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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648-XR075]

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Offshore Wind Construction Activities off of Virginia

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 Virginia Electric and Power Company, d/b/a Dominion Energy Virginia (Dominion), for authorization to take marine mammals incidental to conducting construction activities off the coast of Virginia in the area of Research Lease of Submerged Lands for Renewable Energy Activities on the Outer Continental Shelf (OCS) Offshore Virginia (Lease No. OCS-A-0497), in support of the Coastal Virginia Offshore Wind (CVOW) Project. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an incidental harassment authorization (IHA) to incidentally take marine mammals during the specified activities. NMFS is also requesting comments on a possible one-year renewal that could be issued under certain circumstances and if all requirements are met, as described in *Request for Public Comments* at the end of this notice. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorizations and agency responses will be summarized in the final notice of our decision.

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

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service. Physical comments should be sent to 1315 East-West Highway, Silver Spring, MD 20910 and electronic comments should be sent to *ITP.carduner@noaa.gov*.

Instructions: NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments received electronically, including all attachments, must not exceed a 25-megabyte file size. Attachments to electronic comments will be accepted in Microsoft Word or Excel or Adobe PDF file formats only. All comments received are a part of the public record and will generally be posted online at *www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-other-energy-activities-renewable* 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: Jordan Carduner, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the applications and supporting documents, as well as a list of the references cited in this document, may be obtained by visiting the Internet at: *www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-other-energy-activities-renewable*. In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

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

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

The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

National Environmental Policy Act

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

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

Information in Dominion's application and this notice collectively provide the environmental information related to proposed issuance of these regulations and subsequent incidental take authorization for public review and comment. We will review all comments submitted in response to this notice prior to concluding our NEPA process or making a final decision on the request for incidental take authorization.

Summary of Request

On September 13, 2019, NMFS received a request from Dominion for an IHA to take marine mammals incidental to construction activities off the coast of Virginia in the area of Research Lease of Submerged Lands for Renewable Energy Activities on the Outer Continental Shelf (OCS) Offshore Virginia (Lease No. OCS-A-0497) in support of the CVOW project. A revised application was received on January 21, 2020. NMFS deemed that request to be adequate and complete. Dominion's request is for the take of seven marine mammal species by Level B harassment that would occur over the course of two days of in-water construction. Neither Dominion nor NMFS expects serious injury or mortality to result from this activity and the activity is expected to last no more than one year, therefore, an IHA is appropriate.

Description of the Proposed Activity

Overview

The CVOW Project (the Project) calls for development of two 6-megawatt wind turbines on a site leased by the Virginia Department of Mines Minerals and Energy (DMME). Dominion has an agreement with DMME to build and operate the two turbines within the 2,135-acre site, which lies 27 miles (mi) off the coast of Virginia Beach, Virginia. Dominion has contracted with Ørsted for construction of the two turbines. The goals of the Project are to provide electricity to Virginia and to inform plans for a future large-scale commercial offshore wind development in the adjacent Virginia Wind Energy Area that is also leased by Dominion.

Dominion proposes to conduct in-water construction activities in the area of Research Lease of Submerged Lands for Renewable Energy Activities on the OCS Offshore Virginia (Lease No. OCS-A-0497) (the Lease Area; see Figure 1-1 in the IHA application), as well as cable-lay and marine site characterization surveys along a 27-mile (mi) submarine cable corridor to a landfall location in Virginia, in support of the Project. The objective of the construction activities is to support installation of the wind turbine generator (WTG) foundations.

Dates and Duration

Construction activities are expected to occur during two days and could occur any time between May and October, 2020. Cable-lay and site characterization survey activities could occur for up to three months between May and October, 2020.

Specific Geographic Region

Dominion's activities would occur in the Northwest Atlantic Ocean within Federal and state waters. Construction activities would occur within the Lease Area approximately 27 miles offshore Virginia (see Figure 1-1 in the IHA application) while cable-lay and site characterization survey activities would occur between the Lease Area and a landfall location in Virginia.

Detailed Description of the Specified Activities

As described above, Dominion's proposed activities include in-water construction, cable laying, and marine site characterization surveys. Of these activities, only in-water construction, which would occur for a total of two days, is expected to result in the incidental take of marine mammals. These activities are described in greater detail below.

Cable-lay Activities

A power cable would be used to transmit the energy generated by the WTGs to substations on land. This cable would be buried under the seabed. Specialized vessels designed for laying and burying cables under the seabed would be used for cable-laying activities. To complete cable installation in one continuous run, Dominion has proposed that cable installation operations would be conducted continuously 24 hours per day. The cable would be buried by the use of a jet plow or plow which create subsea trenches. The underwater noise produced by subsea trenching operations are not expected to rise to a level that would result in the take of marine mammals.

Throughout the cable lay process, a dynamic positioning (DP) enabled cable lay vessel would maintain its position (fixed location or predetermined track) by means of its propellers and thrusters using a Global Positioning System, which describes the ship's position by sending information to an onboard computer that controls the thrusters. DP vessels possess the ability to operate with positioning accuracy, safety, and reliability without the need for anchors, anchor handling tugs and mooring lines. Sound produced through use of DP thrusters is similar to that produced by transiting vessels and DP thrusters are typically operated either in a similarly predictable manner or used for short durations around stationary activities. NMFS has determined the acoustic impacts from DP thrusters are not likely to result in take of marine mammals in the absence of activity- or location-specific circumstances that may otherwise represent specific concerns for marine mammals (*i.e.*, activities proposed in area known to be of particular importance for a particular species), or associated activities that may increase the potential to result in take when in concert with DP thrusters. In this case, we are not aware of any such circumstances. Therefore, NMFS believes the likelihood of DP thrusters used during cable lay activities resulting in harassment of marine mammals to be so low as to be discountable. As DP thrusters and subsea trenching operations are not expected to result in take of marine mammals, cable lay activities are not analyzed further in this document.

Marine Site Characterization Survey Activities

Dominion would conduct marine site characterization surveys with the goal of ensuring the installation area is free of obstructions, installation equipment is accurately positioned, and that export cables (between the Project and shore) and inter-array cables (between the WTGs) are installed in the correct locations and to the appropriate depth below the seafloor. Marine site characterization surveys would be conducted 24 hours per day. These surveys would entail use of the following high resolution geophysical (HRG) equipment types:

- Subsea positioning to calculate position by measuring the range and bearing from a vessel-mounted transceiver to an acoustic transponder;
- Depth sounding (multibeam echosounder) to determine water depths and general bottom topography (currently estimated to range from approximately 6 to 26 m (20 to 85 ft) in depth);
- Parametric sub-bottom profiler to provide high-resolution sub-bottom data laterally and vertically over all depth ranges; and
- Shallow penetration sub-bottom profiler (chirp) to map the near surface stratigraphy (top 0 to 5 m (0 to 16 ft) of soils below seabed).

Table 2-2 in the IHA application identifies the representative survey equipment that may be used in support of planned site characterization survey activities. The deployment of HRG survey equipment, including the equipment planned for use during Dominion’s planned activity, produces sound in the marine environment that has the potential to result in harassment of marine mammals. However, as sound propagation is dependent on several factors including operating mode, frequency and beam direction of the HRG equipment, the potential impacts to marine mammals from HRG equipment are driven by the specification of individual HRG sources.

The specifications of the potential equipment planned for use during site characterization survey activities (Table 2-2 in the IHA application) were analyzed to determine whether these types of equipment would have the potential to result in harassment of marine mammals. Equipment that would be operated either at frequency ranges that fall outside the functional hearing ranges of marine mammals (*e.g.*, above 180 kHz), that operate within marine mammal functional hearing ranges but have low sound source levels (*e.g.*, a single pulse at less than 200 dB re re 1 μPa), or that operate with very narrow beam widths (*e.g.*, a one degree beam width) are assumed to not have the potential to result in marine mammal harassment; therefore any sources planned for use by Dominion that falls into these categories (*i.e*., the SeaBat 7125 multibeam echosounder and Innomar SES-2000 parametric sub-bottom profiler) were eliminated from further analysis. Equipment that does not fall into the above categories, but that is expected to produce sound in the marine environment that would attenuate to levels below the threshold for marine mammal harassment (*i.e*., 160 dB re 1 μPa (rms) for intermittent sources) at very short distances (i.e., less than 25-m from the source) are also assumed to not have the potential to result in marine mammal harassment. Modeling of isopleth distances resulting from the remaining HRG sources proposed for use by Dominion (*i.e*., the PanGeo chirp and the Sonardyne Ranger 2 USBL) indicated that sound from these sources is expected to attenuate to levels below the threshold for marine mammal harassment at very short distances (i.e., less than 25-m) from the sound source.As it was determined that the likelihood of take occurring from all HRG equipment types proposed for use by Dominion would be so low as to be discountable, marine site characterization survey activities are not analyzed further in this document.

Construction activities

Dominion proposes to conduct pile driving activities to support installation of two WTG foundations. A monopile is a single, hollow cylinder fabricated from steel that is secured in the seabed. The monopiles proposed for the Project would have a 7.8 meter (m) (26 feet (ft)) diameter at the seafloor and 6 m (20 ft) diameter flange. The two monopiles would be 63 and 64 meters (207 and 210 ft) in length.

The foundations would be constructed by driving the piles into the seabed with hydraulic hammers. Impact pile driving entails the use of a hammer that utilizes a rising and falling piston to repeatedly strike a pile and drive it into the ground. The pile driver operates by lifting a hammer inside the driver and dropping it onto a steel anvil. The anvil transmits the impulse into the top of the pile and the pile is forced into the sediment. Repeated blows drive the monopile to the desired depth, with the vertical travel of the pile decreasing with each blow as greater soil resistance is built up from the contact between the pile surface and the sediment. Each blow typically results in a travel of several centimeters.

The expected hammer energy required for pile driving would be 600 kilojoules (kJ) though up to a maximum of 1,000 kJ may be required. Each pile is expected to take up to two hours to achieve the target penetration depth. Pile driving is expected to occur at a rate of 40 blows per minute. A maximum of 3,419 strikes would be required to install the first foundation and 4,819 strikes would be required to install the second foundation, though the actual number of blows anticipated for the first and second foundations may ultimately be less (the difference in the number of strikes required for the two foundations is a result of variability in soil conditions between the two WTG locations). One monopile would be driven at a time and a maximum of one pile would be driven into the seabed per day.

When piles are driven with impact hammers, they deform, sending a bulge travelling down the pile that radiates sound into the surrounding air, water, and seabed. The acoustic energy travels into the water along different paths: from the top of the pile where the hammer hits, through the air, into the water; from the top of the pile, down the pile, radiating into the air while travelling down the pile, from air into water; from the top of the pile, down the pile, radiating directly into the water from the length of pile below the waterline; and, down the pile radiating into the seafloor, travelling through the seafloor and radiating back into the water. The underwater sound from pile driving may be received by biological receivers such as marine mammals through the water. Underwater sound produced during impact pile driving during installation of the WTGs could result in the incidental take of marine mammals.

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

Description of Marine Mammals in the Area of Specified Activity

Sections 4 and 5 of the IHA application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history, of the potentially affected species. Additional information regarding population trends and threats may be found in NMFS' Stock Assessment Reports (SARs; *www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*) and more general information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS' web site (*www.fisheries.noaa.gov/find-species*).

All species that could potentially occur in the proposed project area are included in Table 4-1 of the IHA application. However, the temporal and/or spatial occurrence of several species listed in Table 4-1 of the IHA application is such that take of these species is not expected to occur either because they have very low densities in the project area and/or are extralimital to the proposed project area. These are: the blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus),* sei whale *(Balaenoptera borealis),* North Atlantic right whale (*Eubalaena glacialis),* humpback whale (*Megaptera novaeangliae),* minke whale (*Balaenoptera acutorostrata),* Bryde's whale (*Balaenoptera edeni*), sperm whale (*Physeter macrocephalus),* long-finned and short-finned pilot whale (*Globicephala* spp.), Cuvier's beaked whale (*Ziphius cavirostris*), four species of Mesoplodont beaked whale (*Mesoplodon* spp.), dwarf and pygmy sperm whale (*Kogia sima* and *Kogia breviceps*), northern bottlenose whale (*Hyperoodon ampullatus*), pygmy killer whale (*Feresa attenuata*), false killer whale (*Pseudorca crassidens*), melon-headed whale (*Peponocephala electra*), harbor porpoise (*Phocoena phocoena),* Risso's dolphin (*Grampus griseus*), striped dolphin (*Stenella coeruleoalba*), white-beaked dolphin (*Lagenorhynchus albirostris*), pantropical spotted dolphin (*Stenella attenuata*), Fraser's dolphin (*Lagenodelphis hosei*), rough-toothed dolphin (*Steno bredanensis*), Clymene dolphin (*Stenella clymene*), spinner dolphin (*Stenella longirostris*), hooded seal (*Cystophora cristata*), and harp seal (*Pagophilus groenlandicus*). As take of these species is not anticipated as a result of the proposed activities, these species are not analyzed further in this document.

Table 1 summarizes information related to the population or stock, including regulatory status under the MMPA and ESA and potential biological removal (PBR), where known. For taxonomy, we follow Committee on Taxonomy (2019). PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS' SARs). While no mortality is anticipated or authorized here, PBR is included here as a gross indicator of the status of the species and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS' stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS' U.S. Atlantic SARs. All values presented in Table 1 are the most recent available at the time of publication and are available in the 2019 draft Atlantic SARs (Hayes *et al.*, 2019), available online at*: www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region.*

Table 1 – Marine Mammals Known to Occur in the Project Area That May be Affected by Dominion's Proposed Activity

Common Name (Scientific Name)	Stock	MMPA and ESA Status; Strategic (Y/N)[1]	Stock Abundance (CV, N_{min}, most recent abundance survey)[2]	Predicted abundance (CV)[3]	PBR[4]	Annual M/SI[4]	Occurrence in project area
Toothed whales (Odontoceti)							
Atlantic white-	W. North	--; N	93,233(0.71;	37,180 (0.07)	544	26	Common

sided dolphin (*Lagenorhynchus acutus)*	Atlantic		54,443; n/a)				
Common dolphin (*Delphinus delphis)*	W. North Atlantic	--; N	172,825 (0.21; 145,216; 2011)	86,098 (0.12)	1,452	419	Common
Atlantic spotted dolphin (*Stenella frontalis*)	W. North Atlantic	--; N	39,921 (0.27; 32,032; 2012)	55,436 (0.32)	320	0	Common
Bottlenose dolphin (*Tursiops truncatus)*	W. North Atlantic, Offshore	--; N	62,851 (0.23; 51,914; 2011)	97,476 (0.06)[5]	519	28	Common offshore
	W. North Atlantic, Southern Migratory Coastal	--; N	3,751 (0.06; 2,353; n/a)		23	0-14.3	Common nearshore in summer
Harbor porpoise (*Phocoena phocoena)*	Gulf of Maine/Bay of Fundy	--; N	79,833 (0.32; 61,415; 2011)	45,089 (0.12)	706	255	Common
Earless seals (Phocidae)							
Gray seal [6] (*Halichoerus grypus)*	W. North Atlantic	--; N	27,131 (0.19; 23,158; n/a)		1,389	5,410	Common
Harbor seal (*Phoca vitulina)*	W. North Atlantic	--; N	75,834 (0.15; 66,884; 2012)		2,006	350	Common

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 Stock abundance as reported in NMFS marine mammal stock assessment reports (SAR) except where otherwise noted. SARs available online at: *www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments.* CV is coefficient of variation; N_{min} is the minimum estimate of stock abundance. In some cases, CV is not applicable. For certain stocks, abundance estimates are actual counts of animals and there is no associated CV. The most recent abundance survey that is reflected in the abundance estimate is presented; there may be more recent surveys that have not yet been incorporated into the estimate. All values presented here are from the 2019 draft Atlantic SARs (Hayes *et al*., 2019).

3 This information represents species- or guild-specific abundance predicted by recent habitat-based cetacean density models (Roberts *et al*., 2016, 2017, 2018). These models provide the best available scientific information regarding predicted density patterns of cetaceans in the U.S. Atlantic Ocean, and we provide the corresponding abundance predictions as a point of reference. Total abundance estimates were produced by computing the mean density of all pixels in the modeled area and multiplying by its area. For those species marked with an asterisk, the available information supported development of either two or

four seasonal models; each model has an associated abundance prediction. Here, we report the maximum predicted abundance.

4 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). Annual M/SI, 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 values often cannot be determined precisely and is in some cases presented as a minimum value. All M/SI values are as presented in the draft 2019 SARs (Hayes *et al*., 2019).

5 Abundance estimates are in some cases reported for a guild or group of species when those species are difficult to differentiate at sea. Similarly, the habitat-based cetacean density models produced by Roberts *et al*. (2016, 2017, 2018) are based in part on available observational data which, in some cases, is limited to genus or guild in terms of taxonomic definition. Roberts *et al*. (2016, 2017, 2018) produced a density model for bottlenose dolphins that does not differentiate between offshore and coastal stocks.

6 NMFS stock abundance estimate applies to U.S. population only, actual stock abundance is approximately 505,000.

Below is a description of the species that have the highest likelihood of occurring in the project area and are thus expected to potentially be taken by the proposed activities. For the majority of species potentially present in the specific geographic region, NMFS has designated only a single generic stock (*e.g.*, "western North Atlantic") for management purposes.

Atlantic White-sided Dolphin

White-sided dolphins are found in temperate and sub-polar waters of the North Atlantic, primarily in continental shelf waters to the 100-m depth contour from central West Greenland to North Carolina (Waring *et al*., 2016). The Gulf of Maine stock is most common in continental shelf waters from Hudson Canyon to Georges Bank, and in the Gulf of Maine and lower Bay of Fundy. Sighting data indicate seasonal shifts in distribution (Northridge *et al*., 1997). During January to May, low numbers of white-sided dolphins are found from Georges Bank to Jeffreys Ledge (off New Hampshire), with even lower numbers south of Georges Bank, as documented by a few strandings collected on beaches of Virginia to South Carolina. From June through September, large numbers of white-sided dolphins are found from Georges Bank to the lower Bay of Fundy. From October to December, white-sided dolphins occur at intermediate densities from southern Georges Bank to southern Gulf of Maine (Payne and Heinemann 1990).

Bottlenose Dolphin

There are two distinct bottlenose dolphin morphotypes in the western North Atlantic: the coastal and offshore forms (Waring *et al.,* 2016). The offshore form is distributed primarily along the outer continental shelf and continental slope in the Northwest Atlantic Ocean from Georges Bank to the Florida Keys. The coastal morphotype is morphologically and genetically distinct from the larger, more robust morphotype that occupies habitats further offshore. Spatial distribution data, tag-telemetry studies, photo-ID studies and genetic studies demonstrate the existence of a distinct Southern Migratory stock of coastal bottlenose dolphins (Waring *et al.,* 2014). The spatial distribution and migratory movements of the Southern Migratory Coastal stock are poorly understood and have been defined based on movement data from satellite-tag telemetry and photo-ID studies, and stable isotope studies. During the warm water months of July–August, the stock is presumed to occupy coastal waters north of Cape Lookout, North Carolina, to Assateague, Virginia, including Chesapeake Bay. During the remainder of the year (September–June), the stock migrates from southern North Carolina (south of Cape Lookout) to northern Florida (Hayes *et al*., 2017). The Western North Atlantic offshore stock and Southern Migratory Coastal stock may overlap to some degree in the project area (Hayes *et al*., 2017).

Common Dolphin

The common dolphin is found world-wide in temperate to subtropical seas. In the North Atlantic, common dolphins are commonly found over the continental shelf between the 100-m and 2,000-m isobaths and over prominent underwater topography and east to the mid-Atlantic Ridge (Waring *et al*., 2016).

Atlantic Spotted Dolphin

Atlantic spotted dolphins are found in tropical and warm temperate waters ranging from southern New England, south to Gulf of Mexico and the Caribbean to Venezuela (Waring *et al*., 2014). This stock regularly occurs in continental shelf waters south of Cape Hatteras and in continental shelf edge and continental slope waters north of this region (Waring *et al*., 2014). There are two forms of this species, with the larger ecotype inhabiting the continental shelf and is usually found inside or near the 200 m isobaths (Waring *et al.*, 2014).

Harbor Porpoise

The Gulf of Maine/Bay of Fundy stock is the only stock that may be present in the project area. This stock is found in U.S. and Canadian Atlantic waters and is concentrated in the northern Gulf of Maine and southern Bay of Fundy region, generally in waters less than 150 m deep (Waring *et al.*, 2016). They are seen from the coastline to deep waters (>1800 m; Westgate *et al.* 1998), although the majority of the population is found over the continental shelf (Waring *et al*., 2016). The main threat to the species is interactions with fisheries, with documented take in the U.S. northeast sink gillnet, mid-Atlantic gillnet, and northeast bottom trawl fisheries and in the Canadian herring weir fisheries (Waring *et al.*, 2016).

Harbor Seal

The harbor seal is found in all nearshore waters of the North Atlantic and North Pacific Oceans and adjoining seas above about 30ºN (Burns, 2009). In the western North Atlantic, harbor seals are distributed from the eastern Canadian Arctic and Greenland south to southern New England and New York, and occasionally to the Carolinas (Waring *et al*., 2016). Haulout and pupping sites are located off Manomet, MA and the Isles of Shoals, ME, but generally do not occur in areas in southern New England (Waring *et al.*, 2016).

Since July 2018, elevated numbers of harbor seal and gray seal mortalities have occurred across Maine, New Hampshire and Massachusetts. This event has been declared a UME. Additionally, stranded seals have shown clinical signs as far south as Virginia, although not in elevated numbers, therefore the UME investigation now encompasses all seal strandings from Maine to Virginia. Lastly, ice seals (harp and hooded seals) have also started stranding with clinical signs, again not in elevated numbers, and those two seal species have also been added to the UME investigation. As of March, 2020 a total of 3,050 reported strandings (of all species) had occurred, including 10 strandings reported in Virginia. Full or partial necropsy examinations have been conducted on some of the seals and samples have been collected for testing. Based on tests conducted thus far, the main pathogen found in the seals is phocine distemper virus. NMFS is performing additional testing to identify any other factors that may be involved in this UME. Information on this UME is available online at: *www.fisheries.noaa.gov/new-england-mid-atlantic/marine-life-distress/2018-2019-pinniped-unusual-mortality-event-along*.

Gray Seal

There are three major populations of gray seals found in the world; eastern Canada (western North Atlantic stock), northwestern Europe and the Baltic Sea. Gray seals in the project area belong to the western North Atlantic stock. The range for this stock is thought to be from New Jersey to Labrador. Current population trends show that gray seal abundance is likely increasing in the U.S. Atlantic EEZ (Waring *et al.*, 2016). Although the rate of increase is unknown, surveys conducted since their arrival in the 1980s indicate a steady increase in abundance in both Maine and Massachusetts (Waring *et al.*, 2016). It is believed that recolonization by Canadian gray seals is the source of the U.S. population (Waring *et al.*, 2016).

As described above, elevated seal mortalities, including gray seals, have occurred from Maine to Virginia since July 2018. This event has been declared a UME, with phocine distemper virus identified as the main pathogen found in the seals. NMFS is performing additional testing to identify any other factors that may be involved in this UME. Information on this UME is available online at: *www.fisheries.noaa.gov/new-england-mid-atlantic/marine-life-distress/2018-2019-pinniped-unusual-mortality-event-along*.

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g.*, Richardson *et al.*, 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al*. (2007)

recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.*, low-frequency cetaceans). Subsequently, NMFS (2016) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibel (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al*. (2007) retained. The functional groups and the associated frequencies are indicated below (note that these frequency ranges correspond to the range for the composite group, with the entire range not necessarily reflecting the capabilities of every species within that group):

- Low-frequency cetaceans (mysticetes): generalized hearing is estimated to occur between approximately 7 Hertz (Hz) and 35 kilohertz (kHz);
- Mid-frequency cetaceans (larger toothed whales, beaked whales, and most delphinids): generalized hearing is estimated to occur between approximately 150 Hz and 160 kHz;
- High-frequency cetaceans (porpoises, river dolphins, and members of the genera Kogia and Cephalorhynchus; including two members of the genus Lagenorhynchus, on the basis of recent echolocation data and genetic data): generalized hearing is estimated to occur between approximately 275 Hz and 160 kHz; and

- Pinnipeds in water; Phocidae (true seals): generalized hearing is estimated to occur between approximately 50 Hz to 86 kH.

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

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information. Fourteen marine mammal species (twelve cetacean and two pinniped (both phocid species) have the reasonable potential to co-occur with the proposed activities (see Table 3). Of the cetacean species that may be present, five are classified as low-frequency cetaceans (*i.e*., all mysticete species), six are classified as mid-frequency cetaceans (*i.e*., all delphinid species and the sperm whale), and one is classified as a high-frequency cetacean (*i.e*., harbor porpoise).

Potential Effects of Specified Activities on Marine Mammals and their Habitat

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

Description of Sound Sources

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

Sound travels in waves, the basic components of which are frequency, wavelength, velocity, and amplitude. Frequency is the number of pressure waves that pass by a reference point per unit of time and is measured in hertz (Hz) or cycles per second. Wavelength is the distance between two peaks or corresponding points of a sound wave (length of one cycle). Higher frequency sounds have shorter wavelengths than lower frequency sounds, and typically attenuate (decrease) more rapidly, except in certain cases in shallower water. Amplitude is the height of the sound pressure wave or the "loudness" of a sound and is typically described using the relative unit of the decibel (dB). A sound pressure level (SPL) in dB is described as the ratio between a measured pressure and a reference pressure (for underwater sound, this is 1 microPascal (μPa)), and is a logarithmic unit that accounts for large variations in amplitude; therefore, a relatively small change in dB corresponds to large changes in sound pressure. The source level (SL) represents the SPL referenced at a distance of 1 m from the source (referenced to 1 μPa), while the received level is the SPL at the listener's position (referenced to 1 μPa).

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

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

When underwater objects vibrate or activity occurs, sound-pressure waves are created. These waves alternately compress and decompress the water as the sound wave travels. Underwater sound waves radiate in a manner similar to ripples on the surface of a pond and may be either directed in a beam or beams or may radiate in all directions (omnidirectional sources), as is the case for sound produced by the pile driving activity considered here. The compressions and decompressions associated with sound waves are detected as changes in pressure by aquatic life and man-made sound receptors such as hydrophones.

Even in the absence of sound from the specified activity, the underwater environment is typically loud due to ambient sound, which is defined as environmental background sound levels lacking a single source or point (Richardson *et al*., 1995). The sound level of a region is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.*, wind and waves, earthquakes, ice, atmospheric sound), biological (*e.g.*, sounds produced by marine mammals, fish, and invertebrates), and anthropogenic (*e.g.*, vessels, dredging, construction) sound. A number of sources contribute to ambient sound, including wind and waves, which are a main source of naturally occurring ambient sound for frequencies between 200 hertz (Hz) and 50 kilohertz (kHz) (Mitson, 1995). In general, ambient sound levels tend to increase with increasing wind speed and wave height. Precipitation can become an important component of total sound at frequencies above 500 Hz, and possibly down to 100 Hz during quiet times. Marine mammals can contribute significantly to ambient sound levels, as can some fish and snapping shrimp. The frequency band for biological contributions is from approximately 12 Hz to over 100 kHz. Sources of ambient sound related to human activity include transportation (surface vessels), dredging and construction, oil and gas drilling and production, geophysical surveys, sonar, and explosions. Vessel noise typically dominates the total ambient sound for frequencies between 20 and 300 Hz. In general, the frequencies of anthropogenic sounds are below 1 kHz and, if higher frequency sound levels are created, they attenuate rapidly.

The sum of the various natural and anthropogenic sound sources that comprise ambient sound at any given location and time depends not only on the source levels (as determined by current weather conditions and levels of biological and human activity) but also on the ability of sound to propagate through the environment. In turn, sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor, and is frequency-dependent. As a result of the dependence on a large number of varying factors, ambient sound levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10-20 decibels (dB) from day to day (Richardson *et al*., 1995). The result is that, depending on the source type and its intensity, sound from the specified activity may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals. Underwater ambient sound in the Atlantic Ocean offshore Virginia is comprised of sounds produced by a number of natural and anthropogenic sources. Human-generated sound is a significant contributor to the ambient acoustic environment in the project location. Details of source types are described in the following text.

Sounds are often considered to fall into one of two general types: pulsed and non-pulsed (defined in the following). The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (*e.g.*, Ward, 1997 in Southall *et al*., 2007). Please see Southall *et al*. (2007) for an in-depth discussion of these concepts. The distinction between these two sound types is not always obvious, as certain signals share properties of both pulsed and non-pulsed sounds. A signal near a source could be categorized as a pulse, but due to propagation effects as it moves farther from the source, the signal duration becomes longer (*e.g.*, Greene and Richardson, 1988).

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

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

Acoustic Effects

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

Potential Effects of Underwater Sound – Note that, in the following discussion, we refer in many cases to a review article concerning studies of noise-induced hearing loss conducted from 1996-2015 (*i.e.*, Finneran, 2015). For study-specific citations, please see that work. Anthropogenic sounds cover a broad range of frequencies and sound levels and can have a range of highly variable impacts on marine life, from none or minor to potentially severe responses, depending on received levels, duration of exposure, behavioral context, and various other factors. The potential effects of underwater sound from active acoustic sources can potentially result in one or more of the following: temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, stress, and masking (Richardson *et al*., 1995; Gordon *et al*., 2004; Nowacek *et al*., 2007; Southall *et al*., 2007; Götz *et al*., 2009). The degree of effect is intrinsically related to the signal characteristics, received level, distance from the source, and duration of the sound exposure. In general, sudden, high level sounds can cause hearing loss, as can longer exposures to lower level sounds. Temporary or permanent loss of hearing will occur almost exclusively for noise within an animal's hearing range. We first describe specific manifestations of acoustic effects before providing discussion specific to pile driving.

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

We describe the more severe effects (*i.e.*, certain non-auditory physical or physiological effects) only briefly as we do not expect that there is a reasonable likelihood that pile driving may result in such effects (see below for further discussion). Potential effects from impulsive sound sources can range in severity from effects such as behavioral disturbance or tactile perception to physical discomfort, slight injury of the internal organs and the auditory system, or mortality (Yelverton *et al*., 1973). Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to high level underwater sound or as a secondary effect of extreme behavioral reactions (*e.g.*, change in dive profile as a result of an avoidance reaction) caused by exposure to sound include neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage (Cox *et al*., 2006; Southall *et al*., 2007; Zimmer and Tyack, 2007; Tal *et al*., 2015). The construction activities considered here do not involve the use of devices such as explosives or mid-frequency tactical sonar that are associated with these types of effects.

Threshold Shift – Marine mammals exposed to high-intensity sound, or to lower-intensity sound for prolonged periods, can experience hearing threshold shift (TS), which is the loss of hearing sensitivity at certain frequency ranges (Finneran, 2015). TS can be permanent (PTS), in which case the loss of hearing sensitivity is not fully recoverable, or temporary (TTS), in which case the animal's hearing threshold would recover over time (Southall *et al*., 2007). Repeated sound exposure that leads to TTS could cause PTS. In severe cases of PTS, there can be total or partial deafness, while in most cases the animal has an impaired ability to hear sounds in specific frequency ranges (Kryter, 1985).

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

Relationships between TTS and PTS thresholds have not been studied in marine mammals, and there is no PTS data for cetaceans, but such relationships are assumed to be similar to those in humans and other terrestrial mammals. PTS typically occurs at exposure levels at least several decibels above (a 40-dB threshold shift approximates PTS onset; *e.g.*, Kryter *et al*., 1966; Miller, 1974) that inducing mild TTS (a 6-dB threshold shift approximates TTS onset; *e.g.*, Southall *et al*. 2007). Based on data from terrestrial mammals, a precautionary assumption is that the PTS thresholds for impulse sounds (such as impact pile driving pulses as received close to the source) are at least 6 dB higher than the TTS threshold on a peak-pressure basis and PTS cumulative sound exposure level thresholds are 15 to 20 dB higher than TTS cumulative sound exposure level thresholds (Southall *et al*., 2007). Given the higher level of sound or longer exposure duration necessary to cause PTS as compared with TTS, it is considerably less likely that PTS could occur.

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

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

Currently, TTS data only exist for four species of cetaceans (bottlenose dolphin, beluga whale (*Delphinapterus leucas*), harbor porpoise, and Yangtze finless porpoise (*Neophocoena asiaeorientalis*)) and three species of pinnipeds (northern elephant seal (*Mirounga angustirostris*), harbor seal, and California sea lion (*Zalophus californianus*)) exposed to a limited number of sound sources (*i.e.*, mostly tones and octave-band noise) in laboratory settings (Finneran, 2015). TTS was not observed in trained spotted (*Phoca largha*) and ringed (*Pusa hispida*) seals exposed to impulsive noise at levels matching previous predictions of TTS onset (Reichmuth *et al*., 2016). In general, harbor seals and harbor porpoises have a lower TTS onset than other measured pinniped or cetacean species (Finneran, 2015). Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species. There are no data available on noise-induced hearing loss for mysticetes. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Southall *et al*. (2007), Finneran and Jenkins (2012), Finneran (2015), and NMFS (2018).

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

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok *et al*., 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. It is important to note that habituation is appropriately considered as a "progressive reduction in response to stimuli that are perceived as neither aversive nor beneficial," rather than as, more generally, moderation in response to human disturbance (Bejder *et al*., 2009). The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure. As noted, behavioral state may affect the type of response. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson *et al*., 1995; NRC, 2003; Wartzok *et al*., 2003). Controlled experiments with captive marine mammals have showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway *et al*., 1997; Finneran *et al*., 2003). Observed responses of wild marine mammals to loud pulsed sound sources (typically airguns or acoustic harassment devices) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds, 2002; see also Richardson *et al*., 1995; Nowacek *et al*., 2007). However, many delphinids approach low-frequency airgun source vessels with no apparent discomfort or obvious behavioral change (*e.g.,* Barkaszi *et al*., 2012), indicating the importance of frequency output in relation to the species' hearing sensitivity.

Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, 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, 2013b). Variations in dive behavior may reflect interruptions in biologically significant activities (*e.g.*, foraging) or they may be of little biological significance. The impact of an alteration to dive behavior resulting from an acoustic exposure depends on what the animal is doing at the time of the exposure and the type and magnitude of the response.

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

Variations in respiration naturally vary with different behaviors and alterations to breathing rate as a function of acoustic exposure can be expected to co-occur with other behavioral reactions, such as a flight response or an alteration in diving. However, respiration rates in and of themselves may be representative of annoyance or an acute stress response. Various studies have shown that respiration rates may either be unaffected or could increase, depending on the species and signal characteristics, again highlighting the importance in understanding species differences in the tolerance of underwater noise when determining the potential for impacts resulting from anthropogenic sound exposure (*e.g.*, Kastelein *et al*., 2001, 2005, 2006; Gailey *et al*., 2007; Gailey *et al*., 2016).

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

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

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

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

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

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

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

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

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

Auditory Masking – Sound can disrupt behavior through masking, or interfering with, an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g.*, those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al*., 1995; Erbe *et al*., 2016).

Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may occur whether the sound is natural (*e.g.*, snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g.*, shipping, sonar, seismic exploration) in origin. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g.*, signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g.*, sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age or TTS hearing loss), and existing ambient noise and propagation conditions.

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

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

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

Potential Effects of the Specified Activity – As described previously (see "Description of Active Acoustic Sound Sources"), Dominion proposes to conduct pile driving. The effects of pile driving on marine mammals are dependent on several factors, including the size, type, and depth of the animal; the depth, intensity, and duration of the pile driving sound; the depth of the water column; the substrate of the habitat; the distance between the pile and the animal; and the sound propagation properties of the environment.

Noise generated by impact pile driving consists of regular, pulsed sounds of short duration. These pulsed sounds are typically high energy with fast rise times. Exposure to these sounds may result in harassment depending on proximity to the sound source and a variety of environmental and biological conditions (Dahl et al. 2015; Nedwell et al., 2007). Illingworth & Rodkin (2007) measured an unattenuated sound pressure within 10 m (33 ft) at a peak of 220 dB re 1 μPa for a 2.4 m (96 in) steel pile driven by an impact hammer. Studies of underwater sound from pile driving finds that most of the acoustic energy is below one to two kHz, with broadband sound energy near the source (40 Hz to >40 kHz) and only low-frequency energy (<~400 Hz) at longer ranges (Bailey et al., 2010; Erbe, 2009; Illingworth & Rodkin, 2007). There is typically a decrease in sound pressure and an increase in pulse duration the greater the distance from the noise source (Bailey et al., 2010). Maximum noise levels from pile driving usually occur during the last stage of driving each pile where the highest hammer energy levels are used (Betke, 2008).

Available information on impacts to marine mammals from pile driving associated with offshore wind is limited to information on harbor porpoises and seals, as the vast majority of this research has occurred at European offshore wind projects where large whales are uncommon. Harbor porpoises, one of the most behaviorally sensitive cetaceans, have received particular attention in European waters due to their protection under the European Union Habitats Directive (EU 1992, Annex IV) and the threats they face as a result of fisheries bycatch. Brandt et al. (2016) summarized the effects of the construction of eight offshore wind projects within the German North Sea between 2009 and 2013 on harbor porpoises, combining PAM data from 2010-2013 and aerial surveys from 2009-2013 with data on noise levels associated with pile driving. Baseline analyses were conducted initially to identify the seasonal distribution of porpoises in different geographic subareas. Results of the analysis revealed significant declines in porpoise detections during pile driving when compared to 25-48 hours before pile driving began, with the magnitude of decline during pile driving clearly decreasing with increasing distances to the construction site. During the majority of projects significant declines in detections (by at least 20 percent) were found within at least 5-10 km of the pile driving site, with declines at up to 20-30 km of the pile driving site documented in some cases. Such differences between responses at the different projects could not be explained by differences in noise levels alone and may be associated instead with a relatively high quality of feeding habitat and a lower motivation of porpoises to leave the noise impacted area in certain locations, though the authors were unable to determine exact reasons for the apparent differences. There were no indications for a population decline of harbor porpoises over the five year study period based on analyses of daily PAM data and aerial survey data at a larger scale (Brandt et al., 2016). Despite extensive construction activities over the study period and an increase in these activities over time, there was no long-term negative trend in acoustic porpoise detections or densities within any of the subareas studied. In some areas, PAM data even detected a positive trend from 2010 to 2013. Even though clear negative short-term effects (1-2 days in duration) of offshore wind farm construction were found (based on acoustic porpoise detections), the authors found no indication that harbor porpoises within the German Bight were negatively affected by wind farm construction at the population level (Brandt et al., 2016).

Monitoring of harbor porpoises before and after construction at the Egmond aan Zee offshore wind project in the Dutch North Sea showed that more porpoises were found in the wind project area compared to two reference areas post-construction, leading the authors to conclude that this effect was linked to the presence of the wind project, likely due to increased food availability as well as the exclusion of fisheries and reduced vessel traffic in the wind project (Lindeboom et al., 2013). The available literature indicates harbor porpoise avoidance of pile driving at offshore wind projects has occurred during the construction phase. Where long term monitoring has been conducted, harbor porpoises have re-populated the wind farm areas after construction ceased, with the time it takes to re-populate the area varying somewhat, indicating that while there are short-term impacts to porpoises during construction, population-level or long-term impacts are unlikely.

Harbor seals are also a particularly behaviorally sensitive species. A harbor seal telemetry study off the East coast of England found that seal abundance was significantly reduced up to 25 km from WTG pile driving during construction, but found no significant displacement resulted from construction overall as the seals' distribution was consistent with the non-piling scenario within two hours of cessation of pile driving (Russell et al., 2016). Based on two years of monitoring at the Egmond aan Zee offshore wind project in the Dutch North Sea, satellite telemetry, while inconclusive, seemed to show that harbor seals avoided an area up to 40 km from the construction site during pile driving, though the seals were documented inside the wind farm after construction ended, indicating any avoidance was temporary (Lindeboom et al., 2013).

Taken as a whole, the available literature suggests harbor seals and harbor porpoises have shown avoidance of pile driving at offshore wind projects during the construction phase in some instances, with the duration of avoidance varying greatly, and with re-population of the area generally occurring post-construction. The literature suggests that marine mammal responses to pile driving in the offshore environment are not predictable and may be context-dependent. It should also be noted that the only studies available on marine mammal responses to offshore wind-related pile driving have focused on species which are known to be more behaviorally sensitive to auditory stimuli than the other species that occur in the project area. Therefore, the documented behavioral responses of harbor porpoises and harbor seals to pile driving in Europe should be considered as a worst case scenario in terms of the potential responses among all marine mammals to offshore pile driving, and these responses cannot reliably predict the responses that will occur in other species.

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). It is possible that the onset of pile driving could result in temporary, short-term changes in an animal's typical behavioral patterns and/or temporary avoidance of the affected area. These behavioral changes may include (Richardson *et al*., 1995): changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities;

changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where sound sources are located; and/or flight responses. The biological significance of many of these behavioral disturbances is difficult to predict, especially if the detected disturbances appear minor. However, the consequences of behavioral modification could be expected to be biologically significant if the change affects growth, survival, or reproduction. Significant behavioral modifications that could lead to effects on growth, survival, or reproduction, such as drastic changes in diving/surfacing patterns or significant habitat abandonment are considered extremely unlikely in the case of the proposed project, as it is expected that mitigation measures, including clearance zones and soft start (described in detail below, see "Proposed Mitigation Measures") will minimize the potential for marine mammals to be exposed to sound levels that would result in more extreme behavioral responses. In addition, marine mammals in the project area are expected to avoid any area that would be ensonified at sound levels high enough for the potential to result in more severe acute behavioral responses, as the environment within the Atlantic Ocean offshore Virginia would allow marine mammals the ability to freely move to other areas without restriction.

In the case of pile driving, sound sources would be active for relatively short durations (i.e., two hours), with relation to potential for masking. The frequencies output by pile driving activity are lower than those used by most species expected to be regularly present for communication or foraging. Those species who would be more susceptible to masking at these frequencies (LF cetaceans) use the area only seasonally. We expect insignificant impacts from masking, and any masking event that could possibly rise to Level B harassment under the MMPA would occur concurrently within the zones of behavioral harassment already estimated for pile driving, and which have already been taken into account in the exposure analysis.

Anticipated Effects on Marine Mammal Habitat

The proposed activities would not result in permanent impacts to habitats used directly by marine mammals, but may have potential short-term impacts to food sources such as forage fish. The proposed activities could also affect acoustic habitat (see masking discussion above), but meaningful impacts are unlikely. There are no known foraging hotspots, or other ocean bottom structures of significant biological importance to marine mammals present in the project area. Therefore, the main impact issue associated with the proposed activity would be temporarily elevated sound levels and the associated direct effects on marine mammals, as discussed previously. The most likely impact to marine mammal habitat occurs from pile driving effects on likely marine mammal prey (*e.g.*, fish). Impacts to the immediate substrate during installation of piles are anticipated, but these would be limited to minor, temporary suspension of sediments, which could impact water quality and visibility for a short amount of time, without any expected effects on individual marine mammals. Impacts to substrate are therefore not discussed further.

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

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

Fish react to sounds which are especially strong and/or intermittent low-frequency sounds, and behavioral responses such as flight or avoidance are the most likely effects. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. The reaction of fish to noise depends on the physiological state of the fish, past exposures, motivation (*e.g.*, feeding, spawning, migration), and other environmental factors. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented effects of pile driving on fish, although several are based on studies in support of large, multiyear bridge construction projects (*e.g.*, Scholik and Yan, 2001, 2002; Popper and Hastings, 2009). Several studies have demonstrated that impulse sounds might affect the distribution and behavior of some fishes, potentially impacting foraging opportunities or increasing energetic costs (*e.g.*, Fewtrell and McCauley, 2012; Pearson *et al*., 1992; Skalski *et al*., 1992; Santulli *et al*., 1999; Paxton *et al*., 2017). However, some studies have shown no or slight reaction to impulse sounds (*e.g.*, Pena *et al*., 2013; Wardle *et al*., 2001; Jorgenson and Gyselman, 2009; Cott *et al*., 2012). More commonly, though, the impacts of noise on fish are temporary.

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

The most likely impact to fish from pile driving activities in the project area would be temporary behavioral avoidance of the area. The duration of fish avoidance of an area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. In general, impacts to marine mammal prey species are expected to be minor and temporary due to the expected short daily duration of individual pile driving events and the relatively small areas being affected.

The area likely impacted by the activities is relatively small compared to the available habitat in the Atlantic Ocean offshore Virginia and there are no known habitat areas of biological importance for marine mammals within the area that would be impacted. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity. Based on the information discussed herein, we conclude that impacts of the specified activity are not likely to have more than short-term adverse effects on any prey habitat or populations of prey species. Further, any impacts to marine mammal habitat are not expected to result in significant or long-term consequences for individual marine mammals, or to contribute to adverse impacts on their populations. Effects to habitat will not be discussed further in this document.

Estimated Take

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

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

Authorized takes would primarily be by Level B harassment, as noise from pile driving has the potential to result in disruption of behavioral patterns for individual marine mammals. There is also some potential for auditory injury (Level A harassment) to result. The proposed mitigation and monitoring measures are expected to minimize the severity of such taking to the extent practicable. The proposed mitigation and monitoring measures are expected to minimize the severity of such taking to the extent practicable.

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

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

Acoustic Thresholds

Using the best available science, NMFS has developed acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

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

Level A harassment - NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). The components of Skipjack's proposed activity that may result in the take of marine mammals include the use of impulsive sources.

These thresholds are provided in Table 2 below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2018 Technical Guidance, which may be accessed at: *www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance.*

Table 2 – Thresholds Identifying the Onset of Permanent Threshold Shift

	PTS Onset Acoustic Thresholds* **(Received Level)**	
Hearing Group	**Impulsive**	**Non-impulsive**

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

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

Note: Peak sound pressure (L_{pk}) has a reference value of 1 μPa, and cumulative sound exposure level (L_E) has a reference value of 1μPa^{2}s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript “flat” is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (*i.e.*, varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

Ensonified Area

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

As described above, Dominion proposes to install two WTGs on monopile foundations. The WTG monopile foundations would each be 7.8-m in diameter. The expected hammer energy required to drive the two monopiles is 600 kJ, though a maximum potential hammer energy of 1,000 kJ may be required. A bubble curtain would also be deployed to attenuate pile driving noise on at least one of the piles. Dominion performed acoustic modeling based on scenarios including 600 kJ and 1,000 kJ hammer energy, and on attenuation levels of 15 dB, 10 dB, 6 dB and 0 dB achieved from the deployment of the bubble curtain.

Modeling was performed using the software dBSea, a 3D model developed by Marshall Day Acoustics that is built by importing bathymetry data and placing noise sources in the environment. The dBSea model allows for the incorporation of several site-specific properties including sound speed profile, temperature, salinity, and current. Noise levels are calculated throughout the project area and displayed in 3D. The model also allows for the incorporation of several "solvers". Two such "solvers" were incorporated in the modeling:

- dBSeaPE (Parabolic Equation Method): The dBSeaPE solver makes use of the parabolic equation method, a versatile and robust method of marching the sound field out in range from the sound source; and
- dBSeaRay (Ray Tracing Method): The dBSeaRay solver forms a solution by tracing rays from the source to the receiver. Many rays leave the source covering a range of angles, and the sound level at each point in the receiving field is calculated by coherently summing the components from each ray.

The number of strikes per pile incorporated in the model were 3,419 blows for the first foundation and 4,819 blows for the second foundation at a rate of 40 blows per minute (as described above, this represents a conservative estimate as the actual number of blows anticipated for the first and second foundations may ultimately be less). Source levels incorporated in the model were derived from data recorded at the Walney Extension Offshore Wind Farm located off the coast of England (NIRAS Consulting Ltd, 2017). Data from the Walney Extension project represents a suitable proxy for the proposed project as the piles at the Walney Extension project were the same diameter as those proposed for use in the CVOW project (i.e., 7.8-m) and water depth at the Walney Extension project was very similar to that at the CVOW project site (a depth of 28-m at the Walney Extention project compared to a depth of 25-m at the CVOW project site). Source levels derived from the Walney Extension project and used in the modeling are shown in Table 3.

Table 3 – Source Levels used in Modeling Pile Driving Noise from the CVOW Project

Hammer Energy Scenario	Source Level at 1 meter
600 kJ Hammer Energy	222 $dBrms_{90}$ 213 SEL 235 Peak
1,000 kJ Hammer Energy	224 $dBrms_{90}$ 215 SEL 237 Peak

Acoustic modeling was performed for scenarios including 600 kJ and 1,000 kJ hammer energy. To be conservative, it was assumed for purposes of the exposure estimate that 1,000 kJ hammer energy would be required at all times during the driving of both piles. This represents a conservative assumption, as less energy may ultimately be required. Modeling scenarios included potential attenuation levels of 15 dB, 10 dB, 6 dB and 0 dB achieved from the deployment of the attenuation system. Table 4 shows modeled isopleth distances to Level A and Level B harassment thresholds based on 1,000 kJ hammer energy and potential attenuation levels of 15 dB, 10 dB, 6 dB and 0 dB. Level A harassment isopleths vary based on marine mammal functional hearing groups. The updated acoustic thresholds for impulsive sounds (such as pile driving) contained in the

Technical Guidance (NMFS, 2018) were presented as dual metric acoustic thresholds using both cumulative sound exposure level (SEL_{cum}) and peak sound pressure level metrics. As dual metrics, NMFS considers onset of PTS (Level A harassment) to have occurred when either one of the two metrics is exceeded (*i.e.*, the metric resulting in the largest isopleth). The SEL_{cum} metric considers both level and duration of exposure, as well as auditory weighting functions by marine mammal hearing group.

Table 4 – Modeled Radial Distances to Thresholds Corresponding to Level A and Level B Harassment from Pile Driving Based on 1,000 kJ Hammer Energy

Attenuation scenario	Radial Distance to Level A Harassment Threshold (m)*				Radial Distance to Level B Harassment Threshold (m)
	High frequency cetaceans (peak SPL / SEL_{cum})	Low frequency cetaceans (peak SPL / SEL_{cum})	Mid frequency cetaceans (peak SPL / SEL_{cum})	Phocid pinnipeds (underwater) (peak SPL / SEL_{cum})	All marine mammals
No attenuation	325 / 2,670	282 / 5,930	182 / 397	N/A / 1,722	5,175
6 dB Reduction	80 / 1,277	N/A / 3,830	N/A / 252	N/A / 567	3,580
10 dB Reduction	N/A / 314	N/A / 2,217	N/A / 229	N/A / 317	2,520
15 dB Reduction	N/A / 233	N/A / 1,277	N/A / 124	N/A / 236	1,370

* N/A indicates the distance to the threshold is so low it was undetectable in the modeling results.

Marine Mammal Occurrence

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

The habitat-based density models produced by the Duke University Marine Geospatial Ecology Laboratory (Roberts *et al*., 2016, 2017, 2018) represent the best available information regarding marine mammal densities in the proposed project area. The density data presented by Roberts *et al.* (2016, 2017, 2018) incorporates aerial and shipboard line-transect survey data from NMFS and other organizations and incorporates data from 8 physiographic and 16 dynamic oceanographic and biological covariates, and controls for the influence of sea state, group size, availability bias, and perception bias on the probability of making a sighting. These density models were originally developed for all cetacean taxa in the U.S. Atlantic (Roberts et al., 2016). In subsequent years, certain models have been updated on the basis of additional data as well as certain methodological improvements. The updated models incorporate additional sighting data, including sightings from the NOAA Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys from 2010–2014 (NEFSC & SEFSC, 2011, 2012, 2014a, 2014b, 2015, 2016). More information, including the initial model results and supplementary information for each model, is available online at *seamap.env.duke.edu/models/Duke-EC-GOM-2015/*.

Marine mammal density estimates in the project area (animals/km^2) were obtained using the model results from Roberts *et al*. (2016, 2017, 2018). While pile driving activities are planned for May, these activities could potentially occur any time between May and October. Average seasonal marine mammal densities were developed for each species and for each season when pile driving activities may occur using maximum monthly densities for each species, as reported by Roberts et al. (2016; 2017; 2018) (Densities from March through May were averaged for spring; June through August densities were averaged for summer; and September through November densities were averaged for fall). To be conservative, the highest average seasonal density for each species was then carried forward in the analysis (i.e., whichever of the three seasonal average densities was highest for each species was applied to the exposure estimate). The maximum seasonal density values used in the exposure estimates are shown in Table 7 below.

Take Calculation and Estimation

Here we describe how the information provided above is brought together to produce a quantitative take estimate. In order to estimate the number of marine mammals predicted to be exposed to sound levels that would result in harassment, radial distances to predicted isopleths corresponding to harassment thresholds were calculated, as described above. The radial distances modeled based on scenarios of 100 kJ hammer energy and 6 dB attenuation, 10 dB attenuation, 15 dB attenuation, and no attenuation (Table 4) were then used to calculate the areas around the pile predicted to be ensonified to sound levels that exceed relevant harassment thresholds.

Marine mammal density values were overlaid on the ensonified zones to relevant thresholds within a geographic information system (GIS). The density values were multiplied by these zones, resulting in daily Level A and Level B harassment exposure estimates. These estimates were then multiplied by the number of days of pile driving activity (i.e., two) in order to estimate the number of marine mammals that would be exposed to pile driving noise above relevant thresholds for the entire project. The exposure numbers were rounded to the nearest whole individual.

The following formula describes these steps:

$Estimated\ Take\ =\ D\ x\ ZOI\ x\ (d)$

Where:

D = average highest species density
ZOI = maximum ensonified area to relevant thresholds
d = number of days

Dominion provided exposure estimates based on two days of pile driving for each scenario (i.e., no attenuation, 6 dB attenuation, 10 dB attenuation and 15 dB attenuation). However, as Dominion has proposed potentially driving one pile with the attenuation system activated and the other pile without the attenuation system activated (described further under **Proposed Mitigation**, below), we assumed for the exposure estimate that one pile would be driven with no attenuation and the other pile would be driven with an attenuation system that would achieve an overall 6 dB reduction in pile driving sound. Thus we halved the exposure estimates provided for the 0 dB attenuation and 6 dB attenuation scenarios to come up with exposure estimates for one day of pile driving for each scenario (i.e., one pile driven with no attenuation, and the other pile driven with 6 dB attenuation). We then combined these to come up with exposure estimates for the two piles. We note that an estimate of an overall 6 dB reduction from the attenuation system represents a conservative assumption, as the attenuation system planned for use is a double bubble curtain which may ultimately result in a greater level of attenuation than the assumed 6 dB (the attenuation system proposed for use is described further under **Proposed Mitigation**, below). Table 5 shows modeled exposures above the Level A harassment threshold for each of the two piles and both piles combined (note that modeling resulted in no takes by Level A harassment for any species, thus we do not propose to authorize any takes by Level A harassment and outputs in Table 5 are for illustrative purposes only). Table 6 shows modeled exposures above the Level B harassment threshold for each of the two piles and both piles combined. Table 7 shows maximum seasonal densities used in the take estimate, the number of takes proposed for authorization, and the total proposed takes as a percentage of population.

Table 5 – Modeled Exposures above the Level A Harassment Threshold Estimated for Each Pile and for Both Piles Combined

Species	One pile with no attenuation	One pile with 6 dB attenuation	Both piles combined
Atlantic-spotted Dolphin	0.0025	0.001	0.0035
White-sided Dolphin	0.005	0.002	0.007
Bottlenose Dolphin (W.N.A. Offshore)	0.059	0.0475	0.1065
Bottlenose Dolphin (W. N. A. Southern Coastal Migratory)	0.059	0.0475	0.1065
Risso's Dolphin	0	0	0
Common Dolphin	0.008	0.003	0.011
Pilot Whales	0	0	0
Sperm Whale	0	0	0
Fin Whale	0.256	0.1065	0.3625
Harbor Porpoise	0.17	0.039	0.209
Humpback Whale	0.11	0.046	0.156
Minke Whale	0.1065	0.0445	0.151
North Atlantic Right Whale	0.0845	0.0355	0.12
Sei Whale	0.002	0.0005	0.0025
Harbor Seal	0.086	0.0095	0.0955
Gray Seal	0.086	0.0095	0.0955

Table 6 – Modeled Exposures above the Level B Harassment Threshold Estimated for Each Pile and for Both Piles Combined

Species*	One pile with no attenuation	One pile with 6 dB attenuation	Both piles combined (rounded)
Common dolphin	1.34	0.45	2
Atlantic-spotted dolphin	0.43	0.14	1
Atlantic white-sided dolphin	0.86	0.29	1
Bottlenose dolphin (W. N. A. Offshore)	20.08	13.49	34
Bottlenose dolphin (W. N. A. Southern Coastal Migratory)	20.08	13.49	34
Harbor porpoise	0.64	0.22	1
Harbor seal	0.78	0.26	1
Gray seal	0.78	0.26	1

*All species potentially occurring in the project area were modeled; only species with at least one exposure above the Level B harassment threshold that were carried forward in the take analysis are shown.

Table 7 – Marine Mammal Densities, Numbers of Potential Incidental Take of Marine Mammals Proposed for Authorization and Proposed Takes as a Percentage of Population

Species	Density (animals / 100 km^2)	Estimated Takes by Level B Harassment[1]	Proposed Takes by Level B Harassment	Total Takes Proposed for Authorization	Total Proposed Takes as a Percentage of Population[2]
Common dolphin [3]	1.591	2	39	39	0.0
Atlantic white-sided dolphin [3]	1.018	1	40	40	0.1
Bottlenose dolphin (W. N. Atlantic Coastal Migratory) [4]	23.861	34	34	34	0.9
Bottlenose dolphin (W. N. Atlantic Offshore) [4]	23.861	34	34	34	0.1
Atlantic spotted dolphin [3]	0.508	1	100	100	0.2
Harbor porpoise [3]	0.760	1	4	4	0.0
Gray seal [4]	0.925	1	1	1	0.0
Harbor seal [4]	0.925	1	1	1	0.0

1 Estimated takes based on a scenario of 1,000 kJ hammer energy and one pile driven with 6 dB attenuation and the other pile driven with no attenuation.

2 Calculations of percentage of stock taken are based on the best available abundance estimate as shown in Table 1. In most cases the best available abundance estimate is provided by Roberts *et al*. (2016, 2017, 2018), when available, to maintain consistency with density estimates derived from Roberts *et al*. (2016, 2017, 2018).

3 Proposed number of authorized takes (Level B harassment only) for these species has been increased from the estimated take number to mean group size. Sources for group size estimates are as follows: Atlantic white-sided dolphin: Cipriano (2018); common dolphin: Palka et al. (2015); harbor porpoise: Palka et al. (2015); Atlantic spotted dolphin: Herzing and Perrin (2018).

4 Roberts *et al*. (2016, 2017, 2018) produced a single density model for all bottlenose dolphins and did not differentiate by bottlenose dolphin stocks, and produced a single density model for all seals and did not differentiate between seal species. Hence, the density value is the same for both stocks of bottlenose dolphin stocks that may be present and for both seal species.

Modeling results predicted no takes by Level A harassment for any marine mammal species (based on both SEL_{cum} and peak SPL) (See Table 5). NMFS has therefore determined that the likelihood of take of marine mammals in the form of Level A harassment occurring as a result of the proposed activity is so low as to be discountable, and we do not propose to authorize the take by Level A harassment of any marine mammals.

Using the take methodology approach described above, the resulting take estimates for Atlantic white-sided dolphin, common dolphin, spotted dolphin and harbor porpoise were less than the average group sizes estimated for these species. However, information on the life histories of these species indicates they are likely to be encountered in groups, therefore it is reasonable to conservatively assume that one group of each of these species will be taken during the proposed activity. We therefore propose to authorize the take of the average group size for these species to account for the possibility that a group of any of these species or stocks is taken by the proposed activities (Table 7).

Roberts *et al*. (2016, 2017, 2018) produced a single density model for all bottlenose dolphins and did not differentiate by bottlenose dolphin stocks. The Western North Atlantic southern migratory coastal stock occurs in coastal waters from the shoreline to approximately the 20-m isobath (Hayes *et al*. 2019). The water depth at the WTG installation location is 25 m. As 20-m represents an approximate depth limit for the coastal stock, both stocks have the potential to occur in the project area. Therefore we propose to authorize take for both stocks. The take calculation methodology described above resulted in an estimate of 34 bottlenose dolphin takes. We have concluded that since either stock may be present it is possible that all modeled takes may accrue to either of the stocks and we therefore propose to authorize 34 takes from both stocks that may be present. We are therefore proposing to authorize twice the amount of takes that the exposure modeling predicts for bottlenose dolphins.

Similar to bottlenose dolphins, Roberts *et al*. (2018) produced density models for all seals and did not differentiate by seal species. Because the seasonality of, and habitat use by, gray seals roughly overlaps with that of harbor seals in the project area, it is possible that modeled seal takes could occur to either species. The take calculation methodology described above resulted in an estimate of one seal take. As the one modeled seal take may accrue to either seal species we therefore propose to authorize one take from both seal species that may be present. . We are therefore proposing to authorize twice the amount of takes that the exposure modeling predicts for seal species.

Proposed Mitigation

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

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

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

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

The mitigation measures described below are consistent with those required and successfully implemented under previous incidental take authorizations issued in association with in-water construction activities. Modeling was performed to estimate zones of influence (ZOI; see “Estimated Take”); these ZOI values were used to inform mitigation measures for pile driving activities to minimize Level A harassment and Level B harassment to the extent possible, while providing estimates of the areas within which Level B harassment might occur.

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

Seasonal Restriction on Pile Driving

No pile driving activities would occur from November 1 through April 30. This seasonal restriction would be established to minimize the potential for North Atlantic right whales to be exposed to pile driving noise. Based on the best available information (Roberts et al., 2017), the highest densities of right whales in the project area are expected during the months of November 1 through April when right whales are migrating. This restriction would greatly reduce the potential for right whale exposure to pile driving noise associated with the proposed project.

Pre-clearance, Exclusion and Monitoring Zones

Dominion would use PSOs to establish a 1,750-m exclusion zone (EZ) around the pile driving equipment to ensure this zone is clear of marine mammals prior to the start of pile driving. The purpose of “clearance” of a particular zone is to prevent potential instances of auditory injury and potential instances of more severe behavioral disturbance as a result of exposure to pile driving noise (serious injury or death are unlikely outcomes even in the absence of mitigation measures) by delaying the activity before it begins if marine mammals are detected within certain pre-defined distances of the pile driving equipment. The primary goal in this case is to prevent auditory injury (Level A harassment), and while we acknowledge that porpoises or seals may not be detected at this distance, the proposed 1,750-m EZ is significantly larger than modeled distances to isopleth distances corresponding to Level A harassment (based on peak SPL) for all marine mammal functional hearing groups (Table 4). The EZ for North Atlantic right whales would effectively extend beyond 1,750-m to as far as PSOs are able to see (i.e., a North Atlantic right whale observed at any distance from the pile, regardless of the whale's distance from the pile, would trigger further mitigation action (either delay or shutdown)).

In addition to the EZ, PSOs would observe a monitoring zone that would correspond with the modeled distance to the Level B harassment isopleth (3,580 m) during pile driving activities. PSOs would record information on marine mammals observed within the monitoring zone, including species, observed behavior, and estimates of number of marine mammals exposed to pile driving noise within the Level B harassment zone. Marine mammals observed within the monitoring zone but outside the EZs would not trigger any mitigation action. All distances are the radius from the center of the pile.

Table 8 – Proposed Exclusion and Monitoring Zones

Exclusion Zone	Monitoring Zone
1,750 m *	3,580 m

*A North Atlantic right whale observed at any distance from the pile would trigger delay or shutdown of pile driving.

If a marine mammal is observed approaching or entering the relevant EZ prior to the start of pile driving operations, pile driving activity would be delayed until either the marine mammal has voluntarily left the respective EZ and been visually confirmed beyond that zone, or, 15 minutes have elapsed without re-detection of the animal in the case of delphinids and pinnipeds or 30 minutes have elapsed without re-detection of the animal in the case of all other marine mammals.

Prior to the start of pile driving activity, the EZ would be monitored for 30 minutes to ensure that they are clear of the relevant species of marine mammals. Pile driving would only commence once PSOs have declared the respective zones clear of marine mammals. Marine mammals observed within a EZ would be allowed to remain in the clearance zone (*i.e.*, must leave of their own volition), and their behavior would be monitored and documented. The EZs may only be declared clear, and pile driving started, when the entire clearance zones are visible (*i.e.*, when not obscured by dark, rain, fog, etc.) for a full 30 minutes prior to pile driving.

Soft Start

The use of a soft start procedure is believed to provide additional protection to marine mammals by warning marine mammals or providing them with a chance to leave the area prior to the hammer operating at full capacity, and typically involves a requirement to initiate sound from the hammer at reduced energy followed by a waiting period. Dominion will utilize soft start techniques for impact pile driving by performing an initial set of three strikes from the impact hammer at a reduced energy level followed by a 30 second waiting period. The soft start process would be conducted a total of three times prior to driving each pile (*e.g.*, three strikes followed by a 30 second delay, then three additional single strikes followed by a 30 second delay, then a final set of three strikes followed by an additional 30 second delay). Soft start would be required at the beginning of each day’s impact pile driving work and at any time following a cessation of impact pile driving of thirty minutes or longer.

Shutdown

The purpose of a shutdown is to prevent some undesirable outcome, such as auditory injury or behavioral disturbance of sensitive species, by halting the activity. If a marine mammal is observed entering or within the EZs after pile driving has begun, the PSO would request a temporary cessation of pile driving. Dominion has proposed that, when called for by a PSO, shutdown of pile driving would be implemented when practicable. However, there may be instances where a shutdown is not practicable, as any significant stoppage of pile driving progress can allow for displaced sediments along the piling surface areas to consolidate and bind, potentially resulting in a situation where a piling is permanently bound in a partially driven position. If a shutdown is called for before a pile has been driven to a sufficient depth to allow for pile stability, then for safety reasons the pile would need to be driven to a sufficient depth to allow for stability and a shutdown would not be practicable until after that depth was reached. We therefore propose that shutdown would be implemented when practicable.

If shutdown is called for by a PSO, and Dominion determines a shutdown to be technically practicable, pile driving would be halted immediately. After shutdown, pile driving may be initiated once all EZs are clear of marine mammals for the minimum species-specific time periods, or, if required to maintain installation feasibility. For North Atlantic right whales, shutdown would occur when a right whale is observed by PSOs at any distance, and a shutdown zone of 1,750 m would be implemented for all other species (Table 8).

Noise Attenuation System

The Project would utilize an attenuation system in order to reduce underwater noise from pile driving during the driving of at least one pile. Bubble curtains are used to reduce acoustic energy emissions from high-amplitude sources and are generated by releasing air through multiple small holes drilled in a hose or manifold deployed on the seabed near the source. The resulting curtain of air bubbles in the water attenuates sound waves propagating through the curtain. The sound attenuating effect of the noise mitigation system bubble curtain or air bubbles in water is caused by: (i) sound scattering on air bubbles (resonance effect) and (ii) (specular) reflection at the transition between water layer with and without bubbles (air water mixture; impedance leap). Use of a "double bubble curtain" entails two concentric rings of bubbles around the pile and can achieve greater levels of attenuation than the use of a single bubble curtain. A double bubble curtain would be deployed to reduce sound during pile driving activities during the driving of at least one pile.

Dominion has proposed driving one pile with the double bubble curtain activated and the other pile without the double bubble curtain activated with the goal of gathering in situ data on the effectiveness of the double bubble curtain via hydroacoustic monitoring during the driving of both piles. This effort would be supported by the Bureau of Ocean Energy Management (BOEM) Real-time Opportunity for Development Environmental Observations (RODEO) program, which aims to collect real-time measurements of the construction and operation activities from the first offshore wind facilities in the United States to allow for more accurate assessments of actual environmental effects and to inform development of appropriate mitigation measures.

The bubble curtains would distribute air bubbles around 100 percent of the piling perimeter for the full depth of the water column. The lowest bubble ring would be in contact with the mudline for the full circumference of the ring, and the weights attached to the bottom ring would ensure 100 percent mudline contact. No parts of the ring or other objects would prevent full mudline contact. Air flow to the bubblers would be balanced around the circumference of the pile.

Visibility Requirements

All pile driving would be initiated during daylight hours, no earlier than 30 minutes after sunrise and no later than 30 minutes before sunset. Pile driving would not be initiated at night, or, when the full extent of the 1,750 m EZ cannot be confirmed to be clear of marine mammals, as determined by the lead PSO on duty. The EZ may only be declared clear, and pile driving initiated, when the full extent of the 1,750 m EZ is visible (*i.e.*, when not obscured by dark, rain, fog, etc.) for a full 30 minutes prior to pile driving. Dominion would attempt to complete all pile driving in daylight; pile driving may continue after dark only when the installation of the same pile began during daylight when the Exclusion Zone was fully visible for at least 30 minutes, and only in extraordinary circumstances when it must proceed for human safety or installation feasibility reasons as determined by the lead engineer.

Monitoring Protocols

Monitoring would be conducted before, during, and after pile driving activities. In addition, observers will record all incidents of marine mammal occurrence, regardless of distance from the construction activity, and monitors will document any behavioral reactions in concert with distance from piles being driven. Observations made outside the

EZ will not result in delay of pile driving; that pile segment may be completed without cessation, unless the marine mammal approaches or enters the EZ, at which point pile driving activities would be halted when practicable, as described above. Pile driving activities include the time to install a single pile, as long as the time elapsed between uses of the pile driving equipment is no more than 30 minutes.

The following additional measures would apply to visual monitoring:

(1) A minimum of two PSOs would be on duty at all times during pile driving and removal activity;

(2) Monitoring would be conducted by qualified, trained PSOs. PSOs would be stationed at the highest practical vantage point on the pile installation vessel;

(3) PSOs may not exceed four consecutive watch hours; must have a minimum two-hour break between watches; and may not exceed a combined watch schedule of more than 12 hours in a 24- hour period;

(4) Monitoring would be conducted from 30 minutes prior to commencement of pile driving, throughout the time required to drive a pile, and for 30 minutes following the conclusion of pile driving;

(5) PSOs would have no other construction-related tasks while conducting monitoring; and

(6) PSOs would have 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;

- Ability to conduct field observations and collect data according to assigned protocols;
- Experience or training in the field identification of marine mammals, including the identification of behaviors;
- Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations;
- Writing skills sufficient to document 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 of marine mammals from construction noise 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.

PSOs employed by Dominion in satisfaction of the mitigation and monitoring requirements described herein must meet the following additional requirements:

- Independent observers (*i.e.*, not construction personnel) are required;
- At least one observer must have prior experience working as an observer;
- Other observers may substitute education (degree in biological science or related field) or training for experience;
- One observer will be designated as lead observer or monitoring coordinator. The lead observer must have prior experience working as an observer; and

- NMFS will require submission and approval of observer CVs.

Vessel Strike Avoidance

Vessel strike avoidance measures will include, but are not limited to, the following, except under circumstances when complying with these measures would put the safety of the vessel or crew at risk:

- All vessel operators and crew must maintain vigilant watch for cetaceans and pinnipeds, and slow down or stop their vessel to avoid striking these protected species;
- All vessels must travel at 10 knots (18.5 km/hr) or less within any designated Dynamic Management Area (DMA) or Seasonal Management Area for North Atlantic right whales;
- All vessel operators must reduce vessel speed to 10 knots (18.5 km/hr) or less when any large whale, any mother/calf pairs, pods, or large assemblages of non-delphinoid cetaceans are observed near (within 100 m (330 ft)) an underway vessel;
- All vessels must maintain a separation distance of 500 m (1640 ft) or greater from any sighted North Atlantic right whale;
- If underway, vessels must steer a course away from any sighted North Atlantic right whale at 10 knots (18.5 km/hr) or less until the 500 m (1640 ft) minimum separation distance has been established. If a North Atlantic right whale is sighted in a vessel’s path, or within 500 m (330 ft) to an underway vessel, the underway vessel must reduce speed and shift the engine to neutral. Engines will not be engaged until the right whale has moved outside of the vessel’s path and beyond 500 m. If stationary, the vessel must not engage engines until the North Atlantic right whale has moved beyond 500 m;

- All vessels must maintain a separation distance of 100 m (330 ft) or greater from any sighted non-delphinoid cetacean. If sighted, the vessel underway must reduce speed and shift the engine to neutral, and must not engage the engines until the non-delphinoid cetacean has moved outside of the vessel's path and beyond 100 m. If a vessel is stationary, the vessel will not engage engines until the non-delphinoid cetacean has moved out of the vessel's path and beyond 100 m;
- All vessels must maintain a separation distance of 50 m (164 ft) or greater from any sighted delphinoid cetacean, with the exception of delphinoid cetaceans that voluntarily approach the vessel (*i.e.*, bow ride). Any vessel underway must remain parallel to a sighted delphinoid cetacean's course whenever possible, and avoid excessive speed or abrupt changes in direction. Any vessel underway must reduce vessel speed to 10 knots (18.5 km/hr) or less when pods (including mother/calf pairs) or large assemblages of delphinoid cetaceans are observed. Vessels may not adjust course and speed until the delphinoid cetaceans have moved beyond 50 m and/or the abeam of the underway vessel;
- All vessels must maintain a separation distance of 50 m (164 ft) or greater from any sighted pinniped; and
- All vessels underway must not divert or alter course in order to approach any whale, delphinoid cetacean, or pinniped. Any vessel underway will avoid excessive speed or abrupt changes in direction to avoid injury to the sighted cetacean or pinniped.

Dominion will ensure that vessel operators and crew maintain a vigilant watch for marine mammals by slowing down or stopping the vessel to avoid striking marine mammals. Project-specific training will be conducted for all vessel crew prior to the start of the construction activities. Confirmation of the training and understanding of the requirements will be documented on a training course log sheet.

The proposed mitigation measures are designed to avoid the already low potential for injury in addition to some instances of Level B harassment, and to minimize the potential for vessel strikes. Further, we believe the proposed mitigation measures are practicable for Dominion to implement. There are no known marine mammal rookeries or mating or calving grounds in the project area that would otherwise potentially warrant increased mitigation measures for marine mammals or their habitat (or both).

We have carefully evaluated Dominion’s proposed mitigation measures and considered a range of other measures in the context of ensuring that we prescribed the means of effecting the least practicable adverse impact on the affected marine mammal species and stocks and their habitat. Based on our evaluation of these measures, we have preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable adverse impact on marine mammal species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for subsistence uses.

Proposed Monitoring and Reporting

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

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

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density).

- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas).

- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors.

- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks.

- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat).

- Mitigation and monitoring effectiveness.

Proposed Monitoring Measures

Dominion will collect sighting data and behavioral responses to pile driving activity 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. PSOs would be stationed on the pile installation vessel. The observer platform would be elevated approximately 40-m above the sea surface. Dominion estimates that at this height a PSO with minimum 7x50 binoculars would be able to monitor a first reticule distance of approximately 3.2 miles from the sound source. PSOs would monitor the EZ and the Level B harassment zone at all times and would document any marine mammals observed within these zones, to the extent practicable. PSOs would conduct monitoring before, during, and after pile driving and removal, with observers located at the best practicable vantage points.

Dominion would implement the following monitoring procedures:

- A minimum of two PSOs will maintain watch at all times when pile driving is underway;
- PSOs would be located at the best possible vantage point(s) on the pile installation vessel to ensure that they are able to observe the entire EZ and as much of the monitoring zone as possible;
- During all observation periods, PSOs will use binoculars and the naked eye to search continuously for marine mammals;
- PSOs will be equipped with reticle binoculars and range finders as well as a digital single-lens reflex 35mm camera;

- Position data will be recorded using hand-held or vessel based global positioning system (GPS) units for each sighting;
- If the EZ is obscured by fog or poor lighting conditions, pile driving will not be initiated until the EZ is fully visible. Should such conditions arise while pile driving is underway, the activity would be halted when practicable, as described above; and
- The EZ and monitoring zone will be monitored for the presence of marine mammals before, during, and after all pile driving activity.

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

Data Collection

We require that observers use standardized data forms. Among other pieces of information, Dominion will record detailed information about any implementation of delays or shutdowns, including the distance of animals to the pile and a description of specific actions that ensued and resulting behavior of the animal, if any. We require that, at a minimum, the following information be collected on the sighting forms:

- Dates and times (begin and end) of all marine mammal monitoring.
- Construction activities occurring during each daily observation period, including how many and what type of piles were driven or removed and by what method (*i.e.*, impact or vibratory).

- Weather parameters and water conditions during each monitoring period (*e.g.*, wind speed, percent cover, visibility, sea state).
- The number of marine mammals observed, by species, relative to the pile location and if pile driving or removal was occurring at time of sighting.
- Age and sex class, if possible, of all marine mammals observed.
- PSO locations during marine mammal monitoring.
- Distances and bearings of each marine mammal observed to the pile being driven or removed for each sighting (if pile driving or removal was occurring at time of sighting).
- Description of any marine mammal behavior patterns during observation, including direction of travel and estimated time spent within the Level A and Level B harassment zones while the source was active.
- Number of individuals of each species (differentiated by month as appropriate) detected within the monitoring zone, and estimates of number of marine mammals taken, by species (a correction factor may be applied to total take numbers, as appropriate).
- Detailed information about any implementation of any mitigation triggered (e.g., shutdowns and delays), a description of specific actions that ensued, and resulting behavior of the animal, if any.
- Description of attempts to distinguish between the number of individual animals taken and the number of incidences of take, such as ability to track groups or individuals.

- An extrapolation of the estimated takes by Level B harassment based on the number of observed exposures within the Level B harassment zone and the percentage of the Level B harassment zone that was not visible.

Submit all PSO datasheets and/or raw sighting data (in a separate file from the Final Report referenced immediately above).

Dominion would note behavioral observations, to the extent practicable, if a marine mammal has remained in the area during construction activities.

Reporting

A draft report would be submitted to NMFS within 90 days of the completion of monitoring for each installation’s in-water work window. The report would include marine mammal observations pre-activity, during-activity, and post-activity during pile driving days, and would also provide descriptions of any behavioral responses to construction activities by marine mammals. The report would detail the monitoring protocol, summarize the data recorded during monitoring including an estimate of the number of marine mammals that may have been harassed during the period of the report, and describe any mitigation actions taken (*i.e.*, delays or shutdowns due to detections of marine mammals, and documentation of when shutdowns were called for but not implemented and why). A final report must be submitted within 30 days following resolution of comments on the draft report.

In the event that personnel involved in the construction activities discover an injured or dead marine mammal, the IHA-holder shall report the incident to the Office of Protected Resources (OPR) (301-427-8401), NMFS and to the Mid-Atlantic regional stranding coordinator as soon as feasible. The report must include the following information:

- Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);
- Species identification (if known) or description of the animal(s) involved;
- Condition of the animal(s) (including carcass condition if the animal is dead);
- Observed behaviors of the animal(s), if alive;
- If available, photographs or video footage of the animal(s); and
- General circumstances under which the animal was discovered.

Negligible Impact Analysis and Determination

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through harassment, NMFS considers other factors, such as the likely nature of any responses (*e.g.*, intensity, duration), the context of any responses (*e.g.*, critical reproductive time or location, migration), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS's implementing regulations (54 FR 40338;

September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

Pile driving and removal activities associated with the proposed project, as described previously, have the potential to disturb or temporarily displace marine mammals. Specifically, the specified activities may result in take, in the form of Level B harassment (potential behavioral disturbance) from underwater sounds generated from pile driving. Potential takes could occur if individual marine mammals are present in the ensonified zone when pile driving is occurring. To avoid repetition, the our analyses apply to all the species listed in Table 1, given that the anticipated effects of the proposed project on different marine mammal species and stocks are expected to be similar in nature.

Impact pile driving has source characteristics (short, sharp pulses with higher peak levels and sharper rise time to reach those peaks) that are potentially injurious or more likely to produce severe behavioral reactions. However, modeling indicates there is limited potential for auditory injury even in the absence of the proposed mitigation measures, with no species predicted to experience Level A harassment. In addition, the already limited potential for injury is expected to be minimized through implementation of the proposed mitigation measures including soft start and the implementation of EZs that would facilitate a delay of pile driving if marine mammals were observed approaching or within areas that could be ensonified above sound levels that could result in auditory 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 its becoming potentially injurious or resulting in more severe behavioral reactions. No Level A harassment of any marine mammal stocks are anticipated or proposed for authorization.

Repeated exposures of individuals to relatively low levels of sound outside of preferred habitat areas are unlikely to significantly disrupt critical behaviors. Thus, even repeated Level B harassment of some small subset of an overall stock is unlikely to result in any significant realized decrease in viability for the affected individuals, and thus would not result in any adverse impact to the stock as a whole. Instances of more severe behavioral harassment are expected to be minimized by proposed mitigation and monitoring measures. Effects on individuals that are taken by Level B harassment, on the basis of reports in the literature as well as monitoring from other similar activities, will likely be limited to reactions such as increased swimming speeds, increased surfacing time, or decreased foraging (if such activity were occurring) (*e.g.*, Thorson and Reyff, 2006; HDR, Inc., 2012; Lerma, 2014). Most likely, individuals will simply move away from the sound source and temporarily avoid the area where pile driving is occurring. Therefore, we expect that animals disturbed by project sound would simply avoid the area during pile driving in favor of other, similar habitats. We expect that any avoidance of the project area by marine mammals would be temporary in nature and that any marine mammals that avoid the project area during construction activities would not be permanently displaced.

Feeding behavior is not likely to be significantly impacted, as prey species are mobile and are broadly distributed throughout the project area; therefore, marine mammals that may be temporarily displaced during construction activities are expected to be able to resume foraging once they have moved away from areas with disturbing levels of underwater noise. Because of the temporary nature of the disturbance and the availability of similar habitat and resources in the surrounding area, the impacts to marine mammals and the food sources that they utilize are not expected to cause significant or long-term consequences for individual marine mammals or their populations. There are no areas of notable biological significance for marine mammal feeding known to exist in the project area, and there are no rookeries, mating areas, or calving areas known to be biologically important to marine mammals within the proposed project area. The area is part of a biologically important migratory area for North Atlantic right whales; however, seasonal restrictions on pile driving activity, which would restrict pile driving to times of year when right whales are least likely to be migrating through the project area, would minimize the potential for the activity to impact right whale migration.

NMFS concludes that exposures to marine mammals due to the proposed project would result in only short-term effects to individuals exposed. Marine mammals may temporarily avoid the immediate area but are not expected to permanently abandon the area. Impacts to breeding, feeding, sheltering, resting, or migration are not expected, nor are shifts in habitat use, distribution, or foraging success. Serious injury or mortality as a result of the proposed activities would not be expected even in the absence of the proposed mitigation and monitoring measures, and no serious injury or mortality of any marine mammal stocks are anticipated or proposed for authorization. NMFS does not anticipate the marine mammal takes that would result from the proposed project would impact annual rates of recruitment or survival.

As described above, gray and harbor seals are experiencing ongoing UMEs. Although the ongoing UME is under investigation, the UME does not yet provide cause for concern regarding population-level impacts to any of these stocks. For harbor seals, the population abundance is over 75,000 and annual M/SI (345) is well below PBR (2,006) (Hayes et al., 2018). For gray seals, the population abundance is over 27,000, and abundance is likely increasing in the U.S. Atlantic EEZ and in Canada (Hayes et al., 2018). No injury, serious injury or mortality is expected or proposed for authorization, and Level B harassment of gray and harbor seals will be reduced to the level of least practicable adverse impact through use of proposed mitigation measures. As such, the proposed authorized takes of gray and harbor seals would not exacerbate or compound the ongoing UMEs in any way.

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

- No Level A harassment, serious injury or mortality is anticipated or proposed for authorization;
- The anticipated impacts of the proposed activity on marine mammals would be temporary behavioral changes due to avoidance of the project area;
- Total proposed authorized takes as a percentage of population are low for all species and stocks (*i.e.*, less than one percent of all stocks);

- The availability of alternate areas of similar habitat value for marine mammals to temporarily vacate the project area during the proposed project to avoid exposure to sounds from the activity;
- Effects on species that serve as prey species for marine mammals from the proposed project are expected to be short-term and are not expected to result in significant or long-term consequences for individual marine mammals, or to contribute to adverse impacts on their populations.;
- There are no known important feeding, breeding, or calving areas in the project area, and authorized activities would be limited to times of year when potential impacts to migration would not be expected;
- The proposed mitigation measures, including visual monitoring, exclusion and monitoring zones, a bubble curtain used on at least one pile, and soft start, are expected to minimize potential impacts to marine mammals.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS preliminarily finds that the total marine mammal take from the proposed activity will have a negligible impact on all affected marine mammal species or stocks.

Small Numbers

As noted above, only small numbers of incidental take may be authorized under sections 101(a)(5)(A) and (D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

We propose to authorize incidental take of seven marine mammal stocks. The total amount of taking proposed for authorization is less than one-third of the best available population abundance estimate for all stocks (Table 7), which we preliminarily find are small numbers of marine mammals relative to the estimated overall population abundances for those stocks.

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

Unmitigable Adverse Impact Analysis and Determination

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated by this action. Therefore, NMFS has determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

Endangered Species Act

Section 7(a)(2) of the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq*.) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat.

To ensure ESA compliance for the issuance of IHAs, NMFS consults internally whenever we propose to authorize take for endangered or threatened species. No incidental take of ESA-listed species is proposed for authorization or expected to result from this activity. Therefore, NMFS has determined that formal consultation under section 7 of the ESA is not required for this action.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue an IHA to Dominion for conducting pile driving activity offshore of Virginia, from May 1, 2020 through October 31, 2020, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. A draft of the proposed IHA can be found at *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act*.

Request for Public Comments

We request comment on our analyses, the proposed authorization, and any other aspect of this Notice of Proposed IHA for Dominion's proposed activity. We also request at this time comment on the potential Renewal of this proposed IHA as described in the paragraph below. Please include with your comments any supporting data or literature citations to help inform decisions on the request for this IHA or a subsequent Renewal IHA.

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

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

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

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

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

Dated: March 10, 2020.

Donna S. Wieting,

Director, Office of Protected Resources,

National Marine Fisheries Service.

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