navy to determine whether additional mitigation measures or modifications to the activities are appropriate.

ii. In the event that 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, scavenger damage), 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. Navy shall provide photographs or video footage or other documentation of the stranded animal sighting to NMFS.

7. This Authorization may be modified, suspended or withdrawn if the holder fails to abide by the conditions prescribed herein, or if 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 analysis, the draft authorization, and any other aspect of this Notice of Proposed IHA for Navy's wharf construction activities. Please include with your comments any supporting data or literature citations to help inform our final decision on Navy's request for an MMPA authorization.

Dated: March 28, 2016.

Wanda Cain,

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

[FR Doc. 2016–07308 Filed 4–1–16; 8:45 am]

BILLING CODE 3510–22–P