DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 217

[Docket No. 201228–0360]

RIN 0648–BK21

Taking Marine Mammals Incidental to the Hampton Roads Bridge Tunnel Expansion Project in Norfolk, Virginia

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

ACTION: Proposed rule; request for comments and information.

SUMMARY: NMFS has received a request from the Hampton Roads Connector Partners (HRCP) for authorization to take small numbers of marine mammals incidental to pile driving and removal activities at the Hampton Roads Bridge Tunnel Expansion Project (HRBT) in Norfolk, Virginia over the course of five years (2021–2026). Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is proposing regulations to govern that take, and requests comments on the proposed regulations. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorization, and agency responses will be summarized in the final notice of our decision.

DATES: Comments and information must be received no later than February 8, 2021.

ADDRESSES: You may submit comments, identified by NOAA–NMFS–2020–0164, by the following method:

• *Comment submissions:* Submit all public comments via the Federal eRulemaking Portal, Go to *www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2020-0164,* click the ‘‘Comment Now!’’ icon, complete the required fields, and enter or attach your comments.

Instructions: Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered by NMFS. All comments received are a part of the public record and will generally be posted for public viewing on *www.regulations.gov* without change. All personal identifying information (*e.g.,* name, address), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NMFS will accept anonymous comments (enter ‘‘N/A’’ in the required fields if you wish to remain anonymous). Attachments to electronic comments will be accepted in Microsoft Word, Excel, or Adobe PDF file formats only.

FOR FURTHER INFORMATION CONTACT: Robert Pauline, Office of Protected Resources, NMFS, (301) 427–8401.

SUPPLEMENTARY INFORMATION:

Availability

A copy of HRCP's application and any supporting documents, as well as a list of the references cited in this document, may be obtained online at: *https://www.fisheries.noaa.gov/action/incidental-take-authorization-hampton-roads-bridge-tunnel-expansion-project-hampton-0.* In case of problems accessing these documents, please call the contact listed above (see **FOR FURTHER INFORMATION CONTACT**).

Purpose and Need for Regulatory Action

This proposed rule would establish a framework under the authority of the MMPA (16 U.S.C. 1361 *et seq.*) to allow for the authorization of take of marine mammals incidental to construction activities including pile installation and pile replacement, as part of the (HRBT). The HRBT is a major road transport infrastructure project conducted by HRCP along the existing I–64 highway in Virginia, consisting of roadway improvements, trestle bridges, and bored tunnels crossing the James River between Norfolk and Hampton. The project will address severe traffic congestion at the existing HRBT crossing by increasing traffic capacity and upgrading lanes. We received an application from HRCP requesting five-year regulations and authorization to take multiple species of marine mammals. Take would occur by Level A and Level B harassment only incidental to impact pile driving, vibratory pile driving, vibratory pile removal, jetting, and down-the-hole (DTH) pile installation. Please see Background below for definitions of harassment.

Legal Authority for the Proposed Action

Section 101(a)(5)(A) of the MMPA (16 U.S.C. 1371(a)(5)(A)) directs the Secretary of Commerce 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 for up to five years if, after notice and public comment, the agency makes certain findings and issues regulations that set forth permissible methods of taking pursuant to that activity and other means of effecting the ‘‘least practicable adverse impact’’ on the affected species or stocks and their habitat (see the discussion below in the Proposed Mitigation section), as well as monitoring and reporting requirements. Section 101(a)(5)(A) of the MMPA and the implementing regulations at 50 CFR part 216, subpart I provide the legal basis for issuing this proposed rule containing five-year regulations, and for any subsequent LOAs. As directed by this legal authority, this proposed rule contains mitigation, monitoring, and reporting requirements.

Summary of Major Provisions Within the Proposed Rule

Following is a summary of the major provisions of this proposed rule regarding HRCP's construction activities. These measures include:

• Shutdown of construction activities under certain circumstances to avoid injury of marine mammals.

• Required monitoring of the construction areas to detect the presence of marine mammals before beginning construction activities.

• Soft start for impact pile driving to allow marine mammals the opportunity to leave the area prior to initiating impact pile driving at full power.

• Use of bubble curtains during impact driving of steel piles except when water depth is less than 20 feet.

Background

Section 101(a)(5)(A) of the MMPA (16 U.S.C. 1361 *et seq.*) directs 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, regulations are issued, and notice is provided to the public.

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), and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of the takings are set forth.

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

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

National Environmental Policy Act

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

This action is consistent with categories of activities identified in Categorical Exclusion B4 (Incidental harassment authorizations (IHAs) with no anticipated serious injury or mortality) of the Companion Manual for NOAA Administrative Order 216–6A, which do not individually or cumulatively have the potential for significant impacts on the quality of the human environment and for which we have not identified any extraordinary circumstances that would preclude this categorical exclusion. Accordingly, NMFS has preliminarily determined that the issuance of the proposed IHA qualifies to be categorically excluded from further NEPA review.

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

Summary of Request

On November 19, 2019, NMFS received an application from HRCP requesting authorization for take of marine mammals incidental to construction activities related to a major road transport infrastructure project along the existing I–64 highway in Virginia, consisting of roadway improvements, trestle bridges, and bored tunnels crossing Hampton Roads between Norfolk and Hampton, Virginia. HRCP submitted a revised LOA application on June 27, 2020 which included changes to construction methods. We determined the application was adequate and complete on September 29, 2020. On October 7, 2020 (85 FR 63256), we published a notice of receipt (NOR) of HRCP's application in the **Federal Register**, requesting comments and information related to the request for thirty days. No comments were received on the NOR.

HRCP requests authorization to take a small number of five species of marine mammals by Level A and Level B harassment only. Neither HRCP nor NMFS expects serious injury or mortality to result from this activity. The proposed regulations would be valid for five years (2021–2026). Note that HRCP had previously applied for an IHA to cover initial in-water pile driving work. NMFS issued the IHA on July 10, 2020 (85 FR 48153; August 10, 2020).

Description of Proposed Activity

HRCP is proposing to conduct construction activities associated with the HRBT project. This is a major road transport infrastructure project along the existing I–64 highway in Virginia, consisting of roadway improvements, trestle bridges, and bored tunnels crossing Hampton Roads between Norfolk and Hampton. The Project will address severe traffic congestion at the existing HRBT crossing by increasing capacity. The Project will include widening I–64 to create an eight-lane facility with a consistent six-lanes between the I–64/I–664 and I–64/I–564 Interchange, which could expand to eight-lanes during peak travel periods with the use of drivable shoulder lanes within the Project limits. The Project will include the construction of two new two-lane tunnels, expansion of the existing portal islands, and full replacement of the existing North and South bridge-trestles.

The proposed HRBT project would include pile installation and pile removal. Pile installation methods will include impact and vibratory driving, jetting, and DTH pile installation. Pile removal techniques for temporary piles will include vibratory pile removal or cutting three feet below the mudline. Impact pile installation is projected to take place at 3 to 4 locations simultaneously and there is the potential for as many as 7 pile installation locations operating concurrently with different hammer types. Pile installation and removal can occur at variable rates, from a few minutes one day to several hours the next. HRCP anticipates that between 1 to 10 piles could be installed per day, depending on project scheduling.

The proposed action may incidentally expose marine mammals occurring in the vicinity to elevated levels of underwater sound, thereby resulting in incidental take, by Level A and Level B harassment.

Dates and Duration

The proposed regulations would be valid for a period of five years (2021–2026). The specified activities may occur at any time during the five-year period of validity of the proposed regulations. HRCP expects pile driving and removal to occur six days per week. The overall number of anticipated days of pile installation and removal is 312 each year for years 1–4 and 181 days for year 5, based on a 6-day work week. Over five years this would result in an estimated total of 1,429 days of in-water construction work, which may last from a few minutes up to several hours per day.

HRCP plans to conduct work during daylight hours although pile installation and removal may extend into evening or nighttime hours as needed to accommodate pile installation requirements (*e.g.,* once pile driving begins, a pile will be driven to design tip elevation). In order to maintain pile integrity and follow safety precautions, pile installation or removal will continue after dark only for piles already in the process of being installed or removed. Installation or removal will not commence on new piles after dark.

Specific Geographic Region

The proposed project area is located in the waterway of Hampton Roads adjacent to the existing bridge and island structures of the HRBT. Hampton Roads is located at the confluence of the James River, the Elizabeth River, the Nansemond River, Willoughby Bay, and the Chesapeake Bay. Navigational channels are maintained by the U.S. Army Corps of Engineers (USACE) within Hampton Roads to provide transit to the many ports in the region. Maintained navigation channels near the project area consist of:

- Norfolk Harbor Entrance Reach (1,000 to 1,400 feet wide and is maintained at a depth of 50 feet Mean Lower Low Water [MLLW]);
- Hampton Creek Entrance Channel (200 feet wide and is maintained at a depth of 12 feet MLLW);
- Phoebus Channel (150 feet wide and is maintained at a depth of 12 feet MLLW); and
- Willoughby Channel (200 feet wide and is maintained at a depth of 10 feet MLLW).

Sediments are mostly fine and medium sands with various amounts of coarse sand and gravel, and low organic carbon content. There is no naturally occurring rocky or cobble bottom present at or adjacent to the project area. The North Shore in Hampton contains estuarine intertidal sandy shore, estuarine intertidal reef, as well as submerged aquatic vegetation (SAV) in shallow estuarine open water. The North Trestle is located in estuarine open water with depths less than 15 feet below MLLW. The North Island is surrounded by estuarine intertidal sandy shore and rocky shore. Estuarine open water depths are primarily less than 15 feet below MLLW, but drop to approximately 25 feet below MLLW near the southwest corner of the island expansion closer to the Hampton Creek Entrance Channel. The South Island is also surrounded by estuarine intertidal sandy shore and rocky shore, followed by estuarine open water. The proposed island expansion is mainly in deep water (15 to 30 feet below MLLW), with a pocket of deeper water approximately 35 feet below MLLW to the west. The South Trestle is primarily located in estuarine open water with depths less than 15 feet below MLLW, with the exception of deep water (15 to 30 feet below MLLW) near the South Island approach. The north shore of Willoughby Bay contains estuarine intertidal sandy shore with two small pockets of estuarine intertidal emergent wetlands to the east. The Willoughby Bay Trestles are located in estuarine open waters with depths of less than 15 feet below MLLW, with the entire west bound trestle in water less than 6.6 feet below MLLW. Willoughby Bay contains an estuarine intertidal sandy shore and consists of estuarine open water with depths to 15 feet below MLLW.

A map of the HRBT Project Area is provided in Figure 1 below and Figures 1–1 and 2–1 in HRCP's application.

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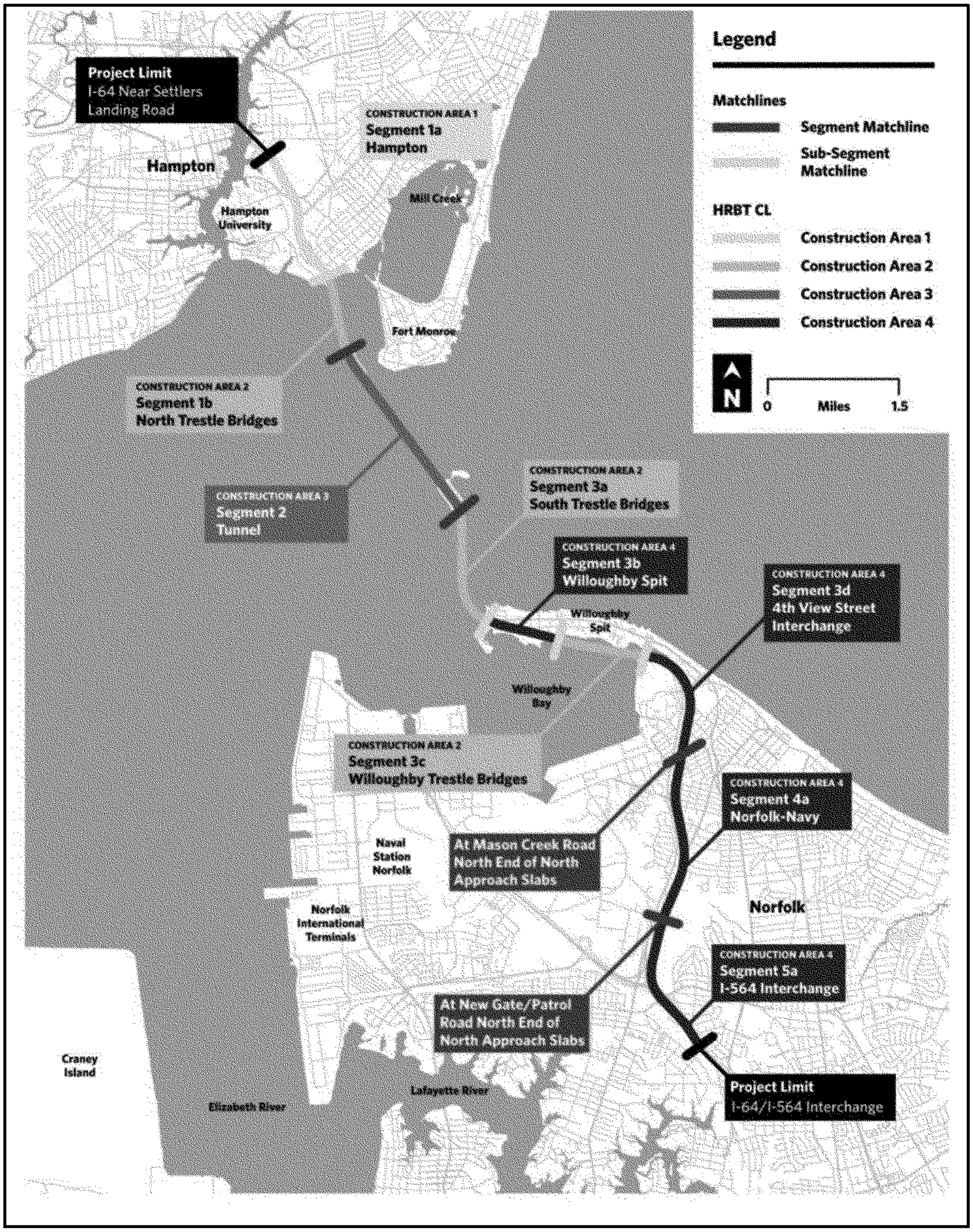

Figure 1 – Project Location

Detailed Description of Specific Activity

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The proposed project will widen I–64 for approximately 9.9 miles along I–64 from Settlers Landing Road in Hampton, Virginia, to the I–64/I–564 interchange in Norfolk, Virginia. The project will create an eight-lane facility with six consistent use lanes and will include full replacement of the North and South Trestle-Bridges, two new parallel tunnels constructed using a tunnel boring machine (TBM), expansion of the existing portal islands, and widening of the Willoughby Bay Trestle-Bridges, Bay Avenue Bridges, and Oastes Creek Bridges. Also, upland portions of I–64 will be widened to accommodate the additional lanes, the Mallory Street Bridge will be replaced, and the I–64 overpass bridges will be improved.

TABLE 1—HRBT EXPANSION PROJECT DESIGN SEGMENTS

Project design segment number and name	Construction area
Segment 1a (Hampton)	Area 1.
Segment 1b (North Trestle-Bridges) [1]	Area 2.
Segment 2a (Tunnel) [1]	Area 3.

TABLE 1—HRBT EXPANSION PROJECT DESIGN SEGMENTS—Continued

Project design segment number and name	Construction area
Segment 3a (South Trestle-Bridge) [1]	Area 2.
Segment 3b (Willoughby Spit) [1]	Area 4.
Segment 3c (Willoughby Bay Trestle-Bridges) [1]	Area 2.
Segment 3d (4th View Street Interchange)	Area 4.
Segment 4a (Norfolk-Navy)	Area 4.
Segment 5a (I–564 Interchange)	Area 4.

[1] Indicates segment includes in-water construction activities.

The proposed project design is divided into five segments as shown in Table 1. However, only the sub-segments identified in Table 1 and described below would include in-water marine construction activities that have the potential to affect marine mammals:

Segment 1b—North Trestle-Bridges

This segment includes new and replacement north tunnel approach trestles, This segment is located in Construction Area 2 as shown in Figure 1 above and Figure 1–1 in HRCP's application.

Temporary Work Trestles for Bridge Construction at the North Trestle—Several temporary work trestles will support construction of the permanent eastbound and westbound North Trestle-Bridges. The temporary North Shore Work Trestle will support construction of the permanent eastbound North Trestle-Bridge in the shallow water (<4 to 6 feet Mean Low Water (MLW)) closer to the North Shore, avoiding the need to dredge or deepen this area. The temporary North Shore Work Trestle (194 36-inch steel pipe piles) will be installed under the 2020 IHA (85 FR 48153; August 10, 2020) and will be removed using a vibratory hammer at the end of the project under this LOA (See Table 6). Unless stated otherwise, all of the work described below will be conducted as part of the proposed LOA.

Additional temporary work trestles will support construction of the permanent westbound North Trestle-Bridge in the shallow water near the North Island. These work trestles will be the same or similar to the North Shore Work Trestle, steel structures founded on 36-inch diameter steel pipe piles with 30 to 40 feet spans sized to accommodate a 300-ton crane. Approximately 182 36-inch steel piles will be installed to support these trestles using a combination of vibratory and impact hammers except along the shoreline where drilling with a DTH hammer may be needed to install piles through the armor stone.

Once that portion of the permanent eastbound and westbound North Trestle-Bridge is complete, the temporary pile foundations will be removed using a vibratory hammer and the work trestle reused for similar purposes at a different location on the project (*e.g.,* Willoughby Bay Work Trestles).

Jump Trestles for Bridge Construction at the North Trestle—Jump Trestles are temporary heavy duty platforms used to support cranes and other equipment, will be used the North Trestle for constructing trestle bridges. Jump trestles are built with a maximum of three spans which are progressively removed and reinstalled one span at a time, moving forward with the construction of the adjacent structure. Each span is supported by six (6) temporary 36-inch steel pipe piles. The steel pipe piles will be installed, removed, and reinstalled as the spans move forward using a combination of vibratory and impact hammers for installation except along the shoreline where drilling with a DTH hammer may be needed to install piles through the armor stone and vibratory hammers will be used for removal. Approximately 270 individual pile installations and 270 removals will be needed to support the Jump Trestle movement for construction of the permanent westbound North Trestle-Bridge.

Templates and Permanent Piles at the North Trestle—Temporary template piles will be used to guide installation of the permanent concrete piles used to support the new North Trestle-Bridge (Table 7). The templates will be supported by four temporary steel piles up to 36-inch in diameter, generally one at each corner of the template. A two-tier template will be used to account for the possible batter of the permanent piles. Each template will allow installation of multiple permanent concrete piles. A vibratory hammer will be used to install and remove the temporary 36-inch steel piles supporting the template.

Five hundred and sixty-two (562) permanent 54-inch concrete cylinder piles will be installed using an impact hammer and will remain in place at the end of construction. Pre-drilling will be done in the open without the use of a casing.

The drill, drill steel, and auger would be in leads and either attached to the pile leads or used independently and indexed to the template to resist rotation. The auger is anticipated to be 54-inch in diameter and 10 feet or less in height.

In areas containing rock obstructions, a casing will be advanced prior to installation of the permanent North Trestle piles. The DTH hammer will advance a 60-inch (outer diameter) steel pipe pile casing before installation of the 54-inch concrete cylinder pile. Approximately 15 60-inch steel pipe casings may be required. The 60-inch steel pipe casings will be left in place and cut to an appropriate length to accommodate final island construction.

Demolition Trestle at the North Trestle—The North Trestle Demolition Trestle will consist of a series of jump trestles, similar to or the same as that used to construct the permanent westbound North Trestle-Bridge. The jump trestles will be located in the shallow water near the North Shore and will be installed, removed, and reinstalled as demolition of the existing structures moves from the shoreline towards deeper water. Each jump trestle used for demolition will be 45 feet wide and approximately 1,200 feet long. Each jump trestle span will be supported by temporary 36-inch steel pipe piles. Approximately 344 individual pile installations and 344 removals will be needed to support the jump trestle movements using a combination of vibratory and impact hammers for installation except along the shoreline where a DTH hammer may be needed to install piles through the armor stone and vibratory hammers will be used for removal.

Moorings at the North Shore Work Trestle—Mooring dolphins that were installed under the existing IHA (85 FR 48153; August 10, 2020) at the southern end and along the outside edge of the North Shore Work Trestle will be removed as part of the LOA. Each dolphin consists of three 24-inch steel piles (Table 6). An additional thirteen

(13) 42-inch steel pipe piles were installed along the outer edge of the work trestle to provide additional single mooring points for barges and vessels delivering material and accessing the trestle. The 24-inch steel pipe piles and 42-inch steel pipe piles will be removed using a vibratory hammer.

Sheet Piles at the North Shore Abutment—Approximately 187 temporary panels of steel sheet piles (AZ–700–19) will be installed using a vibratory hammer at the North Shore shoreline to support excavation and construction of the North Shore Abutment. Most of this work is planned to be done at lower tides so that in-water work is minimized. However, some installation work below the tidal elevations (in-water) can be expected. Sheet piles will be removed using a vibratory hammer.

Segment 2a—Tunnel

This segment includes new bored tunnels, the tunnel approach structures, buildings, the North Island improvements for tunnel facilities, and South Island improvements. This segment is located in Construction Area 3 as shown in Figure 1.

Moorings at the North Island Expansion—Eighty (80) temporary moorings were installed along the perimeter of the North Island Expansion (North and South) under the existing IHA (HRCP 2020). All moorings will be removed using a vibratory hammer or cut to approximately 3 feet below the mudline.

Hampton Creek Approach Channel Marker at the North Island—An existing pile-mounted (Aid to Navigation) channel marker at the entrance to the Hampton Creek Approach Channel will be removed and relocated to allow expansion of the North Island. It will be removed using a vibratory hammer and a new permanent pile (36-inch steel pile) will be installed using a vibratory hammer.

Steel sheet piles will be installed as part of the North Island Expansion and at the shoreline of the North Island (Attachment 1, Figure 9) to support excavation and construction of the North Island Abutments and Expansion. Approximately 54 panels of sheet pile will be installed using a vibratory hammer around the perimeter of the North Island Expansion to support dredge and replacement of native soft soils. An additional 122 sheet pile panels will be installed around the perimeter of the North Island Expansion to support construction of the abutment and tunnel approach structure.

Approximately 128 panels of sheet pile will be installed at the North Island shoreline to support excavation and construction of the North Island Abutment. Most of this work is expected to be done at lower tides so that in-water work is minimized. However, some sheet pile installation work below the tidal elevations (in-water) can be expected. All sheet piles will be removed using a vibratory hammer.

TBM Platform at the South Island—HRCP is constructing the temporary TBM Platform or ''quay'' at the South Island to allow for the delivery, unloading, and assembly of the TBM components from barges to the Island. The installation of the TBM platform will occur under the existing IHA (HRCP 2020).

The TBM Platform is a steel structure erected on 216 36-inch diameter steel piles, with an overall area of approximately 0.70 acre (approximately 377 feet x 81 feet). The TBM Platform piles will be removed using a vibratory hammer or cut to approximately 3 feet below the mudline at the conclusion of the project.

Conveyor Trestle at the South Island—Tunnel boring spoils and other related materials will be moved between the South Island and barges via a conveyor belt and other equipment inside the tunnel boring. The Conveyor Trestle will also be used for maintenance and mooring of barges and vessels carrying TBM materials and other project-related materials. The Conveyor Trestle will be erected on 84 36-inch diameter steel piles. Installation of the Conveyor Trestle will occur under the existing IHA (85 FR 48153; August 10, 2020). At the conclusion of the project, the Conveyor Trestle piles will be removed using a vibratory hammer or cut to approximately 3 feet below the mudline.

Settlement Reduction Piles and Deep Foundation Piles at the South Island—Existing geotechnical conditions at the planned South Island Expansion will require additional considerations to reduce island settlement and support roadway construction. Therefore, approximately 394 24-inch steel pipe settlement reduction piles and 507 30-inch concrete-filled steel pipe deep foundation piles will be installed at the South Island Expansion to address these geotechnical conditions. The settlement reduction piles and the deep foundation piles will be installed using vibratory and impact hammers. Furthermore, the use of drilling with a DTH hammer may be needed to install the deep foundation piles through the armor stone. Temporary templates (Table 7) will be supported by four temporary steel pipe piles up to 36-inch in diameter that will be spudded in place and used to align the piles during installation. Steel sheet piles will be installed to partially enclose the deep foundation piles as installation progresses north to south along the island expansion area. For steel pipe piles in water depths greater than 20 feet, a bubble curtain will be used for pile installation to reduce hydroacoustic impacts caused by the impact hammer. A portion of the settlement reduction piles and deep foundation piles will be installed using a bubble curtain. See Mitigation for additional detail.

Moorings at the South Island—Temporary moorings will be installed along the perimeter of the South Island Expansion to support the construction of the island expansion. Twenty-five (25) 42-inch steel pipe piles will be installed to provide mooring points for barges and vessels. The mooring point piles will be installed using a vibratory hammer and eventually removed using a vibratory hammer.

Sheet Piles at the South Island Expansion and Abutment—Steel sheet piles will be installed as part of the South Island Expansion and at the shoreline of the South Island to support excavation and construction of the South Island Abutment. Approximately 152 panels of AZ–700–26 sheet pile will be installed around the perimeter of the South Island Expansion deep foundation piles using a vibratory hammer as pile installation progresses to support backfilling.

In addition, approximately 226 panels of AZ–700–26 temporary steel sheet pile will be installed around the perimeter of the South Island Expansion to support dredge and replacement of native soft soils. Temporary steel sheet piles will be installed using a vibratory hammer and will be removed using a vibratory hammer after completion of dredging/replacement works.

Approximately 70 panels of AZ–700–19 sheet pile will be installed at the South Island shoreline to support excavation and construction of the abutment and tunnel approach structure at the South Island. Similar to the North Shore Abutment work, most of this work is expected to be done at lower tides so that in-water work is minimized. However, some sheet pile installation work below the tidal elevations (in-water) can be expected. All sheet piles will be removed using a vibratory hammer.

Segment 3a—South Trestle-Bridge

This segment includes the new South Trestle-Bridge and any bridge elements that interface with the South Island to the south end of the south abutments at Willoughby Spit. This segment is located in Construction Area 2 as shown in Figure 1.

Moorings at the South Trestle—Temporary moorings will be installed in the area of the South Trestle to support the construction of temporary work trestles and permanent trestle bridges. The installation of the moorings at the South Trestle will be performed under the existing IHA (HRCP 2020). The temporary moorings will be removed at the conclusion of the project using a vibratory hammer.

Temporary Work Trestles for Bridge Construction at the South Trestle—Several temporary work trestles will support construction of the temporary bridges used for maintaining traffic at the South Trestle during construction (*i.e.,* temporary MOT bridges) and will serve as temporary docks for delivery of deck elements and other materials. The South Trestle Work Trestles will consist of two separate structures at the South Island shoreline (South Island South 1 and 2) and a third structure at the South Shore or Norfolk shoreline.

The temporary South Trestle Work Trestle at South Island South 1 is a steel structure approximately 504 feet long and 44 feet wide, founded on 72 36-inch diameter steel piles with 30 to 40 feet spans sized to accommodate a 300-ton crane. Once the permanent roadway is complete, the temporary MOT Bridge will be removed as well as the South Island South 1 Work Trestle, including the temporary pile foundations and mooring piles. They will be removed via vibratory hammer and the work trestle will be reused for similar purposes at a different project location.

The temporary South Trestle Work Trestle at South Island South 2 is a steel structure approximately 634 feet long and 54 feet wide, founded on 90 36-inch diameter steel piles with 30 to 40 feet spans sized to accommodate a 300-ton crane. The pile foundations will be removed using a vibratory hammer once the permanent roadway is complete.

The temporary South Trestle Work Trestle at the South Shore or Norfolk shoreline will be similar to that used elsewhere on the project. The work trestle will be approximately 500 feet long and 66 feet wide with four 30 feet wide finger piers. The finger piers will consist of 94 36-inch diameter steel piles installed using a vibratory hammer.

Temporary steel pile foundations for each of the work trestles will be installed using vibratory and impact hammers. A bubble curtain will be used during installation of steel pipe piles in water depths greater than 20 feet. Some areas near the shores and islands will require the use of drilling with a DTH hammer to install the temporary piles. The South Trestle Work Trestle pile foundations will be removed using a vibratory hammer.

Templates and Permanent Piles at the South Trestle—Temporary template piles (Table 7) will be used to guide installation of the permanent concrete piles used to support the new South Trestle-Bridge. The templates will use four temporary steel piles up to 36-inch in diameter as supports, generally one at each corner of the template. A two-tier template will be used to account for the possible batter of the piles. Each template will allow installation of multiple permanent concrete piles. A vibratory hammer will be used to install and remove the temporary 36-inch steel piles supporting the template.

Eight hundred and ten (810) permanent 54-inch concrete cylinder piles will be installed using an impact hammer and will remain in place at the end of construction. Pre-drilling will be done in the open without the use of a casing. The drill, drill steel, and drill auger would be in leads and either attached to the pile leads or used independently and indexed to the template to resist rotation. The drill auger is anticipated to be 54-inch in diameter and 10-feet less in height. It is expected that the drill, drill steel, and drill auger would have almost no impact on noise levels.

In areas where there may be rock obstructions, such as at the toe of the existing South Island slope, a casing will be advanced prior to installation of the permanent South Trestle piles. The DTH hammer will advance a 60-inch (outer diameter) steel pipe pile casing before installation of the 54-inch concrete cylinder pile. Approximately 65 60-inch steel pipe casings may be required. The 60-inch steel pipe casings will be left in place and cut to an appropriate length to accommodate final island construction.

Jump Trestle for Bridge Construction at the South Trestle—Temporary jump trestles will be used for constructing trestle bridges (both new permanent and temporary MOT bridges) at the South Trestle. A combination of jump trestles and working from the existing trestles will be used to build the new trestle bridges.

The 36-inch steel pipe piles will be installed, removed, and reinstalled as the spans move forward using a combination of vibratory and impact hammers for installation except along the shoreline where drilling with a DTH hammer may be needed to install piles through the armor stone. Vibratory hammers will be used for removal. A bubble curtain will be used for installation of steel pipe piles in water depths greater than 20 feet. Approximately 420 individual pile installations and 420 removals will be needed to support the jump trestle movement for construction of the permanent westbound South Trestle-Bridge.

Temporary MOT Trestles at the South Trestle—Two temporary MOT Trestle bridges at the South Trestle will be used to phase construction and carry traffic prior to completion of the new structures. The eastbound traffic will be shifted on the new MOT Trestle to allow for a partial demolition of the existing eastbound bridge-trestle. Once the partial demolition is completed, the new eastbound connection to the eight-lane trestle will be built with the support of a jump trestle and eastbound traffic will be shifted on it. A temporary MOT Trestle will be built from South Island next to the existing westbound trestle. The westbound traffic will be shifted on the new MOT Trestle to allow for a partial demolition of the existing westbound bridge-trestle. A portion of the existing eastbound bridge-trestle will also be demolished to allow the new connection between the eight-lane structure and the new westbound bridge-trestle. The temporary MOT Trestle at the South Trestle will be a steel structure erected on 218 36-inch steel pipe piles that will be installed using a combination of vibratory and impact hammers except along the shoreline where drilling with a DTH hammer may be needed to install piles through the armor stone. A bubble curtain will be used for installation of steel pipe piles in water depths greater than 20 feet. Pile foundations will be removed using a vibratory hammer.

Thirty 42-inch steel pipe pile casings will be installed using a vibratory hammer in areas where the MOT trestle is in the footprint of the South Island Expansion. The 42-inch steel pipe pile casings will be left in place and cut to an appropriate length to accommodate final island construction.

Demolition Trestle at the South Trestle—The South Trestle Demolition Trestle will be similar to the work trestles previously described (*e.g.* Demolition Trestle at the North Trestle). Located at the South Shore, the South Trestle Demolition Trestle will be used to access the shallow water at the South Shore and support equipment used to remove the existing trestle structure. Approximately 72 36-inch steel pipe piles will be installed with a combination of vibratory and impact hammers. Some areas near the shores and islands will require the use of a DTH hammer to install the temporary piles. At the conclusion of the project, the South Trestle Demolition Trestle will be removed using a vibratory hammer.

Segment 3C—Willoughby Bay Trestle-Bridges

This segment includes the new South Trestle-Bridge and any bridge elements that interface with the South Island to the south end of the south abutments at Willoughby Spit. This segment is located in Construction Area 2 as shown in Figure 1.

Moorings at Willoughby Bay—Temporary moorings will be installed in Willoughby Bay to support the construction of temporary work trestles and permanent trestle bridges, and to provide a safe haven (harbor of safe refuge) for vessels in the event of severe weather. Moorings will consist of six dolphins—each consisting of three 24-inch steel piles—and 50 42-inch steel pipe piles. The mooring dolphin piles and the single mooring point piles will be installed under the existing IHA (85 FR 48153; August 10, 2020).

An additional 40 42-inch steel pipe piles will be installed in Willoughby Bay to complete the safe haven (50 42-inch piles will be installed under the existing IHA; HRCP 2020). The moorings will be configured as two 2,000-feet long lines with a 42-inch mooring pile every 80-feet. The piles will be installed using a vibratory hammer and removed at the conclusion of the project using a vibratory hammer.

Temporary Work Trestles for Bridge Construction at Willoughby Bay—The existing Willoughby Bay Bridge structure will be modified by widening the two existing structures to the outside in both directions to accommodate new travel lanes, shoulders, and new sound walls. This will require installation of two to three additional piles at each pier location on the outside of both eastbound and westbound structures. Two temporary work trestles, each approximately 500 feet long and 45 feet wide, will be installed along the outside edge of the existing eastbound structure to provide access in the shallow water area near both shorelines. Approximately 212 36-inch steel pipe piles will be installed using a combination of vibratory and impact hammers to support the temporary work trestles. The temporary steel piles will be removed using a vibratory hammer.

Jump Trestle for Bridge Construction at Willoughby Bay—A combination of jump trestles and working from the existing trestles will be used to construct the widening of the existing Willoughby Bay westbound roadway. Similar to other locations (*e.g.,* Jump Trestle at the North Trestle see Section), the jump trestle will be supported by temporary 36-inch steel pipe pile foundations that will be installed, removed, and reinstalled as the spans move forward using a combination of vibratory and impact hammers for installation and vibratory hammers for removal. Approximately 544 individual pile installations and 544 removals will be needed to support the jump trestle movement across Willoughby Bay.

Templates and Permanent Piles at Willoughby Bay—Temporary template piles (Table 7) will be used to guide installation of the permanent concrete piles used to support widening of the eastbound and westbound Willoughby Bay roadway. The templates will be supported by four temporary steel piles up to 36-inch in diameter with one at each corner of the template.

A vibratory hammer will be used to install and remove the temporary 36-inch steel piles supporting the template. Some areas near the shorelines may require the use of a DTH hammer to install the templates (Table 7).

Five hundred and four (504) 24-inch concrete square permanent piles will be installed using an impact hammer and will remain in place at the end of construction. Where geotechnical conditions require, the permanent piles may also be installed via jetting. Where jetting is required, an outer steel pipe pile casing (up to 42-inch in diameter) may be installed using a vibratory hammer before installation of the concrete pile. Approximately 300 casings (60 percent of the 504 concrete piles) will be installed prior to installing the concrete piles. The casing will be driven and the sediment and sand removed from the casing prior to installing the permanent pile. The casing will be removed using a vibratory hammer.

Segment 3b—Willoughby Spit Laydown Area

This segment includes the Willoughby Spit Laydown Area which is a temporary construction staging and laydown area that will include the installation and removal of temporary piers. This segment is located in Construction Area 4 as shown in Figure 1.

Temporary Docks on Spuds and Piles at the Willoughby Spit Laydown Area—HRCP has been granted use of property on Willoughby Spit next to the South Trestle-Bridge to be used for laydown areas and as a base for marine operations. Two temporary piers will be constructed to allow barge access: One will be a fixed pier on 44 36-inch steel pipe piles, and the other will be a floating dock on 8 36-inch steel pipe (spuds) piles. Piles will be installed using vibratory and impact hammers, as well as a pile template. The pile template will be supported by four temporary steel piles up to 36-inch in diameter (Table 7). The temporary piers, including the steel pile foundations, will be removed upon completion of the Project via vibratory hammer.

Temporary Finger Piers on Timber Piles at the Willoughby Spit Laydown Area—The existing bulkheads and piers located on the inside of Willoughby Spit will be repaired to provide access for crew boats and similar-sized vessels. Three timber piers will replace the existing piers and will be constructed using 36 16-inch CCA timber piles, each pier consisting of 12 16-inch CCA timber piles. The piles will be installed using a vibratory hammer. Any existing timber piers will be pulled out of place.

HRCP plans to employ five methods of pile installation including vibratory hammer, impact hammer, pre-drilling, jetting, and use of DTH hammers. More than one installation method could be used within a day and at each location and multiple piles could be installed and/or removed concurrently. Steel pipe piles will most likely be installed using a combination of vibratory (ICE 416L or similar) and impact hammers (S35 or similar). Approximately 80 percent of the time steel pipe piles will be installed using a vibratory hammer while an impact hammer will be used approximately 20 percent of the time. Most piles will be advanced using vibratory methods and then impact driven to final tip elevation.

Temporary steel pile templates will be used to set permanent piles. Templates will be positioned and held in place using spuds or steel pipe piles, up to 36-inch diameter with one at each corner of the template. Template piles are temporary and generally do not bear significant vertical loads, therefore installation (*i.e.,* driving) and removal of template piles requires minimal driving time, estimated at approximately 5 minutes per spud (see Table 7). Permanent concrete piles will be installed using an impact hammer only, although permanent concrete piles may also be installed via jetting at Willoughby Bay. During jetting, high-pressure water is sprayed out of the bottom of the pile to help penetrate dense sand layers and allow pile driving with lower hammer impact energies. Jetting will only be conducted at depth once sufficient resistance to pile installation has been met. Where jetting is required, an outer steel pipe pile casing may be installed before installation of the square concrete piles at Willoughby Bay. Casings will be driven using a vibratory hammer and the sediment and sand removed from the casing prior to driving the permanent concrete pile. HRCP assumed, and NMFS agrees, that jetting will be quieter than vibratory installation of the same pile size, but data for this activity are limited; therefore, sound source levels (SSLs) for vibratory installation were applied to jetting.

Pre-drilling will be performed on the 54-inch concrete cylinder permanent piles without the use of a casing in the open. The drill, drill steel, and auger will be in leads and either attached to the pile leads or used independently and indexed to the template to resist rotation. A 54-inch diameter auger 10-feet or less in height is expected to be employed. Pre-drilling will be conducted to loosen soils directly underneath the pile to maximize pile advancement before the drive and shorten the length of driving time. Pre-drilling may reduce driving times by as much as 50 percent and pre-drilling depth is expected to be less than half the pile length. HRCP may drill to within 3–4 diameters above the final tip elevation in cases of dense sand. HRCP assumed and NMFS agrees that use of the drill, drill turntable, drill steel, drill auger, and drill bit will not result in harassment. These devices have low source levels and, therefore, low signal-to-noise ratios. The signal characteristics (continuous noise) would be occurring in a relatively noisy coastal environment where low-level continuous noise is common. Therefore, they would be unlikely to provoke a reaction consistent with what we would consider to be harassment. Therefore, harassment zone sizes were not estimated for these activities. These devices simply rotate in the sediments and do not displace them without creating a hole. No pile is installed during pre-drilling, and much less energy is expended than during pile installation. The equipment and nature of the act of pre-drilling in soils produce minimal noise and the pre-drilling will significantly reduce the driving time which in turn reduces the total noise levels.

The pile installation methods used will depend on sediment depth and conditions at each pile location. Table 2 through Table 7 provides additional information on the pile driving operation including estimated pile driving times. Note that the sum of the days of pile installation and removal is greater than the anticipated number of days because more than one pile installation method will be used within a day and at each location. The overall number of anticipated days of pile installation and removal is 312 per year, based on a six-day work week for years 1–4. Year 5 will require an estimated 181 days of in-water work. It is possible that installation and removal numbers might shift from one month to another depending on schedule constraints.

HRCP will employ a bubble curtain when installing steel pipe piles in water depths greater than 20 feet to minimize hydroacoustic impacts caused by the impact hammer. Bubble curtains will be used at the South Island to install a portion of the permanent settlement reduction piles and deep foundation piles and at the South Trestle to install a portion of the Temporary MOT Trestle, Jump Trestle, and Work Trestle.

Before installing steel pipe piles near shorelines protected with rock armor and/or rip rap (*e.g.,* South Island shoreline; North Shore shoreline) the rock armoring that protects the shoreline will need to be temporarily shifted to an adjacent area to allow for the installation of the piles. The rock armor should only be encountered at the shoreline and at relatively shallow depths below the mudline. Any rock armor stone and/or rip rap that has been moved will be reinstalled near its original location following the completion of pile installation.

DTH pile installation uses both rotary and percussion-type drill devices and will be used frequently. The device consists of a drill bit that drills through stone using both rotary and pulse impact mechanisms. This breaks up the stone to allow removal of the fragments and insertion of the pile. The pile is usually advanced at the same time that drilling occurs. Drill cuttings are expelled from the top of the pile using compressed air and will be directed through a pipe to a designated location for waste.

Piles may be also be installed without moving the armor stone by first drilling through the stone with a DTH hammer. It is estimated that drilling with a DTH hammer will be used for approximately 1 to 2 hours per pile, when necessary. It is anticipated that approximately 7 percent of the North Shore Work Trestle piles, 4 percent of the North Trestle Jump Trestle piles, 7 percent of the North Trestle Demolition Trestle piles, 100 percent of the North Trestle Casings, 14 percent of the South Trestle Work Trestle piles, 6 percent of the South Trestle Jump Trestle piles, 10 percent of the South Trestle Temporary MOT Trestle piles, 17 percent of the South Trestle Demolition Trestle piles, 100 percent of the South Trestle Casings, and 10 percent of the South Island deep foundation piles may require installation with a DTH hammer (See Table 2 through Table 6).

Temporary steel sheet piles and steel pipe piles will be removed using a vibratory hammer or cut to approximately 3 feet below the mudline. Temporary concrete piles will only be removed by cutting to approximately 3 feet below the mudline.

Table 2 through 6 below show the number and types of piles planned for installation and removal each year by component and segment while Table 7 shows the total number of template piles over five years by location.

TABLE 2—NUMBERS AND TYPES OF PILES TO BE INSTALLED AND REMOVED DURING LOA YEAR ONE FOR EACH HRBT PROJECT COMPONENT AND SEGMENT

Project component	Pile size/ type and material	Total number of piles to be installed	Total number of piles to be removed	Embedment length (feet)	Number of piles down-the-hole	Average down-the-hole duration per pile (minutes)	Number of piles vibrated/ hammered	Average vibratory duration per pile (minutes)	Approximate number of impact strikes per pile	Number of piles per day per hammer	Estimated total number of hours of installation and removal	Number of days of installation and removal
North Trestle (Segment 1b)												
Permanent Piles.	54-inch Concrete Cylinder Pipe.	188	0	140	....	....	188	....	2,100	1	376	188
Casing	60-inch Steel Pipe.	15	0	60	15	120	....	....	....	3	30	5
North Shore Abutment.	AZ 700–19 Steel Sheet.	63	63	20	....	....	126	30	....	10	63	13

TABLE 2—NUMBERS AND TYPES OF PILES TO BE INSTALLED AND REMOVED DURING LOA YEAR ONE FOR EACH HRBT PROJECT COMPONENT AND SEGMENT—Continued

Project component	Pile size/ type and material	Total number of piles to be installed	Total number of piles to be removed	Embedment length (feet)	Number of piles down-the-hole	Average down-the-hole duration per pile (minutes)	Number of piles vibrated/ hammered	Average vibratory duration per pile (minutes)	Approximate number of impact strikes per pile	Number of piles per day per hammer	Estimated total number of hours of installation and removal	Number of days of installation and removal
North Island (Segment 2a)												
Hampton Creek Approach Channel Marker.	Existing, 36-inch Steel Pipe.	1	1	....	....	....	1	50	....	1	2	1
North Island Expansion.	AZ 700–26 Steel Sheet.	176	176	40	....	....	352	30	....	10	176	35
Willoughby Bay (Segment 3c)												
Work Trestle	36-inch Steel Pipe.	212	0	100	....	....	212	50	40	2	177	106
Moorings (Safe Haven).	42-inch Steel Pipe.	40	0	60	....	....	40	30	....	6	20	7
Permanent Piles.	24-inch Concrete Square Pipe.	402	0	140	....	....	402	....	2,100	1	804	402
Casing	42-inch Steel Pipe.	240	240	60	....	....	480	30	....	6	160	80
Willoughby Spit (Segment 3b)												
Dock on Spuds, Floating Dock.	36-inch Steel Pipe.	8	0	100	....	....	8	50	40	3	7	3
Dock on Piles, Fixed Pier.	36-inch Steel Pipe.	44	0	100	....	....	44	50	40	3	37	15
Finger Piers on Timber Piles.	16-inch CCA* Timber.	36	0	60	....	....	36	30	....	4	18	9
South Trestle (Segment 3a)												
Work Trestle	36-inch Steel Pipe.	156	0	100	22	120	134	50	40	2	130	78
Temporary MOT* Trestle.	36-inch Steel Pipe.	113	0	100	11	120	102	50	40	2	85	51
Casing	42-inch Steel Pipe.	30	0	60	....	....	30	30	....	6	15	5
Permanent Piles.	54-inch Concrete Cylinder Pipe.	252	0	140	....	....	252	....	2,100	1	504	252
Casing	60-inch Steel Pipe.	65	0	60	65	120	....	....	....	3	130	22
South Island (Segment 2a)												
Settlement Reduction Piles.	24-inch Steel Pipe.	24	0	85	....	....	24	60	40	6	24	4
Deep Foundation Piles.	30-inch Steel Pipe, Concrete Filled.	82	0	85	8	120	74	60	40	6	82	14
Moorings	42-inch Steel Pipe.	25	0	60	....	....	25	30	....	6	13	4
South Island Abutment.	AZ 700–19 Steel Sheet.	12	0	20	....	....	12	30	....	10	6	2
Total	....	2,184	480	....	....	....	....	....	....	....	....	1,296

TABLE 3—NUMBERS AND TYPES OF PILES TO BE INSTALLED AND REMOVED DURING LOA YEAR TWO FOR EACH HRBT PROJECT COMPONENT AND SEGMENT

Project component	Pile size/ type and material	Total number of piles to be installed	Total number of piles to be removed	Embedment length (feet)	Number of piles down-the-hole	Average down-the-hole duration per pile (minutes)	Number of piles vibrated/ hammered	Average vibratory duration per pile (minutes)	Approximate number of impact strikes per pile	Number of piles per day per hammer	Estimated total number of hours of installation and removal	Number of days of installation and removal
North Trestle (Segment 1b)												
North Shore Work Trestle.	36-inch Steel Pipe.	0	194	100	....	....	194	50	40	3	162	65
Work Trestle	36-inch Steel Pipe.	182	....	100	12	120	170	50	40	2	152	91
Jump Trestle	36-inch Steel Pipe.	42	38	100	3	120	77	50	40	2	65	39

TABLE 3—NUMBERS AND TYPES OF PILES TO BE INSTALLED AND REMOVED DURING LOA YEAR TWO FOR EACH HRBT PROJECT COMPONENT AND SEGMENT—Continued

Project component	Pile size/ type and material	Total number of piles to be installed	Total number of piles to be removed	Embedment length (feet)	Number of piles down-the-hole	Average down-the-hole duration per pile (minutes)	Number of piles vibrated/ hammered	Average vibratory duration per pile (minutes)	Approximate number of impact strikes per pile	Number of piles per day per hammer	Estimated total number of hours of installation and removal	Number of days of installation and removal
Permanent Piles.	54-inch, Concrete Cylinder Pipe.	102	0	140			102		2,100	1	204	102
North Island (Segment 2a)												
North Island Abutment.	AZ 700–19 Steel Sheet.	96	0	20			96	30		10	48	10
Willoughby Bay (Segment 3c).												
Jump Trestle	36-inch Steel Pipe.	84	76	100			160	50	40	2	134	80
Work Trestle	36-inch Steel Pipe.	0	126	100			126	50		2	105	63
Permanent Piles.	24-inch Concrete Square Pipe.	102	0	140			102		2,100	1	204	102
Casing	42-inch Steel Pipe.	60	60	60			120	30		6	60	20
South Trestle (Segment 3a)												
Work Trestle	36-inch Steel Pipe.	100	0	100	14	120	86	50	40	2	84	50
Jump Trestle	36-inch Steel Pipe.	175	175	100	10	120	350	50	40	2	292	175
Temporary MOT* Trestle.	36-inch Steel Pipe.	105	0	100	10	120	95	50		2	80	48
Permanent Piles.	54-inch Concrete Cylinder Pipe.	168	0	140			168		2,100	1	336	168
South Island (Segment 2a)												
Settlement Reduction Piles.	24-inch Steel Pipe, Steel.	370	0	85			370	60	40	6	370	62
Deep Foundation Piles.	30-inch Steel Pipe, Concrete Filled.	425	0	85	42	120	383	60	40	6	425	71
South Island Abutment.	AZ 700–19 Steel Sheet.	12	24	20			36	30		10	18	4
South Island Expansion.	AZ 700–26 Steel Sheet.	378	378	70			756	30		10	189	76
Total		2,401	1,071									1,226

TABLE 4—NUMBERS AND TYPES OF PILES TO BE INSTALLED AND REMOVED DURING LOA YEAR THREE FOR EACH HRBT PROJECT COMPONENT AND SEGMENT

Project component	Pile size/type and material	Total number of piles to be installed	Total number of piles to be removed	Embedment length (feet)	Number of piles down-the-hole	Average down-the-hole duration per pile (minutes)	Number of piles vibrated/ hammered	Average vibratory duration per pile (minutes)	Approximate number of impact strikes per pile	Number of piles per day per hammer	Estimated total number of hours of installation and removal	Number of days of installation and removal
North Trestle (Segment 1b)												
Jump Trestle	36-inch Steel Pipe.	228	232	100	9	120	451	50	40	2	376	226
Permanent Piles.	54-inch, Concrete Cylinder Pipe.	187	0	140			187		2,100	1	374	187
North Shore Abutment.	AZ 700–19 Steel Sheet.	62	62	20			124	30		10	62	13
North Island (Segment 2a)												
North Island Abutment.	AZ 700–19 Steel Sheet.	32	128	20			160	30		10	80	16
Willoughby Bay (Segment 3c)												
Jump Trestle	36-inch Steel Pipe.	460	468	100			928	50	40	2	774	464
Work Trestle	36-inch Steel Pipe.	0	86	100			86	50		2	72	43
South Trestle (Segment 3a)												
Jump Trestle	36-inch Steel Pipe.	245	245	100	14	120	476	50	40	2	397	238

TABLE 4—NUMBERS AND TYPES OF PILES TO BE INSTALLED AND REMOVED DURING LOA YEAR THREE FOR EACH HRBT PROJECT COMPONENT AND SEGMENT—Continued

Project component	Pile size/type and material	Total number of piles to be installed	Total number of piles to be removed	Embedment length (feet)	Number of piles down-the-hole	Average down-the-hole duration per pile (minutes)	Number of piles vibrated/hammered	Average vibratory duration per pile (minutes)	Approximate number of impact strikes per pile	Number of piles per day per hammer	Estimated total number of hours of installation and removal	Number of days of installation and removal
Demolition Trestle.	36-inch Steel Pipe.	15	0	100	2	120	13	50	40	2	13	30
Work Trestle	36-inch Steel Pipe.	0	182	100	....	....	182	50	....	2	152	91
Temporary MOT* Trestle.	36-inch Steel Pipe.	0	110	100	....	....	110	50	....	2	92	55
Permanent Piles.	54-inch Concrete Cylinder Pipe.	196	0	140	....	....	196	....	2,100	1	392	196
South Island (Segment 2a)												
South Island Abutment.	AZ 700–19 Steel Sheet.	46	46	20	....	....	92	30	....	10	46	10
Total	....	1,471	1,559	....	....	....	....	....	....	....	....	1,569

TABLE 5—NUMBERS AND TYPES OF PILES TO BE INSTALLED AND REMOVED DURING LOA YEAR THREE FOR EACH HRBT PROJECT COMPONENT AND SEGMENT

Project component	Pile size/type and material	Total number of piles to be installed	Total number of piles to be removed	Embedment length (feet)	Number of piles down-the-hole	Average down-the-hole duration per pile (minutes)	Number of piles vibrated/hammered	Average vibratory duration per pile (minutes)	Approximate number of impact strikes per pile	Number of piles per day per hammer	Estimated total number of hours of installation and removal	Number of days of installation and removal
North Trestle (Segment 1b)												
Demolition Trestle.	36-inch Steel Pipe.	344	172	100	24	120	492	50	40	2	410	246
Permanent Piles.	54-inch, Concrete Cylinder Pipe.	85	0	140	....	....	85	....	2,100	1	170	85
North Shore Abutment.	AZ 700–19 Steel Sheet.	62	62	20	....	....	124	30	....	10	62	13
South Trestle (Segment 3a)												
Demolition Trestle.	36-inch Steel Pipe.	57	72	100	10	120	119	50	40	2	99	60
Work Trestle	36-inch Steel Pipe.	0	74	100	....	....	74	50	....	2	62	37
Temporary MOT* Trestle.	36-inch Steel Pipe.	0	108	100	....	....	108	50	....	2	90	54
Permanent Piles.	54-inch Concrete Cylinder Pipe.	194	0	140	....	....	194	....	2,100	1	388	194
South Island (Segment 2a)												
TBM Platform	36-inch Steel Pipe.	0	216	140	....	....	216	60	....	2	216	108
Conveyor Trestle.	36-inch Steel Pipe.	0	84	100	....	....	84	50	....	3	70	42
Total	....	742	788	....	....	....	....	....	....	....	....	839

TABLE 6—NUMBERS AND TYPES OF PILES TO BE INSTALLED AND REMOVED DURING LOA YEAR FIVE FOR EACH HRBT PROJECT COMPONENT AND SEGMENT

Project component	Pile size/type and material	Total number of piles to be installed	Total number of piles to be removed	Embedment length (feet)	Number of piles down-the-hole	Average down-the-hole duration per pile (minutes)	Number of piles vibrated/hammered	Average vibratory duration per pile (minutes)	Approximate number of impact strikes per pile	Number of piles per day per hammer	Estimated total number of hours of installation and removal	Number of days of installation and removal
North Trestle (Segment 1b)												
Moorings	42-inch Steel Pipe.	0	36	60	....	....	36	30	....	6	18	6
Moorings	24-inch Steel Pipe.	0	30	60	....	....	30	30	....	6	15	5
Work Trestle	36-inch Steel Pipe.	0	182	100	....	....	182	50	....	2	152	91
Demolition Trestle.	36-inch Steel Pipe.	0	172	100	....	....	172	50	....	2	144	86

TABLE 6—NUMBERS AND TYPES OF PILES TO BE INSTALLED AND REMOVED DURING LOA YEAR FIVE FOR EACH HRBT PROJECT COMPONENT AND SEGMENT—Continued

Project component	Pile size/type and material	Total number of piles to be installed	Total number of piles to be removed	Embedment length (feet)	Number of piles down-the-hole	Average down-the-hole duration per pile (minutes)	Number of piles vibrated/hammered	Average vibratory duration per pile (minutes)	Approximate number of impact strikes per pile	Number of piles per day per hammer	Estimated total number of hours of installation and removal	Number of days of installation and removal
North Island (Segment 2a)												
Moorings	42-inch Steel Pipe.	0	80	60			80	30		6	40	14
Willoughby Bay (Segment 3c)												
Moorings	42-inch Steel Pipe.	0	50	60			50	30		6	25	9
Moorings	24-inch Steel Pipe.	0	18	60			18	30		6	9	3
Moorings (Safe Haven)	42-inch Steel Pipe.	0	90	60			90	30		6	45	15
Willoughby Spit (Segment 3b)												
Dock on Spuds, Floating Dock.	36-inch Steel Pipe.	0	8	100			8	50		3	7	3
Dock on Piles, Fixed Pier.	36-inch Steel Pipe.	0	44	100			44	50		3	37	15
Finger Piers on Timber Piles.	16-inch CCA*, Timber.	0	36	60			36	30		4	18	9
South Trestle (Segment 3a)												
Moorings	42-inch Steel Pipe.	0	41	60			41	30		6	21	7
Moorings	24-inch Steel Pipe.	0	18	60			18	30		6	9	3
South Island (Segment 2a)												
Mooring	42-inch Steel Pipe.	0	25	60			25	30		6	13	5
Total		0	830									271

TABLE 7—NUMBERS OF TEMPLATE PILES (UP TO 36-INCH STEEL PIPE PILES) TO BE INSTALLED AND REMOVED USING A VIBRATORY HAMMER FOR THE HRBT PROJECT

Project component/location	Pile size/type and material	Estimated number of template piles to be installed	Estimated number of template piles to be removed	Average down-the-hole duration per pile (minutes)	Average vibratory duration per template pile (minutes)	Number of piles per day per component (install and removal)
North Trestle Permanent Piles	54-inch Concrete Cylinder Pipe	750	750		5	8
South Trestle Permanent Piles	54-inch Concrete Cylinder Pipe	1080	1080		5	8
Willoughby Bay Permanent Piles	24-inch Concrete Square Pipe	672	672		5	8
Willoughby Spit Fixed Pier*	36-inch Steel Pipe	59	59		5	16
Willoughby Spit Floating Pier*	36-inch Steel Pipe	11	11		5	16
South Island Deep Foundation Piles.	30-inch Steel Pipe, Concrete Filled.	676	676	120	5	16
South Island Settlement Reduction Piles.	24-inch Steel Pipe	526	526		5	16
Estimated Total Template Pile Driving Actions.		3,774	3,774			
Total number of Temporary Template Pile Driving action.		7,584				

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

Description of Marine Mammals in the Area of Specified Activities

Sections 3 and 4 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history, of the potentially affected species. Additional information regarding population trends and threats may be found in NMFS' Stock Assessment Reports (SAR); *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region* and more general information about these species (*e.g.,* physical and behavioral descriptions) may be found on NMFS' website (*https://www.fisheries.noaa.gov/find-species*).

Table 8 lists all species with expected potential for occurrence in the project area and summarizes information related to the population or stock, including regulatory status under the MMPA and ESA and potential biological removal (PBR), where known. For taxonomy, we follow Committee on Taxonomy (2020). 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 and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS's stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS's U.S. Atlantic and Gulf of Mexico SARs (*e.g.,* Hayes *et al.,* 2020). All values presented in Table 8 are the most recent available at the time of publication and are available in the 2019 SARs (Hayes *et al.,* 2020).

TABLE 8—MARINE MAMMAL SPECIES LIKELY TO OCCUR NEAR THE PROJECT AREA

Common name	Scientific name	Stock	ESA/MMPA status; strategic (Y/N) [1]	Stock abundance (CV, N_{min}, most recent abundance survey) [2]	PBR	Annual M/SI [3]
Order Cetartiodactyla—Cetacea—Superfamily Mysticeti (baleen whales)						
Family Balaenopteridae (rorquals):						
Humpback whale	*Megaptera novaeangliae*	Gulf of Maine	–,–; N	1,396 (0; 1,380; see SAR).	22	12.15
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Delphinidae:						
Bottlenose dolphin	*Tursiops truncatus*	Western North Atlantic (WNA) Coastal, Northern Migratory.	–,–; Y	6,639 (0.41; 4,759; 2011)	48	6.1–13.2
		WNA Coastal, Southern Migratory.	–,–; Y	3,751 (0.06; 2,353; 2011)	23	0–14.3
		Northern North Carolina Estuarine System (NNCES).	–,–; Y	823 (0.06; 782; 2013)	7.8	0.8–18.2
Family Phocoenidae (porpoises):						
Harbor porpoise	*Phocoena phocoena*	Gulf of Maine/Bay of Fundy	–, –; N	95,543 (0.31; 74,034; see SAR).	851	217
Order Carnivora—Superfamily Pinnipedia						
Family Phocidae (earless seals):						
Harbor seal	*Phoca vitulina*	WNA	–; N	75,834 (0.15; 66,884, see SAR).	2,006	350
Gray seal [4]	*Halichoerus grypus*	WNA	–; N	27,131 (0.19, 23,158, see SAR).	1,359	5,410

[1] Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (–) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.

[2] NMFS marine mammal stock assessment reports online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region.* CV is coefficient of variation; Nmin is the minimum estimate of stock abundance. In some cases, CV is not applicable.

[3] These values, found in NMFS's SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (*e.g.,* commercial fisheries, ship strike). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value or range. A CV associated with estimated mortality due to commercial fisheries is presented in some cases.

[4] The NMFS stock abundance estimate applies to U.S. population only, however the actual stock abundance is approximately 451,431.

As indicated above, all five species (with seven managed stocks) in Table 8 temporally and spatially co-occur with the activity to the degree that take is reasonably likely to occur, and we have proposed authorizing take. While North Atlantic right whales (*Eubalaena glacialis*), minke whales (*Balaenoptera acutorostrata acutorostrata*), and fin whales (*Balaenoptera physalus*) have been documented in the area, the temporal and/or spatial occurrence of these whales is such that take is not expected to occur, and they are not discussed further beyond the explanation provided here.

Based on sighting data and passive acoustic studies, the North Atlantic right whale could occur off Virginia year-round (DoN 2009; Salisbury *et al.,* 2016). They have also been reported seasonally off Virginia during migrations in the spring, fall, and winter (CeTAP 1981, 1982; Niemeyer *et al.,* 2008; McLellan 2011b, 2013; Mallette *et al.,* 2016a, 2016b, 2017, 2018a; Palka *et al.,* 2017; Cotter 2019). Right whales are known to frequent the coastal waters of the mouth of the Chesapeake Bay (Knowlton *et al.,* 2002) and the area is a seasonal management area (November 1–April 30) mandating reduced ship speeds out to approximately 20 nautical miles for the species; however, the project area is further inside the Bay.

North Atlantic right whales have stranded in Virginia, one each in 2001, 2002, 2004, 2005: Three during winter (February and March) and one in summer (September) (Costidis *et al.,* 2017, 2019). In January 2018, a dead, entangled North Atlantic right whale was observed floating over 60 miles offshore of Virginia Beach (Costidis *et al.,* 2019). All North Atlantic right whale strandings in Virginia waters have occurred on ocean-facing beaches along Virginia Beach and the barrier islands seaward of the lower Delmarva Peninsula (Costidis *et al.,* 2017). Due to the low occurrence of North Atlantic right whales near the project area, NMFS is not proposing to authorize take of this species.

Fin whales have been sighted off Virginia (Cetacean and Turtle Assessment Program (CeTAP) 1981, 1982; Swingle *et al.,* 1993; DoN 2009; Hyrenbach *et al.,* 2012; Barco 2013; Mallette *et al.,* 2016a, b; Aschettino *et al.,* 2018; Engelhaupt *et al.,* 2017, 2018; Cotter 2019), and in the Chesapeake Bay (CeTAP 1981, 1982; Morgan *et al.,* 2002; Barco 2013; Aschettino *et al.,* 2018); however, they are not likely to occur in the project area. Sightings have been documented around the Chesapeake Bay Bridge Tunnel (CBBT), which is approximately 17 km from the project site, during the winter months (CeTAP 1981, 1982; Barco 2013; Aschettino *et al.,* 2018).

Eleven fin whale strandings have occurred off Virginia from 1988 to 2016 mostly during the winter months of February and March, followed by a few in the spring and summer months (Costidis *et al.,* 2017). Six of the strandings occurred in the Chesapeake Bay (three on eastern shore; three on western shore) with the remaining five occurring on the Atlantic coast (Costidis *et al.,* 2017. Documented strandings near the project area have occurred: February 2012, a dead fin whale washed ashore on Oceanview Beach in Norfolk (Swingle *et al.,* 2013); December 2017, a live fin whale stranded on a shoal in Newport News and died at the site (Swingle *et al.,* 2018); February 2014, a dead fin whale stranded on a sand bar in Pocomoke Sound near Great Fox Island, Accomack (Swingle *et al.,* 2015); and, March 2007, a dead fin whale near Craney Island, in the Elizabeth River, in Norfolk (Barco 2013). Only stranded fin whales have been documented in the project area; no free-swimming fin whales have been observed. Due to the low occurrence of fin whales in the project area, NMFS is not proposing to authorize take of this species.

Minke whales have been sighted off Virginia (CeTAP 1981, 1982; Hyrenbach *et al.* 2012; Barco 2013; Mallette *et al.,* 2016a, b; McLellan 2017; Engelhaupt *et al.,* 2017, 2018; Cotter 2019), near the CBBT (Aschettino *et al.,* 2018), but sightings in the project area are from strandings (Jensen and Silber 2004; Barco 2013; DoN 2009). In August 1994, a ship strike incident involved a minke whale in Hampton Roads (Jensen and Silber 2004; Barco 2013). It was reported that the animal was struck offshore and was carried inshore on the bow of a ship (DoN 2009). Twelve strandings of minke whales have occurred in Virginia waters from 1988 to 2016 (Costidis *et al.,* 2017). There have been six minke whale stranding from 2017 through 2020 in Virginia waters. Because all known minke whale occurrences in the project area are due to strandings, NMFS is not proposing to authorize take of this species.

Humpback Whale

Humpback whales are distributed worldwide in all major oceans and most seas. Most humpback whale sightings are in nearshore and continental shelf waters; however, humpback whales frequently travel through deep oceanic waters during migration (Calambokidis *et al.,* 2001; Clapham, P.J. and Mattila, D.K., 1990). Prior to 2016, humpback whales were listed under the ESA as an endangered species worldwide. Following a 2015 global status review (Bettridge *et al.,* 2015), NMFS established 14 DPSs with different listing statuses (81 FR 62259; September 8, 2016) pursuant to the ESA. Humpback whales in the project area are expected to be from the West Indies DPS, which consists of the whales whose breeding range includes the Atlantic margin of the Antilles from Cuba to northern Venezuela, and whose feeding range primarily includes the Gulf of Maine, eastern Canada, and western Greenland. The West Indies DPS was delisted in 2016. Bettridge *et al.* (2003) estimated the size of the West Indies DPS at 12,312 (95 percent CI 8,688–15,954) whales in 2004–05, which is consistent with previous population estimates of approximately 10,000–11,000 whales (Stevick *et al.,* 2003; Smith *et al.,* 1999) and the increasing trend for the West Indies DPS (Bettridge *et al.,* 2015).

Although humpback whales are migratory between feeding areas and calving areas, individual variability in the timing of migrations may result in the presence of individuals in high-latitude areas throughout the year (Straley, 1990). Records of humpback whales off the U.S. mid-Atlantic coast (New Jersey to North Carolina) from January through March suggest these waters may represent a supplemental winter feeding ground used by juvenile and mature humpback whales of U.S. and Canadian North Atlantic stocks (LaBrecque *et al.,* 2015).

The immediate project area is not within normal humpback whale feeding or migration areas. They are most likely to occur near the mouth of the Chesapeake Bay and coastal waters of Virginia Beach between January and March; however, they could be found in the area year-round, based on shipboard sighting and stranding data (Barco and Swingle, 2014; Aschettino *et al.,* 2015; 2016; 2017; 2018). Photo-identification data support the repeated use of the mid-Atlantic region by individual humpback whales. Results of the vessel surveys show site fidelity in the survey area for some individuals and a high level of occurrence within shipping channels (Aschettino *et al.,* 2015; 2016; 2017; 2018). Nearshore surveys conducted in early 2015 reported 61 individual humpback whale sightings, and 135 individual humpback whale sightings in late 2015 through May 2016 (Aschettino *et al.,* 2016). Subsequent surveys confirmed the occurrence of humpback whales in the nearshore survey area: 248 individuals were detected in 2016–2017 surveys (Aschettino *et al.,* 2017), 32 individuals were detected in 2017–2018 surveys (Aschettino *et al.,* 2018), and 80 individuals were detected in 2019 surveys (Aschettino *et al.,* 2019). Sightings in the Hampton Roads area in the vicinity of Naval Station (NAVSTA) Norfolk were reported in nearshore surveys and through tracking of satellite-tagged whales in 2016, 2017 and 2019. The numbers of whales detected, most of which were juveniles, reflect the varying level of survey effort and changes in survey objectives from year to year, and do not indicate abundance trends over time. Therefore, humpback whales could occur near the Project area and incidental take could result from exposure to underwater sounds during pile driving and removal.

Bottlenose Dolphin

Along the U.S. East Coast and northern Gulf of Mexico, there are currently 53 management stocks identified by NMFS in the western North Atlantic and Gulf of Mexico, including oceanic, coastal, and estuarine stocks (Hayes *et al.,* 2020; Waring *et al.,* 2016).

The population structure of bottlenose dolphins off Virginia is complex. There are two morphologically and genetically distinct bottlenose dolphin morphotypes (distinguished by physical differences) described as coastal and offshore forms (Duffield *et al.,* 1983; Duffield, 1986). The offshore form is larger in total length and skull length, and has wider nasal bones than the coastal form. Both inhabit waters in the western North Atlantic Ocean and Gulf of Mexico (Curry and Smith, 1997;

Mead and Potter, 1995) along the U.S. Atlantic coast. The coastal morphotype of bottlenose dolphin is continuously distributed along the Atlantic coast south of Long Island, New York, around the Florida peninsula, and along the Gulf of Mexico coast. This type typically occurs in waters less than 20 meters deep (Waring *et al.,* 2015). The range of the offshore bottlenose dolphin includes waters beyond the continental slope (Kenney R. D., 1990), and offshore bottlenose dolphins may move between the Gulf of Mexico and the Atlantic (Wells *et al.,* 1999). Bottlenose dolphins are the most abundant marine mammal along the Virginia coast and within the Chesapeake Bay, typically traveling in groups of 2 to 15 individuals, but occasionally in groups of over 100 individuals (Engelhaupt *et al.,* 2014; 2015; 2016).

Two coastal stocks are likely to be present in the HRBT project area: Western North Atlantic Northern Migratory Coastal stock and Western North Atlantic Southern Migratory Coastal stock. Additionally, the Northern North Carolina Estuarine System stock may occur in the project area.

The northern migratory coastal stock is best defined by its distribution during warm water months when the stock occupies coastal waters from the shoreline to approximately the 20-m isobath between Assateague, Virginia, and Long Island, New York (Garrison *et al.* 2017). The stock migrates in late summer and fall and, during cold water months (best described by January and February), occupies coastal waters from approximately Cape Lookout, North Carolina, to the North Carolina/Virginia border (Garrison *et al.* 2017b). Historically, common bottlenose dolphins have been rarely observed during cold water months in coastal waters north of the North Carolina/Virginia border, and their northern distribution in winter appears to be limited by water temperatures. Overlap with the southern migratory coastal stock in coastal waters of northern North Carolina and Virginia is possible during spring and fall migratory periods, but the degree of overlap is unknown and it may vary depending on annual water temperature (Garrison *et al.* 2016). When the stock has migrated in cold water months to coastal waters from just north of Cape Hatteras, North Carolina, to just south of Cape Lookout, North Carolina, it overlaps spatially with the Northern North Carolina Estuarine System (NNCES) Stock (Garrison *et al.* 2017b).

The southern migratory coastal stock migrates seasonally along the coast between North Carolina and northern Florida (Garrison *et al.* 2017b). During January–March, the southern migratory coastal stock appears to move as far south as northern Florida. During April–June, the stock moves back north past Cape Hatteras, North Carolina (Garrison *et al.* 2017b), where it overlaps, in coastal waters, with the NNCES stock (in waters ≤1 km from shore). 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 the Chesapeake Bay.

The NNCES stock is best defined as animals that occupy primarily waters of the Pamlico Sound estuarine system (which also includes Core, Roanoke, and Albemarle sounds, and the Neuse River) during warm water months (July–August). Members of this stock also use coastal waters (≤1 km from shore) of North Carolina from Beaufort north to Virginia Beach, Virginia, including the lower Chesapeake Bay. A community of NNCES dolphins are likely year-round Bay residents (Patterson, Pers. Comm).

Vessel surveys conducted along coastal and offshore transects from NAVSTA Norfolk to Virginia Beach in most months from August 2012 to August 2015 reported bottlenose dolphins throughout the survey area, including the vicinity of NAVSTA Norfolk (Engelhaupt *et al.,* 2014; 2015; 2016). The final results from this project confirmed earlier findings that bottlenose dolphins are common in the study area, with highest densities in the coastal waters in summer and fall months. However, bottlenose dolphins do not completely leave this area during colder months, with approximately 200–300 individuals still present in winter and spring months (Engelhaupt *et al.,* 2016).

Harbor Porpoise

Harbor porpoises inhabit cool temperate-to-subpolar waters, often where prey aggregations are concentrated (Watts and Gaskin, 1985). Thus, they are frequently found in shallow waters, most often near shore, but they sometimes move into deeper offshore waters. Harbor porpoises are rarely found in waters warmer than 63 degrees Fahrenheit (17 degrees Celsius) (Read 1999) and closely follow the movements of their primary prey, Atlantic herring (Gaskin 1992).

In the western North Atlantic, harbor porpoise range from Cumberland Sound on the east coast of Baffin Island, southeast along the eastern coast of Labrador to Newfoundland and the Gulf of St. Lawrence, then southwest to about 34 degrees North on the coast of North Carolina (Waring *et al.,* 2016). During winter (January to March), intermediate densities of harbor porpoises can be found in waters off New Jersey to North Carolina, and lower densities are found in waters off New York to New Brunswick, Canada (Waring *et al.,* 2016). Harbor porpoises sighted off the mid-Atlantic during winter include porpoises from other western North Atlantic populations (Rosel *et al.,* 1999). There does not appear to be a temporally coordinated migration or a specific migratory route to and from the Bay of Fundy region (Waring *et al.,* 2016). During fall (October to December) and spring (April to June), harbor porpoises are widely dispersed from New Jersey to Maine, with lower densities farther north and south (LaBrecque *et al.,* 2015).

Based on stranding reports, passive acoustic recorders, and shipboard surveys, harbor porpoise occur in coastal waters primarily in winter and spring months, but there is little information on their presence in the Chesapeake Bay. They do not appear to be abundant in the HRBT project area in most years, but this is confounded by wide variations in stranding occurrences over the past decade. Since 1999, stranding incidents have ranged widely from a high of 40 in 1999 to 2 in 2011, 2012, and 2016 (Barco *et al.* 2017).

Harbor Seal

The Western North Atlantic stock of harbor seals occurs in the HRBT project area. Harbor seal distribution along the U.S. Atlantic coast has shifted in recent years, with an increased number of seals reported from southern New England to the mid-Atlantic region (DiGiovanni *et al.,* 2011; Hayes *et al.,* 2017; Kenney R. D. 2019; Waring *et al.,* 2016). Harbor seals are the most common seal in Virginia (Barco and Swingle 2014) and regular sightings of seals in Virginia have become a common occurrence in winter and early spring (Costidis *et al.,* 2019). Winter haulout sites for harbor seals have been documented in the Chesapeake Bay at the CBBT, on the Virginia Eastern Shore, and near Oregon Inlet, North Carolina (Waring *et al.,* 2016; Rees *et al.,* 2016; Jones *et al.,* 2018).

Harbor seals regularly haul out on rocks around the portal islands of the CBBT and on mud flats on the nearby southern tip of the Eastern Shore from December through April (Rees *et al.,* 2016; Jones *et al.,* 2018). Seals captured in 2018 on the Eastern Shore and tagged with satellite-tracked tags that lasted from 2 to 5 months spent at least 60 days in Virginia waters before departing the area. All tagged seals returned regularly to the capture site while in Virginia waters, but individuals utilized offshore and Chesapeake Bay waters to different extents (Ampela *et al.,* 2019). The area that was utilized most heavily was near the Eastern Shore capture site, but some seals ranged into the Chesapeake Bay.

Gray Seal

The Western North Atlantic stock of gray seal occurs in the project area. The western North Atlantic stock is centered in Canadian waters, including the Gulf of St. Lawrence and the Atlantic coasts of Nova Scotia, Newfoundland, and Labrador, Canada, and the northeast U.S. continental shelf (Hayes *et al.,* 2017). Gray seals range south into the northeastern United States, with strandings and sightings as far south as North Carolina (Hammill *et al.,* 1998; Waring *et al.,* 2004). Gray seal distribution along the U.S. Atlantic coast has shifted in recent years, with an increased number of seals reported in southern New England (DiGiovanni *et al.,* 2011; Kenney R.D., 2019; Waring *et al.,* 2016). Recent sightings included a gray seal in the lower Chesapeake Bay during the winter of 2014 to 2015 (Rees *et al.,* 2016). Along the coast of the United States, gray seals are known to pup at three or more colonies in Massachusetts and Maine.

Gray seals are uncommon in Virginia and in the Chesapeake Bay. Only 15 gray seal strandings were documented in Virginia from 1988 through 2013 (Barco and Swingle, 2014). They are rarely found resting on the rocks around the portal islands of the CBBT from December through April alongside harbor seals. Seal observation surveys conducted at the CBBT recorded one gray seal in each of the 2014/2015 and 2015/2016 seasons while no gray seals were reported during the 2016/2017 and 2017/2018 seasons (Rees *et al.,* 2016, Jones *et al.,* 2018). Sightings have been reported off Virginia and near the project area during the winter and spring (Barco 2013; Rees *et al.,* 2016; Jones *et al.,* 2018; Ampela *et al.,* 2019).

Unusual Mortality Events

An unusual mortality event (UME) is defined under Section 410(6) of the MMPA as a stranding that is unexpected; involves a significant die-off of any marine mammal population; and demands immediate response. Currently, ongoing UME investigations are underway for pinnipeds along the Northeast coast, and humpback whales along the Atlantic coast.

Northeast Pinniped UME

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 an UME. Additionally, seals showing clinical signs have been stranding as far south as Virginia, although not in elevated numbers; therefore, the UME investigation now encompasses all seal strandings from Maine to Virginia. Lastly, while take is not proposed for these species in this proposed rule, 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. Additional information is available at *https://www.fisheries.noaa.gov/new-england-mid-atlantic/marine-life-distress/2018-2020-pinniped-unusual-mortality-event-along.*

Atlantic Humpback Whale UME

Since January 2016, elevated humpback whale mortalities have occurred along the Atlantic coast from Maine through Florida. This event has been declared an UME. A portion of the whales have shown evidence of pre-mortem vessel strike; however, this finding is not consistent across all whales examined, and additional research is needed. Additional information is available at *https://www.fisheries.noaa.gov/national/marine-life-distress/2016-2020-humpback-whale-unusual-mortality-event-along-atlantic-coast.*

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g.,* Richardson *et al.,* 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.,* low-frequency cetaceans). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibel (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. Marine mammal hearing groups and their associated hearing ranges are provided in Table 9.

TABLE 9—MARINE MAMMAL HEARING GROUPS

[NMFS, 2018]

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

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

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

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information. Five marine mammal species (three cetacean and two phocid pinniped species) have the reasonable potential to co-occur with the proposed construction activities. Please refer to Table 8. Of the cetacean species that may be present, one is classified as a low-frequency cetacean (*i.e.,* humpback whale) one is classified as a mid-frequency cetacean (*i.e.,* bottlenose dolphin), 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

The marine soundscape is comprised of both ambient and anthropogenic sounds. Ambient sound is defined as the all-encompassing sound in a given place and is usually a composite of sound from many sources both near and far. The sound level of an area is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.,* waves, wind, precipitation, earthquakes, ice, atmospheric sound), biological (*e.g.,* sounds produced by marine mammals, fish, and invertebrates), and anthropogenic sound (*e.g.,* vessels, dredging, aircraft, construction).

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

In-water construction activities associated with the project would include vibratory pile driving and pile removal, impact pile driving, jetting, and DTH pile installation. The sounds produced by these activities fall into one of two general sound types: Impulsive and non-impulsive. Impulsive sounds (*e.g.,* explosions, gunshots, sonic booms, impact pile driving) are typically transient, brief (less than one second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (ANSI 1986; NIOSH 1998; ANSI 2005; NMFS, 2018). Non-impulsive sounds (*e.g.,* aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems) can be broadband, narrowband or tonal, brief or prolonged (continuous or intermittent), and typically do not have the high peak sound pressure with raid rise/decay time that impulsive sounds do (ANSI 1995; NIOSH 1998; NMFS 2018). 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).

Impact hammers operate by repeatedly dropping a heavy piston onto a pile to drive the pile into the substrate. Sound generated by impact hammers is characterized by rapid rise times and high peak levels, a potentially injurious combination (Hastings and Popper, 2005). Vibratory hammers install piles by vibrating them and allowing the weight of the hammer to push them into the sediment. Vibratory hammers produce significantly less sound than impact hammers. Peak sound pressure levels (SPLs) may be 180 dB or greater, but are generally 10 to 20 dB lower than SPLs generated during impact pile driving of the same-sized pile (Oestman *et al.,* 2009). Rise time is slower, reducing the probability and severity of injury, and sound energy is distributed over a greater amount of time (Nedwell and Edwards 2002; Carlson *et al.,* 2005). A DTH hammer is used to place hollow steel piles or casings by drilling. A DTH hammer is a drill bit that drills through the bedrock using a pulse mechanism that functions at the bottom of the hole. This pulsing bit breaks up rock to allow removal of debris and insertion of the pile. The head extends so that the drilling takes place below the pile. The sounds produced by DTH hammers were previously thought to be continuous. However, recent sound source verification (SSV) monitoring has shown that DTH hammer can create sound that can be considered impulsive (Denes *et al.* 2019). Since sound from DTH activities has both impulsive and continuous components, NMFS characterizes sound from DTH pile installation as being impulsive when evaluating potential Level A harassment (*i.e.,* injury) impacts and as being non-impulsive when assessing potential Level B harassment (*i.e.* behavior) effects.

The likely or possible impacts of HRCP's proposed activity on marine mammals could involve both non-acoustic and acoustic stressors. Potential non-acoustic stressors could result from the physical presence of the equipment and personnel; however, any impacts to marine mammals are expected to primarily be acoustic in nature. Acoustic stressors include effects of heavy equipment operation during pile driving and removal.

Acoustic Impacts

The introduction of anthropogenic noise into the aquatic environment from pile driving and removal is the primary means by which marine mammals may be harassed from HRCP's specified activity. In general, animals exposed to natural or anthropogenic sound may experience physical and psychological effects, ranging in magnitude from none to severe (Southall *et al.* 2007). In general, exposure to pile driving noise has the potential to result in auditory threshold shifts and behavioral reactions (*e.g.,* avoidance, temporary cessation of foraging and vocalizing, changes in dive behavior). Exposure to anthropogenic noise can also lead to non-observable physiological responses such an increase in stress hormones. Additional noise in a marine mammal's habitat can mask acoustic cues used by marine mammals to carry out daily functions such as communication and predator and prey detection. The effects of pile driving noise on marine mammals are dependent on several factors, including, but not limited to, sound type (*e.g.,* impulsive vs. non-impulsive), the species, age and sex class (*e.g.,* adult male vs. mom with calf), duration of exposure, the distance between the pile and the animal, received levels, behavior at time of exposure, and previous history with exposure (Wartzok *et al.* 2004; Southall *et al.* 2007). Here we discuss physical auditory effects (threshold shifts) followed by behavioral effects and potential impacts on habitat.

NMFS defines a noise-induced threshold shift (TS) as a change, usually an increase, in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018). The amount of threshold shift is customarily expressed in dB. A TS can be permanent or temporary. As described in NMFS (2018), there are numerous factors to consider when examining the consequence of TS, including, but not limited to, the signal temporal pattern (*e.g.,* impulsive or non-impulsive), likelihood an individual would be exposed for a long enough duration or to a high enough level to induce a TS, the magnitude of the TS, time to recovery (seconds to minutes or hours to days), the frequency range of the exposure (*i.e.,* spectral content), the hearing and vocalization frequency range of the exposed species relative to the signal's frequency spectrum (*i.e.,* how an animal uses sound within the frequency band of the signal; *e.g.,* Kastelein *et al.* 2014), and the overlap between the animal and the source (*e.g.,* spatial, temporal, and spectral).

Permanent Threshold Shift (PTS)—NMFS defines PTS as a permanent, irreversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018). Available data from humans and other terrestrial mammals indicate that a 40 dB threshold shift approximates PTS onset (see Ward *et al.* 1958, 1959; Ward 1960; Miller 1974; Ahroon *et al.* 1996; Henderson *et al.* 2008). PTS levels for marine mammals are estimates, as with the exception of a single study unintentionally inducing PTS in a harbor seal (Kastak *et al.* 2008), there are no empirical data measuring PTS in marine mammals largely due to the fact that, for various ethical reasons, experiments involving anthropogenic noise exposure at levels inducing PTS are not typically pursued or authorized (NMFS 2018).

Temporary Threshold Shift (TTS)—TTS is a temporary, reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018). Based on data from cetacean TTS measurements (see Southall *et al.* 2007), a TTS of 6 dB is considered the minimum threshold shift clearly larger than any day-to-day or session-to-session variation in a subject's normal hearing ability (Schlundt *et al.* 2000; Finneran *et al.* 2000, 2002). As described in Finneran (2015), marine mammal studies have shown the amount of TTS increases with cumulative sound exposure level (SELcum) in an accelerating fashion: At low exposures with lower SELcum, the amount of TTS is typically small and the growth curves have shallow slopes. At exposures with higher SELcum, the growth curves become steeper and approach linear relationships with the noise sound exposure level (SEL).

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 (similar to those discussed in auditory masking, below). 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 takes place during a time when the animal is traveling through the open ocean, 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. We note that reduced hearing sensitivity as a simple function of aging has been observed in marine mammals, as well as humans and other taxa (Southall *et al.* 2007), so we can infer that strategies exist for coping with this condition to some degree, though likely not without cost.

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 five species of pinnipeds 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. No data are 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 Table 5 in NMFS (2018). Installing piles requires a combination of impact pile driving and vibratory pile driving. For this project, these activities would not occur at the same time and there would be pauses in activities producing the sound during each day. Given these pauses and that many marine mammals are likely moving through the ensonified area and not remaining for extended periods of time, the potential for TS declines.

Behavioral Harassment—Exposure to noise from pile driving and removal also has the potential to behaviorally disturb marine mammals. 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).

Disturbance may result in 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. Pinnipeds may increase their haul out time, possibly to avoid in-water disturbance (Thorson and Reyff 2006). 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). In general, pinnipeds seem more tolerant of, or at least habituate more quickly to, potentially disturbing underwater sound than do cetaceans, and generally seem to be less responsive to exposure to industrial sound than most cetaceans. Please see Appendices B–C of Southall *et al.* (2007) for a review of studies involving marine mammal behavioral responses to sound.

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 curtains 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.

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.,* 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), however distress is an unlikely result of this project based on observations of marine mammals during previous, similar projects in the area.

Masking—Sound can disrupt behavior through masking, or interfering with, an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g.,* those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al.,* 1995). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may occur whether the sound is natural (*e.g.,* snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g.,* pile driving, 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. Masking of natural sounds can result when human activities produce high levels of background sound at frequencies important to marine mammals. Conversely, if the background level of underwater sound is high (*e.g.,* on a day with strong wind and high waves), an anthropogenic sound source would not be detectable as far away as would be possible under quieter conditions and would itself be masked. The project area contains numerous, naval, commercial, and recreational vessels; therefore, it is possible that background underwater sound levels in the area are elevated, meaning that continuous noise from sources such as vibratory pile driving would be less likely to cause disruption of behavioral patterns when detected.

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

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

Marine Mammal Habitat Effects

HRCP's construction activities could have localized, temporary impacts on marine mammal habitat by increasing in-water sound pressure levels and slightly decreasing water quality. Construction activities are of short duration and would likely have temporary impacts on marine mammal habitat through increases in underwater sound. Increased noise levels may affect acoustic habitat (see masking discussion above) and adversely affect marine mammal prey in the vicinity of the project area (see discussion below). During impact and vibratory pile driving, elevated levels of underwater noise would ensonify the project area where both fish and mammals may occur and could affect foraging success. Additionally, marine mammals may avoid the area during construction, however, displacement due to noise is expected to be temporary and is not expected to result in long-term effects to the individuals or populations.

A localized increase in turbidity near the seafloor during construction would occur in the immediate area surrounding the area where piles are installed (and removed in the case of the temporary piles). The sediments on the sea floor will be disturbed during pile driving; however, suspension will be brief and localized and is unlikely to measurably affect marine mammals or their prey in the area. In general, turbidity associated with pile installation is localized to about a 25-ft (7.6-meter) radius around the pile (Everitt *et al.* 1980). Cetaceans are not expected to be close enough to the pile driving areas to experience effects of turbidity, and any pinnipeds could avoid localized areas of turbidity. Therefore, we expect the impact from increased turbidity levels to be discountable to marine mammals and do not discuss it further.

In-Water Construction Effects on Potential Foraging Habitat

The proposed activities would not result in permanent impacts to habitats used directly by marine mammals except for the actual footprint of the project. The total seafloor area affected by pile installation and removal is small compared to the vast foraging area available to marine mammals in the project area and lower Chesapeake Bay.

Avoidance by potential prey (*i.e.,* fish) of the immediate area due to the temporary loss of this foraging habitat is also possible. The duration of fish avoidance of this area after pile driving stops is unknown, but we anticipate a rapid return to normal recruitment, distribution and behavior. Any behavioral avoidance by fish of the disturbed area would still leave large areas of fish and marine mammal foraging habitat in the nearby vicinity in the project area and lower Chesapeake Bay.

In-Water Construction Effects on Potential Prey (Fish)

Sound may affect marine mammals through impacts on the abundance, behavior, or distribution of prey species (*e.g.,* fish). Marine mammal prey varies by species, season, and location. 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 (*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.,* Wardle *et al.,* 2001; Jorgenson and Gyselman, 2009; Cott *et al.,* 2012).

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 at the project areas would be temporary behavioral avoidance of the area. The duration of fish avoidance of an area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated.

In summary, given the relatively small areas being affected, and the fact that these areas do not include habitat of particularly high quality or importance, pile driving and removal activities associated with the proposed action are not likely to have a permanent, adverse effect on any fish habitat, or populations of fish species. Thus, 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.

Estimated Take

This section provides an estimate of the number of incidental takes proposed for authorization through this LOA, 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 generated from in-water pile driving (vibratory and impact) 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, primarily for low- and high-frequency species and phocids because predicted auditory injury zones are larger than for mid-frequency species. Auditory injury is unlikely to occur for mid-frequency species. The proposed mitigation and monitoring measures are expected to minimize the severity of such taking to the extent practicable.

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

Generally speaking, we estimate take by considering: (1) Acoustic thresholds above which marine mammals will be behaviorally disturbed 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

NMFS recommends the use of acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to experience behavioral disturbance (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

Level B Harassment for non-explosive sources—Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source (*e.g.,* frequency, predictability, duty cycle), the environment (*e.g.,* bathymetry), and the receiving animals (hearing, motivation, experience, demography, behavioral context) and can be difficult to predict (Southall *et al.,* 2007, Ellison *et al.,* 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 Level B harassment. NMFS predicts that marine mammals are likely to experience behavioral disturbance in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 μPa (rms) for continuous (*e.g.,* vibratory pile-driving, drilling) and above 160 dB re 1 μPa (rms) for non-explosive impulsive (*e.g.,* seismic airguns) or intermittent (*e.g.,* scientific sonar) sources.

HRCP's proposed activity includes the use of continuous (vibratory pile driving, DTH pile installation) and impulsive (impact pile driving, DTH pile installation), sources, and therefore the 120 and 160 dB re 1 μPa (rms) criteria are applicable. Note that the 120 dB criterion is used for DTH pile installation, as the continuous noise produced through the activity will produce the largest harassment isopleths.

Level A harassment for non-explosive sources—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). As noted previously, HRCP's proposed activity includes the use of impulsive (impact pile driving, DTH pile installation) and non-impulsive (vibratory pile driving/removal, DTH pile installation) sources.

These thresholds are provided in the Table 10 below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2018 Technical Guidance, which may be accessed at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance.*

TABLE 10—THRESHOLDS IDENTIFYING THE ONSET OF PERMANENT THRESHOLD SHIFT

Hearing group	PTS onset acoustic thresholds* (received level)	
	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans/	*Cell 1:* $L_{pk,flat}$: 219 dB; $L_{E,LF,24h}$: 183 dB	*Cell 2:* $L_{E,LF,24h}$: 199 dB.
Mid-Frequency (MF) Cetaceans	*Cell 3:* $L_{pk,flat}$: 230 dB; $L_{E,MF,24h}$: 185 dB	*Cell 4:* $L_{E,MF,24h}$: 198 dB.
High-Frequency (HF) Cetaceans	*Cell 5:* $L_{pk,flat}$: 202 dB; $L_{E,HF,24h}$: 155 dB	*Cell 6:* $L_{E,HF,24h}$: 173 dB.
Phocid Pinnipeds (PW) (Underwater)	*Cell 7:* $L_{pk,flat}$: 218 dB; $L_{E,PW,24h}$: 185 dB	*Cell 8:* $L_{E,PW,24h}$: 201 dB.
Otariid Pinnipeds (OW) (Underwater)	*Cell 9:* $L_{pk,flat}$: 232 dB; $L_{E,OW,24h}$: 203 dB	*Cell 10:* $L_{E,OW,24h}$: 219 dB.

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

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

Ensonified Area

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

The sound field in the project area is the existing background noise plus additional construction noise from the project. Marine mammals are expected to be affected via sound generated by the primary components of the project (*i.e.,* vibratory pile driving, vibratory pile removal, impact pile driving, jetting, and DTH pile installation).

Sound source levels (SSLs) for each method of installation and removal were estimated using empirical measurements from similar projects in Norfolk and Little Creek (Craney Island), elsewhere in Virginia, or outside of Virginia (California, Florida, Washington, Alaska) (Table 11). It is assumed that jetting will be quieter than vibratory installation of the same pile size, but data for this activity are limited; therefore, SSLs for vibratory installation have been applied to jetting.

DTH pile installation includes drilling (non-impulsive sound) and hammering (impulsive sound) to penetrate rocky substrates (Denes *et al.* 2016; Denes *et al.* 2019; Reyff and Heyvaert 2019). DTH pile installation was initially thought be a primarily non-impulsive noise source. However, Denes *et al.* (2019) concluded from a study conducted in Virginia, nearby the location for this project, that DTH should be characterized as impulsive based on Southall *et al.* (2007), who stated that signals with a >3 dB difference in sound pressure level in a 0.035-second window compared to a 1-second window can be considered impulsive. Therefore, DTH pile installation is treated as both an impulsive and non-impulsive noise source. In order to evaluate Level A harassment, DTH pile installation activities are evaluated according to the impulsive criteria. Level B harassment isopleths are determined by applying non-impulsive criteria and using the 120 dB threshold which is also used for vibratory driving. This approach ensures that the largest ranges to effect for both Level A and Level B harassment are accounted for in the take estimation process.

The source level employed to derive Level B harassment isopleths for DTH pile installation of all pile sizes was derived from the Denes *et al.* (2016) study at Kodiak, Alaska. The median source value for drilling was reported to be 166 dB RMS.

The source level employed to derive Level A harassment isopleths for DTH pile installation of piles/holes above 24-inch up to 42-inch in diameter came from a combination of (whichever higher for given metric) Reyff and Heyvaert (2019), Denes *et al.* (2019), and Reyff (2020). For pile/holes 60-inch in diameter, values were provided by Reyff (Reyff personal communication) and are shown in Table 11. Note that during some driving scenarios bubble curtains will be used to reduce sound source levels by 7 dB from the values recorded by Denes *et al.* (2019) at the nearby Chesapeake Bay Bridge Tunnel. These are also noted in Table 11.

TABLE 11—SUMMARY OF PROJECT SOUND SOURCE LEVELS

[a 10 m]

Method and pile type	Sound source level at 10 meters			Literature source
Vibratory Hammer	dB rms			
42-inch steel pile	168			Austin *et al.* 2016.
36-inch steel pile	167			DoN 2015.
30-inch steel pile, concrete filled	167			DoN 2015.
24-inch steel pile	161			DoN 2015.
16-inch CCA timber pile *	162			Caltrans 2015.
AZ 700–19 steel sheet pile	160			Caltrans 2015.
AZ 700–26 steel sheet pile	160			Caltrans 2015.
Jetting	dB rms			
42-inch steel pile	161			Austin *et al.* 2016.
DTH Pile Installation	dB rms	dB SEL	dB peak	
30-inch and 36-inch steel pipe piles	166	164	196	Denes *et al.* 2016, 2019; Reyff and Heyvaert 2019; Reyff 2020.
60-inch steel pipe pile	166	175	196	Denes *et al.* 2016; Reyff pers. comm.

TABLE 11—SUMMARY OF PROJECT SOUND SOURCE LEVELS—Continued

[a 10 m]

Method and pile type				
Impact Hammer	dB rms	dB SEL	dB peak	
36-inch steel pile	193	183	210	Caltrans 2015; Chesapeake Tunnel Joint Venture 2018.
36-inch steel pile, attenuated **	186	176	203	Caltrans 2015; Chesapeake Tunnel Joint Venture 2018 +.
30-inch steel pile, concrete filled	195	186	216	DoN 2015.
30-inch steel pile, concrete filled, attenuated **.	188	179	209	DoN 2015.
24-inch steel pile	190	177	203	Caltrans 2015.
24-inch steel pile, attenuated **	183	170	196	Caltrans 2015.
54-inch concrete cylinder pile ***	187	177	193	MacGillivray *et al.* 2007.
24-inch concrete square pile	176	166	188	Caltrans 2015.

Note: *It is assumed that noise levels during pile installation and removal are similar. dB = decibel: SEL = sound exposure level; dB peak = peak sound level; rms = root mean square; DoN = Department of the Navy; CCA = Chromated Copper Arsenate, Caltrans = California Department of Transportation.*

* *SSL taken from 12-inch timber piles in Norfolk, Virginia.*

** *SSLs are a 7 dB reduction from Chesapeake Tunnel Joint Venture 2018 values due to usage of a bubble curtain.*

*** *SSLs taken from 36-inch concrete square piles, no project specific information provided.*

\+ *The primary literature source for 36-inch steel pipe attenuated piles is Caltrans 2015; however, the Chesapeake Tunnel Joint Venture 2018 is also cited due to the proximity of the project to the HRBT Project.*

Simultaneous use of hammers could result in increased SPLs and harassment zone sizes given the proximity of the component driving sites and the rules of decibel addition. Impact pile installation is projected to take place concurrently at 3 to 4 locations and there is the potential for as many as 7 pile installation locations operating concurrently. NMFS (2018b) handles overlapping sound fields created by the use of more than one hammer differently for impulsive (impact hammer and Level A harassment zones for drilling with a DTH hammer) and continuous sound sources (vibratory hammer and Level B harassment zones for drilling with a DTH hammer) (See Table 12). It is unlikely that the two impact hammers would strike at the same instant, and therefore, the SPLs will not be adjusted regardless of the distance between impact hammers. In this case, each impact hammer will be considered to have its own independent Level A and Level B harassment zones and drilling with a DTH hammer will be considered to have its own independent Level A harassment zones. It will be unlikely that more than one DTH hammer will be used within a day at more than one location; therefore, only one DTH hammer was included in the multiple hammer calculations for Level B harassment zones.

When two continuous noise sources, such as vibratory hammers, have overlapping sound fields, there is potential for higher sound levels than for non-overlapping sources. The method described below was used by Washington State Department of Transportation (WSDOT) and has been used by NMFS (WSDOT 2020).

When two or more vibratory hammers are used simultaneously, and the isopleth of one sound source encompasses the sound source of another isopleth, the sources are considered additive and combined using the following rules (Table 12) for addition of two simultaneous vibratory hammers, the difference between the two SSLs is calculated, and if that difference is between 0 and 1 dB, 3 dB are added to the higher SSL; if difference is between 2 or 3 dB, 2 dB are added to the highest SSL; if the difference is between 4 to 9 dB, 1 dB is added to the highest SSL; and with differences of 10 or more decibels, there is no addition.

TABLE 12—RULES FOR COMBINING SOUND LEVELS GENERATED DURING PILE INSTALLATION

Hammer types	Difference in SSL	Level A harassment zones	Level B harassment zones
Vibratory, Impact	Any	Use impact zones	Use vibratory zone.
Impact, Impact	Any	Use zones for each pile size and number of strikes.	Use zone for each pile size.
Vibratory, Vibratory	0 or 1 dB	Add 3 dB to the higher source level	Add 3 dB to the higher source level.
	2 or 3 dB	Add 2 dB to the higher source level	Add 2 dB to the higher source level.
	4 to 9 dB	Add 1 dB to the higher source level	Add 1 dB to the higher source level.
	10 dB or more	Add 0 dB to the higher source level	Add 0 dB to the higher source level.

When three or more continuous sound sources are used concurrently, such as vibratory hammers, the three overlapping sources with the highest SSLs are identified. Of the three highest SSLs, the lower two are combined using the above rules, then the combination of the lower two is combined with the highest of the three.

It is common for pile installation to start and stop multiple times as each pile is adjusted and its progress is measured and documented. For short durations, it is anticipated that multiple hammers could be in use simultaneously. Following an approach modified from WSDOT in their Biological Assessment manual and described in Table 13, decibel addition calculations were carried out for possible combinations of vibratory installations of 24-, 30-, 36-, and 42-inch steel pipe piles throughout the Project area.

Table 13 -- Possible Vibratory Pile Combinations

Method	Pile Diameter (Inches)	SSL (dB)	24	24+24	30/36	42	30/36+24	24+42	30/36+30/36	42+30/36	42+42
			161	164	167	168	168	169	170	171	171
Vibratory	24	161	**164**	**166**	**168**	**169**	**169**	**169**	**171**	**171**	**172**
Vibratory	DTH	166	**167**	**168**	**170**	**170**	**170**	**171**	**172**	**172**	**172**
Vibratory	30/36	167	**168**	**169**	**170**	**171**	**171**	**171**	**172**	**172**	**172**
Vibratory	42	168	**169**	**169**	**171**	**171**	**171**	**172**	**172**	**172**	**173**

These source levels are used to compute the Level A harassment zones and to estimate the Level B harassment zones.

Level A Harassment Zones

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

Inputs used in the User Spreadsheet (Table 14 and Table 15) and the resulting isopleths are reported below (Table 14). Level A harassment thresholds for impulsive sound sources (impact pile driving, DTH pile installation) are defined for both SELcum and Peak SPL, with the threshold that results in the largest modeled isopleth for each marine mammal hearing group used to establish the effective Level A harassment isopleth.

For purposes of estimated take by Level A harassment, NMFS assumed that the strike rate for impact pile installation was 50 percent of the estimated number of strikes displayed in Table 14 and 15. Similarly, for vibratory driving NMFS assumed that the driving time for each pile was 50 percent of the estimated total. For the DTH hammer calculations, Reyff and Heyvaert 2019 identified a strike rate of 10 Hz. This was also reduced by 50 percent to 5 Hz which to achieve the same 50 percent Level A harassment reduction as was done for impact and vibratory driving. Strikes per Pile values were not altered when calculating Level A harassment zones for DTH pile installation.

Since the marine mammals proposed for authorization are highly mobile, it is unlikely that an animal would remain within an established Level A harassment zone for the entire duration or number of strikes associated with installation or removal of a specified number of piles throughout a given day. This was done to provide more realistic take estimates by Level A harassment. NMFS applied this reduction across all pile sizes, types, and installation/removal methods as shown in Tables 14 and 15. Additionally, note that under some driving scenarios a 7 dB attenuation was applied to impact installation of 24-inch steel, 30-inch Steel, and 36-inch steel due to use of bubble curtains as shown in Table 14.

The calculated Level A isopleths for different size pile and driving types are shown in Tables 16–18.

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Table 14 -- User Spreadsheet Input Parameters Used for Calculating Level A Harassment Isopleths for Vibratory and Impact Hammers*

Model Parameter	Steel Sheet	16-inch Timber	24-inch Steel			24-inch Concrete	30-inch Steel, Concrete Filled			36-inch Steel						42-inch Steel		54-inch Concrete
	Vib	Vib	Vib	Imp	Imp - Bubble	Imp	Vib	Imp	Imp - Bubble	Vib	Vib	Vib	Vib	Imp	Imp - Bubble	Vib	Jetting	Imp
Spreadsheet Tab	A.1	A.1	A.1	E.1	E.1	E.1	A.1	E.1	E.1	A.1	A.1	A.1	A.1	E.1	E.1	A.1	A.1	E.1
Weighting Factor Adjustment (kHz)	2.5	2.5	2.5	2	2	2	2.5	2	2	2.5	2.5	2.5	2.5	2	2	2.5	2.5	2
Sound Pressure Level (SPL_{rms})	160	162	161	190	183	176	167	195	188	167	167	167	193	186	166	168	187	166
SEL_{ss} ($L_{E, p, single strike}$) at 10 meters	-	-	-	177	170	166	-	186	179	-	-	-	-	183	176	-	-	177
$L_{p, 0-pk}$ at 10 meters	-	-	-	203	196	188	-	216	209	-	-	-	-	210	203	-	-	193
Number of piles within 24-hour period	10	4	6	6	6	1	6	6	6	1	8/16	2/3	2	2/3	2	6	1	1

Estimated Duration to drive a single pile (min)	30	30	30/60	-	-	-	60	-	-	50	5	50	60	-	-	30	-	-
50% of Duration to drive a single pile (min)	15	15	15/30	-	-	-	30	-	-	25	2.5	25	30	-	-	15	15	-
Transmission loss coefficient	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Distance from sound pressure level (SPL_{rms}) measurement (m)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
50% of Strikes per pile	-	-	-	20	20	1,050	-	20	20	-	-	-	-	20	20	-	-	1,050
Estimated Strikes per pile	-	-	-	40	40	2,100	-	40	40	-	-	-	-	40	40	-	-	2,100

To provide a more realistic estimate of take by Level A harassment, NMFS assumes that an animal would occur within the vicinity of the construction activity for 50 percent of the pile installation and removal time. HRCP has implemented this reduction across all pile sizes, types, and installation and removal methods. For purposes of vibratory installation, the duration of installation was reduced by half to accomplish the reduction. For impact installation, the number of strikes per pile was reduced by half to accomplish the reduction.

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TABLE 15—USER SPREADSHEET INPUT PARAMETERS USED FOR CALCULATING LEVEL A HARASSMENT ISOPLETHS FOR DRILLING WITH A DTH HAMMER *

Model parameter	30-inch steel, concrete filled	36-inch steel	60-inch steel
	DTH	DTH	DTH
Spreadsheet Tab	E.2	E.2	E.2
Weighting Factor Adjustment (kilohertz)	2	2	2
SEL_{ss} ($L_{E,\ p,\ single\ strike}$) at 10 meters	164	164	175
$L_{p,\ 0\text{-}pk}$ at 10 meters	196	196	196
Number of piles per day	6	2	3
Duration to drive a pile (minutes)	120	120	120
Transmission loss coefficient	15	15	15
Distance from source (meters)	10	10	10
Estimated Number of Strikes per 24-hour period	432,000	144,000	216,000
50% of Strikes per 24-hour period	216,000	72,000	108,000
Strike rate (Hz) average strikes per second	10	10	10
50% of Strike rate (Hz) average strikes per second	5	5	5

** To provide a more realistic estimate of take by Level A harassment, NMFS assumes that an animal would occur within the vicinity of the construction activity for 50 percent of the pile installation and removal time, which equates to 50 percent of the piles planned for installation and removal. HRCP has implemented this reduction across all pile sizes, types, and installation and removal methods. For drilling with a DTH hammer installation, the strike rate (Hz) was reduced by half to accomplish the reduction. A 10 Hz strike rate was identified from Reyff and Heyvaert 2019 which was then reduced by 50% to 5 Hz to accomplish the 50% Level A reduction.*

TABLE 16—CALCULATED DISTANCES TO LEVEL A HARASSMENT ISOPLETHS DURING VIBRATORY INSTALLATION, AND VIBRATORY REMOVAL AND JETTING INSTALLATION WITH NO ATTENUATION

Project component	Pile size/type	Minutes per pile (reduced by half)	Number of piles per day	Level A harassment isopleth distance (meters)				Level A Harassment isopleth areas (km²)			
				Cetaceans			Pinnipeds	Cetaceans			Pinnipeds
				LF	MF	HF	PW	LF	MF	HF	PW
Vibratory Hammer North Trestle											
Moorings	42-inch Pipe, Steel	15	6	27	3	39	16	<0.01			
Template Piles	36-inch Pipe, Steel	2.5	8	9	1	13	5	<0.01			
North Shore Work Trestle, Jump Trestle, Work Trestle, Demolition Trestle.	36-inch Pipe, Steel	25	2	16	2	23	10	<0.01			
Moorings	24-inch Pipe, Steel	15	6	9	1	14	6	<0.01			
North Shore Abutment	AZ 700–19 Sheet, Steel	15	10	11	1	16	7	<0.01			
North Island											
Moorings	42-inch Pipe, Steel	15	6	27	3	39	16	<0.01			
Hampton Creek Approach Channel Marker.	Existing, 36-inch Pipe, Steel	25	1	10	1	15	6	<0.01			
North Island Expansion	AZ 700–26 Sheet, Steel	15	10	11	1	16	7	<0.01			
North Island Abutment	AZ 700–19 Sheet, Steel										
South Island Abutment	AZ 700–19 Sheet, Steel	15	10	11	1	16	7	<0.01			
South Island Expansion	AZ 700–26 Sheet, Steel										
Settlement Reduction Piles	24-inch Pipe, Steel	30	6	15	2	21	9				
Deep Foundation Piles	30-inch Pipe, Steel, Concrete Filled	30	6	36	4	53	22				
TBM Platform	36-inch Pipe, Steel	30	2	18	2	26	11				
Conveyor Trestle	36-inch Pipe, Steel	25	3	20	2	30	13				
Moorings	42-inch Pipe, Steel	15	6	27	3	39	16	<0.01			
Template Piles	36-inch Pipe, Steel	2.5	16	14	2	20	8	<0.01			
South Trestle											
Template Piles	36-inch Pipe, Steel	2.5	8	9	1	13	5	<0.01			
Moorings, Casings	42-inch Pipe, Steel	15	6	27	3	39	16	<0.01			
Work Trestle, Jump Trestle, Demolition Trestle, Temporary MOT Trestle.	36-inch Pipe, Steel	25	2	16	2	23	10				
Moorings	24-inch Pipe, Steel	15	6	9	1	14	6				
Willoughby Bay											
Moorings	24-inch Pipe, Steel	15	6	9	1	14	6	<0.01			
Work Trestle, Jump Trestle	36-inch Pipe, Steel	25	2	16	2	23	10				
Moorings (Safe Haven)	42-inch Pipe, Steel	15	6	27	3	39	16	<0.01			
Casing	42-inch Pipe, Steel	15	6	27	3	39	16	<0.01			
Template Piles	36-inch Pipe, Steel	2.5	8	9	1	13	5	<0.01			
Willoughby Spit Laydown Area											
Finger Piers on Timber Piles	16-inch CCA, Timber	15	4	8	1	12	5	<0.01			
Dock on Spuds, Dock on Piles	36-inch Pipe, Steel	25	3	20	2	30	13	<0.01			
Template Piles	36-inch Pipe, Steel	2.5	16	14	2	20	8	<0.01			
Jetting Willoughby Bay											
Casing	42-inch Pipe, Steel	15	1	3	1	4	2	<0.01			

TABLE 17—CALCULATED DISTANCES TO LEVEL A HARASSMENT ISOPLETHS DURING IMPACT INSTALLATION AND DTH PILE INSTALLATION WITH NO ATTENUATION

Project component	Pile size/type	Number of strikes per pile or strike rate* (reduced by half)	Number of piles per day	Level A harassment isopleth distance (meters)				Level A harassment isopleth areas (km²)			
				Cetaceans			Pinnipeds	Cetaceans			Pinnipeds
				LF	MF	HF	PW	LF	MF	HF	PW
North Trestle											
Permanent Piles	54-inch Pipe, Concrete Cylinder	1,050	1	411	15	490	220	0.53	<0.001	0.75	0.15
Work Trestle, Jump Trestle, Demolition Trestle.	36-inch Pipe, Steel	20	2	117	5	140	63	0.04	<0.001	0.06	0.01
South Island											
Settlement Reduction Piles	24-inch Pipe, Steel	20	6	97	4	116	52	0.02	<0.001	0.03	0.01
Deep Foundation Piles	30-inch Pipe, Steel, Concrete Filled	20	6	386	14	459	207	0.35	<0.001	0.49	0.10
South Trestle											
Work Trestle, Jump Trestle, Demolition Trestle, Temporary MOT Trestle.	36-inch Pipe, Steel	20	2	117	5	140	63	0.04	<0.001	0.06	0.01
Permanent Piles	54-inch Pipe, Concrete Cylinder	1,050	1	411	15	490	220	0.53	<0.001	0.75	0.15
Willoughby Bay											
Work Trestle, Jump Trestle	36-inch Pipe, Steel	20	2	117	5	140	63	0.04	<0.001	0.06	0.01
Permanent Piles	24-inch Pipe, Concrete Square	1,050	1	76	3	91	41	0.02	<0.001	0.03	<0.01
Willoughby Spit Laydown Area											
Dock on Spuds, Dock on Piles	36-inch Pipe, Steel	20	3	154	6	183	82	0.12	0.09	<0.001	0.03
DTH Pile Installation* North Trestle											
Work Trestle, Jump Trestle, Demolition Trestle.	36-inch Pipe, Steel	36,000	2	936	34	1,115	501	1.81	<0.01	2.27	0.78
Casing	60-inch Pipe, Steel	36,000	3	6,633	236	7,901	3,550	34.04	0.18	43.75	13.03
South Island											
Deep Foundation Piles	30-inch Pipe, Steel, Concrete Filled	36,000	6	1,946	70	2,318	1,042	8.28	<0.01	11.30	2.49
South Trestle											
Work Trestle, Jump Trestle, Temporary MOT Trestle, Demolition Trestle.	36-inch Pipe, Steel	36,000	2	936	34	1,115	501	2.67	<0.01	3.67	0.79
Casing	60-inch Pipe, Steel	36,000	3	6,633	236	7,901	3,550	77.50	0.18	102.16	27.12

** For DTH Hammer calculations, a 10 Hz strike rate was identified from Reyff and Heyvaert 2019 which was then reduced by 50% to 5 Hz to accomplish the 50% Level A harassment reduction. Strikes per Pile values were not reduced for DTH methods.*

TABLE 18—CALCULATED DISTANCES TO LEVEL A HARASSMENT ISOPLETHS DURING IMPACT INSTALLATION WITH ATTENUATION

Project component	Pile size/type	Number of strikes per pile (reduced by half)	Number of piles per day	Level A harassment isopleth distance (meters)				Level A harassment isopleth areas (km²)			
				Cetaceans			Pinnipeds	Cetaceans			Pinnipeds
				LF	MF	HF	PW	LF	MF	HF	PW
Impact Hammer South Island											
Settlement Reduction Piles	24-inch Pipe, Steel	20	6	33	2	40	18	<0.01			
Deep Foundation Piles	30-inch Pipe, Steel, Concrete Filled	20	6	132	5	157	71	0.04	<0.001	0.06	0.01
South Trestle											
Temporary MOT Trestle. Jump Trestle. Work Trestle.	36-inch Pipe, Steel	20	2	40	2	48	22	<0.001	0.007	0.002	

Level B Harassment Zones

Transmission loss (TL) is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography.

The general formula for underwater TL is:

TL = B * Log10 (R1/R2),

Where

TL = transmission loss in dB

B = transmission loss coefficient; for practical spreading equals 15

R1 = the distance of the modeled SPL from the driven pile, and

R2 = the distance from the driven pile of the initial measurement

The recommended TL coefficient for most nearshore environments is the practical spreading value of 15. This value results in an expected propagation environment that would lie between spherical and cylindrical spreading loss conditions, which is the most appropriate assumption for HRCP's proposed activity.

Using the practical spreading model, HRCP determined underwater noise would fall below the behavioral effects threshold of 120 dB rms for marine mammals at a maximum radial distance of 15,849 m for vibratory pile driving of 42- and 36-inch diameter piles. Other activities including impact driving and vibratory installation sheet piles have smaller Level B harassment zones. All Level B harassment isopleths are reported in Table 19 below. It should be noted that based on the geography of the project area, and pile driving locations, in many cases sound will not reach the full distance of the Level B harassment isopleth. The radial distances provided in Table 19 and Table 20 are shown as calculated. However, the land areas presented in these tables take into account truncation by various land masses in the project area and only shows the in-water ensonified area.

TABLE 19—DISTANCES TO LEVEL B HARASSMENT ISOPLETHS FOR DIFFERENT PILE SIZES AND TYPES AND METHODS OF INSTALLATION AND REMOVAL WITH NO ATTENUATION

Location and component	Method and pile type	Level B isopleth (m), unattenuated	Level B area unattenuated (km^2)
Vibratory Hammer (Level B Isopleth = 120 dB)			
North Trestle			
Moorings	42-inch steel piles	15,849	96.78
Template Piles	36-inch steel piles	13,594	85.53
Demolition Trestle	36-inch steel piles	13,594	85.53
North Shore Work Trestle	36-inch steel piles	13,594	85.53
Jump Trestle	36-inch steel piles	13,594	85.53
Work Trestle	36-inch steel piles	13,594	85.53
Moorings	24-inch steel piles	5,412	25.34
North Shore Abutment	AZ 700–19 steel sheet piles	4,642	19.81
North Island			
Moorings North	42-inch steel piles	15,849	103.86
Moorings South	42-inch steel piles	15,849	201.04
Hampton Creek Approach Channel Marker	36-inch steel pile	13,594	93.99
North Island Expansion North	AZ 700–26 steel sheet piles	4,642	26.06
North Island Expansion South	AZ 700–26 steel sheet piles	4,642	36.73
North Island Abutment North	AZ 700–19 steel sheet piles	4,642	26.06
North Island Abutment South	AZ 700–19 steel sheet piles	4,642	36.73
South Island			
Moorings	42-inch steel piles	15,849	246.86
Template Piles	36-inch steel piles	13,594	81.75
TBM Platform	36-inch steel piles	13,594	81.75
Conveyor Trestle	36-inch steel piles	13,594	81.75
Deep Foundation Piles	30-inch steel piles, concrete filled	13,594	194.04
Settlement Reduction Piles	24-inch steel piles	5,412	45.10
South Island Expansion	AZ 700–26 steel sheet piles	4,642	34.69
South Island Abutment	AZ 700–19 steel sheet piles	4,642	34.69
South Trestle			
Moorings, Casings	42-inch steel piles	15,849	305.30
Template Piles	36-inch steel piles	13,594	235.60
Temporary MOT Trestle	36-inch steel piles	13,594	235.60
Jump Trestle	36-inch steel piles	13,594	235.60
Work Trestle	36-inch steel piles	13,594	235.60
Demolition Trestle	36-inch steel piles	13,594	235.60
Moorings	24-inch steel piles	5,412	55.87
Willoughby Bay			
Moorings (Safe Haven)	42-inch steel piles	15,849	5.52
Moorings	42-inch steel piles	15,849	5.52
Casing	42-inch steel piles	15,849	5.52
Template Piles	36-inch steel piles	13,594	5.52
Work Trestle	36-inch steel piles	13,594	5.52
Jump Trestle	36-inch steel piles	13,594	5.52
Moorings	24-inch steel piles	5,412	5.52
Willoughby Spit Laydown Area			
Template Piles	36-inch steel piles	13,594	74.45
Dock on Spuds	36-inch steel piles	13,594	74.45
Dock on Piles	36-inch steel piles	13,594	74.45

TABLE 19—DISTANCES TO LEVEL B HARASSMENT ISOPLETHS FOR DIFFERENT PILE SIZES AND TYPES AND METHODS OF INSTALLATION AND REMOVAL WITH NO ATTENUATION—Continued

Location and component	Method and pile type	Level B isopleth (m), unattenuated	Level B area unattenuated (km²)
Finger Piers	16-inch CCA timber piles	6,310	40.62
DTH Pile Installation (Level B Isopleth = 120 dB)			
North Trestle Casings	60-inch steel piles	11,659	72.28
North Trestle Work Trestle, Jump Trestle, Demolition Piles, Templates.	36-inch steel piles	11,659	72.28
South Island Deep Foundation Piles	30-inch steel piles, concrete filled	11,659	152.79
South Trestle Casings	60-inch steel piles	11,659	184.12
South Trestle Work Trestle, Jump Trestle, Demolition Trestle, Temporary MOT Trestle, Templates.	36-inch steel piles	11,659	14.12
Willoughby Bay Templates	36-inch steel piles	11,659	5.52
Jetting (Level B Isopleth = 120 dB) Willoughby Bay			
Casing	42-inch steel piles	5,412	5.52
Impact Hammer (Level B Isopleth = 160 dB) North Trestle			
Permanent Piles	54-inch concrete cylinder piles	631	1.14
Work Trestle	36-inch steel piles	1,585	3.81
Jump Trestle	36-inch steel piles	1,585	3.81
Demolition Trestle	36-inch steel piles	1,585	3.81
South Island			
Deep Foundation Piles	30-inch steel piles, concrete filled	2,154	9.91
Settlement Reduction Piles	24-inch steel piles	1,000	2.29
South Trestle			
Permanent Piles	54-inch concrete cylinder piles	631	1.25
Work Trestle	36-inch steel piles	1,585	6.84
Jump Trestle	36-inch steel piles	1,585	6.84
Temporary MOT Trestle	36-inch steel piles	1,585	6.84
Demolition Trestle	36-inch steel piles	1,585	6.84
Willoughby Bay			
Permanent Piles	24-inch concrete cylinder piles	117	0.04
Work Trestle	36-inch steel piles	1,585	3.15
Jump Trestle	36-inch steel piles	1,585	3.15
Willoughby Spit Laydown Area			
Dock on Spuds	36-inch steel piles	1,585	6.03
Dock on Piles	36-inch steel piles	1,585	6.03

TABLE 20—DISTANCES TO LEVEL B HARASSMENT ISOPLETHS FOR INSTALLATION AND REMOVAL OF STEEL PIPE PILES WITH ATTENUATION BUBBLE CURTAIN

Location and component	Method and pile type	Level B isopleth (m), attenuated	Level B area attenuated (km²)
Impact Hammer (Level B Isopleth = 160 dB) South Island			
Deep Foundation Piles	30-inch steel piles, concrete filled	736	1.25
Settlement Reduction Piles	24-inch steel piles	341	0.27
South Trestle			
Temporary MOT Trestle, Work Trestle, Jump Trestle	36-inch steel piles	541	0.68

The daily duration in which more than one vibratory hammer or DTH pile installation could occur is difficult to predict and quantify. As noted previously, DTH pile installation is considered by NMFS to be both impulsive and continuous. Therefore, decibel addition will not be used to calculate Level A harassment zones during concurrent DTH pile installation activities. The Level A harassment zones for each DTH activity will be based on a single DTH hammer. To simplify implementation of Level A harassment zones for use of more than one vibratory hammer within a day and/or during simultaneous use of multiple vibratory hammers with overlapping isopleths, whether at a single site or multiple sites, Level A harassment zone sizes were calculated for the longest anticipated duration of the largest pile sizes that could be installed within a day. For example, if 18 42-inch steel pipe piles were installed with a vibratory hammer on a single day by multiple hammers with overlapping sound fields, the Level A harassment zone for each of the functional hearing groups likely to be present near the project area would remain smaller than 100 meters as shown in Table 21 with the largest Level A harassment zone being 81 m for harbor porpoises. However, it is highly unlikely that a harbor porpoise could accumulate enough sound from the installation of multiple piles in multiple locations for the duration required to meet the calculated Level A harassment threshold. Furthermore, installation of 18 42-inch steel pipe piles likely represents an unrealistic level of efficiency that will not be achieved in the field. Other combinations of pile sizes and numbers would result in Level A harassment zones smaller than 100 meters. To be precautionary, shutdown zones outlined in Table 21 for each species will be implemented for each vibratory hammer on days when it is anticipated that multiple vibratory hammers will be used, whether at a single or multiple sites. This mitigation measure would also minimize the need for onsite coordination among project sites and components.

TABLE 21—DISTANCES TO LEVEL A HARASSMENT ISOPLETHS FOR INSTALLATION OF 42-INCH PILES BY MULTIPLE VIBRATORY HAMMERS

Pile size/type	Minutes per pile (reduced by half)	Number of piles per day	Level A harassment isopleth distance (meters)			
			Cetaceans			Pinnipeds
			LF	MF	HF	PW
42-inch Pipe, Steel	15	18	55	5	81	33

Note: LF = Low-frequency; MF = Mid-frequency; HF = High frequency; PW = Phocids in water. Table does not stipulate the number of active vibratory hammers, as Level A effects are cumulative. The piles per day could be split between multiple hammers and not affect the size of Level A zones.

The size of the Level B harassment zone during concurrent operation of multiple vibratory hammers will depend on the combination of sound sources due to decibel addition of multiple hammers producing continuous noise. The distances to Level B harassment isopleths during simultaneous installation of piles using two or more vibratory hammers is shown in Table 22. As noted previously, pile installation often involves numerous stops and starts of the hammer for each pile. Therefore, decibel addition is applied only when the adjacent continuous sound sources experience overlapping sound fields, which generally requires close proximity of driving locations. Furthermore, it is expected to be a rare event when three or more 30-, 36-, or 42-inch piles are being installed simultaneously with vibratory hammers.

TABLE 22—DISTANCES TO LEVEL B HARASSMENT ISOPLETHS FOR MULTIPLE HAMMER ADDITIONS

Combined SSL (dB)	Distance to level B isopleth (meters)
164	8,577
165	10,000
166	11,659
167	13,594
168	15,849
169	18,478
170	21,544
171	25,119
172	29,286
173	34,145

Marine Mammal Occurrence and Take Calculation and Estimation

In this section we provide the information about the presence, density, or group dynamics of marine mammals that will inform the take calculations. We describe how the information provided above is brought together to produce a quantitative take estimate.

Humpback Whale

While humpback whales are observed near the mouth of the Chesapeake Bay and the nearshore waters of Virginia during winter and spring months, they are relatively rare in the project area. Density data for this species within the project vicinity do not exist or were not calculated because sample sizes were too small to produce reliable estimates of density. Humpback whale sighting data collected by the U.S. Navy near Naval Station Norfolk and Virginia Beach from 2012 to 2015 (Table 22) (Engelhaupt *et al.* 2014, 2015, 2016) and in the mid-Atlantic (including the Chesapeake Bay) from 2015 to 2019 (Table 23) (Aschettino *et al.* 2015, 2016, 2017a, 2018, 2019) did not produce high enough sample sizes to calculate densities, or survey data were not collected during systematic line-transect surveys. However, humpback whale densities have been calculated for populations off the coast of New Jersey, resulting in a density estimate of 0.000130 animals per square kilometer or one humpback whale within the area (off the coast of New Jersey) on any given day of the year (Whitt *et al.* 2015). In the project area, a similar density may be expected, although the project area is much smaller. Aschettino *et al.* (2018) observed and tracked two individual humpback whales in the Hampton Roads (in the James River) area of the project area and over the 5-year project period (2015–2019), tracked 12 individual humpback whales west of the CBBT (Movebank 2020). Based on these data, and the known movement of humpback whales from November through April at the mouth of the Chesapeake Bay, HRCP requested two takes every month from May to October and three to four each month from November through April for the duration of in-water pile installation and removal. NMFS concurs with the request and therefore, is proposing to authorize a total of 172 takes of humpback whales over the 5-year Project period (Table 24). The largest Level A harassment zone of 6,633 meters for LF cetaceans is associated with drilling with a DTH installation of 60-inch steel pipe piles (casings) (Table 17). It is unlikely but possible that a humpback whale could enter this area. Therefore, HRCP requested and NMFS is proposing to authorize eight humpback whale takes by Level A harassment (2 per year excluding Year 5), 35 Level B harassment takes each year for Years 1–4, and 24 Level B harassment takes for Year 5 (Table 24).

TABLE 23—SUMMARY OF INDIVIDUAL HUMPBACK WHALE SIGHTINGS BY MONTH FROM 2012 TO 2019 IN THE CHESAPEAKE BAY

Month	Engelhaupt surveys				Aschettino surveys					
	2012	2013	2014	2015	2015	2016	2017	2018	2019	Total
January	....	0	0	7	56	43	106	1	30	243
February	....	0	0	0	5	30	84	0	32	151
March	....	....	....	0	0	10	7	0	1	18
April	....	2	1	0	0	....	....	....	1	4
May	....	0	1	0	0	1	....	....	4	6
June	....	....	0	....	....	....	....	....	....	0
July	....	0	0	0	....	....	....	1	....	1
August	....	0	....	0	....	....	....	....	....	0
September	0	1	0	....	....	....	....	....	....	1
October	0	0	0	....	....	....	2	....	....	2
November	0	0	0	....	....	21	8	0	....	29
December	....	....	9	....	42	30	21	11	....	113
Total	0	3	11	7	103	135	228	13	68	568

**Source: Engelhaupt et al. 2014, 2015, 2016 (2012–2015 inshore survey data only; not dedicated humpback whale surveys); Aschettino et al. 2015, 2016, 2017a, 2018, 2019 (2015–2019). Monthly survey data from the 2019–2020 season have not been published; however, Aschettino et al. 2020b reported that during the 2019/2020 field season, which began 21 December 2019 and concluded 27 March 2020, resulted in 44 humpback whale sightings of 60 individuals.*

Table 24 -- Summary of the Estimated Numbers of Humpback Whales Potentially Exposed to Level A and Level B Harassment Sound Levels per Month per Year

Year	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Level A	Level B	Annual Total
Year 1	2	2	4	4	4	4	4	3	2	2	2	2	2	35	37
Year 2	2	2	4	4	4	4	4	3	2	2	2	2	2	35	37
Year 3	2	2	4	4	4	4	4	3	2	2	2	2	2	35	37
Year 4	2	2	4	4	4	4	4	3	2	2	2	2	2	35	37
Year 5	2	2	4	4	4	4	4	-	-	-	-	-		24	24
Monthly 5-Year Total	10	10	20	20	20	20	20	12	8	8	8	8	8	164	172

Bottlenose Dolphin

The total estimated number of takes for bottlenose dolphins in the Project area was estimated using a combined approach of daily sighting rates and density methods from conventional line-transect vessel surveys near Naval Station Norfolk and adjacent areas near Virginia Beach, Virginia, from August 2012 through August 2015 (Engelhaupt *et al.* 2016).

HRCP estimated potential exposure using daily sighting data for areas west of the HRBT area and within the Core Monitoring Area (shown in Figure 11–1 in the LOA application) and used seasonal densities of bottlenose dolphins from Engelhaupt *et al.* (2016) for areas northeast of the HRBT Project and outside the Core Monitoring Area. The Core Monitoring Area will encompass the area south of the HRBT and north of the Hampton Roads Monitor-Merrimac Memorial Bridge-Tunnel (Interstate 664) with observers positioned at key areas to monitor the entire geographic area between the bridges. This is the area that will be ensonified during most of the pile installation and removal activities. Depending on placement, the observers will be able to view west/southwest towards Batten Bay and the mouth of the Nansemond River. The largest ensonified southwest radii extend to the south into the James and Nansemond rivers, areas where marine mammal abundance is anticipated to be low and approaching zero. Towards the northeast direction, the largest of the multiple hammer zones may reach beyond the Chesapeake Bay Bridge and Tunnel. However, concurrent vibratory installation of three or more 30-, 36-, or 42-inch piles will occur infrequently.

This approach also factored in the number of days of pile installation and removal, which is estimated to be 312 days per year for Years 1–4 and 181 days for Year 5. Due to the complex schedule and the inexact timeline in which parts of the project may be completed ahead of or behind schedule, trying to quantify the exact number of days certain isopleths will be active for the purposes of take estimation is infeasible. However, these calculations reflect the best available data for the areas in and around the Project and represent a conservative estimate of potential exposure based on reasonable assumptions.

Sighting rates (numbers of dolphins per day) were determined for each of the four seasons from observations located in the inshore Chesapeake Bay zone (the Chesapeake Bay waters near Naval Station Norfolk) which were used to estimate potential exposure west of the project site and within the Core Monitoring Area. Sightings per season ranged from 5 in spring to 24 in fall while no bottlenose dolphins were sighted in the winter months in this inshore area (Table 25). Note that the winter sighting total of 0 was a result of truncating winter survey data to only include sighting data within the vicinity of the project location. Bottlenose dolphin abundance was highest in the fall, (24 sightings representing 245 individuals), followed by the spring (n = 156), and summer (n = 115). This data was utilized to calculate the number of dolphins per day that could be anticipated to occur in the project area during each season and year. The surveyed width for these surveys was two nautical miles, which encompasses the areas ensonified within the Core Monitoring Area during pile installation and removal (HDR-Mott MacDonald 2020). The number of anticipated days of in-water pile installation and removal for each month was multiplied by the average daily sighting rate estimate of the number of dolphins per month that could be exposed to project noise within the Core Monitoring Area. For the majority of piles being installed and/or removed, the ensonified area is constrained by surrounding land features and does not extend out into Chesapeake Bay. For piles with constrained sound fields, this method is sufficient to calculate potential exposure.

Table 25 depicts values in the average dolphins sighted per day column that are from within the Core Monitoring Area, which is smaller and closer to the river mouth. Values in the seasonal density column (individuals per km^2) are from outside the Core Monitoring Area which is farther out in the Bay and where there are likely to be more dolphins.

TABLE 25—AVERAGE DAILY SIGHTING RATES AND SEASONAL DENSITIES OF BOTTLENOSE DOLPHINS WITHIN THE PROJECT AREA

Season	Number of sightings per season	Average number of dolphins sighted per day within core monitoring area	Seasonal density outside core monitoring area (individuals/km^2)
Spring, March–May	5	17.33	1.00
Summer, June–August	14	16.43	3.55
Fall, September–November	24	27.22	3.88
Winter, December–February	0	0.00	0.63

Source: Engelhaupt et al. 2016.

For each month and year, the average area within the Level B harassment zones and outside the Core Monitoring Area was calculated and used to estimate potential exposure east of the project site and outside the Core Monitoring Area. The weighted average area within the relevant Level B harassment zones outside the Core Monitoring Area was used to calculate potential exposure or take of bottlenose dolphin for each month. The weighting incorporated the number of piles that produce the different zone sizes ensonified by each pile size/hammer/location. The number of piles with each different zone size was multiplied by its relevant ensonified area; those were then summed and the total was divided by the total number of piles.

For example, if there are 5 piles with a 20 km^2 Level B zone each and 2 piles with a 50 km^2 Level B zone, the formula would be:

((5 piles * 20 km^2/pile) + (2 piles * 50 km^2/pile))/(7 piles) = weighted average of 28.6 km^2.

The sum of potential exposures within the Core Monitoring Area (daily sighting rate method) and outside the Core Monitoring Area (density method for zones that extend into Chesapeake Bay) yields the total number of potential bottlenose dolphin exposures (Table 26) for each month and year.

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Table 26 -- Monthly and Annual Estimated Exposures using Number/Day for Core Monitoring Area, and Density/km² for Areas Extending Outside the Core Monitoring Area into Chesapeake Bay

	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Total Level A Takes	Total Level B Takes	Annual Total
Dolphin density (#/km²)	0.63	0.63	0.63	1	1	1	3.55	3.55	3.55	3.88	3.88	3.88	-	-	
Year 1 In CMA	0	0	0	468	451	451	427	444	427	708	708	681	48	4,717	4,765
Year 1 Out CMA	476	428	953	539	539	539	1,914	1,022	1,022	2,989	2,980	2,963	164	16,198	16,362
Year 2 In CMA	0	0	0	468	451	451	427	444	427	708	708	681	48	4,715	4,763
Year 2 Out CMA	1,097	1,526	1,498	2,297	1,304	706	2,631	2,464	1,627	1,342	6,770	6,758	301	29,720	30,021
Year 3 In CMA	0	0	0	468	451	451	427	444	427	708	708	681	48	4,716	4,764
Year 3 Out CMA	2,070	2,090	1,537	240	1,622	1,622	0	0	5,122	0	0	14,058	306	30,256	30,562
Year 4 In CMA	0	0	0	468	451	451	427	444	427	708	708	681	48	4,716	4,764
Year 4 Out CMA	444	0	0	0	0	0	0	0	0	10,146	9,287	6,009	259	25,625	25,884
Year 5 In CMA	0	0	0	468	0	0	0	0	0	708	708	681	26	2,539	2,565
Year 5 Out CMA	0	267	227	360	0	0	0	0	0	0	0	0	9	843	852
Monthly 5-Year Total	4,086	4,311	4,216	7,976	5,267	4,669	6,254	5,260	9,479	18,016	22,576	33,192	1,257	124,045	125,302

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Level A harassment zones and areas are relatively small for bottlenose dolphins. The largest Level A harassment isopleth is 236 m for DTH pile installation of 60-inch steel pipe piles (casings) at the South Trestle and covers an area less than 0.18 km². Given the daily sightings rates shown in Table 24, and the small Level A harassment zones, HRCP and NMFS do not anticipate that bottlenose dolphins will actually incur Level A harassment. However, because animals may enter into a PTS zone before being sighted, HRCP has requested authorization of Level A harassment for bottlenose dolphins as a precaution. Although NMFS does not agree that a brief sighting of a marine mammal within a Level A harassment zone calculated on the basis of accumulated energy necessarily means that the animal has experienced Level A harassment, we nevertheless propose to authorize take as requested by HRCP. HRCP assumed that approximately 1 percent of the total harassment exposures will be in the form of Level A harassment. HRCP has requested and NMFS is proposing to authorize 124,045 exposures by Level B harassment and 1,257 exposures by Level A harassment of bottlenose dolphins divided among the 5 project construction years (125,302 total exposures − 1,257 Level A harassment takes = 124,045 Level B harassment takes). However, due to the construction schedule, these takes will not occur equally during each year of the LOA. Year 3 of the LOA is expected to have 306 takes by Level A harassment and 30,256 takes by Level B harassment for a total of 30,562 proposed takes.

The total number of bottlenose dolphin takes by Level A and Level B harassment is expected to be split between three bottlenose dolphin stocks: Western North Atlantic Southern Migratory Coastal; Western North Atlantic Northern Migratory Coastal; and NNCES. There is insufficient data available to apportion the requested takes precisely to each of these three stocks present in the project area. Given that most of the NNCES stock are found in the Pamlico Sound Estuarine System, the Project will assume that no more than 200 of the requested takes will be from this stock during any given year. Since members of the Western North Atlantic Northern Migratory Coastal and Western North Atlantic Southern Migratory Coastal stocks are thought to occur in or near the Project area in greater numbers, HRCP will conservatively assume that no more than half of the remaining animals will belong to either of these stocks. Additionally, a subset of these takes would likely be comprised of Chesapeake Bay resident dolphins, although the size of that population is unknown. It is assumed that an animal will be taken once over a 24-hour period; however, the same individual may be taken multiple times over the duration of the project. Therefore, both the number of takes for each stock and the affected population percentages represent the maximum potential take numbers.

Harbor Porpoise

Harbor porpoises are rarely seen in the project area although they are known to occur in the coastal waters near Virginia Beach (Hayes *et al.* 2020). They have been sighted on rare occasions in the Chesapeake Bay closer to Norfolk. Density data does not exist for this species within the project area. Sighting data collected by the U.S. Navy near Naval Station Norfolk and Virginia Beach from 2012 to 2015 (Engelhaupt *et al.* 2014, 2015, 2016) did not produce high enough sample sizes to calculate densities. One group of two harbor porpoises was seen during spring 2015 (Engelhaupt *et al.* 2016).

HRCP estimated that one group of two harbor porpoises could be exposed to project-related underwater noise each month during the spring (March–May) for a total of 6 harbor porpoises takes (*i.e.,* 1 group of 2 individuals per month × 3 months per year = 6 harbor porpoises) per year for Years 1–4, and 4 harbor porpoise takes in Year 5.

The largest calculated Level A harassment zone for harbor porpoises extends 7,901 m from the noise source during DTH installation of 60-inch steel pipe piles (casings) at the South Trestle, for a harassment area of 102.16 km^2 (Table 17). However, HRCP has proposed a 100-meter shutdown zone for harbor porpoises. HRCP has requested small numbers of take by Level A harassment for harbor porpoises during the project. While NMFS does not agree that take by Level A harassment is likely, due to the duration of time a harbor porpoise would be required to remain within the Level A zone to accumulate enough energy to experience PTS, we nevertheless propose to authorize limited take as requested by HRCP. It is anticipated that 2 individuals may enter the Level A harassment zone during pile installation and removal each spring, for a total of 2 potential Level A harassment exposures per year. Therefore, NMFS is proposing to authorize 4 takes by Level B harassment each spring for Years 1–4 (6 total exposures − 2 Level A harassment takes = 4 Level B harassment takes). In Year 5, NMFS is proposing to authorize 2 takes by Level B harassment and 2 by Level A harassment.

Harbor Seal

HRCP estimated the expected number of harbor seals in the project area using systematic, land- and vessel-based survey data for in-water and hauled-out seals collected by the U.S. Navy at the CBBT rock armor and portal islands from November 2014 through April 2019 (Rees *et al.* 2016; Jones *et al.* 2018; Jones and Rees 2020). The number of harbor seals sighted by month from 2014 through 2019, in the Chesapeake Bay waters, in the vicinity (lower Chesapeake Bay along the CBBT) of the Project, ranged from 0 to 170 individuals Table 27. During the months of June through October (Table 27 and Table 29) harbor seals are not anticipated to be present in the Chesapeake Bay.

TABLE 27—SUMMARY OF HISTORICAL HARBOR SEAL SIGHTINGS BY MONTH FROM 2014 TO 2019

Month	2014	2015	2016	2017	2018	2019	Monthly average
January	....	....	33	120	170	7	82.5
February	....	39	80	106	159	21	81
March	....	55	61	41	0	18	43.8
April	....	10	1	3	3	4	4.2
May	....	3	0	0	0	....	0.8
June	Seals not expected to be present.					....	0
July	Seals not expected to be present.					....	0
August	Seals not expected to be present.					....	0
September	Seals not expected to be present.					....	0
October	Seals not expected to be present.					....	0
November	1	0	1	0	3	....	1.3

TABLE 27—SUMMARY OF HISTORICAL HARBOR SEAL SIGHTINGS BY MONTH FROM 2014 TO 2019—Continued

Month	2014	2015	2016	2017	2018	2019	Monthly average
December	4	9	24	8	29	....	14.8

TABLE 28—HARBOR SEAL SURVEY EFFORT, TOTAL COUNT, MAX COUNT ON A SINGLE SURVEY DAY, AND THE AVERAGE NUMBER OF SEALS OBSERVED PER SURVEY DAY AT THE CBBT SURVEY AREA

Field season	Number of survey days	Total seal count	Average daily seal count	Max daily seal count
2014–2015	11	113	10	33
2015–2016	14	187	13	39
2016–2017	22	308	14	40
2017–2018	15	340	23	45
2018–2019	10	82	8	17
Average	14.4	186	13.6	34.8

TABLE 29—SUMMARY OF THE ESTIMATED NUMBERS OF HARBOR SEALS POTENTIALLY TAKEN BY LEVEL A AND LEVEL B HARASSMENT PER MONTH PER YEAR [1]

Year	Nov	Dec	Jan	Feb	Mar	Apr	May	Level A	Level B	Annual total
Year 1	176.8	367.2	353.6	326.4	367.2	353.6	176.8	424	1,697	2,122
Year 2	176.8	367.2	353.6	326.4	367.2	353.6	176.8	424	1,697	2,122
Year 3	176.8	367.2	353.6	326.4	367.2	353.6	176.8	424	1,697	2,122
Year 4	176.8	367.2	353.6	326.4	367.2	353.6	176.8	424	1,697	2,122
Year 5 *	176.8	367.2	353.6	326.4	367.2	0	0	318	1,273	1,591
Monthly 5-Year Total	884	1,836	1,768	1,632	1,836	1,414	707	2,015	8,062	10,077

[1] Harbor seals not expected June–October.

The estimated total number of harbor seals potentially exposed to in-water noise at harassment levels is 13.6 per day (the average of the 5-year average daily harbor seal count) (Table 28) for 156 days based on a 6-day work week from mid-November to mid-May. Seals are not expected to be present in the Chesapeake Bay from June through October. It is estimated that 13.6 harbor seals could be exposed per day to Project-related underwater noise for 156 days for a total of 2,122 exposures per year for Years 1–4. In Year 5, it is estimated that 1,591 harbor seals could be exposed to Project-related underwater noise from November through March (Table 29).

The largest Level A harassment isopleth associated with drilling with a DTH hammer of 60-inch steel pipe piles (casings) at the South Trestle for harbor seals is 3,550 meters (Table 17) with a Level A harassment zone of 27.12 km^2. It is possible that harbor seals could enter this or other Level A harassment zones undetected. While NMFS does not believe that take of harbor seals by Level A harassment is likely due to accumulated energy that would be required to experience injury, we nevertheless propose to authorize limited take as requested by HRCP. It is anticipated that up to 20 percent of the total exposures would be at or above the Level A harassment threshold. Therefore, HRCP has requested and NMFS proposes to authorize 1,697 takes by Level B harassment and 424 takes by Level A harassment for project years 1–4 and 1,273 Level B harassment takes and 318 Level A harassment takes of harbor seals for project year 5 (Table 29).

Gray Seal

Gray seals are expected to be very uncommon in the Project area. As described below, historical data indicate that approximately one gray seal has been seen per year in the Chesapeake Bay. Similar to the harbor seal, HRCP estimated the expected number of gray seals in the Project area using systematic, land- and vessel-based survey data for in-water and hauled-out seals collected by the U.S. Navy at the CBBT rock armor and portal islands from 2014 through 2019 (Rees *et al.* 2016; Jones *et al.* 2018; Jones and Rees 2020). Gray seals are not expected to be present in the Chesapeake Bay during the months of March through December. Between 2015 and 2019 only three individual seals were observed, all in the month of February (*i.e.,* 2015, 2016 and 2018).

As a precautionary measure, HRCP assumed that there could be three gray seals taken by Level B harassment during each of the winter months (December through February). Therefore, HRCP requested and NMFS is proposing to authorize nine gray seal takes per year for years 1–4 (3 gray seals per month × 3 months per year = 9 gray seals) and 5 for project year five for a total of 41 takes of gray seals (Table 30). Given the size of the Level A harassment zones and potential for a gray seal to be present within the zone for sufficient duration to incur injury, nine takes by Level A harassment have also been requested (2 during years 1–4 and 1 during year 5). NMFS concurs with this assessment and is proposing to authorize seven takes by Level B harassment per year for years 1–4 (9 takes − 2 takes by Level A harassment = 7 takes by Level B harassment) and 4 takes for year 5 (5 total takes − 1 take by Level A harassment = 4 takes by Level B harassment). NMFS is also proposing to authorize 2 takes of gray seal per year by Level A harassment for years 1–4 and a single take for year 5.

Table 30 below summarizes proposed take numbers by species per project year while Table 31 describes the proposed authorized take for all the species described above as a percentage of stock abundance.

TABLE 30—ESTIMATED TAKE BY LEVEL A AND LEVEL B HARASSMENT, BY SPECIES

Species	2021		2022		2023		2024		2025		Total
	Level A	Level B	Level A	Level B	Level A	Level B	Level A	Level B	Level A	Level B	
Humpback whale	2	35	2	35	2	35	2	35	0	24	172
Bottlenose dolphin	212	20,915	349	34,435	354	34,972	307	30,341	35	3,382	125,302
Harbor porpoise	2	4	2	4	2	4	2	4	2	2	30
Harbor seal	424	1,697	424	1,697	424	1,697	424	1,697	318	1,273	10,075
Gray seal	2	7	2	7	2	7	2	7	1	4	41

TABLE 31—MAXIMUM ANNUAL ESTIMATED TAKE BY LEVEL A AND LEVEL B HARASSMENT, BY SPECIES AND STOCK IN COMPARISON TO STOCK ABUNDANCE

Species	Stock	Stock abundance	Level A harassment take	Level B harassment take	Percent of stock
Humpback Whale	Gulf of Maine	[b] 12,312	2	35	0.3
Bottlenose Dolphin	WNA Coastal, Northern Migratory [a]	6,639	175	17,386	264.5
	WNA Coastal, Southern Migratory [a]	3,751	175	17,386	468.2
	NNCES [c]	823	0	200	24.3
Harbor Porpoise	Gulf of Maine/Bay of Fundy	95,543	2	4	<0.01
Harbor Seal	Western North Atlantic	75,834	424	1,697	2.8
Gray Seal	Western North Atlantic	451,531	2	7	<0.01

[a] Take estimates are weighted based on calculated percentages of population for each distinct stock, assuming animals present would follow same probability of presence in the project area. Please see the Small Numbers section for additional information.
[b] West Indies DPS.
[c] Assumes multiple repeated takes of same individuals from small portion of each stock as well as repeated takes of Chesapeake Bay resident population (size unknown). Please see the Small Numbers section for additional information.

Proposed Mitigation

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

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

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

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

In addition to the measures described later in this section, HRCP will employ the following mitigation measures:

• For in-water heavy machinery work other than pile driving, if a marine mammal comes within 10 m, operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions;

• HRCP will conduct briefings between construction supervisors and crews and the marine mammal monitoring team prior to the start of all pile driving activity and when new personnel join the work, to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures;

• For those marine mammals for which Level A or Level B harassment take has not been requested, in-water pile installation/removal will shut down immediately if such species are observed within or entering the Level A or Level B harassment zone; and

• If take reaches the authorized limit for an authorized species, pile installation/removal will shut down immediately if these species approach the Level A or Level B harassment zone to avoid additional take.

The following mitigation measures apply to HRCP's in-water construction activities.

Time Restriction

For pile driving, work would occur only during daylight hours, when visual monitoring of marine mammals can be conducted. Installation or removal of new piles will not commence after daylight hours.

Shutdown Zones

For all pile driving activities, HRCP will establish shutdown zones for a marine mammal species which correspond to the Level A harassment zones. The purpose of a shutdown zone is generally to define an area within which shutdown of the activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area). In some instances, however, large zone sizes will make it impossible to monitor the entirety of the Level A harassment zones.

During use of a single hammer the following measures will be employed by HRCP:

• A minimum 10-meter shutdown zone will be implemented for all species, pile sizes, and hammer types to prevent direct injury of marine mammals.

• A 15-meter shutdown zone will be implemented for seals to prevent direct injury.

• A 100-meter shutdown zone will be implemented for harbor porpoises when utilizing a DTH hammer and impact hammering to prevent direct injury.

• When the Level A harassment zone is larger than 50 meters, shutdown zones have been rounded up relative to the calculated Level A harassment zones as a precautionary measure. HRCP will also document the duration any animal spends within the Level A harassment zone.

When two or more vibratory hammers are in use HRCP will employ the following measures:

• A shutdown zone will be implemented for each species for each vibratory hammer on days when it is anticipated that multiple vibratory hammers will be used, whether at a single site or multiple sites.

• A 35-meter shutdown zone will be implemented for harbor seals and gray seals to prevent direct injury.

• An 85-meter shutdown zone will be implemented for harbor porpoise to prevent direct injury.

• A 55-meter shutdown zone will be implemented for humpback whales to prevent direct injury.

Calculated Level A harassment zones and shutdown zones for each activity and pile size and type are depicted in Table 32 and Table 33. Note that shutdown zones in Table 33 include a 7 dB reduction due to the use of bubble curtains. Compare shutdown zones in Table 32 with Level A harassment zones contained in Tables 16, 17 and 18. Under some pile driving scenarios, the Level A harassment zones are larger than the specified shutdown zones.

TABLE 32—SHUTDOWN ZONES WITH NO ATTENUATION FOR ALL SPECIES

Method	Pile size and type	Minutes (min) per pile or strikes per pile	Number of piles installed or removed per day	Level A harassment isopleth distance (meters)			
				Cetaceans			Pinnipeds
				LF	MF	HF	
Vibratory Installation and Removal	24-inch Pipe, Steel	15 min	6	[1]10/55	10	[2]14/85	[3]15/35
						15/55	21/85
	30-inch Pipe, Steel, Concrete Filled	30 min	6	36/55		60/85	
	36-inch Pipe, Steel	2.5 min	8	10/55		13/85	
		2.5 min	16	14/55		20/85	
		25 min	1	10/55	15/85		
			2	16/55		23/85	
			3	20/55		30/85	
		30 min	2	18/55		26/85	
	42-inch Pipe, Steel	15 min	6	27/55		39/85	
	Sheet, Steel	15 min	10	11/55		16/85	
	16-inch CCA, Timber	15 min	4	10/55		12/85	
Jetting	42-inch Pipe, Steel	15 min	1	10		10	
Down-the-Hole Installation	30-inch Pipe, Steel, Concrete Filled	36,000 strikes*	6	1,950	70	100	
	36-inch Pipe, Steel		2	940	34		
	60-inch Pipe, Steel		3	6,640	240		
Impact Installation	24-inch Pipe, Steel	20 strikes	6	100	10		
	30-inch Pipe, Steel, Concrete Filled			390	14		
	36-inch Pipe, Steel		2	120	10		
	36-inch Pipe, Steel		3	160	10		
	24-inch Pipe, Concrete Square	1,050 strikes	1	80	10		
	54-inch Pipe, Concrete Cylinder			420	15		

[1] A 55-meter shutdown zone will be implemented for humpback whales during concurrent vibratory driving of two or more hammers.
[2] A 85-meter shutdown zone will be implemented for harbor porpoise during concurrent vibratory driving of two or more hammers.
[3] A 35-meter shutdown zone will be implemented for harbor seals and gray seals during concurrent vibratory driving of two or more hammers.

TABLE 33—SHUTDOWN ZONES WITH ATTENUATION FOR ALL SPECIES

Method	Pile size and type	Strikes per pile	Number of piles per day	Level A harassment isopleth distance (meters)			
				Cetaceans			Pinnipeds
				LF	MF	HF	PW
Impact Installation	24-inch Pipe, Steel	20 strikes	6	33	10	40	18
	30-inch Pipe, Steel, Concrete Filled.			140	10	160	80
	36-inch Pipe, Steel	20 strikes	2	40	10	48	22

Protected Species Observers

The placement of protected species observers (PSOs) during all pile driving and removal activities (described in the Proposed Monitoring and Reporting section) will ensure that the entire shutdown zone is visible during pile driving and removal. Should environmental conditions deteriorate such that marine mammals within the entire shutdown zone would not be visible (*e.g.,* fog, heavy rain), pile driving and removal must be delayed until the PSO is confident marine mammals within the shutdown zone could be detected. However, if work on a pile has already begun, work is allowed to continue until that pile is installed.

Establishment of Level A and Level B Harassment Zones

HRCP will establish monitoring zones based on calculated Level A harassment isopleths associated with specific pile driving activities and scenarios. These are areas beyond the established shutdown zones in which animals could be exposed to sound levels that could result in Level A harassment in the form of PTS. HRCP will also establish and monitor Level B harassment zones which are areas where SPLs are equal to or exceed the 160 dB rms threshold for impact driving and 120 dB rms threshold during vibratory driving and DTH pile installation.

The Level A and Level B harassment monitoring zones are given in Tables 16–19.

Monitoring for Level B Harassment

HRCP will monitor the Level B harassment zones to the extent practicable, as well as Level A harassment zones extending beyond shutdown zones. HRCP will monitor at least a portion of the Level B harassment zone on all pile driving days. Monitoring zones provide utility for observing by establishing monitoring protocols for areas adjacent to the shutdown zones. Monitoring zones enable observers to be aware of and communicate the presence of marine mammals in the project area outside the shutdown zone and thus prepare for a potential cessation of activity should the animal enter the shutdown zone.

Bubble Curtains

Use of air bubble curtain systems will be implemented by HRCP during impact driving of steel piles except in situations where the water depth is less than 20 ft in depth. The use of this sound attenuation device will reduce SPLs and the size of the zones of influence for Level A harassment and Level B harassment. Bubble curtains will meet the following requirements:

- The bubble curtain must distribute air bubbles around 100 percent of the piling perimeter for the full depth of the water column.
- The lowest bubble ring shall be in contact with the mudline and/or rock bottom for the full circumference of the ring, and the weights attached to the bottom ring shall ensure 100 percent mudline and/or rock bottom contact. No parts of the ring or other objects shall prevent full mudline and/or rock bottom contact.
- The bubble curtain shall be operated such that there is proper (equal) balancing of air flow to all bubblers.
- The applicant shall require that construction contractors train personnel in the proper balancing of air flow to the bubblers and corrections to the attenuation device to meet the performance standards. This shall occur prior to the initiation of pile driving activities.

Soft-Start

The use of soft-start procedures are believed to provide additional protection to marine mammals by providing warning and/or giving marine mammals a chance to leave the area prior to the hammer operating at full capacity. For impact pile driving, HRCP will be required to provide an initial set of strikes from the hammer at reduced energy, with each strike followed by a 30-second waiting period. This procedure will be conducted a total of three times before impact pile driving begins. Soft start will be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of 30 minutes or longer. Soft start is not required during vibratory or DTH pile driving activities.

If a marine mammal is present within the shutdown zone, ramping up will be delayed until the PSO has determined, through sighting, that the animal(s) has moved outside the shutdown zone. If a marine mammal is present in the Level A or Level B harassment zone, ramping up may begin and a Level A or Level B harassment take will be recorded. If a marine mammal is present in the Level A or Level B harassment zone, HRCP may elect to delay ramping up to avoid a Level A or Level B harassment take. To avoid a take by Level A or Level B harassment, ramping up will begin only after the PSO has determined, through sighting, that the animal(s) has moved outside the corresponding Level A or Level B harassment zone or 15 minutes have passed.

Pre-Activity Monitoring

Prior to the start of daily in-water construction activity, or whenever a break in pile driving of 30 minutes or longer occurs, PSOs will observe the shutdown and monitoring zones for a period of 30 minutes. The shutdown zone will be cleared when a marine mammal has not been observed within the zone for that 30-minute period. If a marine mammal is observed within the shutdown zone, a soft-start cannot proceed until the animal has left the zone or has not been observed for 15 minutes. If the Level A and Level B harassment zones have been observed for 30 minutes and non-permitted species are not present within the zone, soft start procedures can commence and work can continue even if visibility becomes impaired within the Level A or Level B harassment monitoring zones. When a marine mammal permitted for take by Level A or Level B harassment is present in the Level A or Level B harassment zone, activities may begin and Level A or Level B harassment take will be recorded as appropriate. If work ceases for more than 30 minutes, the pre-activity monitoring of both the Level B harassment and shutdown zone will commence again. Additionally, in-water construction activity must be delayed or cease, if poor environmental conditions restrict full visibility of the shut-down zone(s) until the entire shut-down zone(s) is visible.

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

Proposed Monitoring and Reporting

In order to issue an LOA for an activity, section 101(a)(5)(A) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. NMFS' MMPA implementing regulations further describe the information that an applicant should provide when requesting an authorization (50 CFR 216.104 (a)(13)), including the means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and the level of taking or impacts on populations of marine mammals. 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.

HRCP will submit a Marine Mammal Monitoring Plan which must be approved by NMFS in advance of the start of construction.

Visual Monitoring

Marine mammal monitoring during pile driving and removal must be conducted by PSOs in a manner consistent with the following:

- Independent PSOs (*i.e.,* not construction personnel) who have no other assigned tasks during monitoring periods must be used;
- At least one PSO must have prior experience performing the duties of a PSO during construction activity pursuant to a NMFS-issued incidental take authorization;
- Other PSOs may substitute education (degree in biological science or related field) or training for experience;
- Where a team of three or more PSOs is required, a lead observer or monitoring coordinator must be designated. The lead observer must have prior experience working as a marine mammal observer during construction; and
- HRCP must submit PSO Curriculum Vitae for approval by NMFS prior to the onset of pile driving.

PSOs must have the following additional qualifications:

- Ability to conduct field observations and collect data according to assigned protocols;
- Experience or training in the field identification of marine mammals, including the identification of behaviors;
- Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations;
- Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates, times, and reason for implementation of mitigation (or why mitigation was not implemented when required); and marine mammal behavior; 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 will be positioned at the best practical vantage point(s). The position(s) may vary based on construction activity and location of piles or equipment. At least one of the monitoring locations will have an unobstructed view of the pile being driven, and an unobstructed view of the Level A shutdown and Level B harassment zones, Core Monitoring Area, as well as the 100-meter shutdown zone.

Between one and four PSOs will be stationed at locations offering the best available views of the Level A and Level B harassment monitoring zones during in-water pile installation and removal, depending on where active in-water work is taking place. It is anticipated that a PSO will observe from the North Island when in-water pile installation is occurring at the North Island and North Trestle. If the view field is adequate, Level A and Level B harassment zones may be monitored for multiple pile driving locations by the same individual PSO. Two PSOs will be located at the South Island, where they will monitor for marine mammals passing into and out of the Core Monitoring Area as well as monitor the active hammer sites. This location also provides good views to the east for monitoring when zones extend beyond the Core Monitoring Area into Chesapeake Bay. One PSO will be stationed on Willoughby Spit or a similar location that offers the best available views of the Level A and Level B harassment monitoring zones during in-water pile installation and removal within Willoughby Bay. Finally, on days when use of multiple hammers is planned and it is anticipated that the Level B harassment isopleth will encompass the CBBT, a PSO will be located on one of the CBBT Portal Islands to monitor the extended ensonified area. A central position will generally be staffed by the lead PSO, who will monitor the shutdown zones and communicate with construction personnel about shutdowns and take management. PSOs at the pile installation and removal locations will be able to see at least a radius around the construction site that exceeds the largest Level A harassment zone. PSOs will watch for marine mammals entering and leaving the James River and will alert the lead PSO of the number and species sighted, so that no unexpected marine mammals will approach the construction site. This will minimize Level A harassment take of all species.

Decibel addition is not a consideration when sound fields do not overlap at the sound sources. Willoughby Bay is largely surrounded by land, and sound will be prevented from propagating to other Project construction sites. Therefore, Willoughby Bay will be treated as an independent site with its own monitoring and shutdown zones, as well as observer requirements when construction is taking place within the bay. The Bay is relatively small and will be monitored from the construction site by one to two observers.

Reporting

HRCP would submit an annual draft report for each construction year to NMFS within 90 calendar days of the completion of marine mammal monitoring. A final annual report will be prepared and submitted to NMFS within 30 days following receipt of comments on the draft report from NMFS.

The report will detail the monitoring protocol and summarize the data recorded during monitoring. Specifically, the report must include

- 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).
- Environmental conditions during monitoring periods (at beginning and end of PSO shift and whenever conditions change significantly), including Beaufort sea state and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon, and estimated observable distance (if less than the harassment zone distance).
- 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 marine mammals detected within the harassment zones, by species.

• 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.

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

In the event that personnel involved in the construction activities discover an injured or dead marine mammal, HRCP shall report the incident to the Office of Protected Resources (OPR) (301–427–8401), NMFS and to the Greater Atlantic Region New England/Mid-Atlantic Regional Stranding Coordinator as soon as feasible. If the death or injury was clearly caused by the specified activity, HRCP must immediately cease the specified activities until NMFS is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of the authorization. HRCP must not resume their activities until notified by NMFS.

The report must include the following information:

i. Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);

ii. Species identification (if known) or description of the animal(s) involved;

iii. Condition of the animal(s) (including carcass condition if the animal is dead);

iv. Observed behaviors of the animal(s), if alive;

v. If available, photographs or video footage of the animal(s); and

vi. 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).

To avoid repetition, this introductory discussion of our analyses applies to all of the species listed in Table 31, given that many of the anticipated effects of this project on different marine mammal stocks are expected to be relatively similar in nature. Where there are meaningful differences between species or stocks in anticipated individual responses to activities, impact of expected take on the population due to differences in population status, or impacts on habitat, they are described independently in the analysis below.

Pile driving activities associated with the project, as outlined previously, have the potential to disturb or displace marine mammals. Specifically, the specified activities may result in take, in the form of Level B harassment from underwater sounds generated by pile driving. Potential takes could occur if marine mammals are present in zones ensonified above the thresholds for Level B harassment, identified above, while activities are underway. No serious injury or mortality would be expected even in the absence of the proposed mitigation measures.

A limited number of animals could experience Level A harassment in the form of PTS if they remain within the Level A harassment zone long enough during certain impact driving scenarios. However, the number of animal affected and the degree of injury is expected to be limited to, at most, mild PTS. Furthermore, the reproduction or survival of the individual animals is not likely to affected. It is expected that, if hearing impairments occurs, most likely the affected animal would lose a few dB in its hearing sensitivity, which in most cases is not likely to affect its survival and recruitment.

HRCP's proposed pile driving activities and associated impacts will occur within a limited portion of the confluence of the Chesapeake Bay area. Localized noise exposures produced by project activities may cause short-term behavioral modifications in affected cetaceans and pinnipeds. However, as described previously, the mitigation and monitoring measures are expected to further reduce the likelihood of injury as well as reduce behavioral disturbances.

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). Individual animals, even if taken multiple times, will most likely move away from the sound source and be temporarily displaced from the areas of pile driving, although even this reaction has been observed primarily only in association with impact pile driving. The pile driving activities analyzed here are similar to, or less impactful than, numerous other construction activities conducted along the Atlantic coast, which have taken place with no known long-term adverse consequences from behavioral harassment. Furthermore, many projects similar to this one are also believed to result in multiple takes of individual animals without any documented long-term adverse effects. Level B harassment will be minimized through use of mitigation measures described herein and, if sound produced by project activities is sufficiently disturbing, animals are likely to simply avoid the area while the activity is occurring, particularly as the project is located on a busy waterfront with high amounts of vessel traffic.

As previously described, UMEs have been declared for Northeast pinnipeds (including harbor seal and gray seal) and Atlantic humpback whales. However, we do not expect takes proposed for authorization in this action to exacerbate or compound upon these ongoing UMEs. As noted previously, no injury, serious injury, or mortality is expect or proposed for authorization, and Level A and Level B harassment takes of humpback whale, harbor seal and gray seal will be reduced to the level of least practicable adverse impact through the incorporation of the proposed mitigation measures. For the WNA stock of gray seal, the estimated stock abundance is 451,431 animals, including the Canadian portion of the stock (estimated 27,131 animals in the U.S. portion of the stock). Given that only 7 takes by Level B harassment and two takes by Level A harassment are proposed for this stock annually, we do not expect this proposed authorization to exacerbate or compound upon the ongoing UME.

With regard to humpback whales, the UME does not yet provide cause for concern regarding population-level impacts. Despite the UME, the relevant population of humpback whales (the West Indies breeding population, or distinct population segment (DPS)) remains healthy. Prior to 2016, humpback whales were listed under the ESA as an endangered species worldwide. Following a 2015 global status review (Bettridge *et al.,* 2015), NMFS established 14 DPSs with different listing statuses (81 FR 62259; September 8, 2016) pursuant to the ESA. The West Indies DPS, which consists of the whales whose breeding range includes the Atlantic margin of the Antilles from Cuba to northern Venezuela, and whose feeding range primarily includes the Gulf of Maine, eastern Canada, and western Greenland, was delisted. The status review identified harmful algal blooms, vessel collisions, and fishing gear entanglements as relevant threats for this DPS, but noted that all other threats are considered likely to have no or minor impact on population size or the growth rate of this DPS (Bettridge *et al.,* 2015). As described in Bettridge *et al.* (2015), the West Indies DPS has a substantial population size (*i.e.,* 12,312 (95 percent CI 8,688–15,954) whales in 2004–05 (Bettridge *et al.* 2003)), and appears to be experiencing consistent growth. Further, NMFS is proposing to authorize no more than 35 takes by Level B harassment annually of humpback whale.

For the WNA stock of harbor seals, the estimated abundance is 75,834 individuals. The estimated M/SI for this stock (350) is well below the PBR (2,006). As such, the proposed Level B harassment takes of harbor seal are not expected to exacerbate or compound upon the ongoing UMEs.

The project is also not expected to have significant adverse effects on affected marine mammals' habitats. The project activities will not modify existing marine mammal habitat for a significant amount of time. The activities may cause some fish to leave the area of disturbance, thus temporarily impacting marine mammals' foraging opportunities in a limited portion of the foraging range; but, because of the relatively small area of the habitat that may be affected (with no known particular importance to marine mammals), the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences. Furthermore, there are no known biologically important areas (BIAs), ESA-designated critical habitat, rookeries, or features of special significance for foraging or reproduction.

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 serious injury or mortality is anticipated or authorized;
- Authorized Level A harassment would be limited and of low degree;
- The intensity of anticipated takes by Level B harassment is relatively low for all stocks;
- The number of anticipated takes is very low for humpback whale, harbor porpoise, and gray seal;
- The specified activity and associated ensonifed areas are very small relative to the overall habitat ranges of all species and do not include habitat areas of special significance;
- The lack of anticipated significant or long-term negative effects to marine mammal habitat; and
- The presumed efficacy of the mitigation measures in reducing the effects of the specified activity.

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

Small Numbers

As noted above, only small numbers of incidental take may be authorized under section 101(a)(5)(A) 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. When the predicted number of individuals to be taken is fewer than one third of the species or stock abundance, the take is considered to be of small numbers. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

The maximum annual take of take of humpback whale, harbor porpoise, harbor seal, and gray seal comprises less than one-third of the best available stock abundance estimate for each of these stocks (Table 31). The maximum number of animals authorized to be taken from these stocks would be considered small relative to the relevant stock's abundances even if each estimated taking occurred to a new individual, which is an unlikely scenario.

Three bottlenose dolphin stocks could occur in the project area: WNA Coastal Northern Migratory, WNA Coastal Southern Migratory, and NNCES stocks. Therefore, the estimated takes of bottlenose dolphin by Level B harassment would likely be portioned among these stocks. Based on the stocks' respective occurrence in the area, NMFS estimated that there would be no more than 200 takes from the NNCES stock each year over the five-year period, with the remaining takes evenly split between the northern and southern migratory coastal stocks. Based on consideration of various factors described below, we have determined the maximum number of individuals taken per year would likely comprise less than one-third of the best available population abundance estimate of either coastal migratory stock.

Both the WNA Coastal Northern Migratory and WNA Coastal Southern Migratory stocks have expansive ranges and they are the only dolphin stocks thought to make broad-scale, seasonal migrations in coastal waters of the western North Atlantic. Given the large ranges associated with these stocks it is unlikely that large segments of either stock would approach the project area and enter into the Chesapeake Bay. The majority of both stocks are likely to be found widely dispersed across their respective habitat ranges and unlikely to be concentrated in or near the Chesapeake Bay.

Furthermore, the Chesapeake Bay and nearby offshore waters represent the boundaries of the ranges of each of the two coastal stocks during migration. The WNA Coastal Northern Migratory stock occurs during warm water months from coastal Virginia, including the Chesapeake Bay to Long Island, New York. The stock migrates south in late summer and fall. During cold-water months, dolphins may occur in coastal waters from Cape Lookout, North Carolina, to the North Carolina/Virginia border. During January-March, the WNA Coastal Southern Migratory stock appears to move as far south as northern Florida. From April to June, the stock moves back north to North Carolina. 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 the Chesapeake Bay. There is likely some overlap between the northern and southern migratory stocks during spring and fall migrations, but the extent of overlap is unknown.

The Chesapeake Bay and waters offshore of its mouth are located on the periphery of the migratory ranges of both coastal stocks (although during different seasons). Additionally, each of the migratory coastal stocks are likely to be located in the vicinity of the Chesapeake Bay for relatively short timeframes. Given the limited number of animals from each migratory coastal stock likely to be found at the seasonal migratory boundaries of their respective ranges, in combination with the short time periods (~two months) animals might remain at these boundaries, it is reasonable to assume that takes are likely to occur to only a small portion of either of the migratory coastal stocks.

Both migratory coastal stocks likely overlap with the NNCES stock at various times during their seasonal migrations. The NNCES stock is defined as animals that primarily occupy waters of the Pamlico Sound estuarine system (which also includes Core, Roanoke, and Albemarle sounds, and the Neuse River) during warm water months (July-August). Animals from this stock also use coastal waters (≤1 km from shore) of North Carolina from Beaufort north to Virginia Beach, Virginia, including the lower Chesapeake Bay. Comparison of dolphin photo-identification data confirmed that limited numbers of individual dolphins observed in Roanoke Sound have also been sighted in the Chesapeake Bay (Young, 2018). Like the migratory coastal dolphin stocks, the NNCES stock covers a large range. The spatial extent of most small and resident bottlenose dolphin populations is on the order of 500 km^2, while the NNCES stock occupies over 8,000 km^2 (LeBrecque *et al.,* 2015). Given this large range, it is again unlikely that a preponderance of animals from the NNCES stock would depart the North Carolina estuarine system and travel to the northern extent of the stock's range. However, recent evidence suggests that there is likely a small resident community of NNCES dolphins of indeterminate size that inhabits the Chesapeake Bay year-round (E. Patterson, NMFS, pers. comm.).

Many of the dolphin observations in the Bay are likely repeated sightings of the same individuals. The Potomac-Chesapeake Dolphin Project has observed over 1,200 unique animals since observations began in 2015. Re-sightings of the same individual can be highly variable. Some dolphins are observed once per year, while others are highly regular with greater than 10 sightings per year (J. Mann, Potomac-Chesapeake Dolphin Project, pers. comm.). Similarly, using available photo-identification data, Engelhaupt *et al.* (2016) determined that specific individuals were often observed in close proximity to their original sighting locations and were observed multiple times in the same season or same year. Ninety-one percent of re-sighted individuals (100 of 110) in the study area were recorded less than 30 km from the initial sighting location. Multiple sightings of the same individual would considerably reduce the number of individual animals that are taken by Level B harassment. Furthermore, the existence of a resident dolphin population in the Bay would increase the percentage of dolphin takes that are actually re-sightings of the same individuals in any given year.

In summary and as described above, the following factors primarily support our determination regarding the incidental take of small numbers of the affected stocks of bottlenose dolphin:

- Potential bottlenose dolphin takes in the project area are likely to be allocated among three distinct stocks;
- Bottlenose dolphin stocks in the project area have extensive ranges and it would be unlikely to find a high percentage of any one stock concentrated in a relatively small area such as the project area or the Chesapeake Bay;
- The Chesapeake Bay represents the migratory boundary for each of the specified dolphin stocks and it would be unlikely to find a high percentage of any stock concentrated at such boundaries; and
- Many of the takes would likely be repeats of the same animals and likely from a resident population of the Chesapeake Bay.

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

Unmitigable Adverse Impact Analysis and Determination

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

Adaptive Management

The regulations governing the take of marine mammals incidental to HRCP construction activities would contain an adaptive management component. The reporting requirements associated with this proposed rule are designed to provide NMFS with monitoring data from completed projects to allow consideration of whether any changes are appropriate. The use of adaptive management allows NMFS to consider new information from different sources to determine (with input from HRCP regarding practicability) on an annual or biennial basis if mitigation or monitoring measures should be modified (including additions or deletions). Mitigation measures could be modified if new data suggests that such modifications would have a reasonable likelihood of reducing adverse effects to marine mammals and if the measures are practicable.

The following are some of the possible sources of applicable data to be considered through the adaptive management process: (1) Results from monitoring reports, as required by MMPA authorizations; (2) results from general marine mammal and sound research; and (3) any information which reveals that marine mammals may have been taken in a manner, extent, or number not authorized by these regulations or subsequent LOAs.

Endangered Species Act

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

Request for Information

NMFS requests interested persons to submit comments, information, and suggestions concerning HRCP's request and the proposed regulations (see **ADDRESSES**). All comments will be reviewed and evaluated as we prepare a final rule and make final determinations on whether to issue the requested authorization. This notice and referenced documents provide all environmental information relating to our proposed action for public review.

Classification

Pursuant to the procedures established to implement Executive Order 12866, the Office of Management and Budget has determined that this proposed rule is not significant. Pursuant to section 605(b) of the Regulatory Flexibility Act (RFA), the Chief Counsel for Regulation of the Department of Commerce has certified to the Chief Counsel for Advocacy of the Small Business Administration that this proposed rule, if adopted, would not have a significant economic impact on a substantial number of small entities. HRCP is the sole entity that would be subject to the requirements in these proposed regulations, and HRCP is not a small governmental jurisdiction, small organization, or small business, as defined by the RFA. Because of this certification, a regulatory flexibility analysis is not required and none has been prepared.

Notwithstanding any other provision of law, no person is required to respond to nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act (PRA) unless that collection of information displays a currently valid OMB control number. This proposed rule contains collection-of-information requirements subject to the provisions of the PRA. These requirements have been approved by OMB under control number 0648–0151 and include applications for regulations, subsequent LOAs, and reports.

List of Subjects in 50 CFR Part 217

Administrative practice and procedure, Alaska, Endangered and threatened species, Exports, Fish, Imports, Indians, Labeling, Marine mammals, Oil and gas exploration, Penalties, Reporting and recordkeeping requirements, Seafood, Transportation, Wildlife.

Dated: December 29, 2020.

Samuel D. Rauch, III,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

For reasons set forth in the preamble, 50 CFR part 217 is proposed to be amended as follows:

PART 217—REGULATIONS GOVERNING THE TAKING AND IMPORTING OF MARINE MAMMALS

■ 1. The authority citation for part 217 continues to read as follows:

Authority: 16 U.S.C. 1361 *et seq.,* unless otherwise noted.

■ 2. Add subpart W to read as follows:

Subpart W—Taking and Importing Marine Mammals Incidental to Hampton Roads Connector Partners Construction at Norfolk, Virginia

Sec.
217.20 Specified activity and geographical region.
217.21 Effective dates.
217.22 Permissible methods of taking.
217.23 Prohibitions.
217.24 Mitigation requirements.
217.25 Requirements for monitoring and reporting.
217.26 Letters of Authorization.
217.27 Renewals and modifications of Letters of Authorization.
217.28–217.29 [Reserved]

Subpart W—Taking and Importing Marine Mammals Incidental to Hampton Roads Connector Partners Construction at Norfolk, Virginia

§ 217.20 Specified activity and geographical region.

(a) Regulations in this subpart apply only to the Hampton Roads Connector Partners (HRCP) and those persons it authorizes or funds to conduct activities on its behalf for the taking of marine mammals that occurs in the areas outlined in paragraph (b) of this section and that occurs incidental to construction activities including marine structure maintenance, pile replacement, and select waterfront improvements at the Hampton Roads Bridge Tunnel Expansion Project (HRBT).

(b) The taking of marine mammals by HRCP may be authorized in a Letter of Authorization (LOA) only if it occurs at the Hampton Roads Bridge Tunnel Expansion project location.

§ 217.21 Effective dates.

Regulations in this subpart are effective from [EFFECTIVE DATE OF THE FINAL RULE] to [DATE 5 YEARS AFTER EFFECTIVE DATE OF THE FINAL RULE].

§ 217.22 Permissible methods of taking.

(a) Under an LOA issued pursuant to §§ 216.106 of this chapter and 217.26, the Holder of the LOA (hereinafter ''HRCP'') may incidentally, but not intentionally, take marine mammals within the area described in § 217.20(b) by Level A and Level B harassment associated with construction activities, provided the activity is in compliance with all terms, conditions, and requirements of the regulations in this subpart and the applicable LOA.

(b) [Reserved]

§ 217.23 Prohibitions.

(a) Except for the takings contemplated in § 217.22 and authorized by an LOA issued under §§ 216.106 of this chapter and 217.26, it is unlawful for any person to do any of the following in connection with the activities described in § 217.20:

(1) Violate, or fail to comply with, the terms, conditions, and requirements of this subpart or a LOA issued under §§ 216.106 of this chapter and 217.26;

(2) Take any marine mammal not specified in such LOA;

(3) Take any marine mammal specified in such LOA in any manner other than as specified;

(4) Take a marine mammal specified in such LOA if NMFS determines such taking results in more than a negligible impact on the species or stocks of such marine mammal; or

(5) Take a marine mammal specified in such LOA if NMFS determines such taking results in an unmitigable adverse impact on the species or stock of such marine mammal for taking for subsistence uses.

(b) [Reserved]

§ 217.24 Mitigation requirements.

(a) When conducting the activities identified in § 217.20(a), the mitigation measures contained in any LOA issued under §§ 216.106 of this chapter and 217.26 must be implemented. These mitigation measures shall include but are not limited to:

(1) A copy of any issued LOA must be in the possession of HRCP, its designees, and work crew personnel operating under the authority of the issued LOA.

(2) HRCP shall conduct briefings for construction supervisors and crews, the monitoring team, and HRCP 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.

(3) For in-water heavy machinery work other than pile driving, if a marine mammal comes within 10 meters (m), HRCP shall cease operations and reduce vessel speed to the minimum level required to maintain steerage and safe working conditions.

(4) For all pile driving activity, HRCP shall implement a minimum shutdown zone of a 10 m radius around the pile. If a marine mammal comes within or approaches the shutdown zone, such operations shall cease.

(5) For all pile driving activity, HRCP shall implement shutdown zones with radial distances as identified in a LOA issued under §§ 216.106 of this chapter and 217.26. If a marine mammal comes within or approaches the shutdown zone, such operations shall cease.

(6) HRCP deploy protected species observers (observers or PSOs) as indicated in its Marine Mammal Monitoring Plan approved by NMFS.

(7) For all pile driving activities, between one and four observers shall be stationed at the best vantage points practicable to monitor for marine mammals and implement shutdown/delay procedures.

(8) Monitoring shall take place from 30 minutes prior to initiation of pile driving activity through 30 minutes post-completion of pile driving activity. Pre-activity monitoring shall be conducted for 30 minutes to ensure that the shutdown zone is clear of marine mammals, and pile driving may commence when observers have declared the shutdown zone clear of marine mammals. In the event of a delay or shutdown of activity resulting from marine mammals in the shutdown zone, animals shall be allowed to remain in the shutdown zone (*i.e.,* must leave of their own volition) and their behavior shall be monitored and documented. If a marine mammal is observed within the shutdown zone, a soft-start cannot proceed until the animal has left the zone or has not been observed for 15 minutes. Monitoring shall occur throughout the time required to drive a pile. If in-water pile installation and removal work ceases for more than 30 minutes, the pre-activity monitoring of the shutdown zones must commence. A determination that the shutdown zone is clear must be made during a period of good visibility (*i.e.,* the entire shutdown zone and surrounding waters must be visible to the naked eye).

(9) If a marine mammal approaches or enters the shutdown zone, all pile driving activities at that location shall be halted. In the event of a delay, the activity may not commence or resume until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or fifteen minutes have passed without re-detection of the animal.

(10) Pile driving activity must be halted upon observation of either a species for which incidental take is not authorized or a species for which incidental take has been authorized but the authorized number of takes has been met, entering or within the harassment zone.

(11) Should environmental conditions deteriorate such that marine mammals within the entire shutdown zone would not be visible (*e.g.,* fog, heavy rain), HRCP shall delay pile driving and removal until observers are confident marine mammals within the shutdown zone could be detected.

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

(i) Independent observers are required;

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

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

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

(v) HRCP must submit PSO CVs for approval by NMFS prior to the beginning of pile driving and drilling.

(13) HRCP shall use soft start techniques for impact pile driving. Soft start for impact driving requires HRCP and those persons it authorizes to provide an initial set of three strikes at reduced energy, followed by a thirty-second waiting period, then two subsequent reduced energy three-strike sets. Soft start shall be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of thirty minutes or longer.

(14) HRCP shall employ bubble curtain systems during impact driving of steel piles except under conditions where the water depth is less than 20 feet in depth. Bubble curtains must meet the following requirements:

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

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

(iii) The bubble curtain must be operated such that there is proper (equal) balancing of air flow to all bubblers.

(iv) HRCP shall require that construction contractors train personnel in the proper balancing of air flow to the bubblers and corrections to the attenuation device to meet the performance standards. This shall occur prior to the initiation of pile driving activities.

(b) [Reserved]

§ 217.25 Requirements for monitoring and reporting.

(a) HRCP shall submit a Marine Mammal Monitoring Plan to NMFS for approval in advance of construction.

(b) HRCP shall deploy observers as indicated in its approved Marine Mammal Monitoring Plan.

(c) Observers shall be trained in marine mammal identification and behaviors. Observers shall have no other construction-related tasks while conducting monitoring.

(d) HRCP shall monitor the Level B harassment zones and Level A harassment zones extending beyond the designated shutdown zones to the extent practicable.

(e) HRCP shall monitor the shutdown zones during all pile driving and removal activities.

(f) HRCP shall submit a draft annual monitoring report to NMFS within 90 work days of the completion of annual marine mammal monitoring. The report must detail the monitoring protocol and summarize the data recorded during monitoring. If no comments are received from NMFS within 30 days, the draft report will constitute the final report. If comments are received, a final report addressing NMFS comments must be submitted within 30 days after receipt of comments. Specifically, the report must include:

(1) Dates and times (begin and end) of all marine mammal monitoring.

(2) 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).

(3) Environmental conditions during monitoring periods (at beginning and end of PSO shift and whenever conditions change significantly), including Beaufort sea state and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon, and estimated observable distance (if less than the harassment zone distance).

(4) 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.

(5) Age and sex class, if possible, of all marine mammals observed.

(6) PSO locations during marine mammal monitoring.

(7) 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).

(8) 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.

(9) Number of marine mammals detected within the harassment zones, by species.

(10) 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.

(11) 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.

(g) In the event that personnel involved in the construction activities discover an injured or dead marine mammal, HRCP shall report the incident to the Office of Protected Resources (OPR) (301–427–8401), NMFS and to the Greater Atlantic Region New England/Mid-Atlantic Regional Stranding Coordinator as soon as feasible. If the death or injury was clearly caused by the specified activity, HRCP must immediately cease the specified activities until NMFS is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of the authorization. HRCP must not resume their activities until notified by NMFS. The report must include the following information:

(1) Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);

(2) Species identification (if known) or description of the animal(s) involved;

(3) Condition of the animal(s) (including carcass condition if the animal is dead);

(4) Observed behaviors of the animal(s), if alive;

(5) If available, photographs or video footage of the animal(s); and

(6) General circumstances under which the animal was discovered.

§ 217.26 Letters of Authorization.

(a) To incidentally take marine mammals pursuant to the regulations in this subpart, HRCP must apply for and obtain an LOA.

(b) An LOA, unless suspended or revoked, may be effective for a period of time not to exceed the expiration date of the regulations in this subpart.

(c) If an LOA expires prior to the expiration date of the regulations in this subpart, HRCP may apply for and obtain a renewal of the LOA.

(d) In the event of projected changes to the activity or to mitigation and monitoring measures required by an LOA, HRCP must apply for and obtain a modification of the LOA as described in § 217.27.

(e) The LOA shall set forth the following information:

(1) Permissible methods of incidental taking;

(2) Means of effecting the least practicable adverse impact (*i.e.,* mitigation) on the species, its habitat, and on the availability of the species for subsistence uses; and

(3) Requirements for monitoring and reporting.

(f) Issuance of the LOA shall be based on a determination that the level of taking will be consistent with the findings made for the total taking allowable under the regulations in this subpart.

(g) Notice of issuance or denial of an LOA shall be published in the **Federal Register** within thirty days of a determination.

§ 217.27 Renewals and modifications of Letters of Authorization.

(a) An LOA issued under §§ 216.106 of this chapter and 217.26 for the activity identified in § 217.20(a) shall be renewed or modified upon request by the applicant, provided that:

(1) The proposed specified activity and mitigation, monitoring, and reporting measures, as well as the anticipated impacts, are the same as those described and analyzed for the regulations in this subpart; and

(2) NMFS determines that the mitigation, monitoring, and reporting measures required by the previous LOA under the regulations in this subpart were implemented.

(b) For LOA modification or renewal requests by the applicant that include changes to the activity or the mitigation, monitoring, or reporting that do not change the findings made for the regulations in this subpart or result in no more than a minor change in the total estimated number of takes (or distribution by species or years), NMFS may publish a notice of proposed LOA in the **Federal Register**, including the associated analysis of the change, and solicit public comment before issuing the LOA.

(c) An LOA issued under §§ 216.106 of this chapter and 217.26 for the activity identified in § 217.20(a) may be modified by NMFS under the following circumstances:

(1) HRCP may modify (including augment) the existing mitigation, monitoring, or reporting measures (after consulting with NMFS regarding the practicability of the modifications) if doing so creates a reasonable likelihood of more effectively accomplishing the goals of the mitigation and monitoring set forth in the regulations in this subpart.

(i) Possible sources of data that could contribute to the decision to modify the mitigation, monitoring, or reporting measures in a LOA:

(A) Results from HRCP's monitoring from previous years.

(B) Results from other marine mammal and/or sound research or studies.

(C) Any information that reveals marine mammals may have been taken in a manner, extent or number not authorized by the regulations in this subpart or subsequent LOAs.

(ii) If, through adaptive management, the modifications to the mitigation, monitoring, or reporting measures are substantial, NMFS will publish a notice of proposed LOA in the **Federal Register** and solicit public comment.

(2) If NMFS determines that an emergency exists that poses a significant risk to the well-being of the species or stocks of marine mammals specified in a LOA issued pursuant to §§ 216.106 of this chapter and 217.26, a LOA may be modified without prior notice or opportunity for public comment. Notice would be published in the **Federal Register** within thirty days of the action.

§§ 217.28–217.29 [Reserved]

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