INCIDENTAL HARASSMENT AUTHORIZATION APPLICATION FOR THE COAST GUARD'S FAST RESPONSE CUTTER HOMEPORTING AND IN-WATER CONSTRUCTION PROJECTS AT MOORINGS SEWARD AND MOORINGS SITKA, ALASKA

SEWARD: October 1, 2024 THROUGH September 30, 2025
SITKA: September 1, 2024 THROUGH August 30, 2025

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June 2024

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ACRONYMS AND ABBREVIATIONS

BMP	Best Management Practice
°C	Celsius
Caltrans	California Department of Transportation
CFR	Code of Federal Regulations
dB	decibel
dBA	A-weighted sound level
DPS	Distinct Population Segment
DTH	down-the-hole
EA	Environmental Assessment
ESA	Endangered Species Act
°F	Fahrenheit
FR	Federal Register
FRC	Fast Response Cutter
ft	feet
Hz	hertz
IHA	Incidental Harassment Authorization
kHz	kilohertz
km	kilometer(s)
km^2	square kilometer(s)
m	meter(s)
MLLW	mean lower low water
MMPA	Marine Mammal Protection Act
µPa	microPascal
NAVFAC	Naval Facilities Engineering Systems Command
Navy	U.S. Department of the Navy
NEPA	National Environmental Policy Act
N_{min}	Minimum abundance
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Service
Pa	Pascal
PSO	Protected Species Observer
PTS	permanent threshold shift
RMS	root mean square
s	second(s)
SEL	sound exposure level
SMIC	Seward Marine Industrial Center
SPL	sound pressure level
SPL_{PEAK}	peak sound pressure level
TL	transmission loss
TTS	temporary threshold shift
re 1 µPa	referenced to 1 microPascal
U.S.	United States
USCG	US Coast Guard
USCGC	US Coast Guard Cutter
USFWS	U.S. Fish and Wildlife Service
WLB	Seagoing Buoy Tender
yds	yards

EXECUTIVE SUMMARY

In accordance with the Marine Mammal Protection Act (MMPA) of 1972, as amended, the United States (U.S.) Coast Guard (USCG) is applying for Incidental Harassment Authorizations (IHAs) from National Oceanic and Atmospheric Administration's (NOAA's) National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) for activities associated with two in-water construction projects at USCG's Seward and Sitka mooring facilities.

Project activities at Seward will include:

- Reconfiguration of the Seward Marine Industrial Center (SMIC) floating dock to allow construction of new USCG Fast Response Cutter (FRC) moorings. In-water work is expected to require the removal of up to 10 existing guide piles, assumed to be steel, either by vibratory extraction or cutting at the mud line with a pile clipper or diamond saw. Additionally, up to 10 new guide piles assumed to be approximately 30 inches in diameter and composed of concrete or steel pipe will be installed.
- Installation of new dock including up to 20 guide piles assumed to be no greater than 30 inches in diameter and composed of concrete or steel pipe.

Project activities at Sitka will include:

- Removal of existing mooring dolphin at west end of existing pier, assumed to include up to four concrete piles by vibratory extraction.
- Removal of existing City-owned float including up to six 14-inch timber guide piles. Subsequent reinstallation of the City-owned float including installation of six 14-inch timber guide piles elsewhere in Sitka Harbor.
- Construction of new WLB pier including installation of 105 concrete structure piles approximately 30 inches in diameter and 54 13-inch plastic fender piles.
- Installation of new FRC floating dock including 10 concrete guide piles approximately 30 inches in diameter.
- Installation of new mooring dolphin supported by three approximately 30-inch concrete piles.

This IHA application has been prepared to support the USCG's planned in-water projects at both Moorings Seward and Moorings Sitka, Alaska. For these paired IHA applications, a description of the individual in-water construction activities at each project site is included to support the development of individual IHAs specific to each project. The two projects are presented in a combined submittal to facilitate NMFS review because both projects are USCG actions with similar project activities and anticipated construction methods (i.e., pile removal or installation) with similar species and stocks of marine mammals expected to occur at both locations. It is anticipated that because the projects will occur at different times, approval and start of work for one project is not contingent upon the approval and start of work for the other project, separately issued IHAs and associated notices in the Federal Register and public review periods may be necessary or more expedient.

Thirteen species of marine mammals[1] were included in this analysis to determine if they could be exposed to sound pressure levels (SPLs) and sound exposure levels (SELs) in exceedance of NMFS and USFWS standards associated with installation of new piles to support new floating docks as planned at Seward and Sitka (see each species description in Section 4 for site-specific occurrences):

- Steller sea lion (*Eumetopias jubatus*) – Eastern and Western Stocks
- Northern fur seal (*Callorhinus ursinus*) – Eastern Pacific Stock
- Harbor seal (*Phoca vitulina richardii*) – Prince William Sound and Sitka/Chatham Strait Stocks
- Killer whale (*Orcinus orca*) – Alaska Resident; Gulf of Alaska, Aleutian Islands, and Bering Sea Transient; Northern Resident; and West Coast Transient Stocks
- Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) – North Pacific Stock
- Harbor porpoise (*Phocoena phocoena*) – Yakutat/Southeast Alaska Offshore Waters and Gulf of Alaska Stocks
- Dall's porpoise (*Phocoenoides dalli*) – Alaska Stock
- Sperm whale (*Physeter macrocephalus*) – North Pacific Stock
- Humpback whale (*Megaptera novaeangliae*) – Hawaii and Mexico-North Pacific Stocks
- Gray whale (*Eschrichtius robustus*) – Eastern North Pacific Stock
- Fin whale (*Balaenoptera physalus*) – Northeast Pacific Stock
- Minke whale (*Balaenoptera acutorostrata*) – Alaska Stock
- Northern sea otter (*Enhydra lutris kenyoni*) – Southeast Alaska and Southcentral Alaska Stocks

The current USCG Moorings Seward is located within the City of Seward Harbor while the SMIC (where the new Moorings will be constructed) is located approximately 3.5 miles southeast of Seward Harbor on the east side of Resurrection Bay. The SMIC currently occupies approximately 200 acres on the eastern shore of Resurrection Bay and maintains an enclosed basin protected by rip-rap seawall with a floating dock. In-water activities at the Seward SMIC that are assessed in this IHA that generate underwater noise that my result in injury or harassment of marine mammals are assumed to include:

- Reconfiguration of the Seward Marine Industrial Center (SMIC) floating dock to allow construction of new USCG Fast Response Cutter (FRC) moorings. In-water work is expected to require the removal of up to 10 existing guide piles, assumed to be steel, either by vibratory extraction or cutting at the mud line with a pile clipper or diamond saw. Additionally, up to 10 new guide piles assumed to be no greater than 30 inches in diameter and composed of concrete or steel pipe will be installed.
- Installation of new dock including up to 20 guide piles assumed to be no greater than 30 inches in diameter and composed of concrete or steel pipe.

USCG Moorings Sitka is located on the northeast side of Japonski Island within Sitka Harbor. Japonski Island is also home to Sitka-Rocky Gutierrez Airport, USCG Air Station Sitka, and the University of Alaska-Southeast. The existing mooring at Sitka houses an existing 3,365-sf Cutter Support Building consisting of an approximately 1,967-sf boat maintenance/shop space and 1,398 sf of space for personnel support. The USCG project entails development of a new pier providing including utility connections for the existing WLB with an attached floating dock for the Sentinel FRC. The pier will provide utilities and hotel services as well as a 50- by 50-foot crane hardstand and a

[1] All marine mammal species considered in this application are managed under the jurisdiction of the NMFS except for the Northern sea otter, which is managed under the jurisdiction of the USFWS.

small boat bay. These services maintain the existing WLB pier, allowing the USCGC Kukui to remain in berth during construction activities. In-water activities at USCG Moorings Sitka assessed in this application that are anticipated to generate underwater noise that may result in injury or harassment of marine mammals are assumed to include:

- Removal of existing mooring dolphin at west end of existing pier, assumed to include up to four concrete piles by vibratory extraction.
- Removal of existing City-owned float including up to six 14-inch timber guide piles. Subsequent reinstallation of the City-owned float including installation of six 14-inch timber guide piles elsewhere in Sitka Harbor.
- Construction of new 26,300-sf WLB pier (17,550-sf pier and 8,750 sf of approach pier and gangways) including installation of 105 concrete structure piles approximately 30 inches in diameter and 54 13-inch plastic fender piles.
- Installation of new 3,600-sf concrete FRC floating dock including 10 concrete guide piles approximately 30 inches in diameter.
- Installation of new mooring dolphin supported by three approximately 30-inch concrete piles.

The projects are needed to provide adequate vessel berthing capability, including water depth, to support modern USCG cutters and ultimately, readiness as part of the USCG's overall mission. In this joint IHA/ITR application, the USCG has used NMFS Technical Guidance (NMFS, 2018) and User Spreadsheet (NMFS, 2020), and acoustic data recorded during similar in-water pile installation activities in Alaska and elsewhere on the US West Coast Caltrans (2020) to identify the Level A (injury) and Level B (behavior) zones that would result from pile installation, as outlined in Section 6 and presented in Table ES-1. Empirically measured source levels from similar events as reported in the were used to estimate sound source levels for this project. Source levels for in-water demolition and construction activities are typically measured at 10 meters (m) (33 feet [ft]) from a pile in order to standardize sound measurement data. For all activities that generate underwater noise, sound transmission loss is estimated using the simple spreading loss model. Ambient underwater sound levels for the project area are used as appropriate in the analysis.

The Project will include continued observational monitoring of marine mammal occurrences within established harassment zones. Because a single marine mammal monitor may be unable to monitor a specific Level A shutdown zone due to its size, additional monitors may be employed to ensure full coverage of the activity-specific Level A shutdown zone. Additionally, sound transmission at Moorings Seward will be constrained within the SMIC basin as shielded by a rip-rap seawall and at Moorings Sitka by the limited width of Sitka Harbor and will permit pre-activity monitoring of the Level A shutdown zone and will allow the monitor to "clear" the area and then serve as a "gatekeeper" during noise-generating activities to provide early warning and shutdown notifications should a noise-sensitive marine mammal approach the shutdown zone. For instance, underwater noise from rock socket drilling will be restricted along the axis of the Sitka Harbor which limits the extent of the ensonified area where impacts to marine mammals may occur. Therefore, pre-activity and in-process monitoring by protected species monitors located at the entrances to Sitka Harbor will be able to detect marine mammals approaching the Harbor and could communicate a shutdown order if it appeared that the animal would continue towards Moorings Sitka. This will allow for the prevention of takes of marine mammals to the extent practicable.

Pursuant to the MMPA Section 101(a)(5)(D)[2], the USCG submits this application to the NMFS for two separate IHAs for the incidental, but not intentional, request for:

- Moorings Seward during a single year beginning October 1, 2024 and ending September 30, 2025:
    - NMFS – take of 114 NMFS-managed marine mammals by Level A harassment and 1,157 marine mammals by Level B harassment.; and
    - USFWS – take of 0 USFWS-managed northern sea otters by Level A harassment and 116 northern sea otters by Level B Harassment.
- Moorings Sitka during a single year beginning September 1, 2024 and ending August 30, 2025:
    - NMFS – take of 43 NMFS-managed marine mammals by Level A harassment and 959 marine mammals by Level B harassment; and,
    - USFWS – take of 0 USFWS-managed northern sea otters by Level A harassment and 174 northern sea otters by Level B harassment.

The anticipated take of marine mammals will be in the form of non-lethal, temporary harassment behavioral disturbance and is expected to have a negligible impact on the species. Each of the one-year project windows may be individually restricted to prevent impacts to marine mammals to comply with specific requirements of regulatory agencies (e.g., work at Sitka may be restricted from March 1 to May 31, 2025 to prevent impacts to herring spawning). If in-water activities are not completed within the anticipated one-year, project window from September 1, 2024 to August 30, 2025 at Sitka and October 1, 2024 to September 30, 2025 at Seward, a request for renewal will be submitted and received by NMFS no later than 60 days prior to the expiration of these individual IHAs. The renewal request will include an explanation that the activities to be conducted under the requested renewal are identical to the activities analyzed under the initial, site-specific IHA, are a subset of the activities, or include changes so minor that the changes do not affect the previous analyses, mitigation and monitoring requirements, or take estimates (with the exception of reducing the type or amount of take because only a subset of the initially analyzed activities remain to be completed under the renewal). The renewal request will also include a preliminary monitoring report showing the results of required monitoring to date and an explanation showing that the monitoring results do not indicate impacts of a scale or nature not previously analyzed or authorized.

Regulations governing the issuance of incidental take under certain circumstances are codified at 50 Code of Federal Regulations (CFR) Part 216, Subpart I (Sections 216.101 – 216.108). Section 216.104 sets out 14 specific items that must be addressed in requests for take pursuant to Section 101 (a) (5) (D) of the MMPA. These 14 items are addressed in Sections 1 through 14 of this IHA application.

[2] 16 U.S.C. § 1371(a)(5); 50 CFR Part 216, Subpart I.

1 DESCRIPTION OF ACTIVITIES

A detailed description of the specific activity or class of activities that can be expected to result in incidental taking of marine mammals.

1.1 Introduction

Pursuant to the Marine Mammal Protection Act (MMPA) of 1972, as amended in 1994, Section 101(a)(5)(D), the United States (U.S.) Coast Guard (USCG) submits this application to the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) and United States Fish and Wildlife Service (USFWS) for Incidental Harassment Authorizations (IHAs) for the incidental taking of marine mammal species during in-water demolition and construction activities associated with two in-water work projects at USCG facilities: one at Moorings Seward and one at Moorings Sitka (Figures 1-1 and 1-2), Alaska. This application is intended to cover in-water pile removal and installation that may result in takes of marine mammals for the one-year period between July 1, 2024 and June 30, 2025 at Sitka and August 1, 2024 and July 31, 2025 at Seward, with an estimated maximum of 22 days of in-water activities at Moorings Seward and 117 days of activity at Moorings Sitka during the individual one year permit periods for the two projects.

Project activities at Seward will include:

- Reconfiguration of the Seward Marine Industrial Center (SMIC) floating dock to allow construction of new USCG Fast Response Cutter (FRC) moorings. In-water work is expected to require the removal of up to 10 existing guide piles, assumed to be steel, either by vibratory extraction or cutting at the mud line with a pile clipper or diamond saw. Additionally, up to 10 new guide piles assumed to be approximately 30 inches in diameter and composed of concrete or steel pipe will be installed.
- Installation of new dock including up to 20 guide piles assumed to be no greater than 30 inches in diameter and composed of concrete or steel pipe.

Project activities at Sitka will include:

- Removal of existing mooring dolphin at west end of existing pier, assumed to include up to four concrete piles by vibratory extraction.
- Removal of existing City-owned float including up to six 14-inch timber guide piles. Subsequent reinstallation of the City-owned float including installation of six 14-inch timber guide piles elsewhere in Sitka Harbor.
- Construction of new WLB pier including installation of 105 concrete structure piles approximately 30 inches in diameter and 54 13-inch plastic piles.
- Installation of new FRC floating dock including 10 concrete guide piles approximately 30 inches in diameter.
- Installation of new mooring dolphin supported by three approximately 30-inch concrete piles.

This IHA application has been prepared to support the USCG's planned in-water projects at both Moorings Seward and Moorings Sitka, Alaska. For these paired IHA applications, a description of the

individual in-water construction activities at each project site is included to support the development of individual IHAs specific to each project.

The two projects are presented in a combined submittal to facilitate NMFS and USFWS review because both projects are USCG actions with similar project activities and anticipated methods with similar species and stocks of marine mammals expected to occur at both locations. It is anticipated that because the projects will occur at different times, approval and start of work for one project is not contingent upon the approval and start of work for the other project, separately issued IHAs and associated notices in the Federal Register and public review periods may be necessary or more expedient.

The USCG prepared individual National Environmental Policy Act (NEPA) compliant Environmental Assessments (EAs) in support of the in-water construction activities at Moorings Seward and Moorings Sitka, Alaska. Descriptions of the individual USCG facilities (Moorings Seward and Sitka) and in-water construction activities included in this IHA are based on the Proposed Action analyzed in the USCG EAs.

Code of Federal Regulations (CFR) 50 216.104 sets out 14 specific items that must be included in requests for take pursuant to Section 101(a)(5)(A) of the MMPA. Those 14 items are addressed in Sections 1 through 14 of this joint IHA. If in-water demolition and installation activities at both facilities do not occur within the year anticipated, a request for renewal will be submitted to NMFS no later than 60 days prior to expiration of this IHA. The renewal request will include an explanation that the activities to be conducted under the requested renewal are identical to the activities analyzed under the initial IHA, are a subset of the activities, or include changes so minor that the changes do not affect the previous analyses, mitigation and monitoring requirements, or take estimates (with the exception of reducing the type or amount of take because only a subset of the initially analyzed activities remain to be completed under the Renewal). The Renewal request will also include a preliminary monitoring report showing the results of the required monitoring completed to date and an explanation showing that the monitoring results do not indicate impacts of a scale or nature not previously analyzed or authorized.

1.2 Project Activities

The two in-water projects are roughly similar in their design and approach, including in-water pile driving activities necessary to install a floating dock to support a new FRC at both Moorings Seward and Sitka. Both projects are expected to require pile installation via drilling of rock sockets and then inserting piles into sub-surface sockets. The two projects are expected to differ based on the size of the individual floating docks that will govern the total number of piles necessary to support each facility as described below.

1.2.1 Seward

Currently, USCG presence at Moorings Seward is located on an existing dock owned by, and leased from, the City of Seward on the eastern side of Seward Boat Harbor.

The USCG is proposing to construct shoreside facilities and associated infrastructure to homeport one FRC located in the SMIC. Specific to this application, the project will include in-water construction of a new FRC floating dock. The new FRC floating dock will be constructed parallel to the existing SMIC dock.

In-water activities at the Seward SMIC assessed in this application that are anticipated to generate underwater noise that may result in injury or harassment of marine mammals are assumed to include:

- Reconfiguration of the Seward Marine Industrial Center (SMIC) floating dock to allow construction of new USCG Fast Response Cutter (FRC) moorings. In-water work is expected to require the removal of up to 10 existing guide piles, assumed to be steel, either by vibratory extraction or cutting at the mud line with a pile clipper or diamond saw. Additionally, up to 10 new guide piles assumed to be approximately 30 inches in diameter and composed of concrete or steel pipe will be installed.
- Installation of new dock including up to 20 guide piles assumed to be no greater than 30 inches in diameter and composed of concrete or steel pipe.

1.2.2 Sitka

The shoreside and in-water cutter facilities at Moorings Sitka currently occupy a 1.13-acre upland site with adjacent waterside structures along Seward Avenue on the southeastern shore of Japonski Island. Currently, only one dock is present at Moorings Sitka and supports USCG Cutter (USCGC) Kukui (WLB-203).

The USCG plans to homeport a new FRC at Moorings Sitka; this will require the construction of a new floating dock attached to the existing pier.

In-water activities at USCG Moorings Sitka assessed here that generate underwater noise that may result in injury or harassment of marine mammals are assumed to include:

- Removal of existing mooring dolphin at west end of existing pier, assumed to include up to four concrete piles by vibratory extraction.
- Removal of existing City-owned float including up to six 14-inch timber guide piles. Subsequent reinstallation of the City-owned float including installation of six 14-inch timber guide piles elsewhere in Sitka Harbor.
- Construction of new WLB pier including installation of 105 concrete structure piles approximately 30 inches in diameter and 54 13-inch plastic piles.
- Installation of new FRC floating dock including 10 concrete guide piles approximately 30 inches in diameter.
- Installation of new mooring dolphin supported by three approximately 30-inch concrete piles.

The projects are needed to provide adequate vessel berthing capability, including water depth, to support modern USCG cutters and ultimately, readiness as part of the USCG's overall mission.

While the projects will directly support homeporting new cutters at Moorings Seward and Sitka, ongoing fuel loading, vessel maintenance, and other shoreside activities at these facilities will not be altered. These actions have been analyzed in recent EAs (USCG 2023a; USCG 2023b). Therefore, fuel loading and other shoreside operations associated with the projects are not addressed in this application, which is limited to in-water demolition and installation activities.

Figure 1-1 Seward Proposed Project Location

Figure 1-2 Sitka Proposed Project Location

1.3 Description of Activities

In-water work at both facilities will require the removal of existing in-water infrastructure followed by the installation of the new infrastructure necessary to support the USCG missions at each facility, namely the homeporting of a new FRC at each location. The USCG is proposing to construct shoreside facilities and associated infrastructure at Moorings Seward to homeport one FRC located in the SMIC boat basin and demolishing and constructing shoreside facilities at Moorings Sitka in Sitka Harbor. Specific to this application, the projects will include in-water construction of a new FRC floating dock. The new FRC floating dock will be constructed parallel to the existing SMIC dock.

Moorings Seward

In-water activities at USCG Moorings Seward assessed here that are anticipated to generate underwater noise that may result in injury or harassment of marine mammals are assumed to include:

- Reconfiguration of the Seward Marine Industrial Center (SMIC) floating dock to allow construction of new USCG Fast Response Cutter (FRC) moorings. In-water work is expected to require the removal of up to 10 existing guide piles, assumed to be steel, either by vibratory extraction or cutting at the mud line with a pile clipper or diamond saw. Additionally, up to 10 new guide piles assumed to be approximately 30 inches in diameter and composed of concrete or steel pipe will be installed.
- Installation of new dock including up to 20 guide piles assumed to be no greater than 30 inches in diameter and composed of concrete or steel pipe.

Moorings Sitka

In-water activities at USCG Moorings Sitka assessed here that are anticipated to generate underwater noise that may result in injury or harassment of marine mammals are assumed to include:

- Removal of existing mooring dolphin at west end of existing pier, assumed to include up to four concrete piles by vibratory extraction.
- Removal of existing City-owned float including up to six 14-inch timber guide piles. Subsequent reinstallation of the City-owned float including installation of six 14-inch timber guide piles elsewhere in Sitka Harbor.
- Construction of new WLB pier including installation of 105 concrete structure piles approximately 30 inches in diameter and 54 13-inch plastic piles.
- Installation of new FRC floating dock including 10 concrete guide piles approximately 30 inches in diameter.
- Installation of new mooring dolphin supported by three approximately 30-inch concrete piles.

Section 2 provides more specific detail on the methods to be used during the period of this joint IHA. Generally, demolition activities will be conducted first. These activities will be followed by installation of structural and guide piles. Next, floating docks will be installed around the guide piles. Piers will then be built on top of the installed piles, and fender piles will be installed as needed. Once the floating dock and/or pier decking is installed, ancillary infrastructure (i.e., electricity, water, sewage, communications) will be installed to service the docked cutter(s).

The contractor may stage equipment and material on barges within the SMIC boat basin or Sitka Harbor waterfront as necessary. During in-water demolition and construction activities, floating stick bar booms will be deployed around the active work area to provide a complete barrier to floating debris. Any floating debris will be gathered in work boats and disposed of or recycled as appropriate.

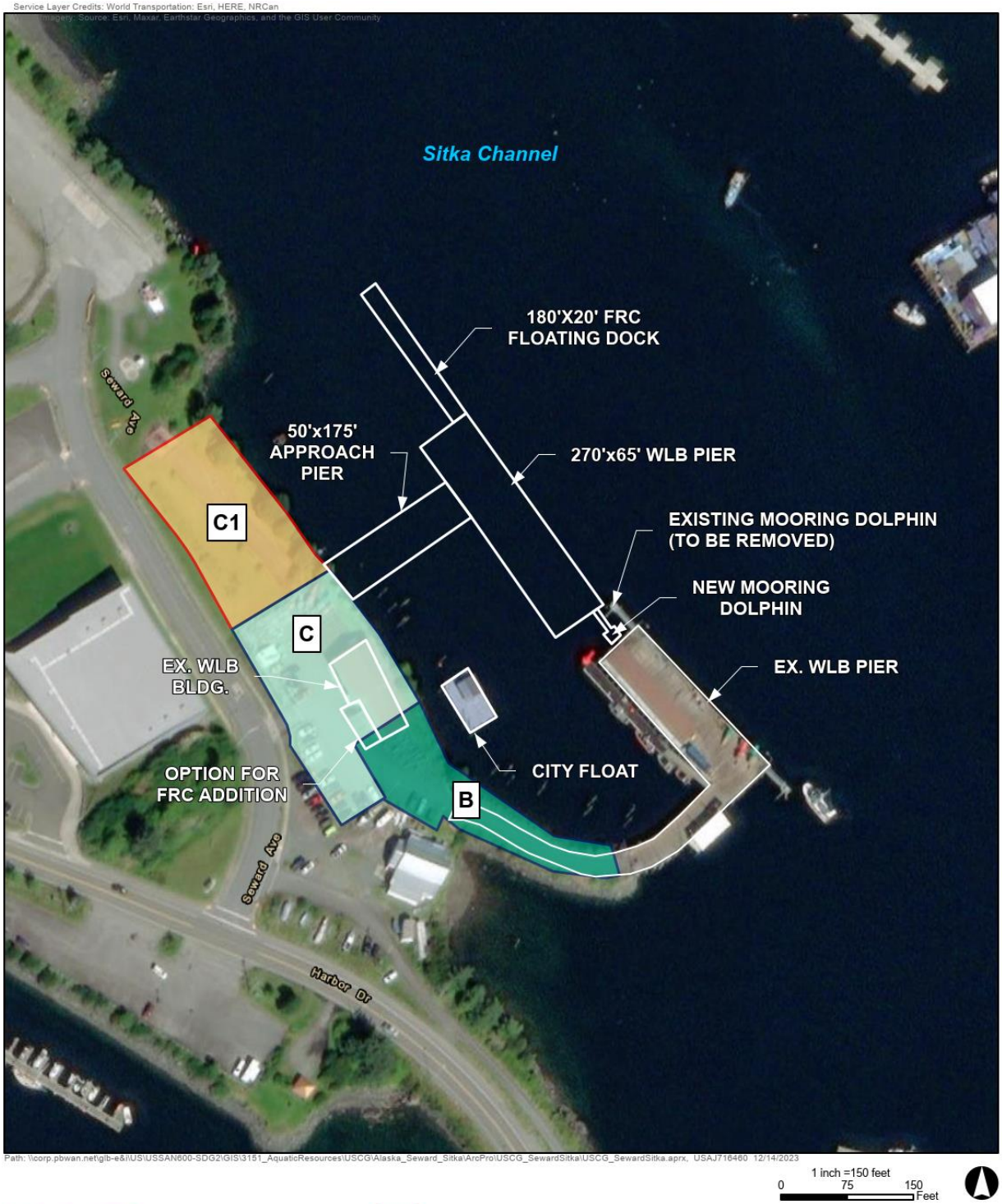
1.4 Best Management Practices, Mitigation, and Minimization Measures

Section 11 describes the general Best Management Practices (BMPs), mitigation, and minimization measures that may be implemented for all in-water activities. BMPs are routinely used by the USCG during pile installation activities to avoid and minimize potential environmental impacts. Additional minimization measures have been added to protect marine mammals as described in Section 11.

Figure 1-3 Seward Proposed Project Components

Seward Proposed Project Overview
Proposed USCG Moorings Seward
Seward, Alaska

Figure 1-4 Sitka Proposed Project Components



2 DATES, DURATION, AND LOCATION OF ACTIVITIES

The dates and duration of such activity and the specific geographical region where it will occur.

2.1 Introduction

In-water construction activities at Seward and Sitka will occur at different times depending upon availability of funding, contractors, and completion of relevant, separate permitting efforts. The expected duration and location of activities at USCG Seward and Sitka are discussed below.

2.2 General Dates for Construction Activity

The overall duration of each project is one year (i.e., one Alaskan construction season). During the one-year authorization period, in-water construction activities will be minimized, to the extent practicable, during sensitive seasons for protected species to reduce the potential for seasonally-present marine mammal species to occur.

2.3 General Duration of Typical Construction Activities

The daily duration of in-water construction activities at each USCG facility will vary based on the type of activity being conducted and the daylight hours available. In winter months, shorter (7- to 10-hour) workdays are anticipated based on reduced daylight. In the early fall and late spring, longer workdays of up to 14 hours are anticipated. While work may occur during these hours, not all activity conducted during a workday will generate in-water noise.

To the extent practicable, in-water construction activities will only be conducted when sufficient light is available for visual observations (generally 30 minutes after sunrise and up to 45 minutes before sunset) (see Section 11 for detailed discussion of monitoring and mitigation measures). Work may not begin without sufficient daylight to conduct pre-activity monitoring, and may extend up to 3 hours past sunset, as needed, to either completely remove an in-process pile or to embed a new pile far enough to safely leave piles in place until removal or installation can resume the next possible day. This is because, during the winter, the shortest days comprise approximately 7 hours of daylight; however, a portion of those daylight hours consist of civil twilight, and it may become lighter later and darker earlier due to surrounding topography and cloudy conditions at either facility. Daylight is needed for safe setup of operations and clear observation of marine mammal shutdown zones designated to prevent impacts to marine mammals to allow pile removal or installation to begin a few hours after sunrise. When available daylight is reduced, this results in the contractor potentially being unable to either fully remove or install a pile to a stable point during a single day while also meeting standard, post-activity monitoring requirements. The construction contractor cannot leave equipment in place overnight due to safety concerns that include large tidal variations. As such, it may be necessary to fully embed a pile before leaving it overnight.

On any given day, the construction contractor may elect to use any/all available pile removal or installation methods (i.e., vibratory extraction, pile cutting/clipping, down-the-hole drilling (DTH), vibratory settling, and impact proofing). Any method, or combination of methods, may occur on the same day, but not at the same time. Only one pile will be removed or installed at any given time during a given day at each facility, limiting in-water noise generation to a single source. The exact pile removal and installation equipment for each component at the separate facilities is unknown

at this time and is dependent on the construction contractor selected as part of the public bid process.

During in-water demolition and construction activities, protected species observers will monitor:

- Physical interaction shutdown zone to prevent direct contact of project equipment and marine mammals;
- Designated Level A Shutdown Zones where if a marine mammal enters the zone, in-water work will cease; and
- Designated Level B Harassment Zones where presence of marine mammals will be documented and included in required reporting to NMFS and USFWS.

2.4 Nearshore Operation of FRCs

Implementation of both projects will involve nearshore operations and maintenance of one FRC to be homeported at Moorings Seward within the SMIC and one FRC to be homeported at Moorings Sitka within Sitka Harbor. Typical FRC activity will include 3-week operational periods followed by 3-week maintenance periods.

During the 3-week operational period, the FRC will return to the floating dock at the SMIC (Moorings Seward) or the pier and floating dock in Sitka Harbor (Moorings Sitka) approximately every 5 days. FRCs will ingress and egress at speeds not exceeding 15 knots with a full bridge team monitoring navigation and environmental conditions. Additionally, crew members will be on deck monitoring the surroundings. Once outside of the nearshore environment in Resurrection Bay (Seward) or Sitka Harbor (Sitka) and within its Area of Operation, the FRC will conduct missions that include port, waterways, and coastal security, fishery patrols, search and rescue, and national defense.

When FRCs return to the assigned homeports during maintenance periods, the vessel will undergo corrosion prevention and hull preservation to include preparation, priming, and painting of steel and aluminum structures. The FRCs will also undergo engineering maintenance repairs including repairs to machinery, crane operations, oil changes, hot work, electrical work, and parts replacement as needed. The FRCs will typically be refueled by commercial trucks.

FRC operations are not anticipated to be covered under the individual one-year IHAs for in-water demolition and construction as operations will continue for the life of the individual FRCs beyond the temporal scope of the IHAs and do not constitute military readiness activity as defined in Section 315 of Public Law 107-314.

2.5 USCG Moorings Seward

2.5.1 Dates and Duration of Activities

It is assumed that in-water activities within the SMIC boat basin will follow a general pathway beginning with demolition of the existing floating dock and removal any guide pile(s) and installation of guide piles through the reconfigured dock and new floating dock. Installation of utilities and other service hook-ups will occur after installation of the floating dock and not in-water to the degree that they are likely to generate underwater noise. Finally, the new FRC will arrive following completion of construction activities. For this analysis, demolition activities are assumed to include the removal of 10 existing piles, assumed to be steel via vibratory extraction, pile clipping, or pile cutting at a rate of 5 piles per day (Table 2-1).

Table 2-1 Pile Removal Methods and Durations at USCG Moorings Seward

Removal Method	Duration	Piles Removed / Day	Estimated Days
Vibratory pile extraction	30 minutes	5	2
Pile clipping	622 seconds	5	
Diamond wire saw	930 seconds	5	

In-water construction activities necessary to install the new floating dock and reconfigure the existing pier include installation of a total of 30 concrete guide piles approximately 30 inches in diameter. Based on previous pile installation projects in Alaska (i.e., USCG Base Ketchikan floating dock), it is assumed that piles will be installed directly into the bedrock to the required depth. Installation of a single concrete pile will require the following three-part sequence: up to three hours of DTH (rock socketing) drilling to create a socket in the bedrock followed by 10 minutes using a vibratory pile driver to settle the pile into its socket, and finally proofing the pile using 5 "taps" from an impact driver to ensure that the pile is fully embedded (Table 2-2). This three-part sequence is expected to occur twice a day during installation of guide piles but the total work period is buffered with five additional days of pile installation for a total of 22 days of in-water work to account for days where fewer than the planned two piles can be installed due to weather, timing, etc.

Table 2-2 Pile Installation Methods and Durations at USCG Moorings Seward

Installation Method	Duration/Impacts Per Pile	Piles Driven / Day	Estimated Days	Buffered Days (+5)
Rock socket drilling	180 minutes	2	15	20
Vibratory pile settling	10 minutes	2		
Impact pile proofing	5 impacts	2		

2.5.2 Project Area Description

The current USCG Moorings Seward is located within the City of Seward Harbor while the SMIC (where the new Moorings will be constructed) is located approximately 3.5 miles southeast of Seward Harbor on the east side of Resurrection Bay. The SMIC currently occupies approximately 200 acres on the eastern shore of Resurrection Bay and maintains an enclosed basin protected by rip-rap seawall with a floating dock.

2.5.2.1 Bathymetric Setting and Tidal Range

Depths in the vicinity of the SMIC are dredged to an approximate depth of -21 feet below mean lower low water (MLLW) in the boat basin and up to -25 feet MLLW at the North Dock.

2.6 USCG Moorings Sitka

2.6.1 Dates and Duration of Activities

It is assumed that in-water activities at USCG Moorings Sitka will follow a general pathway beginning with demolition of the existing mooring, removal of the City-owned float, installation of new pier structural and fender piles, installation of guide piles through the new floating dock, and reinstallation of the City-owned float. Installation of utilities and other service hook-ups will occur after installation of the floating dock and will not occur in-water so they will not generate underwater noise. Finally, the new FRC will arrive following completion of construction activities.

For this analysis, demolition activities are assumed to include including removal of the existing mooring dolphin (up to four concrete piles) and removal of existing City-owned float (up to six timber piles) by vibratory extraction, pile clipping, or pile cutting at a maximum rate of 5 piles per day (Table 2-3).

Table 2-3 Pile Removal Methods and Durations at USCG Moorings Sitka

Removal Method	Duration	Piles Removed / Day	Estimated Days
Vibratory pile extraction	30 minutes	5	2
Pile clipping	622 seconds	5	1
Diamond wire saw	930 seconds		

In-water construction activities necessary to install the new WLB pier include installation of 105 concrete structural piles approximately 30 inches in diameter and 54 13-inch plastic fender piles; installation of a floating dock with 10 concrete guide piles approximately 30 inches in diameter, installation of a new mooring dolphin including 3 piles approximately 30 inches in diameter, and reinstallation of the City-owned float including six 14-inch timber guide piles. Based on previous pile installation projects in Alaska (i.e., USCG Base Ketchikan floating dock), it is assumed that piles will be installed directly into the bedrock to the required depth. Installation of a single pile will require the following three-part sequence to occur: up to 3 hours of DTH drilling to create a socket in the bedrock followed by 10 minutes using a vibratory pile driver to settle the pile into its socket, and finally proofing the pile using 5 "taps" from an impact drive to ensure that the pile is fully embedded (Table 2-4). This three-part sequence would occur twice a day during concrete structure and guide pile installation to install two piles per day over the course of 59 days but the total work period is buffered with 25 additional days of pile installation for a total of 117 days of in-water work to account for days where fewer than the planned two piles can be installed due to weather, timing, etc.

Table 2-4 Pile Installation Methods and Durations at USCG Moorings Sitka

Installation Method	Duration /Impacts Per Pile	Piles Driven / Day	Estimated Days	Buffered Days (+25)
Impact drive plastic fender piles	100 impacts	2	27	27
Impact drive timber guide piles	160 impacts	2	3	3
Rock socket drilling	180 minutes	2	59	84
Vibratory pile installation	10 minutes	2		
Impact driving pile proofing	5 impacts	2		

2.6.2 Project Area Description

The Sitka Mooring facility is located near Sitka Harbor on the Sitka Channel separating Japonski Island from the larger Baranof Island. The Sitka Channel connects the Eastern Anchorage southeast of Sitka to the Western Anchorage northwest of the town. Beyond USCG vessels including the *USCGC Anacapa*, typical vessel traffic within the Sitka Channel includes private watercraft, commercial fishing vessels, and seaplanes.

2.6.2.1 Bathymetric Setting and Tidal Range

The bathymetry of the narrow Sitka Channel, less than 1,000 ft wide at points, is steep at the sides and reaches approximately 30 ft MLLW at the end of the pier where the Moorings facility is located.

3 MARINE MAMMAL SPECIES AND NUMBERS

The species and numbers of marine mammals likely to be found within the activity area.

Due to the likely presence of marine mammals in the vicinity of the new Moorings Seward at the SMIC in Resurrection Bay and at Moorings Sitka in Sitka Harbor, underwater sound generated by pile removal and installation activities associated with the projects are anticipated to potentially result in harassment exposures of marine mammals.

Selection of the 13 species at Seward and Sitka reviewed in this application is based on NMFS Alaska Marine Mammal Stock Assessments (Young et al. 2022; Muto et al. 2020) and USFWS Stock Assessments for the northern sea otter (USFWS 2023a; USFWS 2023b), including the estimated minimum populations of each designated stock of marine mammals that have the potential to occur in the vicinity of the two facilities (Table 3-1 and Table 3-2). Section 4 provides descriptions of the following species: Stellar sea lion (*Eumetopias jubatus*), northern fur seal (*Callorhinus ursinus*), harbor seal (*Phoca vitulina richardii*), killer whale (*Orcinus orca*), Pacific white-side dolphin (*Lagenorhynchus obliquidens*), harbor porpoise (*Phocoena phocoena*), Dall's porpoise (*Phocenoides dalli*), sperm whale (*Physeter macrocephalus*), humpback whale (*Megaptera novaeangliae*), gray whale (*Eschrichtius robustus*), fin whale (*Balaenoptera physalus*), minke whale (*Balaenoptera acutorostrata*), and northern sea otter (*Enhydra lutris kenyoni*). The Project action areas for marine mammals are determined by the limits of potential effects, which in this case are defined by acoustic injury or behavioral harassment zones (see Section 6).

Table 3-1 Marine Mammals with Potential to Occur in Vicinity of USCG Moorings Seward

Species	Stock	ESA Status	MMPA Status	Abundance (N_{est})	Distribution
Family Otariidae					
Steller sea lion (*Eumetopias jubatus*)	Western Stock	Endangered	Depleted	49,837	N/A
Family Phocidae					
Harbor seal (*Phoca vitulina richardii*)	Prince William Sound Stock	Not Listed	Protected	44,756	N/A
Family Delphinidae					
Killer whale (*Orcinus orca*)	Alaska Resident Stock	Not Listed	Protected	1,920	N/A
	Gulf of Alaska, Aleutian Islands, and Bering Sea Transient Stock	Not Listed	Protected	587	N/A
Pacific white-sided dolphin (*Lagenorhynchus obliquidens*)	North Pacific Stock	Not Listed	Protected	26,880	N/A
Family Phocoenidae					
Harbor porpoise (*Phocoena phoncoena*)	Gulf of Alaska Stock	Not Listed	Protected	31,046	N/A
Dall's porpoise (*Phocoenoides dalli*)	Alaska Stock	Not listed	Protected	N/A	N/A
Family Physeteridae					
Sperm whale (*Physeter macrocephalus*)	North Pacific Stock	Endangered	Depleted	N/A	N/A
Family Balaenopteridae					
Humpback whale (*Megaptera novaeanglinae*)	Hawai'i Stock (Hawai'i DPS)	Not Listed	Protected	11,278	0.89
	Mexico-North Pacific Stock (Mexico DPS)	Threatened	Depleted	N/A	0.11
Gray whale (*Eschrictius robustus*)	Eastern North Pacific Stock	Delisted	Protected	26,960	N/A
Fin whale (*Balaenoptera physalus*)	Alaska (Northeast Pacific) Stock	Endangered	Depleted	N/A	N/A
Minke whale (*Balaenoptera acutorostrata*)	Alaska Stock	Not Listed	Protected	N/A	
Family Mustelidae					
Northern sea otter (*Enhydra lutris kenyoni*)	Southcentral Alaska Stock	Not Listed	Protected	14,661	N/A

Abbreviations:

DPS = Distinct Population Segment N_{est} – estimated abundance N_{min} – minimum abundance

[1] For species where multiple stocks may overlap, a distribution percentage is used to allocate the species members present by stock.

Table 3-2 Marine Mammals with Potential to Occur in Vicinity of USCG Moorings Sitka

Species	Stock	ESA Status	MMPA Status	Abundance (N_{est})	Distribution
Family Otariidae					
Steller sea lion (*Eumetopias jubatus*)	Eastern Stock	Delisted	Protected	36,308	0.978
	Western Stock	Endangered	Depleted	49,837	0.022
Northern fur seal (*Callorhinus ursinus*)	Eastern Pacific Stock	Not Listed	Depleted	626,618	N/A
Family Phocidae					
Harbor seal (*Phoca vitulina richardii*)	Sitka/Chatham Strait Stock	Not Listed	Protected	13,289	N/A
Family Delphinidae					
Killer whale (*Orcinus orca*)	Alaska Resident	Not Listed	Protected	1,920	N/A
	Gulf of Alaska, Aleutian Islands, and Bering Sea Transient	Not Listed	Protected	587	N/A
	Northern Resident	Not Listed	Protected	302	302
	West Coast Transient	Not Listed	Protected	349	N/A
Pacific white-sided dolphin (*Lagenorhynchus obliquidens*)	North Pacific Stock	Not Listed	Protected	26,880	N/A
Family Phocoenidae					
Harbor porpoise (*Phocoena phoncoena*)	Yakutat/SE Alaska Offshore Waters Stock	Not Listed	Protected	N/A	N/A
Dall's porpoise (*Phocoenoides dalli*)	Alaska Stock	Not listed	Protected	N/A	N/A
Family Physeteridae					
Sperm whale (*Physeter macrocephalus*)	North Pacific Stock	Endangered	Depleted	N/A	N/A
Family Balaenopteridae					
Humpback whale (*Megaptera novaeanglinae*)	Hawai'i Stock (Hawai'i DPS)	Not Listed	Protected	11,278	0.98
	Mexico-North Pacific Stock(Mexico DPS)	Threatened	Depleted	N/A	0.02
Gray whale (*Eschrichtius robustus*)	Eastern North Pacific Stock	Not Listed	Depleted	26,960	N/A
Fin whale (*Balaenoptera physalus*)	Alaska (Northeast Pacific) Stock	Endangered	Depleted	N/A	N/A
Minke whale (*Balaenoptera acutorostrata*)	Alaska Stock	Not Listed	Protected	N/A	N/A
Family Mustelidae					
Northern sea otter (*Enhydra lutris kenyoni*)	Southeast Alaska Stock	Not Listed	Protected	21,798	N/A

4 AFFECTED SPECIES STATUS AND DISTRIBUTION

A description of the status, distribution, and seasonal distribution (when applicable) of the affected species or stocks of marine mammals likely to be affected by such activities.

4.1 Steller Sea Lion (*Eumetopias jubatus*)

Steller sea lions are the largest of the Otariidae, or eared seals, which include all sea lions and fur seals. Steller sea lions are highly sexually dimorphic with males reaching lengths of 11 feet and weighing up to 2,500 pounds and females reaching lengths of 9.5 feet and weighing up to 800 pounds.

4.1.1 Status

The Steller sea lion was originally listed as threatened under the ESA in 1990 following rookery population declines (55 Federal Register [FR] 12645). In 1997, two DPSs of Steller sea lion were identified based on differences in genetics, distribution, phenotypic traits, and population trends (62 FR 24345). These DPSs are the Eastern and Western DPSs, which are generally separated by a line at 144°W extending seaward from approximately Cape Suckling, Alaska. While the Eastern DPS was recently delisted under the ESA, the Western DPS remains listed as endangered (62 FR 30772). The Eastern DPS (Eastern Stock) is still protected under the MMPA but is not designated as either strategic or depleted.

4.1.2 Population and Distribution

Steller sea lions range throughout the North Pacific from Japan, across the Alaska Coastline, southward as far as central California (Young et al. 2022). The current population estimate for Steller sea lion stocks in Alaska is 96,504 sea lions with estimated minimum population sizes of the two stocks as 53,303 sea lions in the Western Stock and 43,201 sea lions in the Eastern Stock (Young et al. 2022).

4.1.3 Site-Specific Occurrence

Steller sea lions are anticipated to occur in the vicinity of Seward in Resurrection Bay. The dividing line between Eastern and Western Stocks is not impenetrable and intermingling of the two populations occurs in proximity to the 144° W line; however, Seward is far enough west of this line that only members of the Western Stock of Steller sea lions are anticipated to occur at Seward. Previous monitoring efforts in the Seward area have reported two sea lions per day (NMFS pers. Comm. 2021).

Stellar sea lions are also anticipated to occur in the vicinity of Sitka in Sitka Harbor. Sitka sits closer to the dividing line between Eastern and Western Stocks and members of both stocks could occur at this location. Per the draft 2023 stock assessments, Sitka is located in the Central Outer Coast population mixing zone and it is assumed that 2.2 percent of the sea lions in the Sitka area are from the Western Stock and 97.8 percent from the Eastern Stock (Young et al. 2024). Because it is impossible to differentiate members of the Eastern and Western Stocks during monitoring these percentages are used for the purposes of assigning takes and assessment of impacts on this species in this application. Previous construction work at the Old Sitka Dock reported 16 sea lions per day within Sitka Harbor (NMFS pers. Comm. 2021).

4.1.4 Acoustics

NMFS Marine Mammal Hearing Technical Guidance (2018) assigns Steller sea lions, along with other eared seals, to the Otariid pinnipeds marine mammal hearing group with a generalized hearing range between 60 Hz to 39 kilohertz (kHz).

4.1.5 Critical Habitat

NMFS has designated critical habitat for Steller sea lion to include a 20-nautical mile buffer around all major haulouts and rookeries in Southeast Alaska (58 FR 45269). These areas are considered critical to the continued existence of the species throughout their range since they are essential for reproduction, rest, and refuge from predators and human-related disturbance. Haulouts in the vicinity of Seward include two within 20 nautical miles of the SMIC at the mouth of Resurrection Bay. There are no designated haulouts in proximity to Sitka.

4.2 Northern Fur Seal (*Callorhinus ursinus*)

Northern fur seals have a stocky body, small head, very short snout, and extremely dense fur. They are strongly sexually dimorphic with females weighing 120 pound and 5 feet in length while males can grow to 600 pounds and 7 feet in length. Northern fur seals are opportunistic foragers, consuming a wide variety of midwater shellfish and squid species.

4.2.1 Status

Northern fur seals, like all marine mammals, are protected under the MMPA, but are not listed as either threatened or endangered under the ESA. The Eastern Pacific Stock has been designated as depleted (Young et al. 2022).

4.2.2 Population and Distribution

The estimated abundance of the Eastern Pacific Stock of northern fur seals is 626,618 individuals based on pup production estimates on Sea Lion Rock, St. Paul and St. George Islands, and Bagoslof Island (Young et al. 2022). The estimate minimum population size for the Eastern Pacific Stock of northern fur seals is 530,376 individuals.

4.2.3 Site-Specific Occurrence

Eastern Pacific Stock northern fur seals are anticipated to occur only at Moorings Sitka based on an observed occurrence during a construction project at Skagway (NMFS pers. comm. 2024).

4.2.4 Acoustic Ecology

NMFS Marine Mammal Hearing Technical Guidance (2018) assigns northern fur seals, along with other eared seals, to the Otariid pinnipeds marine mammal hearing group with a generalized hearing range between 60 Hz to 39 kilohertz (kHz).

4.3 Harbor Seal (*Phoca vitulina richardii*)

Harbor seals are members of the family Phocidae (“true seals”), with two subspecies extant in the Pacific: *P. v. stejnegeri* in the western North Pacific near Japan and *P. v. richardii* in the eastern North Pacific including the west coast of the United States. Like all true seals, harbor seals have short forelimbs and lack external ear flaps as present in otariids such as the Steller sea lion. Harbor seals inhabit coastal and estuarine waters and shoreline areas from Baja California to western Alaska.

Harbor seals weigh up to 285 pounds and measure up to 6 ft in length with males slightly larger than females.

Of the five harbor seal stocks present in Alaskan waters, two are anticipated to occur in the vicinity of Seward and Sitka:

- Prince William Sound Stock – occurring in mainland coastal water of southcentral Alaska including Resurrection Bay at Seward,
- Sitka/Chatham Strait Stock – occurring on the outer coastal portions of Southeast Alaska and Stephens Passage including Sitka.

4.3.1 Status

Harbor seals, like all marine mammals, are protected under the MMPA, but are not listed as either threatened or endangered under the ESA.

4.3.2 Population and Distribution

Harbor seals are considered abundant throughout most of their range from Baja California to the eastern Aleutian Islands. Peak numbers of harbor seals haul-out on land during late May to early June, which coincides with the peak of their molt. They favor sandy, cobble, and gravel beaches. Currently the estimated population size of the Prince William Sound Stock is 44,756 and the Sitka/Chatham Strait Stock is 13,289 harbor seals.

4.3.3 Site-Specific Occurrence

Prince William Sound Stock harbor seals are anticipated to be present in the vicinity of the SMIC in Resurrection Bay. Previous construction monitoring activities at Valdez (separate from the subject project location at Seward but same harbor seal stock) reported an average of 48.5 harbor seals per day in proximity to that construction site (NMFS pers. comm. 2021).

Sitka/Chatham Strait Stock harbor seals are anticipated to be present in the vicinity of Moorings Sitka within Sitka Harbor. Previous construction monitoring activities for work on the neighboring O'Connell Bridge reported an average of 23 harbor seals per day in proximity to that construction site (NMFS pers. comm. 2021).

4.3.4 Acoustic Ecology

NMFS Marine Mammal Hearing Technical Guidance (2018) assigns harbor seals, along with other true seals, to the Phocid pinnipeds marine mammal hearing group with a generalized hearing range between 60 Hz to 39 kHz.

4.4 Killer Whale (*Orcinus orca*)

Killer whales are the largest member of the Delphinidae and are characterized by their black with white eyespot, underside, and saddle markings, and vertical dorsal fin. Adults can weigh up to 11 tons and reach lengths of 32 feet.

Killer whales take a wide variety of prey, with different subtypes having typical favored prey: resident killer whales prey on fish (primarily salmon); transient killer whales prey on seals, sea lions, porpoises, dolphins, squid, and other whales; and offshore killer whales prey on fish including sharks.

Based on data regarding association patterns, acoustics, movements, and genetic differences, eight killer whale stocks are now recognized within the Pacific territories of the U.S, four of which may occur in the vicinity of Seward or Sitka:

- Alaska Resident Stock, occurring from southeastern Alaska to the Aleutian Islands and Bering Sea (both Seward and Sitka)
- Gulf of Alaska, Aleutian Islands, and Bering Sea Transient Stock (both Seward and Sitka)
- Northern Resident Stock (only at Sitka)
- West Coast Transient Stock, occurring from California through southeastern Alaska (only at Sitka).

The AT1 Stock of killer whale is extremely rare, potentially only seven individuals remaining, and most closely associated with Prince William Sound. There is a small potential for AT1 Stock individuals to occur in proximity to Seward but, given their extreme rarity, no takes are expected or requested in this application.

4.4.1 Status

Based on data regarding association patterns, acoustics, movements, and genetic differences, eight killer whale stocks are now recognized within the Pacific territories of the U.S, four of which may occur at one or both Project sites at Seward and Sitka. Each of these stocks is individually assessed under the MMPA:

- Alaska Resident Stock – not designated as depleted under the MMPA or listed as threatened or endangered under the ESA
- Gulf of Alaska, Aleutian Islands, and Bearing Sea Transient Stock – not designated as depleted under the MMPA or listed as threatened or endangered under the ESA
- Northern Resident Stock – not designated as depleted under the MMPA or listed as threatened or endangered under the ESA
- West Coast Transient Stock – not designated as depleted under the MMPA or listed as threatened or endangered under the ESA.

4.4.2 Population and Distribution

While they are abundant throughout the world's oceans, individual killer whale stocks exhibit a wide range of total populations and distributions with resident stocks typically having larger populations than the rarer transient stocks:

- Alaska Resident Stock – Most common stock throughout the waters of Alaska with an estimated abundance of 1,920 individuals
- Gulf of Alaska, Aleutian Islands, and Bearing Sea Transient Stock – Most common transient stock in the offshore waters of the Gulf of Alaska with an estimated abundance of 587 individuals
- Northern Resident Stock – Resident stock occurring from Washington State through parts of southern British Columbia, but also in coastal waters of from southeastern Alaska through California

- West Coast Transient Stock – Transient stock that ranges from the West Coast of the contiguous United States into the waters of Southeast Alaska with an estimated abundance of 349 individuals.

4.4.3 Site-Specific Occurrence

Killer whales are anticipated to occur in the vicinity of both Moorings Seward and Sitka:

- Alaska Resident Stock – Potential to occur at both Seward and Sitka
- Gulf of Alaska, Aleutian Islands, and Bearing Sea Transient Stock – Potential to occur at both Seward and Sitka
- Northern Resident Stock – Potential to occur only at Sitka
- West Coast Transient Stock – Potential to occur only at Sitka.

Because killer whales cannot be differentiated by stock during monitoring activities, this species will be assessed as a whole without dividing observations by stock during monitoring activities and approximately eight killer whales per day are anticipated at both Moorings Seward and Sitka.

4.4.4 Acoustic Ecology

NMFS Marine Mammal Hearing Technical Guidance (2018) assigns killer whales, along with other dolphins, to the Mid-frequency marine mammal hearing group with a generalized hearing range between 150 Hz to 160 kHz.

4.5 Pacific White-Sided Dolphin (*Lagenorhynchus obliquidens*)

Pacific white-sided dolphins are highly gregarious with groups usually between 10 and 100 animals but ranging up the thousands. They are typically 300 to 400 pounds and reach lengths of 5.5 to 8 feet with characteristic coloration with mixes of dark and light (generally lighter on the ventral side). Pacific white-sided dolphins feed on a variety of prey such as squid and small schooling fish and typically work together as a group to herd schools of fish.

4.5.1 Status

Pacific white-sided dolphins, like all marine mammals, are protected under the MMPA, but are not listed as either threatened or endangered under the ESA. They are neither classified as depleted nor strategic under the MMPA.

4.5.2 Population and Distribution

Pacific white-sided dolphins are common throughout the waters of Alaska with an estimated abundance of 26,800 individuals for the North Pacific Stock with an estimate of 15,200 individuals in the Gulf of Alaska (Young et al. 2023).

4.5.3 Site-Specific Occurrence

Pacific white-sided dolphins are anticipated to occur in the vicinity of Moorings Seward. Previous construction monitoring reported by NOAA as an appropriate proxy for Moorings Seward is three Pacific white-sided dolphins. Only seven Pacific white-sided dolphins were observed during eight years of surveys at Sitka and this species is not considered as present at Moorings Sitka for the purposes of take calculation here (Straley and Pendell 2017).

4.5.4 Acoustic Ecology

Marine Mammal Hearing Technical Guidance (2018) assigns Pacific white-sided dolphins, along with other dolphins, to the Mid-frequency marine mammal hearing group with a generalized hearing range between 150 Hz to 160 kHz.

4.6 Harbor Porpoise (*Phocoena phocoena*)

Harbor porpoises are small, weighing between 135 and 170 pounds, reaching lengths between 5 and 5.5 feet with a short, blunt beak and medium-sized triangular dorsal fin. Their back is dark gray fading to lighter intermediate shades of gray on their sides with a white belly and throat and dark gray chin patch.

Harbor porpoises forage in waters less than 200 m (656 ft) deep on small pelagic schooling fish such as herring, cod, pollock, and smelt, and occasionally feeding on octopus, bottom-dwelling fish, squid, and crustaceans (Bjorge and Tolley 2009). Calving occurs from May to August but varies by region. Harbor porpoises mate approximately 1.5 months after calving, with a gestation period of 10.5 months. Calves forage on solid food within a few months of birth and are weaned before they are a year old (Bjorge and Tolley 2009).

4.6.1 Status

Harbor porpoises, like all marine mammals, are protected under the MMPA, but are not listed as either threatened or endangered under the ESA.

4.6.2 Population and Distribution

Current population estimates for the Yakutat/Southeast Alaska Offshore Waters Stock of harbor porpoise is not currently available The current estimated of the Gulf of Alaska Stock is 31,046 porpoises

4.6.3 Site-Specific Occurrence

Harbor porpoises of the Gulf of Alaska Stock are anticipated to occur in the vicinity of Moorings Seward at a density of 0.4547/square kilometer (km^2) (Navy 2014).

Based on observations during construction work on the neighboring O'Connell Bridge, harbor porpoises of the Yakutat/Southeast Alaska Offshore Waters Stock are anticipated to occur in the vicinity of Moorings Sitka at approximately five individuals per day.

4.6.4 Acoustic Ecology

NMFS Marine Mammal Hearing Technical Guidance (2018) assign true porpoises, including harbor porpoise, to the High-frequency cetaceans hearing group which have a generalized hearing range of 275 Hz to 160 kHZ.

4.7 Dall's Porpoise (*Phocoenoides dalli*)

Dall's porpoises are characterized by their distinctive coloration with a black body with conspicuous white lateral patch. These porpoises typically weigh up to 440 pounds and reach lengths between 7 and 8 ft. Dall's porpoises are considered the fastest swimmers among small cetaceans, capable of reaching speeds of 34 miles per hour.

Dall's porpoises can dive up to 1,640 ft to feed on small schooling fish (e.g., anchovies, herring, and hake) along with mid- and deep-water fish, cephalopods, and occasionally crustaceans.

4.7.1 Status

Dall's porpoises, like all marine mammals, are protected under the MMPA, but are not listed as either threatened or endangered under the ESA. Additionally, the Alaska Stock of Dall's porpoise is not designated as either depleted or strategic under the MMPA.

4.7.2 Population and Distribution

Because available survey data are greater than 8 years old, there are no reliable estimates of the total abundance, minimum population estimate, or current population trends for the Alaska Stock of Dall's porpoise (Young et al 2022). However, recent vessel surveys in the northwestern Gulf of Alaska in 2013 and 2015 reported estimated abundances of Dall's porpoise of as 15,432 in 2013 and 13,110 in 2015 (Rone et al. 2017).

4.7.3 Site-Specific Occurrence

Dall's porpoises of the Alaska Stock area anticipated to occur in the vicinity of Moorings Seward at approximately 0.25 individual per day.

Dall's porpoises of the Alaska Stock are anticipated to occur in the vicinity of Moorings Sitka at a density of 0.121/km^2 (Navy 2014).

4.7.4 Acoustic Ecology

NMFS Marine Mammal Hearing Technical Guidance (2018) assign true porpoises, including Dall's porpoise, to the High-frequency cetaceans hearing group which have a generalized hearing range of 275 Hz to 160 kHZ.

4.8 Sperm Whale (*Physeter macrocephalus*)

Sperm whales are the largest of the toothed whales weighing up to 15 tons (females) to 45 tons (males) and reach lengths of up to 40 feet (females) and 52 feet (males). While mostly dark gray, some whales have white patches on their underside. Their heads are extremely large, accounting for about one-third of their total body length.

4.8.1 Status

Sperm whales are listed as endangered under the ESA and are therefore designated as depleted under the MMPA. As a result, the North Pacific Stock is also classified as a strategic stock. However, based on total abundance, current distribution, and regulatory measures that are in place, it is unlikely that this stock is in danger of extinction.

4.8.2 Population and Distribution

The sperm whale is one of the most widely distributed marine mammal species, perhaps exceeded in its global range by the killer whale and humpback whale (Rice 1989). In the North Pacific, sperm whales were depleted by extensive commercial whaling over a period of more than 100 years, and the species was the primary target of illegal Soviet whaling in the second half of the 20th century (Ivashchenko et al. 2013 and 2014).

Current and historical abundance of sperm whales in the North Pacific are based on limited data and are considered unreliable. The abundance of sperm whales in the North Pacific was estimated to be 1,260,000 prior to exploitation, which by the 1970s was thought to have been reduced to 930,000 whales and include whales from stocks outside of the North Pacific (Rice, 1989). From surveys in the Gulf of Alaska in 2009 and 2015, Rone et al. (2017) estimate 129 (CV-0.44) and 346

sperm whales (CV=0.43) in each year, respectively. These estimates are for a small area that was unlikely to include females and juveniles and do not account for animals missed on the survey's trackline; therefore, they are not considered reasonable estimates. With regard to seasonality, acoustic surveys in the Gulf of Alaska detected the presence of sperm whales year-round in the Gulf of Alaska, but detections were approximately twice as common in summer months than in winter (Mellinger et al. 2004).

As the data used in estimating the abundance of sperm whales in the entire North Pacific are more than 8 years old, a reliable estimate of abundance for the entire North Pacific Stock is considered unavailable. However, based on Rone et al. (2017), it is estimated that the minimum population estimate for North Pacific Stock sperm whales is 244 individuals (Young et al. 2022). However, this is an underestimate for the entire stock because it is based on surveys over a relatively small portion of the stock's range.

4.8.3 Site-Specific Occurrence

While sperm whales are typically offshore, pelagic species, in the past 30 years there have been changes regarding sperm whales in the Gulf of Alaska and Southeast Alaska's Inside Passage. Sightings of sperm whales have become far more common, particularly by longliners fishing the Gulf of Alaska, where sperm whales have learned to take fish from longlines during fishing operations. Another change is an apparent increase in presence in the waters of the Inside Passage, specifically in Chatham where a few individuals probably followed a longliner in and figured out that there were sablefish and squid in the net. In the fall of 2018 and spring of 2019, three sperm whales were seen repeatedly in the Inside water of Chatham Strait and Lynn Canal, and in March 2019 a dead sperm whale washed up north of Berners Bay between Juneau and Haines. Given this greater rate of observation within the nearshore waters of the Inside Passage, sperm whales are considered to have a low potential to appear at Seward and Sitka and are described here but no takes for this species are requested.

4.8.4 Acoustic Ecology

Sperm whales produce a wide range of sounds, or clicks, that may be used for communication and echolocation with suggested communication ranges up to 60 kilometers (km) and echolocation for food up to 16 km (Madsen et al. 2002). Clicks are loud with reported source levels over 220 dB re 1 µPa; however, these clicks are highly directional in that off-axis observations show much lower sound levels (Madsen et al. 2002).

4.9 Humpback Whale (*Megaptera novaeanglinae*)

Humpback whales are migratory baleen whales, recognized by their long pectoral fins, which can reach up to 15 feet in length. Female humpback whales are larger than the males, reaching up to 60 feet long. Humpback whales are dark grey in color and have distinctive patterns of white on their pectoral fins, fluke (tail), and belly. The variation in coloration patterns is so distinctive that individuals can be identified by the patterns on the undersides of their flukes.

4.9.1 Status

Originally the entire world's population of humpback whales was designated as endangered under the Endangered Species Conservation Act of 1970 and the Endangered Species Act of 1973 (ESA).

Two populations can be found in Alaskan waters near the project areas: the Hawai'i Stock and Mexico-North Pacific Stock (Young et al. 2023). The Hawai'i Stock is not listed while the Mexico-North Pacific Stock is threatened. This designation included U.S. waters within Alaska, Washington, Oregon, and California (NMFS 2019).

4.9.1 Population and Distribution

Prior to commercial whaling, the population of humpback whales in the North Pacific was estimated at 15,000 individuals (Young et al. 2022). In 1965, whales became protected by an international whaling commission treaty, but illegal harvests continued by the USSR into the 1970s, and continues today in Japan, Iceland, and Norway. Subsistence harvesting is practiced by indigenous peoples in several countries around the world (e.g., West Indies, Greenland).

The Hawai'i Stock consists of individuals that mostly winter in Hawaii (Hawaiian DPS) and Mexico (Mexico DPS); approximately 89 percent of humpback whales in the Gulf of Alaska (including Seward) are from the Hawai'i stock and 11 percent from the Mexico-North Pacific Stock. In Southeast Alaska (including Sitka), approximately 98 percent of humpback whales are from the Hawai'i stock and 2 percent are from the Mexico-North Pacific Stock (Young et al. 2023). The most recent minimum population estimate for the Hawai'i stock is 11,278 individuals while the Mexico-North Pacific Stock's minimum abundance is 2,241 individuals (Young et al. 2023).

4.9.2 Site-Specific Occurrence

Previous monitoring activities in the vicinity of Moorings Seward have reported approximately one humpback whale per day. Monitoring activities in the vicinity of Moorings Sitka report approximately five humpback whales per day (NMFS pers. comm. 2021).

Of the various humpback whale stocks that occur in Alaska, members of the Hawai'i and Mexico-North Pacific stocks, may occur in the vicinity of Moorings Seward and Sitka. Members of the Hawai'i Stock make up the majority of individuals in Alaskan waters. Members of the Hawai'i and Mexico-North Pacific Stocks may occur in the vicinity of Seward and Sitka with members in different proportions (Table 4-1).

Table 4-1 Humpback Whale DPS Distribution by USCG Facility

USCG Facility	Hawai'i DPS	Mexico DPS
Moorings Seward	0.89	0.11
Moorings Sitka	0.98	0.02

4.9.3 Acoustic Ecology

NMFS categorizes humpback whales in the low-frequency cetacean functional bearing group, with an applied frequency range between 7 Hz and 35 kHz (NMFS 2018).

4.10 Gray Whale (*Eschrichtius robustus*)

Gray whales can grow to approximately 49 feet in length and weigh up to 90,000 pounds. Gray whales lack a dorsal fin but have dorsal hump as well as broad, paddle-shaped pectoral fins. They are typically mottled gray in color.

Gray whales are benthic filter feeders whose diet consists of sea floor and near-sea floor invertebrates. They take in sediment then ejecting sediment and water through baleen plates trapping prey items for consumption.

4.10.1 Status

Gray whales, like all marine mammals, are protected under the MMPA, but are not listed as either threatened or endangered under the ESA and the Eastern North Pacific Stock was delisted in 1994 and is not designated as depleted under the MMPA.

4.10.2 Population and Distribution

Gray whales are found throughout the coastal waters of the North Pacific Ocean. Members of the Eastern North Pacific Stock, present along the west coast of North America, migrate from as far north as the Bering and Chukchi seas for the summer feeding season southward to Baja California in the winter for calving season.

Gray whales are commonly found only in the North Pacific and were extirpated from the Atlantic in the early 1700s (Young et al. 2022). Gray whales in Alaska typically feed along the coast between Kodiak Island and northern California in the summer and fall or in transit between the Chukchi and Bering seas and Baja California.

4.10.3 Site-Specific Occurrence

Members of the Eastern North Pacific Stock have the potential to occur in the vicinity of the Sitka Moorings facility and have a small chance to occur at the northern end of Resurrection Bay near the Seward Moorings facility. Based on monitoring activities for work on the O'Connell Bridge reported to NMFS, potential gray whale occurrence is expected to be 0.1 individual per day (NMFS pers. comm. 2021). The estimated density of individuals in the Gulf of Alaska, as a proxy for Seward, is 0.0155 individual/km2 between the coast and 10km offshore (Navy 2019).

4.10.4 Acoustic Ecology

NMFS Marine Mammal Hearing Technical Guidance (2018) assigns gray whales, along with all baleen whales, to the Low-frequency marine mammal hearing group with a generalized hearing range between 7 Hz and 35 kHz.

4.11 Fin Whale (*Balaenoptera physalus*)

The fin whale is the second largest species of whale, reaching lengths from 72 to 89 feet and weights between 66 to 99 tons. Fin whales have a noticeable dorsal fin near their tail, giving them their name. Fin whales are the fastest whale, traveling speeds up to 20 knots (23 miles per hour) and have a sleek, streamlined appearance (Bose and Lien 1989). Diet for the fin whale varies by location and availability, but includes primarily krill, large copepods, some small squid, and small schooling fish (Cooke 2018). Much of their foraging occurs in spring, summer, and fall, with fasting or minimal feeding occurring during winter. Foraging locations include areas of high prey productivity, usually along or beyond continental shelf breaks, but sometimes over shelves as well. An individual fin whale can eat up to 2 tons of food every day. Fin whales are generally solitary but can also occur in groups of 2 to 7 individuals.

4.11.1 Status

The fin whale was listed as endangered throughout its range in 1970 under the precursor of the Endangered Species Act and is managed by NMFS. The fin whale is also protected under the MMPA. Critical habitat is not designated for the fin whale.

There are no reliable estimates of historical and current estimates of fin whales for the Northeast Pacific Stock (Young et al. 2022). In the North Pacific, pre-whaling estimates of fin whale

populations are 42,000 to 45,000 animals. By 1973, abundance had declined to 13,600 to 18,700 animals, as harvesting peaked between 1951 and 1972. The current best estimate of fin whales in the North Pacific Stock is a minimum of 2,554 individuals; the stock is increasing at a rate of 4.8% annually. These are minimum estimates because the survey only covered a small portion of the large range of this stock (Zerbini et al. 2006; NOAA 2019).

An area within the Gulf of Alaska near Kodiak Island has been designated as a Biologically Important Area for fin whales. This area is designated as important feeding grounds for this species (Ferguson et al. 2015). They are rare offshore in southeastern Alaska and have not returned to protected inshore areas of this region, where they were once common prior to commercial whaling.

4.11.2 Population and Distribution

Fin whales are found throughout all oceans worldwide, except for most of the Arctic Ocean and tropical areas between 20˚N and 20˚S in deep, offshore waters in temperate to polar latitudes. In the U.S., the fin whale is divided into four stocks for management purposes: California/Oregon/Washington Stock, Hawaii Stock, Alaska (Northeast Pacific) Stock, and Western North Atlantic Stock (Young et al. 2022). The current minimum population estimate for fin whales is 2,554 in Alaskan waters (Young et al. 2022).

4.11.3 Site-Specific Occurrence

Fin whales have the potential to occur at both the Seward and Sitka Moorings. Based on survey data, fin whales in the vicinity of Moorings Seward are anticipated to occur at a density of 0.068/km^2. Based on survey data, fin whales in the vicinity of Moorings Sitka are anticipated to occur at a density of 0.0001/km^2 (Navy 2014).

4.11.4 Acoustic Ecology

NMFS (2018) assigns fin whales to the Low-frequency marine mammal hearing group characterized by generalized hearing range between 7 Hz and 35 kilohertz (kHz), like all baleen whales.

4.12 Minke Whale (*Balaenoptera acutorostrata*)

Minke whales are the smallest of the Balaenopteridae and are characterized by their small size of up to about 35 feet in length and weight of up to 20,000 pounds. Minke whales are tall, with a sickle-shaped dorsal fin located about two-thirds down their back. Minke whale coloration is typically black to dark grayish/brownish, with a pale chevron on the back behind the head and above the flippers and a white underside.

4.12.1 Status

Minke whales, like all marine mammals, are protected under the MMPA, but are not listed as either threatened or endangered under the ESA.

4.12.2 Population and Distribution

Minke whales are found throughout the northern hemisphere in polar, temperate, and tropical waters. They are the most abundant of the Balaenopteridae and their population is considered stable throughout most of their range. Commercial whaling practices may have reduced populations in the western North Pacific by as much as half; however, commercial whaling of larger baleen whale species may have allowed minke whales to flourish.

There are no reliable estimates of historical and current estimates of minke whales for the North Pacific (Young et al. 2022). Surveys for Minke whales in the waters off Alaska reported most sightings in the Aleutian Islands, rather than in the Gulf of Alaska, and in water shallower than 200 m while offshore surveys in the Gulf of Alaska reported so few minke whales that offshore population estimates could not be determined (Rone et al. 2017). Surveys in southeast Alaska have consistently identified individuals throughout inland waters in low numbers (Dahlheim et al. 2009).

4.12.3 Site-Specific Occurrence

Members of the Alaska Stock have the potential to occur at both Seward and Sitka. Based on survey data, minke whales in the vicinity of Moorings Seward are anticipated to occur at a density of 0.006/km^2 (Navy 2014). Previous construction monitoring efforts at the O'Connell Bridge in Sitka reported approximately one minke whale per day (NMFS pers. comm. 2021).

4.12.4 Acoustic Ecology

NMFS Marine Mammal Hearing Technical Guidance (2018) assigns minke whales, along with all baleen whales, to the Low-frequency marine mammal hearing group with a generalized hearing range between 7 Hz and 35 kHz.

4.13 Northern Sea Otter (*Enhydra lutris kenyoni*)

The northern sea otter is the second smallest marine mammal in the world (second to the South American sea otter). The adults live for 15 to 20 years and average 4.5 feet long with males averaging 70 to 90 pounds, and females 40to 60 pounds.

4.13.1 Status

The sea otter (*Enhydra lutris*) is divided into three recognized subspecies: *E. l. lutris* which occurs in Russia; *E.l. neris* which occurs in coastal California, and *E.l. kenyoni* which has a range that extends from southwest Alaska on the Aleutian Islands to the coast of Washington State.

The northern sea otter (*Enhydra lutris kenyoni*) subspecies in Alaska consists of three subpopulations or stocks with the Southeast Stock ranging from Cape Yakataga to Dixon Entrance. While all subpopulations of the northern sea otter are protected under the MMPA, neither the Southeast Stock nor the Southcentral Stock are listed as either threatened or endangered under the ESA.

4.13.2 Population and Distribution

The most recent USFWS Stock Assessment Reports for the three Alaska sea otter stocks report minimum abundance estimates of 21,798 Southeast Alaska Stock sea otters and 21,617 Southcentral Alaska Stock sea otters.

4.13.3 Site-Specific Occurrence

Individuals of the Southcentral Alaska Stock sea otters have the potential to occur in the vicinity of Moorings Seward. Per communications with USFWS staff, Southcentral Alaska Stock sea otters are anticipated to occur in the Seward area at a density of 2.31/km^2 (Patterson pers. comm 2021).

Individuals of the Southeast Alaska Stock have the potential to occur in the vicinity of Moorings Sitka. A recent study (Weitzman and Esslinger 2015) assessed the population trends of northern sea otters in Southeast Alaska. Sea otter abundance was mapped at a scale of 400 m by 400 m (1,312 ft by 1,312 ft) cells based on aerial surveys.

4.13.4 Acoustic Ecology

Sea otter-specific criteria have not been established by NOAA Fisheries or USFWS; however, because of the biological similarities between otariid pinnipeds and sea otters (Ghoul and Reichmuth 2014), it is assumed that noise criteria developed for injury for otariid pinnipeds are a suitable proxy for sea otters.

Table 4-2 Anticipated Species/Stock Occurrence at Moorings Seward and Sitka

Species	Stock	Seward	Sitka
Family Otariidae			
Steller sea lion (*Eumetopias jubatus*)	Western Stock	2/day	1 group of 2/day (2.2% Western) (97.8% Eastern)
	Eastern Stock		
Northern fur seal (*Callorhinus ursinus*)	Eastern Pacific Stock		1/month
Family Phocidae			
Harbor seal (*Phoca vitulina richardii*)	Prince William Sound Stock	48.95/day	
	Sitka/Chatham Strait		1 group of 2.1/day
Family Delphinidae			
Killer whale (*Orcinus orca*)	Alaska Resident Stock	1/day	6.6/week
	GOA, Aleutian Islands, and Bering Sea Transient Stock		
	Northern Resident Stock		
	West Coast Transient Stock		
Pacific white-sided dolphin (*Lagenorhynchus obliquidens*)	North Pacific Stock	3/day (NOAA provided)	0
Family Phocoenidae			
Harbor porpoise (*Phocoena phoncoena*)	Gulf of Alaska Stock	0.4547/km^2	1 group of 5/14 days
Dall's porpoise (*Phocoenoides dalli*)	Alaska Stock	0.25/day	0.121/km^2
Family Physeteridae			
Sperm whale (*Physeter macrocephalus*)	North Pacific Stock		0.002/km^2
Family Balaenopteridae			
Humpback whale (*Megaptera novaeanglinae*)	Hawai'i Stock	1/day Hawai'i – 0.89 Mexico-North Pacific – 0.11	1 group 3.5/14 days (98% Hawai'i) (2% Mexico-North Pacific)
	Mexico-North Pacific Stock		
Gray whale (*Eschrictius robustus*)	Eastern North Pacific Stock	0.0155/km^2	1 group 3.5/14 days
Fin whale (*Balaenoptera physalus*)	Northeast Pacific Stock	0.068/km^2	0.0001/km^2
Minke whale (*Balaenoptera acutorostrata*)	Alaska Stock	0.006/km^2	1 group 3.5/14 days
Family Mustelidae			
Northern sea otter (*Enhydra lutris kenyoni*)	Southcentral Alaska Stock	2.31/km^2	
	Southeast Alaska Stock		Survey-Based

5 HARASSMENT AUTHORIZATION REQUESTED

The type of incidental taking authorization that is being requested (i.e., takes by harassment only, takes by harassment, injury and/or death), and the method of incidental taking.

Under Section 101 (a)(5)(D) of the MMPA, the USCG requests an IHA for the take of small numbers of marine mammals, by Level B behavioral harassment only, incidental to the installation of piles for the construction of the floating docks at Seward and Sitka. The USCG requests separate IHAs for activities at Seward and Sitka that will be conducted during a one-year period beginning October 1, 2024 and September 1, 2024, respectfully.

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] (50 CFR, Part 216, Subpart A, Section 216.3-Definitions).

5.1 Method of Incidental Taking

This authorization request considers noise from pile installation activities at both installations including rock socket drilling, vibratory installation, and impact driver pile proofing. These activities were deemed as the only activities that have the potential to disturb or displace marine mammals or produce a temporary threshold shift (TTS) in their hearing ability resulting in Level B harassment, as defined above.

A detailed analysis of the effects on marine mammals related to noise exposures from pile installation activities at Seward and Sitka is presented in Section 6 (*Numbers and Species Exposed*). The USCG's mitigation procedures, presented in Section 11 (*Mitigation Measures to Protect Marine Mammals and their Habitat*), include monitoring of shutdown zones prior to, during, and after initiation of pile installation activities as well as other monitoring and reporting requirements. The USCG believes that these mitigation measures will be effective in avoiding exposure of NMFS- and USFWS-managed marine mammals to sound levels that constitute Level A harassment with the exception of harbor porpoises, Dall's porpoises, and harbor seals, which are quick and small enough that it is possible they may enter the Level A shutdown zones established for them before a Protected Species Observer (PSO) can observe them and call for a work stoppage.

This analysis results in a request for the following Level A exposures at Moorings Seward:

- Steller sea lion (Western DPS) - 4
- Harbor seal (Prince William Sound Stock) - 98
- Pacific white-sided dolphin (North Pacific Stock) – 6
- Harbor porpoise (Gulf of Alaska Stock) – 5
- Dall's porpoise (Alaska Stock) - 1

This analysis results in a request for the following Level A exposures at Moorings Sitka:

- Steller sea lion (Western DPS) – 1
- Steller sea lion (Eastern DPS) – 16
- Harbor seal (Sitka/Chatham Strait Stock) – 18
- Harbor porpoise (Yakutat/Southeast Alaska) – 3
- Dall's porpoise (Alaska Stock) - 5

See Section 6 for estimates of exposures by species that could be classified as Level A under the MMPA (Tables 5-1 and 5-2). The USCG's mitigation procedures, presented in Section 11, include monitoring of physical interaction shutdown, Level A shutdown, and Level B harassment zones during in-water activities. The USCG believes that these mitigation measures will be effective in avoiding marine mammal exposures to sound levels that constitute Level A harassment.

Table 5-1 Number of Level A and B Takes Requested Per Species at Seward

Species (Stock)	Number of Level A Takes Requested	Number of Level B Takes Calculated (Requested)
Steller Sea Lion (Western)	4	40
Northern Fur Seal (Eastern Pacific)	0	0
Harbor Seal (Prince William Sound)	98	980
Killer Whale (Alaska Resident)	0	28
Killer Whale (Gulf of Alaska, Aleutian Island, and Bering Sea Transient)		
Killer Whale (Northern Resident)		
Killer Whale (West Coast Transient)		
Pacific White-Sided Dolphin (North Pacific)	6	60
Harbor Porpoise (Gulf of Alaska)	5	18
Dall's porpoise (Alaska)	1	5
Sperm Whale	0	0
Humpback Whale (Hawai'i)	0	20
Humpback Whale (Mexico-North Pacific)	0	2
Gray Whale (East N. Pacific)	0	1
Fin Whale (Northeast Pacific)	0	3
Minke Whale (Alaska)	0	0
NMFS Total	**114**	**1,157**
USFWS - Northern Sea Otter (Southcentral)	**0**	**116**
Total	**114**	**1,273**

Note: Take estimates were not calculated for the North Pacific Right Whale in the IHA analysis since this species is extremely rare and unlikely to occur. In the unlikely event that an individual is observed close to the monitoring zones, all work will be halted until the individual leaves the area. This is applicable to any marine mammal species with unexpected with no calculated/requested takes authorized under this IHA if they should appear in proximity to work at Moorings Seward (e.g., the northern fur seal or sperm whale).

Table 5-2 Number of Level A and B Takes Requested Per Species at Sitka

Species (Stock)	Number of Level A Takes Requested	Number of Level B Takes Calculated (Requested)
Steller Sea Lion (Western)	1	7
Steller Sea Lion (Eastern)	16	336
Northern Fur Seal (Eastern Pacific)	0	3
Harbor Seal (Sitka/Chatham Strait)	18	342
Killer Whale (Alaska Resident)	0	90
Killer Whale (Gulf of Alaska, Aleutian Island, and Bering Sea Transient)		
Killer Whale (Northern Resident)		
Killer Whale (West Coast Transient)		
Pacific White-Sided Dolphin (North Pacific)	0	0
Harbor Porpoise (Yakutat/SE AK Offshore)	3	32
Dall's porpoise (Alaska)	5	61
Sperm Whale	0	0
Humpback Whale (Hawai'i)	0	43
Humpback Whale (Mexico)	0	1
Gray Whale (Eastern North Pacific	0	22
Fin Whale (Northeast Pacific)	0	0
Minke Whale (Alaska)	0	22
NMFS Total	**43**	**959**
USFWS -Northern Sea Otter (Southeastern)	**0**	**174**
Total	**43**	**1,133**

Note: Take estimates were not calculated for the North Pacific Right Whale in the IHA analysis since this species is extremely rare and unlikely to occur. In the unlikely event that an individual is observed close to the monitoring zones, all work will be halted until the individual leaves the area. This is applicable to any marine mammal species with unexpected with no calculated/requested takes authorized under this IHA if they should appear in proximity to work at Moorings Sitka (e.g., the sperm whale).

6 NUMBERS AND SPECIES EXPOSED

By age, sex, and reproductive condition (if possible), the number of marine mammals (by species) that may be taken by each type of taking identified in [Section 5], and the number of times such takings by each type of taking are likely to occur.

6.1 Introduction

This NMFS and USFWS application(s) for IHAs requires applicants to determine the number of marine mammals that are expected to be incidentally harassed by an action and the nature of the harassment (Level A or B). Section 5 defines MMPA Level A and Level B and Section 6 presents how these definitions were relied on to develop the quantitative acoustic analysis methodologies used to assess the potential for the projects to affect marine mammals.

The project activities as outlined in Sections 1 and 2 have the potential to take marine mammals by Level A and Level B harassment through construction activities involving in-water demolition and construction activities at Moorings Seward and Sitka.

Research suggests that increased noise may impact marine mammals in several ways and that these impacts depend on many factors. Noise impacts are discussed in more detail in Section 7. Assessing whether a sound may disturb or injure a marine mammal involves understanding the characteristics of the acoustic source and the potential effects that sound may have on the physiology and behavior of that marine mammal. Sound is important for marine mammal communication, navigation, and foraging (National Research Council 2003), and understanding the auditory effects from anthropogenic sound on marine mammals has continued to be researched and developed (Southall et al. 2019). Furthermore, many other factors besides the received level of sound may affect an animal's reaction, such as the animal's physical condition, prior experience with the sound, and proximity to the source of the sound.

Based on the BMPs identified in Sections 11 and 13, non-impulsive and impulsive sound sources associated with in-water activities will limit Level A exposure of marine mammals as defined under the MMPA to the extent practicable. However, the noise-related impacts discussed in this application may result in Level B harassment. The methods for estimating the number and types of exposures are summarized below.

The following methods were used to determine exposure of marine mammals:

- Estimating the area of impact where noise levels exceed acoustic thresholds for marine mammals (Sections 6.7)
- Evaluating the potential presence of marine mammals based on historical occurrence or density as outlined in (Section 6.8)
- Estimating potential harassment exposures by multiplying the density of marine mammals calculated in the area by their probable duration during construction or expected daily or weekly group size occurrence (Section 6.8).

6.2 Fundamentals of Sound

Sound is a physical phenomenon consisting of regular pressure oscillations that travel through a medium, such as air or water. Sound frequency is the rate of oscillation, measured in cycles per second or Hertz (Hz). The amplitude (loudness) of a sound is its pressure, whereas its intensity is proportional to power and is pressure squared. The standard international unit of measurement for pressure is the Pascal, which is a force of 1 Newton exerted over an area of 1 square meter; sound pressures are measured in microPascals (µPa).

Due to the wide range of pressure and intensity encountered during measurements of sound, a logarithmic scale is used, based on the decibel (dB), which, for sound intensity, is 10 times the log10 of the ratio of the measurement to reference value. For SPL, the amplitude ratio in dB is 20 times the log10 ratio of measurement to reference. Hence each increase of 20 dB in SPL reflects a 10-fold increase in signal amplitude (whether expressed in terms of pressure or particle motion). That is, 20 dB means 10 times the amplitude, 40 dB means 100 times the amplitude, 60 dB means 1,000 times the amplitude, and so on. Because the dB is a relative measure, any value expressed in dB is meaningless without an accompanying reference. In describing underwater sound pressure, the reference amplitude is usually 1 µPa, and is expressed as "dB re 1 µPa." For in-air sound pressure, the reference amplitude is usually 20 µPa and is expressed as "dB re 20 µPa."

The method commonly used to quantify airborne sounds consists of evaluating all frequencies of a sound according to a weighted filter that mimics human sensitivity to amplitude as a function of frequency. This is called A-weighting and the decibel level measured is called the A-weighted sound level (dBA). Methods of frequency weighting that reflect the hearing of marine mammals have been proposed (Southall et al. 2007, Finneran and Jenkins 2012) and are being used in new analyses of US Navy testing and training effects but have not been adopted for pile driving and other non-explosive impulsive sounds by other agencies (Marine Species Modeling Team 2012). Therefore, underwater sound levels are not weighted and measure the entire frequency range of interest. In the case of marine construction work, the frequency range of interest is 20 Hz to 20 kHz.

Table 6-1 summarizes commonly used terms to describe underwater sounds. Two common descriptors are the instantaneous peak SPL and the root mean square (RMS) sound pressure level (SPL). The peak pressure is the instantaneous maximum overpressure, or underpressure, observed during each pulse or sound event and is presented in dB re 1 µPa. The RMS level is the square root of the mean of the squared pressure (= intensity) level as measured over a specified period. All underwater sound levels throughout the remainder of this application are presented in dB re 1 µPa unless otherwise noted.

Table 6-1 Definitions of Acoustical Terms

Term	Definition
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for water is 1 µPa and for air is 20 µPa (approximate threshold of human audibility).
Sound Pressure Level, SPL	Sound pressure is the force per unit area, usually expressed in microPascals where 1 Pascal equals 1 Newton exerted over an area of 1 square meter. The SPL is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressure exerted by the sound to a reference sound pressure. SPL is the quantity that is directly measured by a sound level meter.
Frequency, Hz	Frequency is expressed in terms of oscillations, or cycles, per second or Hz. Typical human hearing ranges from 20 Hz to 20 kHz.
Peak Sound Pressure, dB re 1 µPa	Peak SPL is based on the largest absolute value of the instantaneous sound pressure over the frequency range from 20 Hz to 20 k Hz. This pressure is expressed in this application as dB re 1 µPa.
Root-Mean-Square (RMS), dB re 1µPa	The RMS level is the square root of the mean of the squared pressure level(s) as measured over a specified period. For pulses, the RMS has been defined as the average of the squared pressures over the time that comprise that portion of waveform containing 90 % of the sound energy for one impact pile driving impulse.
Sound Exposure Level (SEL), dB re 1 μPa^2 sec	Sound exposure level is a measure of energy. Specifically, it is the dB level of the time integral of the squared-instantaneous sound pressure, normalized to a 1-sec period. It can be an extremely useful metric for assessing cumulative exposure because it enables sounds of differing duration, to be compared in terms of total energy.
Waveforms, µPa over time	A graphical plot illustrating the time history of positive and negative sound pressure of individual pile strikes shown as a plot of µPa over time (i.e., seconds).
Frequency Spectrum, dB over frequency range	The amplitude of sound at various frequencies, usually shown as a graphical plot of the mean square pressure per unit frequency (μPa^2/Hz) over a frequency range (e.g., 10 Hz to 10 kHz in this application).
A-Weighting Sound Level, dBA	The SPL in decibels as measured on a sound level meter using the A- or C-weighting filter network. The A-weighting filter de-emphasizes the low and high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective human reactions to noise.
Ambient Noise Level	The background sound level, which is a composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.

6.3 Description of Noise Sources

Underwater sound levels are comprised of multiple sources, including physical noise, biological noise, and anthropogenic noise. Physical noise includes waves at the surface, earthquakes, ice, and atmospheric noise. Biological noise includes sounds produced by marine mammals, fish, and invertebrates. Anthropogenic noise consists of vessels (small and large), dredging, aircraft overflights, and construction noise (Table 6-2).

Table 6-2 Representative Levels of Underwater Anthropogenic Noise Sources

Noise Source	Frequency Range (Hz)	Source Level	Reference
Dredging	1–500	161–186 dB RMS re: 1 µPa at 1 meter	Richardson et al. 1995
Small vessels	860–8,000	141–175 dB RMS re: 1 µPa at 1 meter	Galli et al. 2003; Matzner & Jones 2011; Sebastianutto et al. 2011
Large ship	20–1,000	157–188 dB re: 1 µPa^{2}sec SEL at 1 meter	McKenna 2011; Kipple and Gabriele 2007
Tug docking gravel barge	200–1,000	149 dB at 100 meters	Blackwell and Greene 2002

Abbreviations:
dB = decibel; Hz = Hertz; RMS = root mean square; sec = second; SEL = sound exposure level
dB re 1 µPa at 1 m = decibels (dB) referenced to (re) 1 micro (µ) Pascal (Pa) at 1 meter

6.3.1 Ambient Noise

Ambient noise is background noise with no single source or point. Ambient noise varies with location, season, time of day, and frequency. Ambient noise is continuous but highly variable on time scales ranging from less than one second to one year (Richardson et al. 1995).

As an example from Southeastern Alaska, Ketchikan is a busy industrial port with median background underwater noise levels at 117.1 dB re 1 µPa (Warner and Austin 2016). Others have reported underwater background noise levels in Tongass Narrows near Ketchikan ranging from 120 to 130 dB re 1 µPa, with levels peaking during the summer months (HDR, Inc. 2018). The background noise in this area primarily stems from the continuous noise transmitted through water by marine vessels transiting the Tongass Narrows similar to what is expected at Seward and Sitka where marine traffic is likely the largest component of the marine noise environment.

Project-related sounds become undetectable with regard to potential monitoring and verification of sound levels and suggest that these sounds not be perceived by marine mammals as louder or significantly different than regularly occurring background noise. As such, Project-related sounds are unlikely to elicit biologically significant behavioral reactions, especially considering that there are not associated stimuli (e.g., a moving vessel) to suggest an approaching threat.

6.3.2 Types of Noise

The sounds produced by in-water construction activities fall into two sound types: *impulsive* and *non-impulsive* (defined below). Impact pile driving produces impulsive sounds, while a vibratory hammer produces non-impulsive sounds, and rock socket drilling (DTH drilling) produces both impulsive and non-impulsive sounds. The distinction between these two general sound types is important because their potential to cause physical effects differs, particularly with regard to hearing.

Impulsive sounds (e.g., explosions, DTH drilling, and impact pile driving), which are referred to as pulsed sounds by Southall et al. (2007, 2019), are brief, broadband, atonal transients (Harris, 1998) and occur either as isolated events or are repeated in some succession (Southall et al. 2007, 2019). Impulsive sounds are characterized by a relatively rapid rise from ambient pressure to a maximal pressure value, followed by a decay period that may include a period of diminishing, oscillating maximal and minimal pressures (Southall et al. 2007). Impulsive sounds generally have a greater capacity to induce physical injury compared with sounds that lack these features (Southall et al. 2007, 2019).

Non-impulsive sounds (referred to as non-pulsed in Southall et al. 2007, 2019) can be tonal, broadband, or both. They lack the rapid rise time and can have longer durations than impulsive sounds. Non-impulsive sounds can be either intermittent or continuous. Examples of non-impulsive sounds include vessels, aircraft, and machinery operations such as rotary-bit drilling, dredging, and vibratory pile driving (Southall et al. 2007, 2019). In some environments, the duration of both impulsive and non-impulsive sounds can be extended due to reverberations.

6.4 Sound Exposure Criteria and Thresholds

Under the MMPA, the NMFS has defined levels of harassment for marine mammals. Level A harassment is defined as "any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild." Level B harassment is defined as "any act of pursuit, torment, or annoyance which 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."

Currently, the NMFS uses underwater sound exposure thresholds to determine when an activity could result in impacts to a marine mammal defined as Level A (injury) or Level B (disturbance including behavioral and TTS) harassment (NMFS 2018 and 2020). NMFS has developed acoustic threshold levels for determining the onset of PTS in marine mammals in response to underwater impulsive and non-impulsive sound sources (Table 6-3). NMFS equates the onset of PTS, which is a form of auditory injury, with Level A harassment under the MMPA, and with "harm" under the ESA. Level B harassment occurs when marine mammals are exposed to non-impulsive underwater sounds above 120 dB RMS re 1 µPa, such as from vibratory hammering or rock socket drilling, and impulsive sounds above 160 dB RMS re 1 µPa, such as impact driving proofing (Table 6-3). The USFWS uses the 160 dB RMS re 1 µPa threshold for both impulsive and non-impulsive sounds for assessing Level B harassment of sea otters. The onset of TTS is a form of Level B harassment under the MMPA and a form of "harassment" under the ESA. All forms of harassment, either auditory or behavioral, constitute "incidental take" under these statutes.

Level A harassment is assumed to result in a "stress response." The stress response per se is not considered injury but refers to an increase in energetic expenditure that results from exposure to the stressor and which is predominantly characterized by either the stimulation of the sympathetic nervous system or the hypothalamic-pituitary-adrenal axis (Reeder and Kramer 2005). The presence and magnitude of a stress response in an animal depends on the animal's life history stage, environmental conditions, reproductive state, and experience with the stressor.

Behavioral harassment (Level B) is considered to have occurred when NMFS-managed marine mammals are exposed to sounds at or above 160 dB RMS re 1µPa for impulse sounds (e.g., impact pile driving) and 120 dB RMS re 1µPa for continuous noise (e.g., pile clipping or cutting), or USFWS-managed sea otter are exposed to impulsive or continuous sounds at or above160 dB RMS re 1 µPa, but below injurious thresholds. Level B harassment may or may not result in a stress response. The application of the 120 dB RMS re 1µPa threshold can sometimes be problematic because this threshold level can be either at or below the ambient noise level of certain locations. As a result, these levels are considered precautionary (74 FR 41684).

Table 6-3 Injury and Disturbance Threshold Criteria for Underwater Noise by Marine Mammal Hearing Group

Marine Mammal Hearing Group	Underwater Non-impulsive Noise (non-impulsive sounds) (re 1 µPa)		Underwater Impact Pile-Driving Noise (impulsive sounds) (re 1 µPa)[1]	
	PTS Onset (Level A) Threshold	Level B Disturbance Threshold	PTS Onset (Level A) Threshold[2]	Level B Disturbance Threshold
Low-Frequency Cetaceans[5]	199 dB SEL_{CUM}	120 dB RMS	219 dB Peak[3] 183 dB SEL_{CUM}[4]	160 dB RMS
Mid-Frequency Cetaceans	198 dB SEL_{CUM}	120 dB RMS	230 dB Peak[3] 185 dB SEL_{CUM}[4]	160 dB RMS
High-Frequency Cetaceans[5]	173 dB SEL_{CUM}	120 dB RMS	202 dB Peak[3] 155 dB SEL_{CUM}[4]	160 dB RMS
Phocidae	201 dB SEL_{CUM}	120 dB RMS	218 dB Peak[3] 185 dB SEL_{CUM}[4]	160 dB RMS
Otariidae	219 dB SEL_{CUM}	120 dB RMS	232 dB Peak[3] 203 dB SEL_{CUM}[4]	160 dB RMS
Mustelidae[6]	219 dB SEL_{CUM}	160 dB RMS	232 dB Peak[3] 203 dB SEL_{CUM}[4]	160 dB RMS

Notes:

[1] No impulsive noise-generating uses are included in the Project and thresholds are included here for informational purposes only.

[2] Dual metric acoustic thresholds for impulsive sounds. Whichever results in the largest isopleth for calculating PTS onset is used in the analysis.

[3] Flat weighted or unweighted peak sound pressure within the generalized hearing range.

[4] Cumulative sound exposure level over 24 hours.

[5] No Low- or High-Frequency Cetaceans are anticipated to appear in the Project study area and PTS and TTS thresholds are included here for informational purposes only.

[6] Mustelidae (i.e., Northern sea otter) are assumed to experience Level A onset at similar levels to Otariid pinnipeds and per USFWS policy, Level B harassment is assessed at the 160 dB RMS threshold for both impulsive and non-impulsive sound sources.

Abbreviations:
µPa = microPascal; dB = decibel; PTS = permanent threshold shift; RMS = root mean square; SEL = sound exposure level; cum = cumulative

Air noise thresholds have not been established for cetaceans given their limited above water exposure limited to porpoising or breaching; whereas airborne behavioral disturbance thresholds for pinnipeds have been established to account for potential airborne noise effects while these animals are hauled out. Sea otter-specific criteria have not been established by NOAA Fisheries or USFWS; however, because of the biological similarities between otariid pinnipeds and sea otters (Ghoul and Reichmuth, 2014) it is assumed that noise criteria developed for injury for otariid pinnipeds are a suitable proxy for sea otters.

Table 6-4 Airborne Behavioral Disturbance Thresholds for Pinnipeds and Mustelids

Source	Harbor Seals	Other Pinnipeds (including sea otters)
Impulsive and Non-Impulsive Sources	90 dB re 20 µPa	110 dB re 20 µPa

6.5 Limitations of Existing Noise Criteria

The application of the 120 dB RMS re 1 µPa behavioral threshold can sometimes be problematic because this threshold level can be either at or below the ambient noise level of certain locations. The 120 dB RMS re 1 µPa threshold level for non-impulsive noise originated from research conducted for California gray whale response to continuous industrial sounds, such as drilling operations.

To date, there is no research or data supporting a response by pinnipeds or odontocetes to non-impulsive sounds, such as from vibratory pile driving, as low as the 120 dB re 1µPa threshold. Southall et al. (2007) reviewed studies conducted to document the behavioral responses of harbor seals and northern elephant seals to non-impulsive sounds under various conditions. They concluded that those limited studies suggest that exposures between 90 dB and 140 dB RMS re 1 µPa generally do not appear to induce strong behavioral responses. While the Level B threshold criteria for non-impulsive noise is 120 dB RMS re 1 µPa, noise from non-impulsive sources associated with the Project is assumed to become indistinguishable from background noise as it diminishes to 120 dB RMS. This value is used as a local baseline ambient noise value for all noise sources to be employed during pile installation activities.

6.6 Auditory Masking

Natural and artificial sounds can disrupt behavior through auditory masking or interference with a marine mammal's ability to detect and interpret other relevant sounds, such as communication and echolocation signals (Wartzok et al, 2004). Masking occurs when both the signal and masking sound have similar frequencies and either overlap or occur very close to each other in time. A signal is very likely to be masked if the noise is within a certain "critical bandwidth" around the signal's frequency and its energy level is similar or higher. Noise within the critical bandwidth of a marine mammal signal will show increased interference with detection of the signal as the level of the noise increases (Wartzok et al. 2004). For example, in delphinid subjects, relevant signals needed to be 17 to 20 dB louder than masking noise at frequencies below 1 kHz to be detected and 40 dB greater at approximately 100 kHz (Richardson et al., 1995). Noise at frequencies outside of a signal's critical bandwidth will have little to no effect on the detection of that signal (Wartzok et al. 2004).

Additional factors influencing masking are the temporal structure of the noise and the behavioral and environmental context in which the signal is produced. Continuous noise is more likely to mask signals than intermittent noise of the same amplitude; quiet "gaps" in the intermittent noise allow detection of signals that would not be heard during continuous noise (Brumm and Slabbekoorn 2005). The behavioral function of a vocalization (e.g., contact call, group cohesion vocalization, echolocation click) and the acoustic environment at the time of signaling may both influence the call source level (Holt et al. 2011), which directly affects the chances that a signal will be masked (Nemeth and Brumm 2010).

Masking noise from anthropogenic sources could cause behavioral changes if the masking disrupts communication, echolocation, or other hearing-dependent behaviors. As noted above, noise frequency and amplitude both contribute to the potential for vocalization masking; noise from pile driving typically covers a frequency range of 10 Hz to 1.5 kHz, which is likely to overlap with the frequencies of vocalizations produced by species that may occur in the Project area. Amplitude of noise from pile installation methods is variable and may exceed that of marine mammal vocalizations within an unknown range of each incident pile.

Depending on the animal's location and vocalization source level, this range may vary over time but the short-term duration and limited areas affected make it very unlikely that marine mammal survival would be affected. Any masking event that could possibly rise to Level B harassment under the MMPA would occur concurrently within the zones of behavioral harassment already estimated for pile installation activities, and which have already been taken into account in this exposure analysis.

6.7 Modeling Potential Noise Impacts from Pile Installation

In this IHA application, the USCG has used NMFS Technical Guidance, the NMFS User Spreadsheet, practical spreading loss model (NMFS 2018, 2020), and acoustic data recorded during previous in-water projects that have included analogous pile installation methods including DTH drilling, vibratory installation, and impact driving on the US West Coast to identify Level A (injury) and Level B (behavior) harassment zones that would result from pile installation, as outlined below.

6.7.1 Sound Propagation

Pile installation activities will generate airborne and underwater noise that could potentially result in disturbance to marine mammals swimming in the Project area. Transmission loss (TL) is the decrease in sound intensity due to sound spreading that occurs as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth and distance, water depth, water chemistry, and bathymetry. The general TL formula is:

$$TL = B * \log10(R) + C * R, \text{ where}$$

B = logarithmic (predominantly spreading) loss C = linear (scattering and absorption) loss

R = ratio of receiver distance to source reference distance (usually 1m or 10m)

The C term is strongly dependent on frequency, temperature, and depth, but is conservatively assumed to equal zero. The B term has a value of 10 for cylindrical spreading and 20 for spherical spreading. A practical spreading value of 15 is often used in shallow water conditions where spreading may start out spherically but then end up cylindrically as the sound in constrained by the surface and the bottom. The TL is the same for different sound source levels and is applied to each of the different activities to determine the point at which the applicable thresholds are reached (i.e., sound reduction to ambient level at a given facility) as a function of distance from the source. For airborne noise, transmission loss is calculated using the spherical spreading loss factor of B = 20. Maximum distances to Level A thresholds for cumulative sound exposure were calculated using the current NMFS Technical Guidance and User Spreadsheet (NMFS 2018, 2020).

6.7.2 Airborne Sound

In-water activities (e.g., use of a vibratory or impact hammer mounted at the top of the pile being removed/installed) will generate airborne noise that will propagate over water and land in the immediate vicinity of these activities Moorings Seward and Sitka. In-water activities where the primary noise generator will be fully submerged (i.e., pile clipper where the clipper teeth meet the pile and underwater saw where the blade meets the pile) were determined not to generate significant airborne noise.

Average maximum airborne noise levels for common construction equipment range from about 73 to 101 dBA measured at 50 feet (Washington State Department of Transportation [2020] reporting average maximum values included in Federal Highway Administration 2011; Figure 6-5).

Table 6-5 Observed Airborne Noise Levels by Equipment Type

Equipment	Measured Average dB re 20 µPa at 50 ft
Concrete Saw	85
Rock Drill (airborne analogue for socket drill)	93
Impact Pile Driver	105
Vibratory Pile Driver (no size specified)	80

Source: WSDOT 2020

Using the sound propagation loss equation with the airborne spherical spreading loss factor B = 20 described above, distances over which observed airborne noise levels for the equipment listed in Table 6-6 would exceed the threshold levels for harbor seals, other pinnipeds and sea otters were calculated.

Table 6-6 Calculated Distances of Airborne Noise Exceedance for Harbor Seals (90 dB), Other Pinnipeds, and Sea Otters (110 dB)

Equipment	Harbor Seals (m)	Other Pinnipeds including Sea Otters(m)
Concrete Saw	8.5	0.9
Rock Drill (airborne analogue for socket drill)	21.4	2.1
Impact Pile Driver	85.5	8.5
Vibratory Pile Driver (no size specified)	4.9	0.5

6.7.3 Underwater Sound

In-water activities will generate underwater noise that potentially could result in disturbance to marine mammals swimming by the Project areas. Maximum distances where underwater sound would exceed Level A thresholds for cumulative sound exposure were calculated using the current NOAA Fisheries Technical Guidance and User Spreadsheet (NMFS 2018 and 2020).

The intensity of pile removal and installation sound is greatly influenced by factors such as the type of pile, the type of equipment, and the physical environment in which the activity takes place. To determine reasonable SPLs from pile installation, activities with properties similar to the subject project were evaluated. Tables 6-7 and 6-8 present proxy data sources for pile removal and installation for similar activities projected to occur at Moorings Seward and Sitka, respectively.

Table 6-7 Proxy Data Sources for In-Water Activities at Moorings Seward

In-Water Activity	Proxy Pile Size/Type	Data Source
Removal		
Vibratory Pile Extraction	14-inch steel guide pile	NMFS 2024
Concrete Pile Clipping		Naval Facilities Engineering Systems Command Southwest (NAVFAC SW 2020)
Diamond Wire Saw		NAVFAC SW 2020
Installation		
Rock Socket – DTH	30-inch concrete guide pile	NMFS 2022
Vibratory Pile Settling		NMFS 2024
Impact Pile Proofing		NMFS 2024

Table 6-8 Proxy Data Sources for In-Water Activities at Moorings Sitka

In-Water Activity	Proxy Pile Size/Type	Data Source
Removal		
Vibratory Pile Extraction	12-inch timber piles	California Department of Transportation (Caltrans) 2020
Concrete Pile Clipping	24-inch concrete mooring dolphin pile	NAVFAC SW 2020
Diamond Wire Saw		NAVFAC SW 2020
Installation		
Impact Drive	13-inch plastic pile[3]	Caltrans 2020
Impact Drive	14-inch timber pile	Caltrans 2020
Rock Socket – DTH	30-inch concrete piles	NMFS 2022
Vibratory Pile Settling		NMFS 2024
Impact Pile Proofing		NMFS 2024

6.7.3.1 Non-Impulsive Noise Sources

Source levels associated with non-impulsive sources are shown in Tables 6-9 and 6-10 for Moorings Seward and Sitka, respectively. Data from the activities reported in Tables 6-7 and 6-8 have been used as proxies for the project activities at Moorings Seward and Sitka. Because DTH systems use both a hammering (impulsive) action and drilling (non-impulsive) action, the non-impulsive and impulsive noise components of these activities are reported in their relevant sections (NMFS 2022; 6.7.3.1 and 6.7.3.2). Per recent NMFS guidance, the non-impulsive component of DTH drilling noise is used to assess potential Level B impacts (NMFS 2022).

[3] Information related to impact driving plastic piles at Sitka is provided here to allow greater flexibility to the USCG in selecting pile installation methods in place of timber piles. However, underwater noise values from pile driving timber piles is used below to estimate impacts and takes because it is a louder activity.

Table 6-9 Observed Non-Impulsive Sound Levels and Durations for In-Water Activities Likely to Occur at Moorings Seward

In-Water Activity	Pile Size and Type	RMS SPL (dB re 1 µPa)	Average Duration per Pile (seconds)	Piles / Day
Removal				
Vibratory Pile Extraction [a]	14-inch steel guide pile	160.0	1,800	5
Pile Clipping [b]		161.2	622	
Diamond Wire Saw [b]		161.5	930	
Installation				
Vibratory Pile Settling [a]	30-inch concrete guide pile	163.0	600	2
Rock socket drill [c] (non-impulsive component)		174	10,800	

Abbreviations:
dB re 1 µPa = decibels referenced to a pressure of 1 microPascal,
m = meters
Sources:
[a] Values recommended by NMFS (2024)
[b] Naval Facilities Engineering Systems Command (NAFVAC) Southwest, 2020
[c] NMFS 2022

Table 6-10 Observed Non-Impulsive Sound Levels and Durations for In-Water Activities Likely to Occur at Moorings Sitka

In-Water Activity	Pile Size and Type	RMS SPL (dB re 1 µPa) at 10m	Average Duration per Pile (seconds)	Piles / Day
Removal				
Vibratory Pile Extraction [a]	12-inch timber piles	162.0	1,800	5
Concrete Pile Clipping [b]	24-inch concrete mooring dolphin pile	161.2	622	
Diamond Wire Saw [b]		161.5	930	
Installation				
Vibratory Pile Settling [a]	30-inch concrete guide and structure pile	163.0	600	2
Rock socket drill [c] (non-impulsive component)		174	10,800	

Abbreviations:
dB re 1 µPa = decibels referenced to a pressure of 1 microPascal,
m = meters
Sources:
[a] Values recommended by NMFS (2024)
[b] Naval Facilities Engineering Systems Command (NAFVAC) Southwest, 2020
[c] NMFS 2022

6.7.3.2 Impulsive Noise Sources

Source levels associated with single impulsive sources – i.e., rock socket drilling and the use of an impact hammer to proof piles by "tapping" each pile following vibratory installation to ensure the pile is seated properly in its socket – is shown in Tables 6-11 and 6-12. DTH drilling has been previously assessed as a non-impulsive, continuous noise source, but recent updates to the NMFS guidance have incorporated this method as producing both impulsive and non-impulsive noise where the impulsive component of the DTH drilling is used to assess potential Level A impacts (NMFS 2022).

Table 6-11 Observed Impulsive Sound Levels and Durations for Pile Installation Activities Likely to Occur at Moorings Seward

Installation Method	Pile Size and Type	Peak (dB re 1 µPa) at 10m	RMS (dB re 1 µPa) at 10m	$SEL_{single\text{-}strike}$ (dB re 1 µPa) at 10m	Strikes per Day
Rock socket drill[a]	30-inch concrete guide pile	194	174	164	216,000 (up to 108,000 strikes per pile and 2 piles per day)
Impact hammer proofing[b]		198	186	173	10 (up to 5 strikes per pile and 2 piles per day)

Abbreviations:
dB re 1 µPa = decibels referenced to a pressure of 1 microPascal
m = meters
Source:
[a] NMFS 2022
[b] NMFS 2024

Table 6-12 Observed Impulsive Sound Levels and Durations for Pile Installation Activities Likely to Occur at Moorings Sitka

Installation Method	Pile Size and Type	Peak (dB re 1 µPa) at 10m	RMS (dB re 1 µPa) at 10m	$SEL_{single\text{-}strike}$ (dB re 1 µPa) at 10m	Strikes per Day
Impact drive[a]	13-inch plastic fender pile	177	153	162	200 (up to 100 strikes per pile and 2 piles per day)
Impact drive[a]	14-inch timber guide pile	180	170	160	320 (up to 160 strikes per pile and 2 piles per day)
Rock socket drill[b]	30-inch concrete guide pile	194	174	164	216,000 (up to 108,000 strikes per pile and 2 piles per day)
Impact hammer proofing[c]		198	186	173	10 (up to 5 strikes per pile and 2 piles per day)

Abbreviations:
dB re 1 µPa = decibels referenced to a pressure of 1 microPascal
m = meters
Source:
[a] Caltrans 2020
[b] NMFS 2022
[c] NMFS 2024

6.7.4 Noise Modeling Results for Level A and B Harassment Zones

For the analyses that follow, the previously observed source levels and durations identified in Tables 6-9 through 6-11 were utilized along with the TL model described above to calculate the expected noise propagation from pile installation methods considered in this application.

6.7.4.1 Level A Threshold Distances

Projected distances to Level A (onset PTS) thresholds based on cumulative SEL have been calculated as shown in Appendix A using the NMFS Technical Guidance and User Spreadsheets (2020a) and identified in Tables 6-13 and 6-14.

Table 6-13 Projected Distances to Underwater Level A Thresholds by Marine Mammal Hearing Group at Moorings Seward

In-Water Activity	Projected Distances to Level A Thresholds (m)				
	LF	MF	HF	PW	OW
Removal					
Vibratory pile extraction	10.8	1.0	16.0	6.6	0.5
Pile clipping	6.4	0.6	9.4	3.9	0.3
Diamond wire saw	8.7	0.8	12.9	5.3	0.4
Installation					
DTH (Impulsive component)[1]	1945.5	69.2	2,317.4	1,041.2	75.8
Vibratory settling	4.5	0.4	6.6	2.7	0.2
Impact driver proofing	10.0	0.4	11.9	5.3	0.4

Abbreviations:
RMS = root mean square, dB re 1 µPa = decibels referenced to a pressure of 1 microPascal
m = meters, ft = feet
LF = low-frequency cetaceans, MF = mid-frequency cetaceans, HF = high-frequency cetaceans
PW = phocid pinnipeds, OW = otariid pinnipeds (inclusive of mustelids – Northern sea otter)

Of the calculated Level A injury harassment distances, only those associated with rock socket drilling at Moorings Seward have the intensity and duration to generate cumulative noise levels in exceedance of thresholds beyond the 30-m physical interaction shutdown zone. While the calculated distance for Level A injury ranges for DTH rock socket drilling between 69.2 m to 2,317.4m depending on marine mammal hearing group, the natural shoreline geometry and built environment (i.e., SMIC seawall) will largely contain underwater noise within the SMIC Basin with a "wedge" of Level A exceeding sound extending to the northwest (Appendix C).

Table 6-14 Projected Distances to Underwater Level A Thresholds by Marine Mammal Hearing Group at Moorings Sitka

In-Water Activity	Projected Distances to Level A Thresholds (m)				
	LF	MF	HF	PW	OW
Removal					
Vibratory pile extraction	14.7	1.3	21.7	6.9	0.6
Pile clipping	6.4	0.6	9.4	3.9	0.3
Diamond wire saw	8.7	0.8	12.9	5.3	0.4
Installation					
Impact drive plastic fender piles	13.6	0.5	16.2	7.3	0.5
Impact drive timber guide piles	13.7	0.5	16.3	7.3	0.5
DTH (Impulsive component)	1,945.5	69.2	2,317.4	1,041.2	75.8
Vibratory settling concrete piles	4.5	0.4	6.6	2.7	0.2
Impact driver proofing concrete piles	10.0	0.4	11.9	5.3	0.4

Abbreviations:
RMS = root mean square, dB re 1 µPa = decibels referenced to a pressure of 1 microPascal
m = meters, ft = feet
LF = low-frequency cetaceans, MF = mid-frequency cetaceans, HF = high-frequency cetaceans
PW = phocid pinnipeds, OW = otariid pinnipeds (inclusive of mustelids – Northern sea otter)

Of the Level A injury harassment distances calculated for noise-generating equipment types to be used during the project, only those associated with rock socket drilling at Moorings Sitka have the intensity and duration to generate cumulative noise levels in exceedance of thresholds far beyond the 30-m physical interaction shutdown zone. The Level A area associated with vibratory extraction of existing guide piles will extend to 21.7 m (for high-frequency cetaceans) but this will be accounted for via an expanded shutdown zone. While the range of calculated distances for Level A effects are large, ranging between 69.2 m to 2,317.4 m depending on marine mammal hearing group, the natural shoreline geometry and built environment (i.e., existing docks and breakwaters protecting Sitka Harbor) will largely contain underwater noise within Sitka Harbor which a "wedge" of Level A exceeding sound extending to the northwest to the furthest Sitka Harbor breakwaters and to the southeast under the O'Connell Bridge. (Appendix D).

6.7.4.1 Level B Threshold Distances

The calculated radial distances to Level B behavioral disturbance thresholds and corresponding areas within the harassment zones are summarized in Tables 6-15 and 6-16. Distances are based on the distance at which the maximum sound from a given project source diminishes to the respective Level B disturbance thresholds at 120 dB RMS for non-impulsive sounds (i.e., vibratory hammer and the non-impulsive component of rock socket drilling) or 160 dB RMS for impulsive sounds (i.e., impact driver). Tables 6-16 and 6-17 also include the total area (km^2) of Level B harassment areas for each in-water activity as constrained by the local topography and development that may block transmission of underwater sound.

Table 6-15 Distances to Underwater Level B Thresholds and Harassment Zone Areas within the Thresholds from Pile Installation at Moorings Seward

In-Water Activity	NMFS-Managed Species Level B Thresholds		USFWS-Managed Species Level B Thresholds	
	Maximum Radial Distance (m)	Total Harassment Zone Area (km^2)	Maximum Radial Distance (m)	Total Harassment Zone Area (km^2)
Removal				
Vibratory Pile Extraction	4,641.6	1.94	10	0.00
Pile Clipping	5,580.4	2.26[1]	12	0.00
Diamond Wire Saw	5,843.4	2.26[1]	13	0.00
Installation				
Rock Socket Drilling	39,810.7	2.26[1]	85.8	0.02
Vibratory Settling	7,356.4	2.26[1]	15.8	0.0
Impact Driver Proofing	541.2	0.11	541.2	0.11

[1] Total harassment areas are the same despite having varying radii because the maximum distance intersects with the other side of Resurrection Bay near Seward resulting in the same areal extent.

Abbreviations:

dB re 1 µPa = decibels referenced to a pressure of 1 microPascal
km^2 = square kilometers, m = meters

Table 6-16 Distances to Underwater Level B Thresholds and Harassment Zone Areas within the Thresholds from Pile Installation at Moorings Sitka

In-Water Activity	NMFS-Managed Species Level B Thresholds		USFWS-Managed Species Level B Thresholds	
	Maximum Radial Distance (m)	Total Harassment Zone Area (km^2)	Maximum Radial Distance (m)	Total Harassment Zone Area (km^2)
Removal				
Vibratory Pile Extraction	6,309.6	4.17	13.6	0.00
Pile Clipping	5,580.4	3.53	12	0.00
Diamond Wire Saw	5,843.4	3.75	12.6	0.00
Installation				
Impact Drive Plastic Fender Piles	3.4	0.0	3.4	0.00
Impact Drive Timber Piles	46.4	0.01	46.4	0.02
Rock Socket Drilling	39,810.7	6.31	85.8	0.02
Vibratory Settling	7,356.4	4.89	15.8	0.00
Impact Driver Proofing	541.2	0.33	541.2	0.33

Abbreviations:

dB re 1 µPa = decibels referenced to a pressure of 1 microPascal
km^2 = square kilometers, m = meters

6.8 Basis for Estimating Injury and Harassment Takes

The following assumptions were used to calculate potential Level A and B exposures to pile removal and installation activities:

- Each animal can be "taken" via Level A or Level B harassment once every 24 hours.
- Differing methods of pile removal and installation will not occur coincidentally and one single pile will be removed or installed at a time.
- Each pile installation sequence will be the same (i.e., each installed pile will require DTH rock socket drilling, vibratory settling, and impact proofing in sequence). Because DTH rock socket drilling is the loudest and has the most extensive Level A and Level B distance, it assumed that animals will be taken during the DTH portion of daily pile installation activities; thus, this activity is used for all Level A and B take estimations for pile installation.
- In-water demolition and construction activities at Moorings Seward are estimated to require 17 days of in-water construction activities that would generate underwater noise and Level A and B takes. Take calculations are buffered by adding an additional 5 days of DTH guide pile installation in case only one pile can be installed per day for a maximum of 22 days of in-water work and take generation over the course of the 1-year IHA period.
    - Two days of existing pile removal
    - 20 days of guide pile installation (15 days at planned rate with 5-day buffer)
- In-water demolition and construction activities at Moorings Sitka are estimated to require 96 days of in-water construction activities that would generate underwater noise and Level A and B takes. Take calculations are buffered by adding an additional 25 days of DTH guide pile installation to make up for days when only one pile day can be installed per day for a maximum of 117 days of the course of the 1-year IHA period.
    - One day to remove existing mooring dolphin piles
    - Two days to remove existing timber guide piles at City Float
    - Three days to install timber guide piles for relocated City Float
    - 27 days to install plastic fender piles (no takes generated because impact boundary is closer than proposed 30m shutdown zone)
    - 84 days of structure and guide pile installation (59 days at planned rate with 25-day buffer)
- For species where observation data are available either from the intermediate vicinity or from a nearby site, the number of individuals by species is the estimated daily occurrence of that species multiplied by the days of in-water work by activity.
- For species without observation data, estimated species density (individuals per km^2) is used in conjunction with the GIS-estimated total area of Level A (by marine mammal hearing group) exceedance and Level B areas to estimate the daily number of individuals within the relevant Level A and B ensonified zones multiplied by the number of days of work.
- USFWS Sea Otter Exposure Estimate is based either on the estimated density of sea otters (individuals per km^2 [Seward]) or the sum of the sea otter abundance of each 400=m by 400=m cell that is partially or completely within the Level B harassment zone for each in-water activity (Sitka). Where there are gaps in the survey data, the highest neighboring survey cell value will be used for the most conservative estimate.

Level A Take Estimates

Level A (PTS onset) takes, as well as risks of physical injury resulting from direct contact of equipment with a marine mammal, would only potentially result from DTH rock socket drilling activities that would generate underwater noise in exceedance of Level A thresholds for all marine mammal hearing groups beyond the 30-m physical interaction shutdown zone that will be implemented for all in-water activities. Therefore, larger shutdown zones will be implemented during DTH activities (Table 6-17) and implemented by placement of additional PSOs to monitor the larger areas and provide shutdown directions if marine mammals approach while DTH activities are occurring.

Table 6-17 Level A Shutdown Distance by Activity and Marine Mammal Hearing Group

In-Water Activity	Proposed Shutdown Zones (m)				
	LF	MF	HF	PW	OW
Removal					
Vibratory Pile Extraction	30	30	30	30	30
Pile Clipping	30	30	30	30	30
Diamond Wire Saw	30	30	30	30	30
Installation					
Impact Drive Timber Piles	30	30	30	30	30
Impact Drive Plastic Piles	30	30	30	30	30
Rock Socket Drilling	1,955	85	2,325	1,050	85
Vibratory Settling	30	30	30	30	30
Impact Driver Proofing	30	30	30	30	30

Note: Multiple Protected Species Observers will be required to implement shutdown zones.

Moorings Seward

Of the various in-water project activities at Moorings Seward within the SMIC on the eastern shore of Resurrection Bay, only DTH rock socket drilling is anticipated to generate underwater noise of such intensity and duration to potentially result in Level A injury takes to all marine mammal hearing groups (Table 6-17) beyond the 30-m physical interaction shutdown zone. However, the geometry of the SMIC breakwater prevents broadcast throughout Resurrection Bay and only allows a "wedge" of Level A exceedance for Low Frequency Cetaceans (baleen whales – humpback, gray, fin, and minke), High Frequency Cetaceans (harbor and Dall's porpoises), and Phocid Pinnipeds (harbor seals) to extend northwest out of the mouth of the SMIC Basin (Appendices A and C).

The establishment of shutdown zones by marine mammal hearing groups (Low Frequency Cetaceans, High Frequency Cetaceans, and Phocid Pinnipeds beyond the universal 30-m physical interaction shutdown zone, that will cover the SMIC Basin and a northwestern projection from the SMIC out into Resurrection Bay will be managed by PSOs placed within the SMIC Basin, at the entrance to the SMIC Basin, and potentially on a vessel, or vessels, in Resurrection Bay. PSOs will act as "gatekeepers" to provide warning that marine mammals – namely harbor seals, harbor and Dall's porpoises, and any baleen whales – may approach the SMIC Basin and shut down noise-generating activities.

Table 6-17 Estimated Level A Takes at Moorings Seward

Marine Mammal Hearing Group	Occurrence	Daily Density (individuals/km^2)	Days of DTH	Level A Area (km^2)	Calculated Occurrence	Level A Takes Requested	Notes
High-Frequency Cetaceans							
Harbor Porpoise	-	0.4547	20	0.53	3.6	5	Due to the cryptic nature of this species, there is a potential for a small number of individuals to enter the Level A zone undetected.
Dall's Porpoise	0.25/day	-	20	0.53	5	1	NMFS expects only 10% of expected take would enter Level A zone undetected.
Mid-Frequency Cetaceans							
Pacific White-Sided Dolphin	3/day	-	20		60	6	NMFS expects only 10% of expected take would enter Level A zone undetected.
Otariid Pinnipeds							
Steller Sea Lion (Western)	2/day	-	20		40	4	NMFS expects only 10% of expected take would enter Level A zone undetected.
Phocid Pinnipeds							
Harbor Seal	48.95/day	-	20	0.16	979	98	NMFS expects only 10% of expected take would enter Level A zone undetected.
Low Frequency Cetaceans							
Humpback Whale	1	-	20	0.4			Due to the size of shutdown zones, the conspicuous nature of these species, and presence of boat-based PSOs, it is expected that any take would be mitigated to 0 Level A takes for each species.
Hawaii Stock (89%)		-			5.34	0	
Mexico-N. Pacific (11%)		-			0.66	0	
Gray Whale	-	0.0155	20	0.4	0.1	0	
Fin Whale	-	0.068	20	0.4	0.4	0	
Minke Whale	-	0.006	20	0.4	0.4	0	

Note: Multiple Protected Species Observers will be required to implement shutdown zones.

Moorings Sitka

Of the various in-water project activities at Moorings Sitka within Sitka Harbor, only DTH rock socket drilling will generate underwater noise of such intensity and duration to potentially result in Level A injury takes to all marine mammal hearing groups (Table 6-18) beyond the 30-m physical interaction shutdown zone. However, the compressed geometry of Sitka Harbor prevents widescale broadcast of noise throughout the Sitka area and would largely restrict noise within Sitka Harbor (Appendices B and D).

The establishment of shutdown zones, or a single shutdown zone, beyond the 30-m physical interaction shutdown zone that conforms to all of Sitka Harbor from the northwestern breakwaters to the O'Connell Bridge southeast of Moorings Sitka will ensure that no Level A takes will occur during DTH rock socket drilling. Implementation of the expanded Level A shutdown zone will be managed by PSOs placed at Moorings Sitka for immediate monitoring of the 30-m physical interaction shutdown zone, at least one on the shore of the northern part of Sitka Harbor and one at the O'Connell Bridge with views of the harbor entrances to act as "gatekeepers" to provide warning that marine mammals; namely, harbor seals, harbor and Dall's porpoises, and any baleen whales; may enter Sitka Harbor and shut down noise-generating activities.

Table 6-18 Estimated Level A Takes at Moorings Sitka

Marine Mammal Hearing Group	Occurrence	Daily Density (individuals/km^2)	Days of DTH	Level A Area (km^2)	Calculated Occurrence	Level A Takes Requested	Notes
High-Frequency Cetaceans							
Harbor Porpoise	1 group of 5 every 14 days	-	84	1.4	30	3	NMFS expects only 10% of expected take would enter Level A zone undetected.
Dall's Porpoise		0.121	84	1.4	14.2	5	NMFS expects only 10% of expected take would enter Level A zone undetected. However, due to the species usually being found in groups of 2-12, request for 5 Level A takes.
Otariid Pinnipeds							
Steller Sea Lion (Western – 2.2%	One group of 2/day		84		4	1	NMFS expects only 10% of expected take would enter Level A zone undetected.
Steller Sea Lion (Eastern-97.8%)					164	16	
Northern Fur Seal	1/month		84		2.8	0	NMFS expects only 10% of

Marine Mammal Hearing Group	Occurrence	Daily Density (individuals/km^2)	Days of DTH	Level A Area (km^2)	Calculated Occurrence	Level A Takes Requested	Notes
							expected take would enter Level A zone undetected, in this case 0.28 rounded to 0 with monitoring.
Phocid Pinnipeds							
Harbor Seal	2.1	-	84	0.55	176.4	18	NMFS expects only 10% of expected take would enter Level A zone undetected.
Low Frequency Cetaceans							
Humpback Whale	One group of 3.5 every 14 days	-	84	1.24			Due to the size of shutdown zones, the conspicuous nature of these species, and presence of boat-based PSOs, it is expected that any take would be mitigated to 0 Level A takes for each species.
Hawaii Stock (97.8%)		-		1.24	20.5	0	
Mexico-N. Pacific (2.2%)		-		1.24	0.5	0	
Gray Whale	One group of 3.5 every 14 days	0.0155	84	1.24	21	0	
Fin Whale	-	0.0001	84	1.24	0.01	0	
Minke Whale	One group of 3.5 every 14 days	-	84	1.24	21	0	

Level B Take Estimates

Potential Level B takes would occur during in-water demolition and construction activities if marine mammals are present within the relevant Level B harassment zones. Beyond the size of the harassment zones associated with in-water demolition and construction activities, estimated takes are based on the estimated occurrence (either assumed daily occurrence or species density of individual marine mammals in proximity to the noise-generating in-water activities at Moorings Seward and Sitka (Table 6-19 and 6-20). As a note regarding northern sea otters at Sitka only DTH and impact driving timber piles would exceed the 30m shutdown ozone resulting in takes and where abundance is based on 400-foot by 400-foot survey cells, there is a gap in the survey data (Appendix B). To fill in the survey gap the largest value from an adjacent cell is duplicated for the missing data which sums:

- Cell centered on project: 0.179174 sea otters / day
- Cell south of project: 0.175414 sea otters / day
- Cell north of project: 0.181865 sea otters / day
- Duplicate value of highest adjacent cell: 0.181865 sea otters / day
- Total sea otters per day at Sitka: 0.718318

Table 6-19 Summary of Species-Specific Level B Harassment Takes by In-Water Activity at Moorings Seward

Species Stock	Estimated Daily Occurrence	Density (ind./km²)	Removal (2 days)	Removal Area (2.26 km²)	Install (20 days)	Install Area (2.26 km²)	Adjusted Level B Takes	Requested Level B Takes (minus Level A)
Steller Sea Lion – Western	2		4		40		44	40
Harbor Seal – Prince William Sound	48.95		98		979		1,078	980
Killer Whale – Alaska Resident	One group of 7 per week – Rounded up to 4 weeks of work or 28 individuals		2		20		28	28 Total requested take to be apportioned to either stock
GOA, Aleutian Islands, and Bering Sea Transient								
Pacific-White Sided Dolphin – North Pacific	3		6		60		66	60
Harbor Porpoise - GOA		0.4547		2		21	23	18
Dall's porpoise - Alaska	0.25		1		5		6	5
Humpback Whale – Hawai'i (89%)	1		2		18		20	20
Mexico-N. Pacific (11%)			0		2		2	2
Gray Whale – E.N. Pacific		0.0155		0		1	1	1
Fin Whale – Northeast Pacific		0.068		1		2	3	3
Minke Whale - Alaska		0.006		0		0	0	0
NMFS Total								1,157
USFWS Northern Sea Otter – Southcentral		2.31		11		105	116	116

Table 6-20 Summary of Species-Specific Level B Harassment Takes by In-Water Activity at Moorings Sitka

Species Stock	Estimated Daily Occurrence	Density (ind./km²)	Timber Vibratory Removal (2 days)	Removal Area (4.17 km²)	Concrete Pile Removal (1 day)	Removal Area (3.75 km²)	Timber Pile Install (3 days)	Timber Pile Install Area (0.01 km²)	Plastic Pile Install (27 days)	Plastic Pile Install Area (0.0 km²)	DTH (84 days)	DTH Area (6.31 km²)	Level B Takes	Requested Level B Takes
Steller Sea Lion – Eastern (97.8%)	Two groups of 2/day (4)		8		4		12		0		336		352	336
Western (2.2%)			0		0		0		0		30		8	7
Northern Fur Seal – E. Pacific	1/month		0		0		0		0		2.8		3	3 (rounded up to 4 to account for fractional calculations)
Harbor Seal – Chatham/Sitka	Two groups of 2.1/day		9		4		13		0		353		360	342
Killer Whale – Alaska Resident	One group of 6.6/week (rounded up to 1/day for calculation)		2		1		3		0		84		90	90 Total proposed take may be apportioned to any stock.
GOA, Aleutian Islands, and Bering Sea Transient														
Northern Resident														
West Coast Transient														
Harbor Porpoise – Yakutat/SE AK	One group of 5 every 2 weeks		1		1		1		0		30		32	32
Dall's porpoise - Alaska		0.121		1		0		0		0		65	66	61
Sperm Whale – N. Pacific		0.002		1		1		1		0		2	1	0[4]
Humpback Whale – Hawai'i (98%)	One group of 3.4/week		1		1		2		0		40		43	43
-Mexico-N. Pacific (2%)			0		0		0		0		1		1	1
Gray Whale – E. N. Pacific	One group 3.5/2 weeks		1		1		1		0		21		22	22
Fin Whale – Northeast Pacific		0.0001		0		0		0		0		0	0	0

[4] Due to expected behavioral patterm, this species is not expected to move into the ensonified area and NMFS does not recommend requesting take.

Minke Whale - Alaska	One group 3.5/2 weeks		1		1		1		0		21		22	22
NMFS Total														**959**
USFWS - Northern Sea Otter – Southeastern	0.718318		0		0		6		0		168		174	174

7 IMPACTS TO MARINE MAMMAL SPECIES OR STOCKS

The anticipated impact of the activity upon the species or stock of marine mammals.

7.1 Potential Effects of In-Water Demolition and Construction Activities on Marine Mammals

7.1.1 Potential Effects Resulting from Underwater Noise

The effects of in-water activities on marine mammals are dependent on several factors, including the species, size, and depth of the animal; the depth, intensity, and duration of the in-water activity; the depth of the water column; the substrate of the habitat; in the case of piling, the distance between the pile and the animal; and the sound propagation properties of the environment. Impacts on marine mammals from pile installation activities are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the received level and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The farther away from the source, the less intense the exposure should be. The substrate and depth of the habitat affect the sound propagation properties of the environment. Shallow environments are typically more structurally complex, which leads to rapid sound attenuation. In addition, substrates that are soft (e.g., sand) will absorb or attenuate the sound more readily than hard substrates (e.g., rock), which may reflect the acoustic wave.

Potential impacts on marine species are expected to be the result of physiological responses to both the type and strength of the acoustic signature (Viada et al. 2008). Behavioral impacts may also occur, though the type and severity of these effects are more difficult to define due to limited studies addressing the behavioral effects of impulsive as well as non-impulsive sounds on marine mammals. Potential effects can range from brief acoustic effects such as behavioral disturbance, tactile perception, physical discomfort, slight injury of the internal organs and temporary to permanent impairment of the auditory system to death of the animal (Yelverton et al. 1973, O'Keefe and Young 1984, Ketten 1995, Finneran et al. 2015, Kastelein et al. 2018).

7.1.1.1 Physiological Responses

Because the ears are the organ most sensitive to pressure, they are the organs most sensitive to injury (Ketten 2000). Sound-related trauma can be lethal or sub-lethal. Lethal impacts are those that result in immediate death or serious debilitation; lethal noise impacts are those that may occur near an intense source (Ketten 1995). Sub-lethal damage to the ear from a pressure wave can rupture the tympanum, fracture the ossicles, damage the cochlea, cause hemorrhage, and leak cerebrospinal fluid into the middle ear (Ketten et al. 2004). Sub-lethal impacts also include hearing loss, which is caused by exposure to perceptible sounds. Moderate injury implies partial hearing loss. Permanent hearing loss (also called permanent threshold shift [PTS]) can occur when the hair cells of the ear are damaged by a very loud event, as well as prolonged exposure to noise. Instances of TTS and/or auditory fatigue are well documented in marine mammal literature as being one of the primary avenues of acoustic impact. TTS has been documented in controlled settings using captive marine mammals exposed to strong SELs at various frequencies (Ridgway et al. 1997, Kastak et al. 1999, Finneran et al. 2015). While injuries to other sensitive organs are possible, they are less likely since impacts are almost entirely acoustically mediated.

Based on Section 4, marine mammals may be present at varying levels at both Moorings Seward and Sitka during in-water activities. Therefore, marine mammals that are present during construction may experience auditory effects. Based on the mitigation measures outlined in Section 11 and the conservative modeling assumptions discussed in Section 6, the implementation of the physical interaction shutdown zone and Level A injury shutdown zones will prevent injury impacts to the extent practicable. However, these effects will not cause population-level impacts or affect the continued survival of the species.

7.1.1.2 Behavioral Responses

Behavioral responses to sound are highly variable and context-specific. For each potential behavioral change, the magnitude of the change ultimately determines the severity of the response. Several factors may influence an animal's response to noise, including its previous experience, its auditory sensitivity, its biological and social status (including age and sex), and its behavioral state and activity at the time of exposure. Habituation occurs when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok et al. 2004). Animals are most likely to habituate to sounds that are predictable and unvarying. The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure.

Behavioral state or differences in individual tolerance levels may also affect response types. For example, animals that are resting may show greater behavioral change in response to disturbing noise levels than animals that are highly motivated to remain in an area for feeding (Richardson et al. 1995; National Research Council 2003; Wartzok et al. 2004). Indicators of disturbance may include sudden changes in the animal's behavior or avoidance of the affected area. A marine mammal may show signs that it is startled by the noise and/or it may swim away from the sound source and avoid the area. Increased swimming speed, increased surfacing time, and cessation of foraging in the affected area indicate disturbance or discomfort. Pinnipeds may increase their haul-out time, possibly to avoid in-water disturbance.

Controlled experiments with captive marine mammals showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway et al. 1997) and an increase in the respiration rate of harbor porpoises (*Phocoena phocoena*) (Kastelein et al. 2013). Observed responses of wild marine mammals to loud pulsed sound sources (typically including seismic guns or acoustic harassment devices and pile driving) have been varied, but these responses often consist of avoidance behavior or other behavioral changes that suggest discomfort (Morton & Symonds 2002; also see reviews in Gordon et al. 2004, Wartzok et al. 2004, and Nowacek et al. 2007). Some studies of acoustic harassment and acoustic deterrence devices have found habituation in resident populations of seals and harbor porpoises (see Southall et al. 2007). Blackwell et al. (2004) found that ringed seals (*Phoca hispida*) exposed to underwater pile-driving sounds in the 153 to 160 dB RMS re 1µPa range tolerated this noise level and neither seemed unwilling to dive nor reacted strongly to pile-driving activities. Responses of two pinniped species to impact pile driving at the San Francisco-Oakland Bay Bridge East Span Seismic Safety Project were mixed (Caltrans 2001). Harbor seals were observed in the water at distances of approximately 400 to 500 m (1,312 to 1,640 ft) from the pile-driving activity and exhibited no alarm responses, although several showed alert reactions. None of the seals appeared to remain in the area, although they may have been transiting to the haul-out site or feeding areas. One of these harbor seals was even seen to swim to within 150 m (492 ft) of the pile-driving barge during pile driving. Several California sea lions, however, were

observed at distances of 500 to 1,000 m (1,640 to 3,280 ft) swimming rapidly and porpoising away from pile-driving activities. Both harbor seals and California sea lions continued feeding on dense schools of herring that occasionally occurred during pile driving (Caltrans 2001).

Observations of marine mammals on Naval Base Kitsap at Bangor, Washington during the Test Pile Program Project concluded that pinniped (harbor seal) foraging behaviors decreased slightly during construction periods involving impact and vibratory pile driving, and both pinnipeds and harbor porpoise were more likely to change direction while traveling during construction (HDR 2012). Pinnipeds were more likely to dive and sink when closer to pile-driving activity, and a greater variety of other behaviors were observed with increasing distance from pile driving.

A comprehensive review of acoustic and behavioral responses to noise exposure by Nowacek et al. (2007) concluded that one of the most common behavioral responses is displacement. To assess the significance of displacements, it is necessary to know the areas to which the animals relocate, the quality of that habitat, and the duration of the displacement in the event that they return to the pre-disturbance area. Short-term displacement may not be of great concern unless the disturbance happens repeatedly. Similarly, long-term displacement may not be of concern if adequate replacement habitat is available.

Marine mammals encountering in-water activities over the span of the Project's construction time frame would likely avoid affected areas in which they experience noise-related discomfort, limiting their access to forage and resting areas. As described in the Section 6 above, individual responses to in-water activity noise are expected to vary. Some individuals may occupy the Project area(s) during in-water work without apparent discomfort, but others may be displaced with undetermined effects. Avoidance of the affected area during in-water demolition and construction operations would reduce the likelihood of injury impacts but would also reduce access to foraging areas. Each of the harassment zones is only a small portion of foraging habitat utilized in Resurrection Bay (Seward) and Southeast Alaska (Sitka) in general and largely restricted to the SMIC Basin (Seward) and Sitka Harbor (Sitka) respectively. Noise-related disturbance may also inhibit some marine mammals from transiting the area. There is a potential for displacement of marine mammals from affected areas due to these behavioral disturbances during the in-water construction season. However, in some areas, habituation may occur, resulting in a decrease in the severity of the response. Since pile installation activities will only occur during daylight hours, marine mammals swimming, foraging, or resting in the Project area(s) at night will not be affected. Effects of in-water activities will be experienced by individual marine mammals but will not cause population-level impacts or affect the continued survival of the species.

7.2 Conclusions Regarding Impacts to Species or Stocks

Individual marine mammals may be exposed to SPLs during in-water construction activities which may result in Level A (permanent threshold shift and Level B harassment (temporary threshold shift). Any marine mammals which are taken (harassed) may change their normal behavior patterns (i.e., swimming speed, foraging habits, etc.) or be temporarily displaced from the area of construction. Any takes will likely have only a minor effect on individuals and no effect on the population. Mitigation (See Section 11) is likely to avoid most potential adverse underwater impacts to marine mammals from in-water demolition and construction activities. Nevertheless, some level of impact is unavoidable. The expected level of unavoidable impact (defined as an acoustic or harassment "take") is described in Section 6. This level of effect is not anticipated to have any detectable adverse impact to any of the studied marine mammal populations' recruitment (reproduction), survival, or recovery.

8 IMPACT ON SUBSISTENCE USE

The anticipated impact of the activity on the availability of the species or stock of marine mammals for subsistence uses.

Of the species considered in this application, three species (Steller sea lion, harbor seal, and northern sea otter) have been taken as part of subsistence harvests in Resurrection Bay and Southeast Alaska within the last 20 years (Table 8-1; Young et al. 2022 and USFWS 2023a, 2023b).

Because in-water demolition and construction Project activities at Moorings Seward and Sitka may result in harassment of marine mammals (Section 6) in regions where subsistence harvests have occurred historically, it is anticipated that these activities may temporarily result in marine mammals briefly avoiding the immediate vicinity of Moorings Seward and Sitka and surrounding harassment zones of noise-generating activities. However, in-water demolition and construction activities will be restricted to the closed and secured waterfront of Moorings Seward within the SMIC and Mooring Sitka within Sitka Harbor and will neither displace any subsistence uses nor place physical barriers between marine mammals and subsistence hunters. Harassment zones, namely the drilling of rock sockets, will result in behavioral harassment throughout the SMIC at Moorings Seward and Sitka Harbor surrounding Moorings Sitka, both of which are heavily travelled waterways/industrial and recreational harbors with typical traffic including private and commercial vessels.

While preparing the NEPA-compliant EAs for the project, the USCG consulted with the City of Seward in the vicinity of Seward and the Sitka Tribe in the vicinity of Sitka. At this time, no comments relevant to marine mammal protection have been received.

Moorings Seward and Sitka are not located within the traditional range of bowhead whales and their typical subsistence hunting grounds in the Bering, Chukchi, and Beaufort seas.

Therefore, in-water demolition and construction activities at Moorings Seward and Sitka will not lead to unmitigable adverse impacts on the availability of marine mammal species for subsistence uses.

Table 8-1 Subsistence Takes of Marine Mammals in Southeast Alaska

Marine Mammal	Stock	Subsistence Take Summary
Steller Sea Lion	Eastern	Statewide data are no longer being consistently collected, but subarea collection is occurring periodically. Between 2010 and 2017, monitoring occurred only in 2012, when one animal was landed and eight animals were struck and lost. Therefore, the most recent 5 years of data (2005 to 2008 and 2012) was used to calculate an annual mortality and serious injury estimate. The average number of animals harvested, plus those struck and lost, is 11 animals per year during that 5-year period.
	Western	Statewide data are no longer being collected. The mean annual subsistence harvest from this stock for all areas except St. Paul and St. George between 2004 and 2008 (172) combined with the mean annual harvest for St. Paul (31) and St. George (1.2) between 2013 and 2017 is 204 western sea lions.
Northern Fur Seal	Eastern Pacific	360 Northern fur seal taken as part of Alaska Native subsistence harvests between 2015 and 2019 (Young et al. 2023).
Harbor Seal	Prince William Sound	Average annual harvest (2004-2008): 439 Annual harvest 2011: 255 Annual harvest 2014: 387
	Sitka/Chatham Strait	Average annual harvest (2004-2008) Annual harvest 2011: 77
Killer Whale	Alaska Resident	There are no reports of subsistence takes of killer whale in Alaska.
	Gulf of Alaska, Aleutian Islands, and Bering Sea Transient	
	AT1 Transient	
Pacific White-Sided Dolphin	North Pacific	There are no reports of subsistence takes of Pacific white-sided dolphin in Alaska.
Harbor Porpoise	Gulf of Alaska	Harvests from this stock have not been reported by subsistence hunters since the early 1900s.
	Yakutat/Southeast Alaska Offshore Waters	Subsistence hunters in Alaska have not been reported to take from these stocks of harbor porpoise.
Dall's Porpoise	Alaska	There are no reports of subsistence takes of Dall's porpoise in Alaska.
Sperm Whale	North Pacific	Sperm whales have never been reported to be taken by subsistence hunters.
Humpback Whale	Western North Pacific DPS	Subsistence hunters in Alaska are not authorized to take from any of these stocks. An intentional unauthorized take of a humpback whale occurred in 2016.
	Hawai'i DPS	
	Mexico DPS	
Gray Whale	Eastern North Pacific	Subsistence takes of gray whales do not occur in the coastal waters of Alaska. Note: gray whale subsistence takes are only approved for the Makah Indian Tribe in their usual and accustomed fishing grounds off Washington State.
Fin Whale	Northeast Pacific	Subsistence hunters in Alaska and Russia have not been reported to take fin whales.
Minke Whale	Alaska	Subsistence takes of minke whales by Alaska Natives are rare but have been known to occur. The most recent reported catches (two whales) in Alaska occurred in 1989 but reporting is likely incomplete.
Northern Sea Otter	Southcentral Alaska	Average annual harvest (2017-2021): 388
	Southeast Alaska	Average annual harvest (2017-2021): 851

9 IMPACTS TO THE MARINE MAMMAL HABITAT AND THE LIKELIHOOD OF RESTORATION

The anticipated impact of the activity upon the habitat of the marine mammal populations, and the likelihood of restoration of the affected habitat.

Project activities at Moorings Seward and Sitka are expected to have few if any permanent effects on the distribution of marine mammals within the Project area(s) (the SMIC in Resurrection Bay or Sitka Harbor). Only small numbers of marine mammals are expected to be present during temporary in-water demolition and construction activities. Permanent changes to the local environment will be fully contained within developed and operational industrial, commercial, and recreational harbors that are unlikely to be used as foraging areas by marine mammals and would not create barriers to movement for marine mammals. Therefore, the primary impact of concern associated with the project is the potential for temporarily elevated noise levels and the associated direct effects on marine mammals, as discussed in Sections 6 and 7.

10 IMPACTS TO MARINE MAMMAL FROM LOSS OR MODIFICATION OF HABITAT

The anticipated impact of the loss or modification of the habitat on the marine mammal populations involved.

Project activities at Moorings Seward and Sitka are not expected to have any habitat-related effects that could cause significant or long-term consequences for individual marine mammals or their larger populations. Based on the discussions in Section 9, there will be no impacts to marine mammals resulting from loss or modification of marine mammal habitat.

11 MITIGATION MEASURES TO PROTECT MARINE MAMMALS AND THEIR HABITAT

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, their habitat, and on their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance.

The exposures outlined in Section 6 represent the maximum expected number of marine mammals that could be exposed to acoustic sources reaching Level B harassment levels. The USCG will employ the mitigation measures discussed below to minimize the number of marine mammals potentially affected by Project activities.

11.1 FRC Nearshore Standard Operating Procedures to Protect Living Marine Resources

Aside from the in-water mitigation measures described in Section 11.2 – Mitigation for In-Water Demolition and Construction Activities, the USCG operational guidance listed below addresses the protection of living marine resources and applies to all nearshore vessel operations:

- **Marine Protected Species Program for the Gulf of Alaska, Bering Sea/Aleutian Islands, and Arctic (Coast Guard District I7 Instruction [CGD17INST] 16214.2A).** CGD17INST 16214.2A outlines procedures for avoiding marine mammals and protected species; reporting whale and protected species sightings, strandings, and injuries; and enforcing the MMPA and the ESA.
- **Vessel Environmental Manual (COMDTINST M16455.1A).** This manual describes measures for protecting marine wildlife applicable to USCG vessels. In accordance with this instruction, all Commanding Officers and Officers in Charge must plan and act to protect marine mammals during operations and planning. Whale avoidance measures are prescribed, including requiring that vessels be especially alert for activity and proceed with caution in areas of known whale migration routes or high animal density, and that vessels do not approach whales head on during non-emergency maneuvering.
- **Maritime Law Enforcement Manual (COMDTINST 16247.1D).** Per this manual, the USCG shall seek to avoid collision with whales during all normal maritime law enforcement activities; operators of USCG vessels transiting critical habitat, migratory routes, and high-use areas shall use caution, remain alert, and reduce speeds, as appropriate. Additional reductions in speed are considered when a whale is sighted or known to be in the vicinity or within 5 nautical miles of the vessel.
- **Protected Living Marine Resources Program (COMDTINST 16475.7).** This instruction outlines USCG actions during its operations to support the recovery of protected living marine resources through internal compliance with and enforcement of federal, state, and international laws designed to preserve marine protected species.

11.2 Mitigation for In-Water Demolition and Construction Activities

General Mitigation Measures

1. The USCG will inform NMFS and USFWS of impending in-water activities a minimum of one week prior to the onset of those activities.
2. If construction activities occur outside of the time window specified in this authorization, the USCG will notify NMFS and USFWS in writing within 48 business hours (as feasible), with a detailed description of work to take place outside of the original time window and justification for the requested change.
3. In-water work will be conducted at the lowest points of the tidal cycle feasible (e.g., if in-water work will occur in an area with large tidal ranges, and the activities will not take much time, it may be appropriate for pile driving occur within 2 hours of either side of low tide or when the project site is dewatered in order to reduce sound transmission in the water column.
4. Project-associated staff will cut all materials that form closed loops (e.g., plastic packing bands, rubber bands, and all other loops) prior to proper disposal in a closed and secured trash bin. Trash bins will be properly secured with locked or secured lids that cannot blow open, preventing trash from entering the environment, thereby reducing the risk of entanglement in the event that waste enters marine waters.
5. Project-associated staff will properly secure all ropes, nets, and other marine mammal entanglement hazards to ensure they do not blow or wash into the water.

Protected Species Observer (PSO)-Related Measures

6. One or more PSOs will perform PSO duties onsite throughout all in-water demolition and construction activities.
7. For each in-water activity, PSOs will monitor all marine waters within the indicated shutdown zone radius for that activity (see Section 6).
8. PSOs will be positioned such that they will collectively be able to monitor the entirety of each activity's shutdown zone. The USCG will coordinate with NMFS and USFWS on the placement of PSOs prior to commencing in-water work.
9. Prior to commencing in-water activities including pile removal, DTH rock socket drilling, vibratory settling, and impact proofing, PSOs will scan water within the relevant activity-specific shutdown zone and confirm no marine mammals are within the relevant shutdown zone for at least 30 minutes immediately prior to initiation of the in-water activity. If one or more marine mammal is observed within the relevant shutdown zone, the in-water activity will not begin until the individual exits the shutdown zone of their own accord, or the shutdown zone has remained clear of marine mammals for 30 minutes immediately prior to start of activities.
10. The on-duty PSO(s) will continuously monitor the relevant shutdown zone and adjacent waters during in-water activities operations for the presence of any marine mammals.
11. In-water activities will take place only:
    a. Between civil dawn and civil dusk, generally 30 minutes after sunrise and up to 45 minutes before sunset, and work may not begin without sufficient daylight to conduct pre-activity monitoring, and may extend up to 3 hours past sunset, as needed to either completely remove an in-process pile or to embed a new pile far enough to safely leave piles in place until work can resume the next day;
    b. During conditions with a Beaufort Sea State of 4 or less; and
    c. When the entire shutdown zone and adjacent waters are visible (e.g., monitoring effectiveness is not reduced due to rain, fog, haze, or other environmental/atmospheric conditions).

12. If visibility degrades such that a PSO can no longer ensure that the relevant shutdown zone remains devoid of marine mammals during in-water activities, the crew will cease in-water work until the entire shutdown zone is visible and the PSO has indicated that the zone has remained devoid of marine mammals for 30 minutes.
13. The PSO will order the in-water activities to immediately cease if one or more marine mammal has entered, or appears likely to enter, the associated shutdown zone.
14. If the in-water activities are shut down for less than 30 minutes due to the presence of a marine mammal in the shutdown zone, activities may commence when the PSO provides assurance that marine mammals were observed exiting the shutdown zone. Otherwise, the activities may only commence after the PSO provides assurance that marine mammals have not been seen in the shutdown zone for 30 minutes (for cetaceans) or 15 minutes (for pinnipeds).
15. Following a lapse of in-water activities of more than 30 minutes, the PSO will authorize resumption of activities only after the PSO provides assurance that marine mammals have not been present in the shutdown zone for at least 30 minutes immediately prior to the resumption of operations.
16. If a marine mammal is observed within a shutdown zone or is otherwise harassed, harmed, injured, or disturbed, PSOs will immediately report that occurrence to NMFS or USFWS, as appropriate using the contact information in Table 11-1.
17. At the end of each day with in-water demolition and construction activities, the PSO will monitor the area for 30 minutes for post-activity monitoring.

Protected Species Observer Requirements

18. PSOs must be independent (i.e., not construction personnel) and have no other assigned tasks during monitoring periods.
19. The USCG or its designated non-federal representative will provide resumes or qualifications of PSO candidates to the NMFS and USFWS consultation biologist or Section 7 coordinator for approval at least one week prior to the in-water work. NMFS and/or USFWS will provide a brief explanation of lack of approval in instances where an individual is not approved.
20. At least one PSO will have prior experience performing the duties of a PSO during construction activities.
21. At least one PSO on the project will complete PSO training prior to deployment (e.g., see https://aisobservers.com/protected-species/new-protected-species-observer-training/). PSO training will include:
    a. Field identification of marine mammals and marine mammal behavior;
    b. Ecological information on marine mammals and specifics on the ecology and management concerns of those marine mammals;
    c. ESA and MMPA regulations;
    d. Proper equipment use;
    e. Methodologies in marine mammal observation and date recording and proper reporting protocols; and
    f. An overview of PSO roles and responsibilities.
22. Where a team of three or more PSOs are required, a lead observer or monitoring coordinator will be designated.
23. PSOs will:
    a. Have vision correctable to 20/20;
    b. Be able to effectively communicate orally, by radio and in person with project personnel;
    c. Be able to collect field observations and record field data accurately and in accordance with project protocols;

d. Be able to identify to species all marine mammals that occur in the relevant action area; and
e. Have writing skills sufficient to create understandable records of observations.

24. PSOs will work in shifts lasting no longer than 4 hours with at least a 1-hour break from monitoring duties between shifts. PSOs will not perform PSO duties for more than 12 hours in a 24-hour period.
25. PSOs will have the ability and authority to order appropriate mitigation response, including shutdowns, to avoid takes of all listed species.
26. The PSOs will have the following equipment to address their duties:
    a. Tools which enable them to accurately determine the position of a marine mammal in relationship to the shutdown zone;
    b. Two-way radio communication, or equivalent, with onsite project manager;
    c. Tide tables for the project area;
    d. Watch or chronometer;
    e. Binoculars (7x50 or high magnification) with built-in rangefinder or reticles (rangefinder may be provided separately);
    f. Instruments that allow observer to determine geographic coordinates of observed marine mammals;
    g. A legible copy of this IHA and all appendices including the Marine Mammal Monitoring Program; and
    h. Legible and fillable observation record form allowing for required PSO data entry.
27. Prior to commencing in-water work or at changes in watch, PSOs will establish a point of contact with the construction crew. The PSO will brief the point of contact as to the shutdown procedures if marine mammals are observed likely to enter or with the shutdown zone, and will request that the point of contact instruct the crew to notify the PSO when a marine mammal is observed. If the point of contact goes "off shift" and delegates their duties, the PSO must be informed and brief the new point of contact.

Impact Pile Proofing and DTH Rock Socket Drilling

Please see Section 6 for required shutdown zones by activity type, location, and marine mammal hearing group.

28. If no marine mammals are observed within the rock socket drilling and impact proofing shutdown zones for 30 minutes immediately prior to activity startup, soft-start procedures will be implemented immediately prior to activity commencement. Soft start requires contractors to provide an initial set of strikes at no more than half the operational power, followed by a 30-second waiting period, then two subsequent reduced power strike sets. A soft start must be implemented at the start of each day's impact proofing or rock socket drilling; any time these activities have been shutdown or delayed due to the presence of a marine mammal, and following cessation of these activities for a period of 30 minutes or longer.
29. Following this soft-start procedure, operational impact pile proofing and rock socket drilling may commence and continue provided marine mammals remain absent from the relevant shutdown zones.

Vibratory Pile Driving and Removal

30. If no marine mammals are observed within the vibratory pile driving and removal shutdown for 30 minutes immediately prior to pile driving, vibratory pile driving may commence. This pre-pile driving observation period will take place at the start of each day's vibratory pile driving, each

time pile driving has been shut down or delayed due to the presence of a marine mammals, and following cessation of pile driving for a period of 30 minutes or longer.

Work Vessels

31. Vessel operators will:
    a. Maintain a watch for marine mammals at all times when underway;
    b. Stay at least 91 m (100 yds) away from all marine mammals, except they will remain at least 460 m (500 yards [yds]) from endangered North Pacific right whales[5];
    c. Travel at less than 5 knots (9 km/hour) when within 274 m (300 yds) of a whale;
    d. Avoid changes in direction and speed when within 274 m (300 yds) of a whale, unless doing so is necessary for maritime safety;
    e. Not position vessel(s) in the path of a whale, and will not cut in front of a whale in a way or at a distance that causes the whale to change direction of travel or behavior (including breathing/surfacing pattern);
    f. Check the waters immediately adjacent to the vessel(s) to ensure that no whales will be injured when the propellers are engaged; and
    g. Reduce vessel speed to less than 10 knots when weather conditions reduce visibility to 1.6 km (1 mile) or less.
32. Vessel operators will adhere to Alaska Humpback Whale Approach Regulations when vessels are transiting to and from the project site (see 50 CF §§216.18, 223.214, 224.103(b)). Note: these regulations apply to all humpback whales. Specifically, pilot and crew will not:
    a. Approach, by any means, including by interception (i.e., placing a vessel in the path of oncoming humpback whale), within 91 m (100 yds) of any humpback whale;
    b. Cause a vessel or other object to approach within 91 m (100 yds) of a humpback whale;
    c. Disrupt the normal behavior or prior activity of a whale by any other act or omission.
33. If a whale's course and speed are such that it will likely cross in front of a vessel that is underway, or approach within 91 m (100 yds) of the vessel, and if maritime conditions safely allow, the engine will be put in neutral and the whale will be allowed to pass beyond the vessel, except that vessel, except that vessels will remain 460 m (500 yds) from North Pacific right whales.
34. Vessels will take reasonable steps to alert other vessels in the vicinity of whale(s).
35. Vessels will not allow lines to remain in the water unless both ends are under tension and affixed to the vessel or gear. No materials capable of becoming entangled around marine mammals will be discarded into marine waters.

Vessel Transit – Steller Sea Lion Haul Outs

35. Vessels will not approach within 3,000 ft of any Steller sea lion haulout or rookery.

General Data Collection and Reporting

Data Collection

36. PSOs will record observations on data forms or into electronic data sheets.
37. The USCG will ensure that PSO data will be submitted electronically in a format that can be queried such as a spreadsheet or database (i.e., digital images of data sheets are not sufficient).

[5] As stated in previous sections, North Pacific right whales are not expected to occur in proximity to either Seward or Sitka and no impacts are expected to affect and no takes have been requested for this species. However, if a North Pacific right whale is encountered during construction vessel transit these regulations would be followed and if one were to approach the active work area in-water construction activities would be shutdown as for any species not included in this IHA.

38. PSOs will record the following:
    a. Date, shift start time, shift stop time, and PSO identifier;
    b. Data and time of each reportable event (e.g., a marine mammal observation, operations shutdown, reason for operational shutdown, change in weather);
    c. Weather parameters (e.g., percent cloud cover, percent glare, visibility) and sea state (Beaufort Wind Force Scale will be used to determine sea state [https://www.weater.gov/mfl/beaufort]);
    d. Species numbers, and if possible, sex and age class of observed marine mammals, and observation data, time, and location. In the case of larger shutdown zones to be implemented for specific marine mammal hearing groups (i.e., high and low frequency cetaceans and phocid pinnipeds) during rock socket drilling and impact pile proofing, species or higher taxonomic group (i.e., baleen whale, seal, porpoise, etc.), number of individuals, and observation date, time, and location;
    e. Predominant anthropogenic sound-producing activities occurring during each marine mammal observation;
    f. Bearing and direction of travel of observed marine mammal(s);
    g. Observations of marine mammal behaviors and reactions to anthropogenic sounds and presence;
    h. Initial, closest, and last location of marine mammals, including distance from observer to the marine mammal, and minimum distance from the predominant sound-producing activity or activities to marine mammals;
    i. Whether the presence of marine mammals necessitated the implementation of mitigation measures to avoid acoustic impact, and the duration of the time that normal operations were affected by the presence of marine mammals; and
    j. Geographic coordinates for the observed animals, with the position recorded by using the most precise coordinates practicable (coordinates will be recorded in decimal degrees, or similar standard and defined coordinate system).

Data Reporting

39. All observations of North Pacific right whales will be reported to NMFS within 24 hours. These observation reports will include the following information:
    a. Date, time, and geographic coordinates of the observation(s);
    b. Number of North Pacific right whales observed, including number of adults/juveniles/calves observed, if determinable; and
    c. Environmental conditions as they existed during each observation event, including sea conditions, weather conditions, visibility, lighting conditions, and percent ice cover.
40. When project vessels are travelling within North Pacific right whale critical habitat[6] in a manner that requires the use of PSOs (i.e., vessel is travelling within North Pacific right whale critical habitat at greater then 5 knots), PSOs will collect, organize, and report on vessel travel within North Pacific right whale critical habitat and on marine mammal observations made within critical habitat. These reports will be submitted to AKE.section7@noaa.gov by the end of the calendar year. The report will outline the following information;
    a. Ship logs (time and location at which a vessel entered and exited North Pacific right whale critical habitat);
    b. Species, date, and time for each observation;

[6] Work vessels are not anticipated to cross North Pacific right whale critical habitat at any point related to work at either Seward or Sitka but these standard NMFS regulations are included here for completeness.

c. Number of animals per observation event, and number of adults/juveniles/calves per observation event (if determinable);
d. Geographic coordinates for the observed animals, with the position recorded by using the most precise coordinates practicable (coordinates will be recorded in decimal degrees, or similar standard (and define) coordinate system);
e. Environments as they existed during each observation event, including sea conditions, weather conditions, visibility, lighting conditions, and percent ice cover; and
f. Photographs and video of North Pacific right whales that were encountered.

41. Observations of humpback whales will be transmitted to AKR.section7@noaa.gov by the end of the calendar year, including:
    a. Photographs (especially flukes) and video obtained;
    b. Geographic coordinates for the observed animals, with the position recorded by using the most precise coordinates (coordinates will be recorded in decimal degrees, or similar standard [and defined coordinate system]);
    c. Number of humpback whales observed, including number of adults/juvenile/calves observed (if determinable);
    d. Environmental conditions as they exist during each observation event, including sea conditions, weather conditions, visibility, lighting conditions and percent ice cover.

Unauthorized Take

42. If a listed NMFS-managed marine mammal is determined by the PSO to have been disturbed, harassed, harmed, injured, or killed (e.g., a listed marine mammal(s) is observed entering a shutdown zone before operations can be shut down, or is injured or killed as a direct or indirect result of this action), the PSO will report the incident to NMFS within one business day, with information submitted to AKR.Section7@noaa.gov.
    a. All information to be provided in the final report (see Mitigation Measures under the *Final Report* heading below);
    b. Number of animals of each threatened and endangered species affected;
    c. Date, time, and location, or each event (provide geographic coordinates);
    d. Description of the event;
    e. Time the animal(s) was first observed or entered the shutdown zone, time the animal was last seen or exited the zone (if known), and the fate of the animal;
    f. Mitigation measures implemented prior to and after the animal was taken;
    g. If a vessel struck a marine mammal, the contact information for the PSO on duty, or the contact information for the individual piloting the vessel if there was not PSO on duty; and
    h. Photographs or video footage of the animal(s) (if available).
43. If project activities cause unauthorized take (i.e., greater than the number of authorized takes of the Southcentral (Seward) or Southeast Alaska (Sitka) stocks of northern sea otters, a form of take other than Level A or Level B harassment, or take of one or more sea otters through methods not described in the IHA), the US Coast Guard must take the following actions:
    a. Cease its activities immediately (or reduce activities to the minimum level necessary to maintain safety).
    b. Report the details of the incident to the USFWS within 48 hours.
    c. Suspend further activities until the USFWS has reviewed the circumstances an determined whether additional mitigation measures are necessary to avoid further unauthorized taking.

Stranded, Injured, Sick, or Dead Marine Mammal (not associated with the project)

43. If PSOs observe an injured, sick, or dead marine mammal (i.e., stranded marine mammal), they will notify the Alaska Marine Mammal Stranding Hotline at (877) 925-7773. PSOs will submit photos and available data to aid NMFS in determining how to respond to the stranded animal. If possible, data submitted to NMFS in response to stranded marine mammals will include date/time, location of the stranded marine mammal, species and number of stranded marine mammals, description of the stranded marine mammal's condition, event type (e.g., entanglement, dead, floating), and behavior of live-stranded marine mammals.
44. Injured, dead, or distressed sea otters that are not associated with project activities (e.g., animals known to be form outside the project area, previously wounded animals, or carcasses with moderate to advance decomposition or scavenger damage) must be reported to the USFWS within 24 hours of the discovery to either the USFWS's Marine Mammal Management Office (800-362-5148, business hours), the Alaska SeaLife Center in Seward (888-774-7325, 24 hours a day), or both. Photographs, video, location information, or any other available documentation must be provided to the USFWS.

Illegal Activities

44. If PSOs observe marine mammals being disturbed, harassed, harmed, injured, or killed (e.g., feeding or unauthorized harassment), these activities will be reported to NMFS Alaska Region Office of Law Enforcement and the USFWS Alaska Office of Law Enforcement.
45. Data submitted to NMFS will include date/time, location, description of the event, and any photos or videos taken.

Monthly Report

46. Submit interim monthly PSO monitoring reports, including data sheets, for each site where maintenance activities occurred during that year. These reports will include a summary of marine mammal species and behavioral observations, shutdowns or delays, and work completed.
47. Monthly NMFS reports will be submitted to AKR.section7@noaa.gov and pr.itp.monitoringreports@noaa.gov within 90 calendar days of the completion of project activities for the year.
48. Monthly USFWS reports will be submitted to the USFWS's Marine Mammal Management office for all months during which noise-generating work takes place. The monthly report will contain and summarize the following information:
    a. Dates, times, weather, and sea conditions (Beaufort Scale sea state and wind force conditions) when sea otters were sighted.
    b. The number, location, distance from the sound source, and behavior of observed sea otters.
    c. The associated project activities and a description of the implementation and effectiveness of mitigation measures with a discussion of any specific behaviors the sea otters exhibited in response to mitigation.

Final Report

48. A final report will be submitted to NMFS within 90 calendar days of the completion of the project summarizing the data recorded and submitted to AKR.section7@noaa.gov and pr.itp.monitoringreports@noaa.gov. The report will summarize all in-water activities associated with the projects and results of PSO monitoring conducted during pile installation activities.
49. The final NMFS report will include:

a. Summaries of monitoring efforts, including dates and time of construction, dates and times of monitoring, dates and times and duration of shutdowns due to marine mammal present;
b. Date and time of marine mammal observations, geographic coordinates of marine mammals at their closet approach to the project site, marine mammal species, numbers, age/size/gender categories (if determinable), and group size;
c. Number of marine mammals observed (by species) during periods with and without project activities (and other variables that could affect detectability);
d. Observed marine mammal behaviors and movement types versus project activity at time of observation;
e. Numbers of marine mammal observations/individuals seen versus project activity at time of observation;
f. Distribution of marine mammals around the action are versus project activity at time of observation;
g. Digital, queryable documents containing PSO observations and records, and digital queryable reports.

50. A final report will be submitted to USFWS within 90 calendar days after notifying USFWS that the project is complete or the expiration date of the IHA. The final report will be submitted to fw7_mmm_reports@fws.gov.
51. The final USFWS report will include:
    a. A summary of monitoring efforts (hours of monitoring, activities monitored, number of PSOs, and, if requested by the USFWS, the daily monitoring logs.
    b. A description of all project activities, along with any additional work yet to be done. Factors influencing visibility and detectability of marine mammals (e.g., sea state, number of observers, and fog and glare) will be discussed.
    c. A description of factors affecting the presence and distribution of sea otters (e.g., weather, sea state, and project activities). An estimate will be included of the number of sea otters exposed to noise at received levels greater than or equal to 160 dB (based on visual observation).
    d. A description of changes in sea otter behavior resulting from project activities and any specific behaviors of interest.
    e. A discussion of the mitigation measures implemented during project activities and their observed effectiveness for minimizing impacts to sea otters. Sea otter observation records will be provided to the USFWS in the form of electronic database or spreadsheet files.
52. Time Restriction – In-water activities will only be conducted when sufficient light is available for visual observations (generally 30 minutes after sunrise and up to 45 minutes before sunset).
53. General Vessel and Machinery Stoppage – For in-water activities, heavy machinery activities other than those defined in this application but not included as noise-generating activities (e.g., use of barge-mounted excavator) must cease operations and reduce vessel speed to the minimum level required to maintain steerage and safe working conditions if a marine mammal approaches within 30 m (100 ft). For all other activities, all crew members (i.e., construction supervisors and crews, PSOs, and relevant staff) must avoid direct physical interaction with marine mammals during construction activities. If a marine mammal comes within 30 m (100 ft) of such activity, operations must cease.
54. Pre-Construction Briefing – Prior to the start of in-water activities, briefings will be conducted for construction supervisors and crews and the monitoring team when new personnel join the

work or a new activity begins, to explain responsibilities, communication procedures, the marine mammal protocols, and operations procedures.

Table 11-1 Regulator Points of Contact

Reason for Contact	Contact Information
Consultation Questions & Unauthorized Take	Alyssa Clevenstine: Alyssa.clevenstine@noaa.gov Heather Patterson Heather_Patterson@fws.gov or Leslie Curran Leslie_curran@fws.gov
Reports & Data Submittal	AKR.Section7@noaa.gov (please include NMFS AKRO tracking number in subject line) pr.itp.monitoringreports@noaa.gov fw7_mmm_reports@fws.gov
Stranded, Injured, or Dead Marine Mammal (not related to project activities)	NMFS Stranding Hotline (24/7 coverage) 877-925-7773 USFWS Marine Mammals Management 800-362-5148 Alaska SeaLife Center (Seward) 888-774-7325
Oil Spill & Hazardous Materials Response	US Coast Guard National Response Center: 800-424-8802 NMFS - AKRNMFSSpillResponse@noaa.gov USFWS – Alaska Regional Spill Team 907-242-6893 fwsakspillresponse@fws.gov
Illegal Activities (not related to project activities; e.g., feeding, unauthorized harassment, or disturbance to marine mammals)	NMFS Office of Law Enforcement AK Hotline: 800-853-1964 USFWS Office of Law Enforcement AK Hotline: 844-397-8477
In the event that this contact information becomes obsolete	NMFS Anchorage Main Office: 907-271-5006 NMFS Juneau Main Office: 907-586-7236 USFWS Alaska Marine Mammals Management Officer 800-362-5148

55. Establishment of Level A and Level B Harassment Zones During In-Water Activities
    a. During all in-water pile installation activities, regardless of predicted SPLs, a physical interaction shutdown zone of 30 m (100 ft) will be implemented. Since most marine mammals are fast-swimming, this is appropriate to reduce the likelihood of injury to marine mammal species due to physical interaction with noise-generating equipment during in-water activities. If an animal enters the shutdown zone, the pile installation activity will be stopped until the individual(s) has left the zone of its own volition, or not been sighted for 15 minutes for pinnipeds and 30 minutes for cetaceans.
    b. To the maximum extent practicable, the relevant activity and species-specific Level A shutdown zone (see table below) will be monitored during the all in-water pile installation activities. If a marine mammal is observed entering the relevant Level A shutdown zone, work will cease until the marine mammal exits the shutdown zone or has not been observed within the shutdown zone for 15 minutes (pinnipeds) or 30 minutes (cetaceans).

c. To the maximum extent practicable, the Level B harassment zones will be monitored throughout the time required to install piles. Because many of the Level B harassment zones may be outside the visual range a PSO (due to shifts in weather or sea state), an inferred take will be calculated for the unobserved portion of the Level B harassment zone based on the application of the listed species density to the difference between the total Level B area for a given pile installation activity and the area observed by the PSO (i.e., [Local Species Density X Total Level B Area – Observed Area] = Inferred Unobserved Take. Observed and inferred take would be recorded separately in daily monitoring logs. If a marine mammal is observed entering the Level B harassment zone, an exposure would be recorded, and behaviors documented. Work would continue without cessation, unless the animal approaches or enters the shutdown zone, at which point installation activities shall be halted.

Visual Monitoring

54. Monitoring will be conducted for a 30-m (100-ft) physical interaction shutdown zone and relevant Level A shutdown and Level B harassment zones identified for the specific activities and the greatest visual extent possible before, during, and after in-water activities. Monitoring will take place from 30 minutes to initiation through 30 minutes post-completion of activities. PSOs must record all observations of marine mammals, regardless of distance from the activity being conducted, as well as the additional data required.
55. Monitoring will be conducted by qualified, independent PSOs approved by NMFS. All PSOs will be trained in marine mammal identification and behaviors and have experience conducting marine mammal monitoring or surveys. Trained PSOs will be placed at the best vantage point(s) practicable (e.g., from a small boat, shore, or any other suitable gatekeeping location) to monitor for marine mammals and implement shutdown procedures, when applicable, by notifying the operator of a need for a shutdown of construction.
56. Up to five PSOs will be deployed on land or vessel with a clear view of the shutdown and harassment zones.
57. PSOs will work in shifts lasting no longer than 4 hours with a one-hour break from monitoring duties between shifts. PSOs will not perform PSO duties for more than 12 hours in a 24-hour period.
58. Prior to the start of in-water work, the relevant activity-specific shutdown zone and relevant Level B harassment zone will be monitored for 30 minutes to ensure that they are clear of marine mammals. In-water maintenance activities will only commence once observers have declared the zones clear of marine mammals. Animals will be allowed to remain in the Level B harassment zone and their behavior will be monitored and documented.
59. If a marine mammal approaches/enters the activity-specific shutdown zone during in-water work, the noise-generating activity will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone, or 15 minutes for pinnipeds or 30 minutes for cetaceans have passed without a re-detection of the animal(s) from the last observation time.
60. If a marine mammal species not covered in this IHA enters the Level B harassment zone, all in-water activities shall be halted until the animal(s) has been observed to have left the Level B harassment zone. NMFS will be notified immediately with information regarding the species and precautions made during the encounter. In-water activities will be allowed to proceed if the above measures are fulfilled for non-IHA species.

61. In the event of conditions (such as heavy fog) that prevent visual detection of marine mammals with the physical interaction shutdown zone or render the physical interaction shutdown zone not completely visible once in-water activities have been initiated, activities will be delayed until the full zone is once again visible.
62. If the take of a marine mammal species approaches take limits specified in the IHA, NMFS and/or USFWS will be notified, and appropriate steps will be discussed.
63. Soft Start – The use of impact pile driving soft-start procedures are believed to provide additional protection to marine mammals by providing a warning and/or giving marine mammals a chance to leave the area prior to the hammer operating at full capacity. The soft-start procedure is described below:

    Soft-start requires contractors to provide an initial set of strikes at reduced energy, followed by a 30-second waiting period, then two subsequent reduced energy strike sets. A soft-start must by 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.

64. Daylight Construction – In-water maintenance work will occur only during daylight hours that allow for sighting of marine protected species within all project area and defined monitoring zones (generally 30 minutes after sunrise and up to 45 minutes before sunset).

12 MITIGATION MEASURES TO PROTECT SUBSISTENCE USE

Where the proposed activity would take place in or near a traditional Arctic subsistence hunting area and/or may affect the availability of a species or stock of marine mammal for Arctic subsistence uses, you must submit either a plan of cooperation or information that identifies what measures have been taken and/or will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses.

The in-water demolition and construction activities described in the two IHAs at Moorings Seward and Sitka will occur within developed harbors (i.e., the SMIC and Sitka Harbor) or waterfronts; potential noise-related impacts are not anticipated to extend beyond the immediate vicinity of each facility. Of the marine mammals considered in these IHA applications, only Steller sea lions, harbor seals, and northern sea otters are known to be taken as part of subsistence harvest in the immediate vicinity of either USCG facility. Mitigation measures described in Section 11 will ensure that noise-generating in-water demolition and construction activities will not kill or injure marine mammals, including those important for local subsistence harvests.

As part of ongoing NEPA government-to-government coordination in support of the EAs for each project, the USCG has contacted Alaska Native tribes in Southeast and Southcentral Alaska. If any Alaska Native tribe expresses concerns regarding the projects' impacts to subsistence harvests of marine mammals, further coordination with the USCG will occur, including provision of additional project information and clarification of any mitigation and minimization measures that may reduce potential impacts on subsistence uses.

13 MONITORING AND REPORTING MEASURES

The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity. Monitoring plans should include a description of the survey techniques that would be used to determine the movement and activity of marine mammals near the activity site(s) including migration and other habitat uses, such as feeding.

13.1 Monitoring Plan

The following monitoring measures will be implemented along with the mitigation measures (Section 11) to reduce impacts to marine mammals to the lowest extent practicable during the period of this IHA(s). Marine mammal monitoring plans will be developed further and submitted to NMFS and USFWS for approval well in advance of the start of construction during the individual IHA periods.

13.1.1 Visual Marine Mammal Observations

USCG will collect sightings data and behavioral responses to in-water demolition and construction activities for marine mammal species observed in the region of activity during the period of construction. All observers will be trained in marine mammal identification and behaviors.

13.1.2 Methods of Monitoring

USCG will monitor the 30-m physical interaction shutdown zone, activity/species-specific Level A shutdown zones, and Level B harassment zones before, during, and after in-water activities. The Marine Mammal Monitoring Plan will include the following procedures:

- PSOs will be independent (i.e., not construction personnel), and approved by NMFS and USFWS as appropriate, who have no other assigned tasks during monitoring periods. Where a team of more than three PSO (up to five) is required, a lead observer or monitoring coordinator must be designated. The lead observer or monitoring coordinator will be referred to as "Command" and must have prior experience working as a marine mammal observer during construction while other PSOs may substitute education (degree in biological science or related field) or training for experience. All PSO resumes and *curricula vitae* must be submitted to NMFS and USFWS for review and approval prior to the onset of in-water activities.
- Monitoring will be conducted during daylight hours (i.e., between civil dawn and twilight). If lighting conditions do not allow PSOs to observe the entire 30-m physical interaction shutdown zone effectively or relevant Level A shutdown zones, in-water activities will not be allowed to start (or continue) until conditions improve.
- For each type of in-water activity, PSOs will be placed at the best vantage point(s) practicable (e.g., from a small boat, construction barge, onshore).
- A team of three PSOs (up to five PSOs) at up to three locations (including two PSOs on a captained vessel in the case of a five-member team) will conduct the marine protected species monitoring depending on the activity and size of monitoring zones. When there are

two or more PSOs, all will be in radio or cell phone communication with each other to enhance tracking of marine mammals that may be moving through the area and to minimize duplicate observation records of the same animal by different PSOs (i.e., a re-sighting).

- One land-/barge-based PSO ("Command" position) will be stationed with clear view of the shutdown zone and will be responsible for the collection of pile repair, removal, and/or installation start and stop times, identification of all marine protected species in the vicinity of the in-water maintenance activity, and notifying the contractor if activities must be delayed or stopped due to the presence of a marine protected species within the shutdown zone.
- For activities with monitoring zones beyond the visual range of the PSO/Command position, additional monitoring locations or the use of a vessel with captain and up to three other PSOs (depending on width of the monitoring zones) will conduct monitoring. Data will be collected on any marine protected species observed within the monitoring zones in accordance with monitoring data collection procedures.
- Monitoring will be conducted before, during, and after in-water activities. Results of all marine protected species observations during pre-activity, during activity, and post-activity monitoring will be recorded on electronic tablet or hardcopy datasheets.
- During all observation periods, the PSOs will use binoculars and/or the naked eye to search continuously for marine protected species.
- A 30-m (100-ft) physical interaction shutdown zone will be established around all in-water maintenance activities to avoid the potential for Level A injury of marine protected species
- If a marine protected species enters the relevant shutdown zone(s), all in-water activities must be halted. The animal(s) must be allowed to remain in the zone (i.e., must leave of their own volition) and their behavior must be monitored and documented.
- If an injured, sick, or dead marine mammal is observed, appropriate reporting procedures will be followed (Section 11).

Pre-, During, and Post-Activity visual survey protocols are further described below.

- Pre-Activity Monitoring:
    - Visual surveys will occur for at least 30 minutes prior to the start of in-water activities.
    - If a marine mammal is present within the 30-m physical interaction shutdown zone or activity and species-specific shutdown zone (as appropriate), in-water activities will be delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone, or 15 minutes (pinnipeds and sea otters) or 30 minutes (cetaceans) have elapsed since the last observation time without a re-detection of the animal.
    - The shutdown zone may only be declared clear, and in-water work started, when the entire shutdown zone is visible (i.e., when not obscured by poor light, rain, fog, etc.). If the shutdown zone is obscured by fog or poor lighting conditions, activity at the location will not be initiated until the shutdown zone is visible.

  - If marine mammals are present within the Level B monitoring zone, in-water activities will not need to be delayed.

- During Activity Monitoring:
  - If any marine protected species approaches, or appears to be approaching, the 30-m physical interaction shutdown zone, or activity and species-specific Level A shutdown zone, the PSO who first observed the animal will alert the PSO/"Command," who will notify the construction crew of the animal's current status; in-water activities will be allowed to continue while the animal remains outside the relevant shutdown zone.
  - If the marine protected species enters the 30-m (100-ft) physical interaction shutdown zone or the relevant activity and species-specific Level A shutdown zone, a shutdown will be called by the PSO/"Command." As the animal enters the shutdown zone, all in-water activities will be stopped, and the animal(s) will by continually tracked. Once a shutdown has been initiated, all in-water activities that generate potentially impactful noise will be delayed until the animal has voluntarily left the shutdown zone and has been visually confirmed beyond the shutdown zone, or 15 minutes (pinnipeds and sea otters) or 30 minutes (cetaceans) have passed without re-detection of the animal (i.e., the zone is deemed clear of marine protected species). The PSO/"Command" will inform the construction contractor that activities can re-commence.
  - If shutdown and/or clearance procedures would result in an imminent concern for human safety, then the activity will be allowed to continue until the safety concern is addressed. During that timeframe, the animal will be continuously monitored, and the USCG point of contact will be notified and consulted prior to re-initiation of project-related activities.
  - Shutdown shall occur if a species, for which authorization has not been granted, or for which the authorized numbers of takes have been met, approaches or is observed within the Level B harassment zone. The monitoring coordinator or lead PSO shall notify the USCG point of contact, who will then contact NMFS or USFWS (in the case of a polar bear or walrus) immediately. For non-IHA species, non-DTH rock socket drilling will be allowed to proceed if the animal(s) is observed to leave the Level B harassment zone or if one hour has lapsed since the last observation.
  - The number, species, and locations of all marine mammals observed will be documented using an electronic tablet or hardcopy datasheets in compliance with NMFS and USFWS reporting requirements.
  - If a marine mammal is observed entering the Level B monitoring zones, the pile being worked on will be completed with cessation (removed or installed), unless the animal enters or approaches the shutdown zone. Regardless of location within the Level B monitoring zone, an initial behavior and the location of the animal will be logged. Behaviors will be continuously logged until the animal is either passed off to another PSO, the animal is no longer visible, or it has left the Level B monitoring zone.
  - To the maximum extent practicable, the relevant activity and species-specific Level A shutdown zone will be monitored and the whole of the shutdown zone will be

monitored during all in-water activities. If a marine mammal is observed entering their relevant Level A shutdown zone, work would cease until the marine mammal exits the shutdown zone or has not been observed within the shutdown area for 15 minutes (pinnipeds and sea otters) or 30 minutes (cetaceans).

- Post-Activity Monitoring:
    - Monitoring of all zones will continue for 30 minutes following completion of noise generating activities. These surveys will record all marine mammal observations following the same procedures as identified for the pre-construction monitoring time and will focus on observing and reporting unusual or abnormal behaviors.

13.1.3 Data Collection

NMFS requires that the PSOs use monitoring forms that collect, at a minimum, the following information:

- Date and time that pile removal begins or ends;
- Construction activities occurring during each observation period;
- Weather parameters (e.g., wind, humidity, temperature);
- Tide state and water currents;
- Visibility;
- Species, numbers, and if possible, sex and age class of marine mammals;
- Marine mammal behavior patterns observed, including bearing and direction of travel, and if possible, the correlation to SPLs;
- Distance from in-water activities to marine mammals and distance from the marine mammal to the observation point;
- Locations of all marine mammal observations; and
- Other human activity in the area.

To the extent practicable, the USCG will record behavioral observations that may make it possible to determine if the same or different individuals are being "taken" as a result of Project activities over the course of a day.

13.1.4 Reporting

A draft report will be submitted to NMFS (AKR.section7@noaa.gov and pr.itp.monitoringreports@noaa.gov) and USFWS (fw7_mmm_reports@fws.gov) within 90 calendar days of the completion of marine mammal monitoring. The results will be summarized in textual, graphical, and tabular formats and include summary metrics, as applicable. A final report will be prepared and submitted to the NMFS and USFWS within 30 days following receipt of comments on the draft report from the NMFS and USFWS.

The NMFS marine mammal report shall contain informational elements including:

- Dates and times (beginning and end) of all marine mammal monitoring;
- Construction activities occurring during each daily observation period, including:

  - The number and type of piles that were driven or removed and the method (i.e., impact, vibratory, DTH drilling)
  - Total duration of driving time for each pile (vibratory driving) and number of strikes for each pile (impact driving); and
  - For DTH drilling, duration of operation for both impulsive and non-pulse components including estimated total number of strikes for each pile
- 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.
- Upon observation of a marine mammal, the following information:
  - Name of PSO who sighted the animal(s) and PSO location and activity at time of sighting
  - Time of sighting
  - Identification of the animal(s) (e.g., genus/species, lowest possible taxonomic level, or unidentified), PSO confidence in identification, and composition of the group if there is a mix of species
  - Distance and bearing of each marine mammal observed relative to the pile being driven for each sighting
  - Estimated number of animals (min/max/best-estimate)
  - Estimated number of animals by cohort (adults, juveniles, neonates, group composition, etc.)
  - Animal's closest point of approach and estimated time spent within the harassment zone
  - Description of any marine mammal behavioral observations (e.g., observed behaviors such as feeding or traveling), including an assessment of behavioral responses thought to have resulted from the activity (e.g., no response or changes in behavioral state such as ceasing feeding, changing direction, flushing, or breaching)
- 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.
- Submit all PSO datasheets and/or raw sighting data (in a separate file from the Final Report referenced immediately above).
- Observations of humpback whales will be transmitted to AKR.section7@noaa.gov by the end of the calendar year, including:
  - Photographs (especially flukes) and video obtained
  - Geographic coordinates for the observed animals, with the position recorded using the most precise coordinates practicable (coordinates will be recorded in decimal degrees, or similar standard [and defined] coordinate system)

  - Number of humpback whales observed, including number of adults/juveniles/calves observed (if determinable)
  - Environmental conditions as they existed during each observation event, including sea conditions, weather conditions, visibility, lighting conditions, and percent ice cover.

- Illegal Activities
  - If PSOs observe marine mammals being disturbed, harassed, harmed, injured, or killed (e.g., feeding and unauthorized harassment), these activities will be reported to NMFS Alaska Region Office of Law Enforcement (1-800-853-1964).
  - Data submitted to NMFS will include date/time, locations, description of the event, and any photos or videos taken.

The USFWS final report will be submitted to fw7_mmm_reports@fws.gov upon project completion (as notification is supplied to the USFWS) and will include:

- A summary of monitoring efforts (hours of monitoring, activities monitored, number of PSOs, and, if requested by the USFWS, the daily monitoring logs.
- A description of all project activities, along with any additional work yet to be done. Factors influencing visibility and detectability of marine mammals (e.g., sea state, number of observers, and fog and glare) will be discussed.
- A description of the factors affecting the presence and distribution of sea otters (e.g., weather, sea state, and project activities). An estimate will be included of the number of sea otters exposed to noise at received levels greater than or equal to 160 dB (based on visual observation).
- A description of changes in sea otter behavior resulting from project activities and any specific behaviors of interest.
- A discussion of the mitigation measures implemented during project activities and their observed effectiveness for minimizing impacts to sea otters. Sea otter observation records will be provided to the USFWS in the form of electronic database or spreadsheet files.

14 SUGGESTED MEANS OF COORDINATION

Suggested means of learning of, encouraging, and coordinating research opportunities, plans, and activities relating to reducing such incidental taking and evaluating its effects.

To reduce the likelihood that incidental take of the species and stocks of marine mammals discussed in this application will occur, USCG activities at Moorings Seward and Sitka in support of the individual in-water demolition and construction projects, and nearshore operation of their respective FRCs, will be conducted in compliance with all relevant federal, state, and local laws and regulations. The USCG will continue to conduct coordination and consultation activities with appropriate federal agencies responsible for managing and protecting marine mammals (i.e., NMFS and USFWS) and State of Alaska agencies as necessary.

The USCG will cooperate with other marine mammal monitoring and research programs currently underway, or occurring during the two IHA periods, within Southeast Alaska and Resurrection Bay. Updated or improved mitigation measures will be implemented to further eliminate or minimize impacts from in-water maintenance to the extent possible. The USCG will make available its field date and behavioral observations of marine mammals that occur in the vicinity of the individual facilities during in-water demolition and construction activities. Annual result of monitoring efforts will be provided to NMFS and USFWS (for Northern sea otter) as a draft annual report, as described in Section 13, within 90 days of the completion of the IHA period. This information will be made available to regional, state, and federal resource agencies, tribal governments, universities, and other interested private parties upon written request to NMFS and USFWS.

15 LIST OF PREPARERS

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Appendix A

Moorings Seward In-Water Activity PTS Calculations

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Appendix B

Moorings Sitka In-Water Activity PTS Calculations

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Appendix C

Moorings Seward Level A and Level B Propagation Figures

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Appendix D

Moorings Sitka Level Level A and Level B Propagation Figures

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Vibratory Pile Driving

Use check boxes for Taxa present

☑ Fishes ☑ Sea Turtles ☑ Phocid

☑ LF Cet. ☑ MF Cet. ☑ HF Cet. ☑ Otariid

VERSION 1.2-Multi-Species: 2022

KEY

User Provided Information *Default values are in bold, italics turquoise (can be changed by user if project-specific information is available).*

Preset NMFS Provided Information (cannot be altered by user). **NMFS thresholds/default weighting value are in bold red.**

OUTPUT: Resultant Isopleth/Range to Effects (cannot be altered by user); Note: isopleths are presented in meters and feet

Automatically Calculated Values Based on User Provided Information (only weighting adjustment (-dB) can be altered by user; Row 64, if spectrum is available)

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE and CONTACT	US Coast Guard Moorings Seward SMIC Dock Reconfiguration & Floating Dock Construction
PROJECT/SOURCE INFORMATION (size, material, number, duration to drive pile, etc.)	Vibratory Extraction 14-inch steel guide pile RMS - 160 dB RMS 30 minutes per pile Maximum of 5 piles per day

Notes (please include all assumptions)

extra information

STEP 2: QUANTITATIVE PROJECT-SPECIFIC INFORMATION

1 sec SEL = RMS	METRIC RMS (NOT Peak)	WEIGHTING (WFA in kHz) Sea Turtle Default WFA (kHz)	 Marine Mammal Default WFA (kHz)
Unattenuated Sound Pressure Level (dB) (see Proxy Level Tab for surrogate values; Copy, ONLY Paste Values (123), not formulas)	160		
Attenuated Sound Pressure Level (dB)* (calculation done automatically)	**160**	**0.16**	**2.5**
Distance associated with sound pressure level measurement/Measurement distance from pile (meters); Typically, 10-m but please double check data being used	*10*		
Transmission loss constant (NMFS recommends: 15 if unknown)	*15*		
Number of piles per day (best estimate based on previous experience)	5	**Attenuation (e.g., bubble curtain)** (enter positive number)	0
Duration to drive a single pile (minutes) (best estimate based on previous experience)	30		
Duration of Sound Production within a day (seconds)	9000	**Cumulative SEL at measured distance (dB)**	199.54
10 Log (duration of sound production)	39.54		

*If sound pressure level provided includes attenuation methods (e.g., bubble curtain), please note this in Project/Source Information in Step 1

RESULTANT ISOPLETHS

(Range to Effects)

For vibratory pile driving, only behavioral thresholds exist for fishes

Fishes present

FISHES	
BEHAVIOR	
RMS Threshold (dB)	
150	
Isopleth (meters)	**46.4**
Isopleth (feet)	**152.3**

Sea Turtles present

SEA TURTLES	
PTS ONSET	**BEHAVIOR**
PTS SEL_{cum} Threshold (dB)	**RMS Threshold (dB)**
220	**175**
Isopleth (meters)	**0.4**	**1.0**
Isopleth (feet)	**1.4**	**3.3**

MARINE MAMMALS

Hearing Group	LF Cetacean PTS SEL_{cum} Threshold (dB)	MF Cetacean PTS SEL_{cum} Threshold (dB)	PTS ONSET HF Cetacean PTS SEL_{cum} Threshold (dB)	PW Pinniped PTS SEL_{cum} Threshold (dB)	OW Pinniped PTS SEL_{cum} Threshold (dB)
	199	**198**	**173**	**201**	**219**
Isopleth (meters)	**10.8**	**1.0**	**16.0**	**6.6**	**0.5**
Isopleth (feet)	**35.4**	**3.1**	**52.3**	**21.5**	**1.5**

ALL MARINE MAMMALS

BEHAVIOR	
RMS Threshold (dB)	
120	
Isopleth (meters)	**4,641.6**
Isopleth (feet)	**15,228.3**

LF Cet. present
MF Cet. present
HF Cet. present
Phocids present
Otariids present

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW):true seals
Otariid pinnipeds (OW):sea lions and fur seals

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Sea Turtles
a	1	1.6	1.8	1	2	1.4
b	2	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94	0.077
f_2	19	110	140	30	25	0.44
C	0.13	1.2	1.36	0.75	0.64	2.35
Adjustment (-dB)†	-0.05	-16.83	-23.50	-1.29	-0.60	0.00

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

Vibratory Pile Driving

Use check boxes for Taxa present

☑ Fishes ☑ Sea Turtles ☑ Phocid

☑ LF Cet. ☑ MF Cet. ☑ HF Cet. ☑ Otariid

VERSION 1.2-Multi-Species: 2022

KEY

User Provided Information *Default values are in bold, italics turquoise (can be changed by user if project-specific information is available).*

Preset NMFS Provided Information (cannot be altered by user). NMFS thresholds/default weighting value are in bold red.

OUTPUT: Resultant Isopleth/Range to Effects (cannot be altered by user); Note: isopleths are presented in meters and feet

Automatically Calculated Values Based on User Provided Information (only weighting adjustment (-dB) can be altered by user; Row 64, if spectrum is available)

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE and CONTACT	US Coast Guard Moorings Seward SMIC Dock Reconfiguration & Floating Dock Construction
PROJECT/SOURCE INFORMATION (size, material, number, duration to drive pile, etc.)	Pile Clipping 14-inch steel guide pile RMS - 161.2 dB RMS 10.37 minutes per pile Maximum of 5 piles per day

Notes (please include all assumptions)

extra information

STEP 2: QUANTITATIVE PROJECT-SPECIFIC INFORMATION

1 sec SEL = RMS	METRIC RMS (NOT Peak)	WEIGHTING (WFA in kHz) Sea Turtle Default WFA (kHz)	 Marine Mammal Default WFA (kHz)
Unattenuated Sound Pressure Level (dB) (see Proxy Level Tab for surrogate values; Copy, ONLY Paste Values (123), not formulas)	161.2		
Attenuated Sound Pressure Level (dB)* (calculation done automatically)	**161**	**0.16**	**2.5**
Distance associated with sound pressure level measurement/Measurement distance from pile (meters); Typically, 10-m but please double check data being used	*10*		
Transmission loss constant (NMFS recommends: 15 if unknown)	*15*		
Number of piles per day (best estimate based on previous experience)	5	**Attenuation (e.g., bubble curtain) (enter positive number)**	0
Duration to drive a single pile (minutes) (best estimate based on previous experience)	10.37		
Duration of Sound Production within a day (seconds)	3111	**Cumulative SEL at measured distance (dB)**	196.13
10 Log (duration of sound production)	34.93		

*If sound pressure level provided includes attenuation methods (e.g., bubble curtain), please note this in Project/Source Information in Step 1

RESULTANT ISOPLETHS

(Range to Effects)

For vibratory pile driving, only behavioral thresholds exist for fishes

Fishes present

FISHES	
BEHAVIOR	
RMS Threshold (dB)	
150	
Isopleth (meters)	**55.8**
Isopleth (feet)	**183.1**

Sea Turtles present

SEA TURTLES	
PTS ONSET	**BEHAVIOR**
PTS SEL_{cum} Threshold (dB)	**RMS Threshold (dB)**
220	**175**
Isopleth (meters)	**0.3**	**1.2**
Isopleth (feet)	**0.8**	**3.9**

MARINE MAMMALS

Hearing Group	LF Cetacean PTS SEL_{cum} Threshold (dB)	MF Cetacean PTS SEL_{cum} Threshold (dB)	PTS ONSET HF Cetacean PTS SEL_{cum} Threshold (dB)	PW Pinniped PTS SEL_{cum} Threshold (dB)	OW Pinniped PTS SEL_{cum} Threshold (dB)
	199	**198**	**173**	**201**	**219**
Isopleth (meters)	**6.4**	**0.6**	**9.4**	**3.9**	**0.3**
Isopleth (feet)	**21.0**	**1.9**	**31.0**	**12.7**	**0.9**

ALL MARINE MAMMALS

BEHAVIOR	
RMS Threshold (dB)	
120	
Isopleth (meters)	**5,580.4**
Isopleth (feet)	**18,308.5**

LF Cet. present
MF Cet. present
HF Cet. present
Phocids present
Otariids present

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW):true seals
Otariid pinnipeds (OW):sea lions and fur seals

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Sea Turtles
a	1	1.6	1.8	1	2	1.4
b	2	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94	0.077
f_2	19	110	140	30	25	0.44
C	0.13	1.2	1.36	0.75	0.64	2.35
Adjustment (-dB)†	-0.05	-16.83	-23.50	-1.29	-0.60	0.00

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

Vibratory Pile Driving

Use check boxes for Taxa present

☑ Fishes ☑ Sea Turtles ☑ Phocid

☑ LF Cet. ☑ MF Cet. ☑ HF Cet. ☑ Otariid

VERSION 1.2-Multi-Species: 2022

KEY

	User Provided Information *Default values are in bold, italics turquoise (can be changed by user if project-specific information is available).*
	Preset NMFS Provided Information (cannot be altered by user). **NMFS thresholds/default weighting value are in bold red.**
	OUTPUT: Resultant Isopleth/Range to Effects (cannot be altered by user); Note: isopleths are presented in meters and feet
	Automatically Calculated Values Based on User Provided Information (only weighting adjustment (-dB) can be altered by user; Row 64, if spectrum is available)

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE and CONTACT	US Coast Guard Moorings Seward SMIC Dock Reconfiguration & Floating Dock Construction
PROJECT/SOURCE INFORMATION (size, material, number, duration to drive pile, etc.)	Diamond Wire Saw 14-inch steel guide pile RMS - 161.5 dB RMS 15.5 minutes per pile Maximum of 5 piles per day

Notes (please include all assumptions)

extra information

STEP 2: QUANTITATIVE PROJECT-SPECIFIC INFORMATION

1 sec SEL = RMS	METRIC RMS (NOT Peak)	WEIGHTING (WFA in kHz) Sea Turtle Default WFA (kHz)	 Marine Mammal Default WFA (kHz)
Unattenuated Sound Pressure Level (dB) (see Proxy Level Tab for surrogate values; Copy, ONLY Paste Values (123), not formulas)	161.5		
Attenuated Sound Pressure Level (dB)* (calculation done automatically)	**162**	**0.16**	**2.5**
Distance associated with sound pressure level measurement/Measurement distance from pile (meters); Typically, 10-m but please double check data being used	*10*		
Transmission loss constant (NMFS recommends: 15 if unknown)	*15*		
Number of piles per day (best estimate based on previous experience)	5	**Attenuation (e.g., bubble curtain)** (enter positive number)	0
Duration to drive a single pile (minutes) (best estimate based on previous experience)	15.5		
Duration of Sound Production within a day (seconds)	4650	**Cumulative SEL at measured distance (dB)**	198.17
10 Log (duration of sound production)	36.67		

*If sound pressure level provided includes attenuation methods (e.g., bubble curtain), please note this in Project/Source Information in Step 1

RESULTANT ISOPLETHS

(Range to Effects)

For vibratory pile driving, only behavioral thresholds exist for fishes

Fishes present

FISHES	
	BEHAVIOR
	RMS Threshold (dB)
	150
Isopleth (meters)	**58.4**
Isopleth (feet)	**191.7**

Sea Turtles present

SEA TURTLES		
	PTS ONSET	**BEHAVIOR**
	PTS SEL_{cum} Threshold (dB)	**RMS Threshold (dB)**
	220	**175**
Isopleth (meters)	**0.4**	**1.3**
Isopleth (feet)	**1.2**	**4.1**

MARINE MAMMALS

			PTS ONSET		
Hearing Group	**LF Cetacean PTS SEL_{cum} Threshold (dB)**	**MF Cetacean PTS SEL_{cum} Threshold (dB)**	**HF Cetacean PTS SEL_{cum} Threshold (dB)**	**PW Pinniped PTS SEL_{cum} Threshold (dB)**	**OW Pinniped PTS SEL_{cum} Threshold (dB)**
	199	**198**	**173**	**201**	**219**
Isopleth (meters)	**8.7**	**0.8**	**12.9**	**5.3**	**0.4**
Isopleth (feet)	**28.7**	**2.5**	**42.4**	**17.4**	**1.2**

ALL MARINE MAMMALS

BEHAVIOR	
RMS Threshold (dB)	
120	
Isopleth (meters)	**5,843.4**
Isopleth (feet)	**19,171.3**

LF Cet. present
MF Cet. present
HF Cet. present
Phocids present
Otariids present

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW):true seals
Otariid pinnipeds (OW):sea lions and fur seals

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Sea Turtles
a	1	1.6	1.8	1	2	1.4
b	2	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94	0.077
f_2	19	110	140	30	25	0.44
C	0.13	1.2	1.36	0.75	0.64	2.35
Adjustment (-dB)†	-0.05	-16.83	-23.50	-1.29	-0.60	0.00

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^a}\right\}$$

IMPACT PILE DRIVING

Use check boxes for Taxa present

☐ Fishes ☐ Sea Turtles ☐ Phocid
☐ LF Cet. ☐ MF Cet. ☐ HF Cet. ☐ Otariid

VERSION 1.2-Multi-Species: 2022

KEY

User Provided Information *Default values are in bold, italics turquoise (can be changed by user if project-specific information is available).*

Preset NMFS Provided Information (cannot be altered by user). NMFS thresholds/default weighting value are in bold red.

OUTPUT: Resultant Isopleth/range to effects (cannot be altered by user); Note: isopleths are presented in meters and feet

Automatically Calculated Values Based on User Provided Information (only weighting adjustment (-dB) can be altered by user, Row 67, if spectrum is available)

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE and CONTACT	US Coast Guard Moorings Seward SMIC Dock Reconfiguration & Floating Dock Construction
PROJECT/SOURCE INFORMATION (size, material, number, pile strikes, etc.)	DTH Impulsive Component 30-Inch Concrete Piles RMS - 174 dB RMS SEL - 164 dB SEL 108,000 impacts per pile Maximum of 2 piles per day

Notes (Please include all assumptions)

STEP 2: QUANTITATIVE PROJECT-SPECIFIC INFORMATION

	METRICS				WEIGHTING (WFA in kHz)	
	Peak	**SELss**	**RMS**			
Unattenuated Single strike level (dB) (see Proxy Level Tab for surrogate values; Copy, ONLY Paste Values (123), not formulas)		164	174	**Effective Quiet (Fish Only)**	**Sea Turtle Default WFA (kHz)**	**Marine Mammal Default WFA (kHz)**
Attenuated Single strike level (dB)* (calculation done automatically)	**0**	**164**	**174**	**150**	**0.16**	**2**
Distance associated with single strike level/Measurement distance from pile (meters); Typically, 10-m but please double check data being used	*10*	*10*	*10*		WFA: Weighting Factor Adjustment	
Transmission loss constant (NMFS recommends: 15 if unknown)	*15*					
Number of piles per day (best estimate based on previous experience)	2	**Attenuation assumed (e.g., bubble curtain) (enter positive number)**	0			
Number of strikes per pile (best estimate based on previous experience)	108000		NMFS recommends 5 dB as default, If attenuation used			
Number of strikes per day	216000					
Cumulative SEL at measured distance	217					

RESULTANT ISOPLETHS‡ (Range to Effects)

‡Impulsive sounds have dual metric thresholds for injury (SEL_{cum} & PK). Metric producing largest isopleth should be used.

FISHES

NO FISHES

	ONSET OF	PHYSICAL	INJURY	BEHAVIOR
	Peak (PK) Threshold (dB)	SEL_{cum} Threshold (dB)**		RMS Threshold (dB)
		Fish ≥ 2 g	Fish < 2 g	
	206	187	183	150
Isopleths (meters)	0.0	85.8	85.8	398.1
Isopleth (feet)	0.0	281.4	281.4	1,306.1

**This calculation accounts for single strike SEL < 150 dB do not accumulate to cause injury (Effective Quiet)

SEA TURTLES

NO SEA TURTLES

	PTS ONSET		BEHAVIOR
	Peak (PK) Threshold (dB)	SEL_{cum} Threshold (dB)	RMS Threshold (dB)
	232	204	175
Isopleths (meters)	0.0	77.6	8.6
Isopleth (feet)	0.0	254.6	28.1

MARINE MAMMALS

	PTS ONSET				
Hearing Group	LF Cetacean PTS Peak (PK) Threshold (dB)	MF Cetacean Peak (PK) Threshold (dB)	HF Cetacean PTS Peak (PK) Threshold (dB)	PW Pinniped PTS Peak (PK) Threshold (dB)	OW Pinniped PTS Peak (PK) Threshold (dB)
	219	230	202	218	232
Isopleths (meters)	0.0	0.0	0.0	0.0	0.0
Isopleth (feet)	0.0	0.0	0.0	0.0	0.0
	LF Cetacean PTS SEL_{cum} Threshold (dB)	MF Cetacean PTS SEL_{cum} Threshold (dB)	HF Cetacean PTS SEL_{cum} Threshold (dB)	PW Pinniped PTS SEL_{cum} Threshold (dB)	OW Pinniped PTS SEL_{cum} Threshold (dB)
	183	185	155	185	203
Isopleths (meters)	1,945.5	69.2	2,317.4	1,041.2	75.8
Isopleth (feet)	6,383.0	227.0	7,603.2	3,415.9	248.7

ALL MARINE MAMMALS

	BEHAVIOR
	RMS Threshold (dB)
	160
Isopleths (meters)	85.8
Isopleth (feet)	281.4

NO LF CET.
NO MF CET.
NO HF CET.
NO PHOCIDS
NO OTARIIDS

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW):true seals
Otariid pinnipeds (OW):sea lions and fur seals

WEIGHTING FUNCTION CALCULATIONS (Sea Turtles and Marine Mammals Only)

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Sea Turtles
a	1	1.6	1.8	1	2	1.4
b	2	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94	0.077
f_2	19	110	140	30	25	0.44
C	0.13	1.2	1.36	0.75	0.64	2.35
Adjustment (-dB)†	-0.01	-19.74	-26.87	-2.08	-1.15	0.00

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

Vibratory Pile Driving

Use check boxes for Taxa present

☑ Fishes ☑ Sea Turtles ☑ Phocid

☑ LF Cet. ☑ MF Cet. ☑ HF Cet. ☑ Otariid

VERSION 1.2-Multi-Species: 2022

KEY

	User Provided Information *Default values are in bold, italics turquoise (can be changed by user if project-specific information is available).*
	Preset NMFS Provided Information (cannot be altered by user). **NMFS thresholds/default weighting value are in bold red.**
	OUTPUT: Resultant Isopleth/Range to Effects (cannot be altered by user); Note: isopleths are presented in meters and feet
	Automatically Calculated Values Based on User Provided Information (only weighting adjustment (-dB) can be altered by user; Row 64, if spectrum is available)

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE and CONTACT	US Coast Guard Moorings Seward SMIC Dock Reconfiguration & Floating Dock Construction
PROJECT/SOURCE INFORMATION (size, material, number, duration to drive pile, etc.)	DTH (Non-Impulsive Component) 30-Inch Concrete Piles RMS - 174 dB RMS 180 minutes per pile Maximum of 2 piles per day

Notes (please include all assumptions)

extra information

STEP 2: QUANTITATIVE PROJECT-SPECIFIC INFORMATION

1 sec SEL = RMS	METRIC RMS (NOT Peak)	WEIGHTING (WFA in kHz) Sea Turtle Default WFA (kHz)	 Marine Mammal Default WFA (kHz)
Unattenuated Sound Pressure Level (dB) (see Proxy Level Tab for surrogate values; Copy, ONLY Paste Values (123), not formulas)	174		
Attenuated Sound Pressure Level (dB)* (calculation done automatically)	**174**	**0.16**	**2.5**
Distance associated with sound pressure level measurement/Measurement distance from pile (meters); Typically, 10-m but please double check data being used	*10*		
Transmission loss constant (NMFS recommends: 15 if unknown)	*15*		
Number of piles per day (best estimate based on previous experience)	2	**Attenuation (e.g., bubble curtain) (enter positive number)**	0
Duration to drive a single pile (minutes) (best estimate based on previous experience)	180		
Duration of Sound Production within a day (seconds)	21600	**Cumulative SEL at measured distance (dB)**	217.34
10 Log (duration of sound production)	43.34		

*If sound pressure level provided includes attenuation methods (e.g., bubble curtain), please note this in Project/Source Information in Step 1

RESULTANT ISOPLETHS

(Range to Effects)

For vibratory pile driving, only behavioral thresholds exist for fishes

Fishes present

FISHES	
BEHAVIOR	
RMS Threshold (dB)	
150	
Isopleth (meters)	**398.1**
Isopleth (feet)	**1,306.1**

Sea Turtles present

SEA TURTLES	
PTS ONSET	**BEHAVIOR**
PTS SEL_{cum} Threshold (dB)	**RMS Threshold (dB)**
220	**175**
Isopleth (meters)	**6.7**	**8.6**
Isopleth (feet)	**21.8**	**28.1**

MARINE MAMMALS

Hearing Group	LF Cetacean PTS SEL_{cum} Threshold (dB)	MF Cetacean PTS SEL_{cum} Threshold (dB)	PTS ONSET HF Cetacean PTS SEL_{cum} Threshold (dB)	PW Pinniped PTS SEL_{cum} Threshold (dB)	OW Pinniped PTS SEL_{cum} Threshold (dB)
	199	**198**	**173**	**201**	**219**
Isopleth (meters)	**165.9**	**14.7**	**245.3**	**100.8**	**7.1**
Isopleth (feet)	**544.3**	**48.2**	**804.7**	**330.8**	**23.2**

ALL MARINE MAMMALS

BEHAVIOR	
RMS Threshold (dB)	
120	
Isopleth (meters)	**39,810.7**
Isopleth (feet)	**130,612.6**

LF Cet. present
MF Cet. present
HF Cet. present
Phocids present
Otariids present

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW):true seals
Otariid pinnipeds (OW):sea lions and fur seals

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Sea Turtles
a	1	1.6	1.8	1	2	1.4
b	2	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94	0.077
f_2	19	110	140	30	25	0.44
C	0.13	1.2	1.36	0.75	0.64	2.35
Adjustment (-dB)†	-0.05	-16.83	-23.50	-1.29	-0.60	0.00

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^a}\right\}$$

Vibratory Pile Driving

Use check boxes for Taxa present

☑ Fishes ☑ Sea Turtles ☑ Phocid

☑ LF Cet. ☑ MF Cet. ☑ HF Cet. ☑ Otariid

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KEY

User Provided Information *Default values are in bold, italics turquoise (can be changed by user if project-specific information is available).*

Preset NMFS Provided Information (cannot be altered by user). NMFS thresholds/default weighting value are in bold red.

OUTPUT: Resultant Isopleth/Range to Effects (cannot be altered by user); Note: isopleths are presented in meters and feet

Automatically Calculated Values Based on User Provided Information (only weighting adjustment (-dB) can be altered by user; Row 64, if spectrum is available)

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE and CONTACT	US Coast Guard Moorings Seward SMIC Dock Reconfiguration & Floating Dock Construction
PROJECT/SOURCE INFORMATION (size, material, number, duration to drive pile, etc.)	Vibratory Settling Post-DTH 30-Inch Concrete Piles RMS - 163 dB RMS 10 minutes per pile Maximum of 2 piles per day

Notes (please include all assumptions)

extra information

STEP 2: QUANTITATIVE PROJECT-SPECIFIC INFORMATION

1 sec SEL = RMS	METRIC RMS (NOT Peak)	WEIGHTING (WFA in kHz) Sea Turtle Default WFA (kHz)	 Marine Mammal Default WFA (kHz)
Unattenuated Sound Pressure Level (dB) (see Proxy Level Tab for surrogate values; Copy, ONLY Paste Values (123), not formulas)	163		
Attenuated Sound Pressure Level (dB)* (calculation done automatically)	**163**	**0.16**	**2.5**
Distance associated with sound pressure level measurement/Measurement distance from pile (meters); Typically, 10-m but please double check data being used	*10*		
Transmission loss constant (NMFS recommends: 15 if unknown)	*15*		
Number of piles per day (best estimate based on previous experience)	2	**Attenuation (e.g., bubble curtain) (enter positive number)**	0
Duration to drive a single pile (minutes) (best estimate based on previous experience)	10		
Duration of Sound Production within a day (seconds)	1200	Cumulative SEL at measured distance (dB)	193.79
10 Log (duration of sound production)	30.79		

*If sound pressure level provided includes attenuation methods (e.g., bubble curtain), please note this in Project/Source Information in Step 1

RESULTANT ISOPLETHS

(Range to Effects)

For vibratory pile driving, only behavioral thresholds exist for fishes

Fishes present

FISHES	
BEHAVIOR	
RMS Threshold (dB)	
150	
Isopleth (meters)	**73.6**
Isopleth (feet)	**241.4**

Sea Turtles present

SEA TURTLES	
PTS ONSET	**BEHAVIOR**
PTS SEL_{cum} Threshold (dB)	**RMS Threshold (dB)**
220	**175**
Isopleth (meters)	**0.2**	**1.6**
Isopleth (feet)	**0.6**	**5.2**

MARINE MAMMALS

Hearing Group			PTS ONSET HF Cetacean PTS SEL_{cum} Threshold (dB)	PW Pinniped PTS SEL_{cum} Threshold (dB)	OW Pinniped PTS SEL_{cum} Threshold (dB)
	LF Cetacean PTS SEL_{cum} Threshold (dB)	MF Cetacean PTS SEL_{cum} Threshold (dB)			
	199	**198**	**173**	**201**	**219**
Isopleth (meters)	**4.5**	**0.4**	**6.6**	**2.7**	**0.2**
Isopleth (feet)	**14.6**	**1.3**	**21.7**	**8.9**	**0.6**

ALL MARINE MAMMALS

BEHAVIOR	
RMS Threshold (dB)	
120	
Isopleth (meters)	**7,356.4**
Isopleth (feet)	**24,135.2**

LF Cet. present
MF Cet. present
HF Cet. present
Phocids present
Otariids present

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW):true seals
Otariid pinnipeds (OW):sea lions and fur seals

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Sea Turtles
a	1	1.6	1.8	1	2	1.4
b	2	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94	0.077
f_2	19	110	140	30	25	0.44
C	0.13	1.2	1.36	0.75	0.64	2.35
Adjustment (-dB)†	-0.05	-16.83	-23.50	-1.29	-0.60	0.00

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

IMPACT PILE DRIVING

Use check boxes for Taxa present

☐ Fishes ☐ Sea Turtles ☐ Phocid
☐ LF Cet. ☐ MF Cet. ☐ HF Cet. ☐ Otariid

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KEY

User Provided Information *Default values are in bold, italics turquoise (can be changed by user if project-specific information is available).*

Preset NMFS Provided Information (cannot be altered by user). NMFS thresholds/default weighting value are in bold red.

OUTPUT: Resultant Isopleth/range to effects (cannot be altered by user); Note: isopleths are presented in meters and feet

Automatically Calculated Values Based on User Provided Information (only weighting adjustment (-dB) can be altered by user, Row 67, if spectrum is available)

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE and CONTACT	US Coast Guard Moorings Seward SMIC Dock Reconfiguration & Floating Dock Construction
PROJECT/SOURCE INFORMATION (size, material, number, pile strikes, etc.)	Impact Proofing Post-DTH 30-Inch Concrete Piles RMS - 186 dB RMS SEL - 173 dB SEL 5 impacts per pile Maximum of 2 piles per day

Notes (Please include all assumptions)

STEP 2: QUANTITATIVE PROJECT-SPECIFIC INFORMATION

METRICS					
	Peak	**SELss**	**RMS**		**WEIGHTING (WFA in kHz)**
Unattenuated Single strike level (dB) (see Proxy Level Tab for surrogate values; Copy, ONLY Paste Values (123), not formulas)		173	186	**Effective Quiet (Fish Only)**	**Sea Turtle Default WFA (kHz)** / **Marine Mammal Default WFA (kHz)**
Attenuated Single strike level (dB)* (calculation done automatically)	**0**	**173**	**186**	**150**	**0.16** / **2**
Distance associated with single strike level/Measurement distance from pile (meters); Typically, 10-m but please double check data being used	*10*	*10*	*10*		WFA: Weighting Factor Adjustment
Transmission loss constant (NMFS recommends: 15 if unknown)	*15*				
Number of piles per day (best estimate based on previous experience)	2	**Attenuation assumed (e.g., bubble curtain) (enter positive number)**	0		
Number of strikes per pile (best estimate based on previous experience)	5		NMFS recommends 5 dB as default, If attenuation used		
Number of strikes per day	10				
Cumulative SEL at measured distance	183				

RESULTANT ISOPLETHS‡ (Range to Effects)

‡Impulsive sounds have dual metric thresholds for injury (SEL_{cum} & PK). Metric producing largest isopleth should be used.

FISHES

NO FISHES

	ONSET OF	PHYSICAL	INJURY	BEHAVIOR
	Peak (PK) Threshold (dB)	SEL_{cum} Threshold (dB)**		RMS Threshold (dB)
		Fish ≥ 2 g	Fish < 2 g	
	206	187	183	150
Isopleths (meters)	0.0	5.4	10.0	2,511.9
Isopleth (feet)	0.0	17.8	32.8	8,241.1

**This calculation accounts for single strike SEL < 150 dB do not accumulate to cause injury (Effective Quiet)

SEA TURTLES

NO SEA TURTLES

	PTS ONSET		BEHAVIOR
	Peak (PK) Threshold (dB)	SEL_{cum} Threshold (dB)	RMS Threshold (dB)
	232	204	175
Isopleths (meters)	0.0	0.4	54.1
Isopleth (feet)	0.0	1.3	177.5

MARINE MAMMALS

	PTS ONSET				
Hearing Group	LF Cetacean PTS Peak (PK) Threshold (dB)	MF Cetacean Peak (PK) Threshold (dB)	HF Cetacean PTS Peak (PK) Threshold (dB)	PW Pinniped PTS Peak (PK) Threshold (dB)	OW Pinniped PTS Peak (PK) Threshold (dB)
	219	230	202	218	232
Isopleths (meters)	0.0	0.0	0.0	0.0	0.0
Isopleth (feet)	0.0	0.0	0.0	0.0	0.0
	LF Cetacean PTS SEL_{cum} Threshold (dB)	MF Cetacean PTS SEL_{cum} Threshold (dB)	HF Cetacean PTS SEL_{cum} Threshold (dB)	PW Pinniped PTS SEL_{cum} Threshold (dB)	OW Pinniped PTS SEL_{cum} Threshold (dB)
	183	185	155	185	203
Isopleths (meters)	10.0	0.4	11.9	5.3	0.4
Isopleth (feet)	32.8	1.2	39.0	17.5	1.3

ALL MARINE MAMMALS

NO LF CET.
NO MF CET.
NO HF CET.
NO PHOCIDS
NO OTARIIDS

BEHAVIOR	
RMS Threshold (dB)	
160	
Isopleths (meters)	541.2
Isopleth (feet)	1,775.5

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW):true seals
Otariid pinnipeds (OW):sea lions and fur seals

WEIGHTING FUNCTION CALCULATIONS (Sea Turtles and Marine Mammals Only)

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Sea Turtles
a	1	1.6	1.8	1	2	1.4
b	2	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94	0.077
f_2	19	110	140	30	25	0.44
C	0.13	1.2	1.36	0.75	0.64	2.35
Adjustment (-dB)†	-0.01	-19.74	-26.87	-2.08	-1.15	0.00

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

Vibratory Pile Driving

Use check boxes for Taxa present

☑ Fishes ☑ Sea Turtles ☑ Phocid

☑ LF Cet. ☑ MF Cet. ☑ HF Cet. ☑ Otariid

VERSION 1.2-Multi-Species: 2022

KEY

	User Provided Information *Default values are in bold, italics turquoise (can be changed by user if project-specific information is available).*
	Preset NMFS Provided Information (cannot be altered by user). NMFS thresholds/default weighting value are in bold red.
	OUTPUT: Resultant Isopleth/Range to Effects (cannot be altered by user); Note: isopleths are presented in meters and feet
	Automatically Calculated Values Based on User Provided Information (only weighting adjustment (-dB) can be altered by user; Row 64, if spectrum is available)

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE and CONTACT	US Coast Guard Moorings Sitka New WLB Pier and Floating Dock
PROJECT/SOURCE INFORMATION (size, material, number, duration to drive pile, etc.)	Vibratory Pile Extraction 12-inch Timber Piles RMS - 162 dB RMS 30 minutes per pile Maximum of 5 piles per day

Notes (please include all assumptions)

extra information

STEP 2: QUANTITATIVE PROJECT-SPECIFIC INFORMATION

1 sec SEL = RMS	METRIC RMS (NOT Peak)	WEIGHTING (WFA in kHz) Sea Turtle Default WFA (kHz)	 Marine Mammal Default WFA (kHz)
Unattenuated Sound Pressure Level (dB) (see Proxy Level Tab for surrogate values; Copy, ONLY Paste Values (123), not formulas)	162		
Attenuated Sound Pressure Level (dB)* (calculation done automatically)	**162**	**0.16**	**2.5**
Distance associated with sound pressure level measurement/Measurement distance from pile (meters); Typically, 10-m but please double check data being used	*10*		
Transmission loss constant (NMFS recommends: 15 if unknown)	*15*		
Number of piles per day (best estimate based on previous experience)	5	**Attenuation (e.g., bubble curtain) (enter positive number)**	0
Duration to drive a single pile (minutes) (best estimate based on previous experience)	30		
Duration of Sound Production within a day (seconds)	9000	**Cumulative SEL at measured distance (dB)**	201.54
10 Log (duration of sound production)	39.54		

*If sound pressure level provided includes attenuation methods (e.g., bubble curtain), please note this in Project/Source Information in Step 1

RESULTANT ISOPLETHS

(Range to Effects)

For vibratory pile driving, only behavioral thresholds exist for fishes

Fishes present

FISHES	
BEHAVIOR	
RMS Threshold (dB)	
150	
Isopleth (meters)	**63.1**
Isopleth (feet)	**207.0**

Sea Turtles present

SEA TURTLES	
PTS ONSET	**BEHAVIOR**
PTS SEL_{cum} Threshold (dB)	**RMS Threshold (dB)**
220	**175**
Isopleth (meters)	**0.6**	**1.4**
Isopleth (feet)	**1.9**	**4.5**

MARINE MAMMALS

Hearing Group	LF Cetacean PTS SEL_{cum} Threshold (dB)	MF Cetacean PTS SEL_{cum} Threshold (dB)	PTS ONSET HF Cetacean PTS SEL_{cum} Threshold (dB)	PW Pinniped PTS SEL_{cum} Threshold (dB)	OW Pinniped PTS SEL_{cum} Threshold (dB)
	199	**198**	**173**	**201**	**219**
Isopleth (meters)	**14.7**	**1.3**	**21.7**	**8.9**	**0.6**
Isopleth (feet)	**48.1**	**4.3**	**71.1**	**29.3**	**2.1**

ALL MARINE MAMMALS	BEHAVIOR
	RMS Threshold (dB)
	120
Isopleth (meters)	**6,309.6**
Isopleth (feet)	**20,700.7**

LF Cet. present
MF Cet. present
HF Cet. present
Phocids present
Otariids present

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW):true seals
Otariid pinnipeds (OW):sea lions and fur seals

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Sea Turtles
a	1	1.6	1.8	1	2	1.4
b	2	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94	0.077
f_2	19	110	140	30	25	0.44
C	0.13	1.2	1.36	0.75	0.64	2.35
Adjustment (-dB)†	-0.05	-16.83	-23.50	-1.29	-0.60	0.00

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

Vibratory Pile Driving

Use check boxes for Taxa present

☑ Fishes ☑ Sea Turtles ☑ Phocid

☑ LF Cet. ☑ MF Cet. ☑ HF Cet. ☑ Otariid

VERSION 1.2-Multi-Species: 2022

KEY

	User Provided Information *Default values are in bold, italics turquoise (can be changed by user if project-specific information is available).*
	Preset NMFS Provided Information (cannot be altered by user). NMFS thresholds/default weighting value are in bold red.
	OUTPUT: Resultant Isopleth/Range to Effects (cannot be altered by user); Note: isopleths are presented in meters and feet
	Automatically Calculated Values Based on User Provided Information (only weighting adjustment (-dB) can be altered by user; Row 64, if spectrum is available)

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE and CONTACT	US Coast Guard Moorings Sitka New WLB Pier and Floating Dock
PROJECT/SOURCE INFORMATION (size, material, number, duration to drive pile, etc.)	Pile Clipping 14-inch steel guide pile RMS - 161.2 dB RMS 10.37 minutes per pile Maximum of 5 piles per day

Notes (please include all assumptions)

extra information

STEP 2: QUANTITATIVE PROJECT-SPECIFIC INFORMATION

1 sec SEL = RMS	METRIC RMS (NOT Peak)	WEIGHTING (WFA in kHz) Sea Turtle Default WFA (kHz)	 Marine Mammal Default WFA (kHz)
Unattenuated Sound Pressure Level (dB) (see Proxy Level Tab for surrogate values; Copy, ONLY Paste Values (123), not formulas)	161.2		
Attenuated Sound Pressure Level (dB)* (calculation done automatically)	**161**	**0.16**	**2.5**
Distance associated with sound pressure level measurement/Measurement distance from pile (meters); Typically, 10-m but please double check data being used	*10*		
Transmission loss constant (NMFS recommends: 15 if unknown)	*15*		
Number of piles per day (best estimate based on previous experience)	5	**Attenuation (e.g., bubble curtain) (enter positive number)**	0
Duration to drive a single pile (minutes) (best estimate based on previous experience)	10.37		
Duration of Sound Production within a day (seconds)	3111	**Cumulative SEL at measured distance (dB)**	196.13
10 Log (duration of sound production)	34.93		

*If sound pressure level provided includes attenuation methods (e.g., bubble curtain), please note this in Project/Source Information in Step 1

RESULTANT ISOPLETHS

(Range to Effects)

For vibratory pile driving, only behavioral thresholds exist for fishes

Fishes present

FISHES	
BEHAVIOR	
RMS Threshold (dB)	
150	
Isopleth (meters)	**55.8**
Isopleth (feet)	**183.1**

Sea Turtles present

SEA TURTLES	
PTS ONSET	**BEHAVIOR**
PTS SEL_{cum} Threshold (dB)	**RMS Threshold (dB)**
220	**175**
Isopleth (meters)	**0.3**	**1.2**
Isopleth (feet)	**0.8**	**3.9**

MARINE MAMMALS

Hearing Group	LF Cetacean PTS SEL_{cum} Threshold (dB)	MF Cetacean PTS SEL_{cum} Threshold (dB)	PTS ONSET HF Cetacean PTS SEL_{cum} Threshold (dB)	PW Pinniped PTS SEL_{cum} Threshold (dB)	OW Pinniped PTS SEL_{cum} Threshold (dB)
	199	**198**	**173**	**201**	**219**
Isopleth (meters)	**6.4**	**0.6**	**9.4**	**3.9**	**0.3**
Isopleth (feet)	**21.0**	**1.9**	**31.0**	**12.7**	**0.9**

ALL MARINE MAMMALS

BEHAVIOR	
RMS Threshold (dB)	
120	
Isopleth (meters)	**5,580.4**
Isopleth (feet)	**18,308.5**

LF Cet. present
MF Cet. present
HF Cet. present
Phocids present
Otariids present

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW):true seals
Otariid pinnipeds (OW):sea lions and fur seals

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Sea Turtles
a	1	1.6	1.8	1	2	1.4
b	2	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94	0.077
f_2	19	110	140	30	25	0.44
C	0.13	1.2	1.36	0.75	0.64	2.35
Adjustment (-dB)†	-0.05	-16.83	-23.50	-1.29	-0.60	0.00

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

Vibratory Pile Driving

Use check boxes for Taxa present

☑ Fishes ☑ Sea Turtles ☑ Phocid

☑ LF Cet. ☑ MF Cet. ☑ HF Cet. ☑ Otariid

VERSION 1.2-Multi-Species: 2022

KEY

	User Provided Information *Default values are in bold, italics turquoise (can be changed by user if project-specific information is available).*
	Preset NMFS Provided Information (cannot be altered by user). NMFS thresholds/default weighting value are in bold red.
	OUTPUT: Resultant Isopleth/Range to Effects (cannot be altered by user); Note: isopleths are presented in meters and feet
	Automatically Calculated Values Based on User Provided Information (only weighting adjustment (-dB) can be altered by user; Row 64, if spectrum is available)

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE and CONTACT	US Coast Guard Moorings Sitka New WLB Pier and Floating Dock
PROJECT/SOURCE INFORMATION (size, material, number, duration to drive pile, etc.)	Diamond Wire Saw 14-inch steel guide pile RMS - 161.5 dB RMS 15.5 minutes per pile Maximum of 5 piles per day

Notes (please include all assumptions)

extra information

STEP 2: QUANTITATIVE PROJECT-SPECIFIC INFORMATION

1 sec SEL = RMS	METRIC RMS (NOT Peak)	WEIGHTING (WFA in kHz) Sea Turtle Default WFA (kHz)	 Marine Mammal Default WFA (kHz)
Unattenuated Sound Pressure Level (dB) (see Proxy Level Tab for surrogate values; Copy, ONLY Paste Values (123), not formulas)	161.5		
Attenuated Sound Pressure Level (dB)* (calculation done automatically)	**162**	**0.16**	**2.5**
Distance associated with sound pressure level measurement/Measurement distance from pile (meters); Typically, 10-m but please double check data being used	*10*		
Transmission loss constant (NMFS recommends: 15 if unknown)	*15*		
Number of piles per day (best estimate based on previous experience)	5	**Attenuation (e.g., bubble curtain) (enter positive number)**	0
Duration to drive a single pile (minutes) (best estimate based on previous experience)	15.5		
Duration of Sound Production within a day (seconds)	4650	**Cumulative SEL at measured distance (dB)**	198.17
10 Log (duration of sound production)	36.67		

*If sound pressure level provided includes attenuation methods (e.g., bubble curtain), please note this in Project/Source Information in Step 1

RESULTANT ISOPLETHS

(Range to Effects)

For vibratory pile driving, only behavioral thresholds exist for fishes

Fishes present

FISHES	
BEHAVIOR	
RMS Threshold (dB)	
150	
Isopleth (meters)	**58.4**
Isopleth (feet)	**191.7**

Sea Turtles present

SEA TURTLES	
PTS ONSET	**BEHAVIOR**
PTS SEL_{cum} Threshold (dB)	**RMS Threshold (dB)**
220	**175**
Isopleth (meters)	**0.4**	**1.3**
Isopleth (feet)	**1.2**	**4.1**

MARINE MAMMALS

Hearing Group	LF Cetacean PTS SEL_{cum} Threshold (dB)	MF Cetacean PTS SEL_{cum} Threshold (dB)	PTS ONSET HF Cetacean PTS SEL_{cum} Threshold (dB)	PW Pinniped PTS SEL_{cum} Threshold (dB)	OW Pinniped PTS SEL_{cum} Threshold (dB)
	199	**198**	**173**	**201**	**219**
Isopleth (meters)	**8.7**	**0.8**	**12.9**	**5.3**	**0.4**
Isopleth (feet)	**28.7**	**2.5**	**42.4**	**17.4**	**1.2**

ALL MARINE MAMMALS

BEHAVIOR	
RMS Threshold (dB)	
120	
Isopleth (meters)	**5,843.4**
Isopleth (feet)	**19,171.3**

LF Cet. present
MF Cet. present
HF Cet. present
Phocids present
Otariids present

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW):true seals
Otariid pinnipeds (OW):sea lions and fur seals

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Sea Turtles
a	1	1.6	1.8	1	2	1.4
b	2	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94	0.077
f_2	19	110	140	30	25	0.44
C	0.13	1.2	1.36	0.75	0.64	2.35
Adjustment (-dB)†	-0.05	-16.83	-23.50	-1.29	-0.60	0.00

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^a}\right\}$$

IMPACT PILE DRIVING

Use check boxes for Taxa present

☑ Fishes ☑ Sea Turtles ☑ Phocid
☑ LF Cet. ☑ MF Cet. ☑ HF Cet. ☑ Otariid

VERSION 1.2-Multi-Species: 2022

KEY

User Provided Information *Default values are in bold, italics turquoise (can be changed by user if project-specific information is available).*

Preset NMFS Provided Information (cannot be altered by user). NMFS thresholds/default weighting value are in bold red.

OUTPUT: Resultant Isopleth/range to effects (cannot be altered by user); Note: isopleths are presented in meters and feet

Automatically Calculated Values Based on User Provided Information (only weighting adjustment (-dB) can be altered by user, Row 67, if spectrum is available)

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE and CONTACT	US Coast Guard Moorings Sitka New WLB Pier and Floating Dock
PROJECT/SOURCE INFORMATION (size, material, number, pile strikes, etc.)	Impact Drive 13-inch Plastic Fedner Piles RMS - 153 dB SEL - 162 dB 100 strikes per pile Maximum of 2 piles per day

Notes (Please include all assumptions)

STEP 2: QUANTITATIVE PROJECT-SPECIFIC INFORMATION

	Peak	SELss	RMS		WEIGHTING (WFA in kHz)	
Unattenuated Single strike level (dB) (see Proxy Level Tab for surrogate values; Copy, ONLY Paste Values (123), not formulas)		162	153	**Effective Quiet (Fish Only)**	**Sea Turtle Default WFA (kHz)**	**Marine Mammal Default WFA (kHz)**
Attenuated Single strike level (dB)* (calculation done automatically)	**0**	**162**	**153**	**150**	**0.16**	**2**
Distance associated with single strike level/Measurement distance from pile (meters); Typically, 10-m but please double check data being used	*10*	*10*	*10*		WFA: Weighting Factor Adjustment	
Transmission loss constant (NMFS recommends: 15 if unknown)	*15*					
Number of piles per day (best estimate based on previous experience)	2	**Attenuation assumed (e.g., bubble curtain) (enter positive number)**	0			
Number of strikes per pile (best estimate based on previous experience)	100		NMFS recommends 5 dB as default, If attenuation used			
Number of strikes per day	200					
Cumulative SEL at measured distance	185					

RESULTANT ISOPLETHS‡ (Range to Effects)

‡Impulsive sounds have dual metric thresholds for injury (SEL_{cum} & PK). Metric producing largest isopleth should be used.

FISHES

Fishes present	ONSET OF PHYSICAL INJURY		BEHAVIOR
	Peak (PK) Threshold (dB)	SEL_{cum} Threshold (dB)**	RMS Threshold (dB)
		Fish ≥ 2 g	Fish < 2 g	
	206	187	183	150
Isopleths (meters)	0.0	7.4	13.6	15.8
Isopleth (feet)	0.0	24.2	44.7	52.0

**This calculation accounts for single strike SEL < 150 dB do not accumulate to cause injury (Effective Quiet)

SEA TURTLES

Sea Turtles present	PTS ONSET		BEHAVIOR
	Peak (PK) Threshold (dB)	SEL_{cum} Threshold (dB)	RMS Threshold (dB)
	232	204	175
Isopleths (meters)	0.0	0.5	0.3
Isopleth (feet)	0.0	1.8	1.1

MARINE MAMMALS

Hearing Group	LF Cetacean PTS Peak (PK) Threshold (dB)	MF Cetacean PTS Peak (PK) Threshold (dB)	HF Cetacean PTS Peak (PK) Threshold (dB)	PW Pinniped PTS Peak (PK) Threshold (dB)	OW Pinniped PTS Peak (PK) Threshold (dB)
	219	230	202	218	232
Isopleths (meters)	0.0	0.0	0.0	0.0	0.0
Isopleth (feet)	0.0	0.0	0.0	0.0	0.0
	LF Cetacean PTS SEL_{cum} Threshold (dB)	MF Cetacean PTS SEL_{cum} Threshold (dB)	HF Cetacean PTS SEL_{cum} Threshold (dB)	PW Pinniped PTS SEL_{cum} Threshold (dB)	OW Pinniped PTS SEL_{cum} Threshold (dB)
	183	185	155	185	203
Isopleths (meters)	13.6	0.5	16.2	7.3	0.5
Isopleth (feet)	44.6	1.6	53.1	23.9	1.7

ALL MARINE MAMMALS	BEHAVIOR
	RMS Threshold (dB)
	160
Isopleths (meters)	3.4
Isopleth (feet)	11.2

LF Cet. present
MF Cet. present
HF Cet. present
Phocids present
Otariids present

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW):true seals
Otariid pinnipeds (OW):sea lions and fur seals

WEIGHTING FUNCTION CALCULATIONS (Sea Turtles and Marine Mammals Only)

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Sea Turtles
a	1	1.6	1.8	1	2	1.4
b	2	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94	0.077
f_2	19	110	140	30	25	0.44
C	0.13	1.2	1.36	0.75	0.64	2.35
Adjustment (-dB)†	-0.01	-19.74	-26.87	-2.08	-1.15	0.00

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

IMPACT PILE DRIVING

Use check boxes for Taxa present

☑ Fishes ☑ Sea Turtles ☑ Phocid
☑ LF Cet. ☑ MF Cet. ☑ HF Cet. ☑ Otariid

VERSION 1.2-Multi-Species: 2022

KEY

User Provided Information *Default values are in bold, italics turquoise (can be changed by user if project-specific information is available).*

Preset NMFS Provided Information (cannot be altered by user). NMFS thresholds/default weighting value are in bold red.

OUTPUT: Resultant Isopleth/range to effects (cannot be altered by user); Note: isopleths are presented in meters and feet

Automatically Calculated Values Based on User Provided Information (only weighting adjustment (-dB) can be altered by user, Row 67, if spectrum is available)

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE and CONTACT	US Coast Guard Moorings Sitka New WLB Pier and Floating Dock
PROJECT/SOURCE INFORMATION (size, material, number, pile strikes, etc.)	Impact Drive 14-inch Timber Guide Piles RMS - 170 dB SEL - 160 dB 160 strikes per pile Maximum of 2 piles per day

Notes (Please include all assumptions)

STEP 2: QUANTITATIVE PROJECT-SPECIFIC INFORMATION

	Peak	SELss	RMS		WEIGHTING (WFA in kHz)	
Unattenuated Single strike level (dB) (see Proxy Level Tab for surrogate values; Copy, ONLY Paste Values (123), not formulas)		160	170	**Effective Quiet (Fish Only)**	**Sea Turtle Default WFA (kHz)**	**Marine Mammal Default WFA (kHz)**
Attenuated Single strike level (dB)* (calculation done automatically)	**0**	**160**	**170**	**150**	**0.16**	**2**
Distance associated with single strike level/Measurement distance from pile (meters); Typically, 10-m but please double check data being used	*10*	*10*	*10*			
Transmission loss constant (NMFS recommends: 15 if unknown)	*15*					
Number of piles per day (best estimate based on previous experience)	2	**Attenuation assumed (e.g., bubble curtain) (enter positive number)**	0			
Number of strikes per pile (best estimate based on previous experience)	160		NMFS recommends 5 dB as default, If attenuation used			
Number of strikes per day	320					
Cumulative SEL at measured distance	185					

WFA: Weighting Factor Adjustment

RESULTANT ISOPLETHS‡ (Range to Effects)

‡Impulsive sounds have dual metric thresholds for injury (SEL_{cum} & PK). Metric producing largest isopleth should be used.

FISHES

Fishes present	ONSET OF PHYSICAL INJURY		BEHAVIOR
	Peak (PK) Threshold (dB)	SEL_{cum} Threshold (dB)**	RMS Threshold (dB)
		Fish ≥ 2 g	Fish < 2 g	
	206	187	183	150
Isopleths (meters)	0.0	7.4	13.7	215.4
Isopleth (feet)	0.0	24.3	45.0	706.8

**This calculation accounts for single strike SEL < 150 dB do not accumulate to cause injury (Effective Quiet)

SEA TURTLES

Sea Turtles present	PTS ONSET		BEHAVIOR
	Peak (PK) Threshold (dB)	SEL_{cum} Threshold (dB)	RMS Threshold (dB)
	232	204	175
Isopleths (meters)	0.0	0.5	4.6
Isopleth (feet)	0.0	1.8	15.2

MARINE MAMMALS

Hearing Group	PTS ONSET				
	LF Cetacean PTS Peak (PK) Threshold (dB)	MF Cetacean Peak (PK) Threshold (dB)	HF Cetacean PTS Peak (PK) Threshold (dB)	PW Pinniped PTS Peak (PK) Threshold (dB)	OW Pinniped PTS Peak (PK) Threshold (dB)
	219	230	202	218	232
Isopleths (meters)	0.0	0.0	0.0	0.0	0.0
Isopleth (feet)	0.0	0.0	0.0	0.0	0.0
	LF Cetacean PTS SEL_{cum} Threshold (dB)	MF Cetacean PTS SEL_{cum} Threshold (dB)	HF Cetacean PTS SEL_{cum} Threshold (dB)	PW Pinniped PTS SEL_{cum} Threshold (dB)	OW Pinniped PTS SEL_{cum} Threshold (dB)
	183	185	155	185	203
Isopleths (meters)	13.7	0.5	16.3	7.3	0.5
Isopleth (feet)	44.9	1.6	53.5	24.0	1.7

ALL MARINE MAMMALS	BEHAVIOR
	RMS Threshold (dB)
	160
Isopleths (meters)	46.4
Isopleth (feet)	152.3

LF Cet. present
MF Cet. present
HF Cet. present
Phocids present
Otariids present

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW):true seals
Otariid pinnipeds (OW):sea lions and fur seals

WEIGHTING FUNCTION CALCULATIONS (Sea Turtles and Marine Mammals Only)

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Sea Turtles
a	1	1.6	1.8	1	2	1.4
b	2	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94	0.077
f_2	19	110	140	30	25	0.44
C	0.13	1.2	1.36	0.75	0.64	2.35
Adjustment (-dB)†	-0.01	-19.74	-26.87	-2.08	-1.15	0.00

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

IMPACT PILE DRIVING

Use check boxes for Taxa present

☐ Fishes ☐ Sea Turtles ☐ Phocid
☐ LF Cet. ☐ MF Cet. ☐ HF Cet. ☐ Otariid

VERSION 1.2-Multi-Species: 2022

KEY

User Provided Information *Default values are in bold, italics turquoise (can be changed by user if project-specific information is available).*

Preset NMFS Provided Information (cannot be altered by user). NMFS thresholds/default weighting value are in bold red.

OUTPUT: Resultant Isopleth/range to effects (cannot be altered by user); Note: isopleths are presented in meters and feet

Automatically Calculated Values Based on User Provided Information (only weighting adjustment (-dB) can be altered by user, Row 67, if spectrum is available)

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE and CONTACT	US Coast Guard Moorings Sitka New WLB Pier and Floating Dock
PROJECT/SOURCE INFORMATION (size, material, number, pile strikes, etc.)	DTH Impulsive Component 30-Inch Concrete Piles RMS - 174 dB RMS SEL - 164 dB SEL 108,000 impacts per pile Maximum of 2 piles per day

Notes (Please include all assumptions)

STEP 2: QUANTITATIVE PROJECT-SPECIFIC INFORMATION

	METRICS				WEIGHTING (WFA in kHz)	
	Peak	**SELss**	**RMS**			
Unattenuated Single strike level (dB) (see Proxy Level Tab for surrogate values; Copy, ONLY Paste Values (123), not formulas)		164	174	**Effective Quiet (Fish Only)**	**Sea Turtle Default WFA (kHz)**	**Marine Mammal Default WFA (kHz)**
Attenuated Single strike level (dB)* (calculation done automatically)	**0**	**164**	**174**	**150**	**0.16**	**2**
Distance associated with single strike level/Measurement distance from pile (meters); Typically, 10-m but please double check data being used	*10*	*10*	*10*		WFA: Weighting Factor Adjustment	
Transmission loss constant (NMFS recommends: 15 if unknown)	*15*					
Number of piles per day (best estimate based on previous experience)	2	**Attenuation assumed (e.g., bubble curtain)** (enter positive number)	0			
Number of strikes per pile (best estimate based on previous experience)	108000		NMFS recommends 5 dB as default, If attenuation used			
Number of strikes per day	216000					
Cumulative SEL at measured distance	217					

RESULTANT ISOPLETHS‡ (Range to Effects)

‡Impulsive sounds have dual metric thresholds for injury (SEL_{cum} & PK).
Metric producing largest isopleth should be used.

NO FISHES

FISHES	ONSET OF PHYSICAL INJURY		BEHAVIOR
	Peak (PK) Threshold (dB)	SEL_{cum} Threshold (dB)**	RMS Threshold (dB)
		Fish ≥ 2 g	Fish < 2 g	
	206	187	183	150
Isopleths (meters)	0.0	85.8	85.8	398.1
Isopleth (feet)	0.0	281.4	281.4	1,306.1

**This calculation accounts for single strike SEL < 150 dB do not accumulate to cause injury (Effective Quiet)

NO SEA TURTLES

SEA TURTLES	PTS ONSET		BEHAVIOR
	Peak (PK) Threshold (dB)	SEL_{cum} Threshold (dB)	RMS Threshold (dB)
	232	204	175
Isopleths (meters)	0.0	77.6	8.6
Isopleth (feet)	0.0	254.6	28.1

MARINE MAMMALS			PTS ONSET		
Hearing Group	LF Cetacean PTS Peak (PK) Threshold (dB)	MF Cetacean Peak (PK) Threshold (dB)	HF Cetacean PTS Peak (PK) Threshold (dB)	PW Pinniped PTS Peak (PK) Threshold (dB)	OW Pinniped PTS Peak (PK) Threshold (dB)
	219	230	202	218	232
Isopleths (meters)	0.0	0.0	0.0	0.0	0.0
Isopleth (feet)	0.0	0.0	0.0	0.0	0.0
	LF Cetacean PTS SEL_{cum} Threshold (dB)	MF Cetacean PTS SEL_{cum} Threshold (dB)	HF Cetacean PTS SEL_{cum} Threshold (dB)	PW Pinniped PTS SEL_{cum} Threshold (dB)	OW Pinniped PTS SEL_{cum} Threshold (dB)
	183	185	155	185	203
Isopleths (meters)	1,945.5	69.2	2,317.4	1,041.2	75.8
Isopleth (feet)	6,383.0	227.0	7,603.2	3,415.9	248.7

NO LF CET.
NO MF CET.
NO HF CET.
NO PHOCIDS
NO OTARIIDS

ALL MARINE MAMMALS	BEHAVIOR
	RMS Threshold (dB)
	160
Isopleths (meters)	85.8
Isopleth (feet)	281.4

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW):true seals
Otariid pinnipeds (OW):sea lions and fur seals

WEIGHTING FUNCTION CALCULATIONS (Sea Turtles and Marine Mammals Only)

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Sea Turtles
a	1	1.6	1.8	1	2	1.4
b	2	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94	0.077
f_2	19	110	140	30	25	0.44
C	0.13	1.2	1.36	0.75	0.64	2.35
Adjustment (-dB)†	-0.01	-19.74	-26.87	-2.08	-1.15	0.00

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

Vibratory Pile Driving

Use check boxes for Taxa present

☑ Fishes ☑ Sea Turtles ☑ Phocid

☑ LF Cet. ☑ MF Cet. ☑ HF Cet. ☑ Otariid

VERSION 1.2-Multi-Species: 2022

KEY

	User Provided Information *Default values are in bold, italics turquoise (can be changed by user if project-specific information is available).*
	Preset NMFS Provided Information (cannot be altered by user). NMFS thresholds/default weighting value are in bold red.
	OUTPUT: Resultant Isopleth/Range to Effects (cannot be altered by user); Note: isopleths are presented in meters and feet
	Automatically Calculated Values Based on User Provided Information (only weighting adjustment (-dB) can be altered by user; Row 64, if spectrum is available)

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE and CONTACT	US Coast Guard Moorings Sitka New WLB Pier and Floating Dock
PROJECT/SOURCE INFORMATION (size, material, number, duration to drive pile, etc.)	DTH (Non-Impulsive Component) 30-Inch Concrete Piles RMS - 174 dB RMS 180 minutes per pile Maximum of 2 piles per day

Notes (please include all assumptions)

extra information

STEP 2: QUANTITATIVE PROJECT-SPECIFIC INFORMATION

1 sec SEL = RMS	METRIC RMS (NOT Peak)	WEIGHTING (WFA in kHz) Sea Turtle Default WFA (kHz)	 Marine Mammal Default WFA (kHz)
Unattenuated Sound Pressure Level (dB) (see Proxy Level Tab for surrogate values; Copy, ONLY Paste Values (123), not formulas)	174		
Attenuated Sound Pressure Level (dB)* (calculation done automatically)	**174**	**0.16**	**2.5**
Distance associated with sound pressure level measurement/Measurement distance from pile (meters); Typically, 10-m but please double check data being used	*10*		
Transmission loss constant (NMFS recommends: 15 if unknown)	*15*		
Number of piles per day (best estimate based on previous experience)	2	**Attenuation (e.g., bubble curtain) (enter positive number)**	0
Duration to drive a single pile (minutes) (best estimate based on previous experience)	180		
Duration of Sound Production within a day (seconds)	21600	**Cumulative SEL at measured distance (dB)**	217.34
10 Log (duration of sound production)	43.34		

*If sound pressure level provided includes attenuation methods (e.g., bubble curtain), please note this in Project/Source Information in Step 1

RESULTANT ISOPLETHS

(Range to Effects)

For vibratory pile driving, only behavioral thresholds exist for fishes

Fishes present

FISHES	
BEHAVIOR	
RMS Threshold (dB)	
150	
Isopleth (meters)	**398.1**
Isopleth (feet)	**1,306.1**

Sea Turtles present

SEA TURTLES	
PTS ONSET	**BEHAVIOR**
PTS SEL_{cum} Threshold (dB)	**RMS Threshold (dB)**
220	**175**
Isopleth (meters)	**6.7**	**8.6**
Isopleth (feet)	**21.8**	**28.1**

MARINE MAMMALS

Hearing Group	LF Cetacean PTS SEL_{cum} Threshold (dB)	MF Cetacean PTS SEL_{cum} Threshold (dB)	PTS ONSET HF Cetacean PTS SEL_{cum} Threshold (dB)	PW Pinniped PTS SEL_{cum} Threshold (dB)	OW Pinniped PTS SEL_{cum} Threshold (dB)
	199	**198**	**173**	**201**	**219**
Isopleth (meters)	**165.9**	**14.7**	**245.3**	**100.8**	**7.1**
Isopleth (feet)	**544.3**	**48.2**	**804.7**	**330.8**	**23.2**

ALL MARINE MAMMALS

BEHAVIOR	
RMS Threshold (dB)	
120	
Isopleth (meters)	**39,810.7**
Isopleth (feet)	**130,612.6**

LF Cet. present
MF Cet. present
HF Cet. present
Phocids present
Otariids present

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW):true seals
Otariid pinnipeds (OW):sea lions and fur seals

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Sea Turtles
a	1	1.6	1.8	1	2	1.4
b	2	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94	0.077
f_2	19	110	140	30	25	0.44
C	0.13	1.2	1.36	0.75	0.64	2.35
Adjustment (-dB)†	-0.05	-16.83	-23.50	-1.29	-0.60	0.00

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

Vibratory Pile Driving

Use check boxes for Taxa present

☑ Fishes ☑ Sea Turtles ☑ Phocid

☑ LF Cet. ☑ MF Cet. ☑ HF Cet. ☑ Otariid

VERSION 1.2-Multi-Species: 2022

KEY

	User Provided Information *Default values are in bold, italics turquoise (can be changed by user if project-specific information is available).*
	Preset NMFS Provided Information (cannot be altered by user). NMFS thresholds/default weighting value are in bold red.
	OUTPUT: Resultant Isopleth/Range to Effects (cannot be altered by user); Note: isopleths are presented in meters and feet
	Automatically Calculated Values Based on User Provided Information (only weighting adjustment (-dB) can be altered by user; Row 64, if spectrum is available)

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE and CONTACT	US Coast Guard Moorings Sitka New WLB Pier and Floating Dock
PROJECT/SOURCE INFORMATION (size, material, number, duration to drive pile, etc.)	Vibratory Settling Post-DTH 30-Inch Concrete Piles RMS - 163 dB RMS 10 minutes per pile Maximum of 2 piles per day

Notes (please include all assumptions)

extra information

STEP 2: QUANTITATIVE PROJECT-SPECIFIC INFORMATION

1 sec SEL = RMS	METRIC RMS (NOT Peak)	WEIGHTING (WFA in kHz) Sea Turtle Default WFA (kHz)	 Marine Mammal Default WFA (kHz)
Unattenuated Sound Pressure Level (dB) (see Proxy Level Tab for surrogate values; Copy, ONLY Paste Values (123), not formulas)	163		
Attenuated Sound Pressure Level (dB)* (calculation done automatically)	**163**	**0.16**	**2.5**
Distance associated with sound pressure level measurement/Measurement distance from pile (meters); Typically, 10-m but please double check data being used	*10*		
Transmission loss constant (NMFS recommends: 15 if unknown)	*15*		
Number of piles per day (best estimate based on previous experience)	2	**Attenuation (e.g., bubble curtain) (enter positive number)**	0
Duration to drive a single pile (minutes) (best estimate based on previous experience)	10		
Duration of Sound Production within a day (seconds)	1200	**Cumulative SEL at measured distance (dB)**	193.79
10 Log (duration of sound production)	30.79		

*If sound pressure level provided includes attenuation methods (e.g., bubble curtain), please note this in Project/Source Information in Step 1

RESULTANT ISOPLETHS

(Range to Effects)

For vibratory pile driving, only behavioral thresholds exist for fishes

Fishes present

FISHES	
BEHAVIOR	
RMS Threshold (dB)	
150	
Isopleth (meters)	**73.6**
Isopleth (feet)	**241.4**

Sea Turtles present

SEA TURTLES	
PTS ONSET	**BEHAVIOR**
PTS SEL_{cum} Threshold (dB)	**RMS Threshold (dB)**
220	**175**
Isopleth (meters)	**0.2**	**1.6**
Isopleth (feet)	**0.6**	**5.2**

MARINE MAMMALS

Hearing Group			PTS ONSET HF Cetacean PTS SEL_{cum} Threshold (dB)	PW Pinniped PTS SEL_{cum} Threshold (dB)	OW Pinniped PTS SEL_{cum} Threshold (dB)
	LF Cetacean PTS SEL_{cum} Threshold (dB)	**MF Cetacean PTS SEL_{cum} Threshold (dB)**			
	199	**198**	**173**	**201**	**219**
Isopleth (meters)	**4.5**	**0.4**	**6.6**	**2.7**	**0.2**
Isopleth (feet)	**14.6**	**1.3**	**21.7**	**8.9**	**0.6**

ALL MARINE MAMMALS

BEHAVIOR	
RMS Threshold (dB)	
120	
Isopleth (meters)	**7,356.4**
Isopleth (feet)	**24,135.2**

LF Cet. present
MF Cet. present
HF Cet. present
Phocids present
Otariids present

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW):true seals
Otariid pinnipeds (OW):sea lions and fur seals

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Sea Turtles
a	1	1.6	1.8	1	2	1.4
b	2	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94	0.077
f_2	19	110	140	30	25	0.44
C	0.13	1.2	1.36	0.75	0.64	2.35
Adjustment (-dB)†	-0.05	-16.83	-23.50	-1.29	-0.60	0.00

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

IMPACT PILE DRIVING

Use check boxes for Taxa present

☐ Fishes ☐ Sea Turtles ☐ Phocid
☐ LF Cet. ☐ MF Cet. ☐ HF Cet. ☐ Otariid

VERSION 1.2-Multi-Species: 2022

KEY

User Provided Information *Default values are in bold, italics turquoise (can be changed by user if project-specific information is available).*

Preset NMFS Provided Information (cannot be altered by user). NMFS thresholds/default weighting value are in bold red.

OUTPUT: Resultant Isopleth/range to effects (cannot be altered by user); Note: isopleths are presented in meters and feet

Automatically Calculated Values Based on User Provided Information (only weighting adjustment (-dB) can be altered by user, Row 67, if spectrum is available)

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE and CONTACT	US Coast Guard Moorings Sitka New WLB Pier and Floating Dock
PROJECT/SOURCE INFORMATION (size, material, number, pile strikes, etc.)	Impact Proofing Post-DTH 30-Inch Concrete Piles RMS - 186 dB RMS SEL - 173 dB SEL 5 impacts per pile Maximum of 2 piles per day

Notes (Please include all assumptions)

STEP 2: QUANTITATIVE PROJECT-SPECIFIC INFORMATION

METRICS

	Peak	SELss	RMS
Unattenuated Single strike level (dB) (see Proxy Level Tab for surrogate values; Copy, ONLY Paste Values (123), not formulas)		173	186
Attenuated Single strike level (dB)* (calculation done automatically)	**0**	**173**	**186**
Distance associated with single strike level/Measurement distance from pile (meters); Typically, 10-m but please double check data being used	*10*	*10*	*10*
Transmission loss constant (NMFS recommends: 15 if unknown)	*15*		
Number of piles per day (best estimate based on previous experience)	2	**Attenuation assumed (e.g., bubble curtain) (enter positive number)**	0
Number of strikes per pile (best estimate based on previous experience)	5		NMFS recommends 5 dB as default, If attenuation used
Number of strikes per day	10		
Cumulative SEL at measured distance	183		

	Effective Quiet (Fish Only)	WEIGHTING (WFA in kHz) Sea Turtle Default WFA (kHz)	Marine Mammal Default WFA (kHz)
	150	0.16	2

WFA: Weighting Factor Adjustment

RESULTANT ISOPLETHS‡ (Range to Effects)

‡Impulsive sounds have dual metric thresholds for injury (SEL_{cum} & PK). Metric producing largest isopleth should be used.

FISHES

NO FISHES

	ONSET OF PHYSICAL INJURY		BEHAVIOR
	Peak (PK) Threshold (dB)	SEL_{cum} Threshold (dB)** Fish ≥ 2 g	Fish < 2 g	RMS Threshold (dB)
	206	187	183	150
Isopleths (meters)	0.0	5.4	10.0	2,511.9
Isopleth (feet)	0.0	17.8	32.8	8,241.1

**This calculation accounts for single strike SEL < 150 dB do not accumulate to cause injury (Effective Quiet)

SEA TURTLES

NO SEA TURTLES

	PTS ONSET		BEHAVIOR
	Peak (PK) Threshold (dB)	SEL_{cum} Threshold (dB)	RMS Threshold (dB)
	232	204	175
Isopleths (meters)	0.0	0.4	54.1
Isopleth (feet)	0.0	1.3	177.5

MARINE MAMMALS

	PTS ONSET				
Hearing Group	LF Cetacean PTS Peak (PK) Threshold (dB)	MF Cetacean Peak (PK) Threshold (dB)	HF Cetacean PTS Peak (PK) Threshold (dB)	PW Pinniped PTS Peak (PK) Threshold (dB)	OW Pinniped PTS Peak (PK) Threshold (dB)
	219	230	202	218	232
Isopleths (meters)	0.0	0.0	0.0	0.0	0.0
Isopleth (feet)	0.0	0.0	0.0	0.0	0.0
	LF Cetacean PTS SEL_{cum} Threshold (dB)	MF Cetacean PTS SEL_{cum} Threshold (dB)	HF Cetacean PTS SEL_{cum} Threshold (dB)	PW Pinniped PTS SEL_{cum} Threshold (dB)	OW Pinniped PTS SEL_{cum} Threshold (dB)
	183	185	155	185	203
Isopleths (meters)	10.0	0.4	11.9	5.3	0.4
Isopleth (feet)	32.8	1.2	39.0	17.5	1.3

ALL MARINE MAMMALS

BEHAVIOR	
RMS Threshold (dB)	
160	
Isopleths (meters)	541.2
Isopleth (feet)	1,775.5

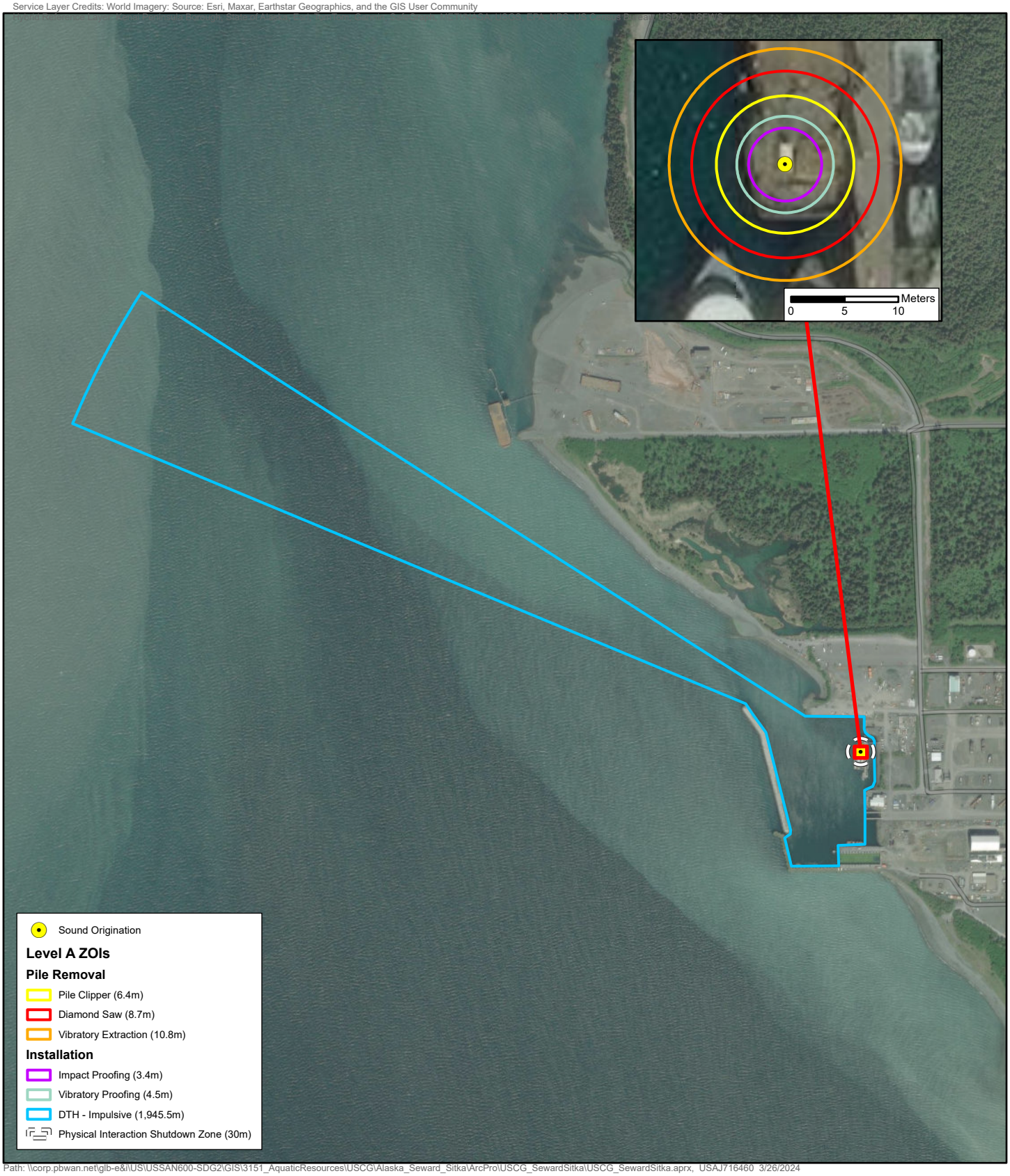
NO LF CET.
NO MF CET.
NO HF CET.
NO PHOCIDS
NO OTARIIDS

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW):true seals
Otariid pinnipeds (OW):sea lions and fur seals

WEIGHTING FUNCTION CALCULATIONS (Sea Turtles and Marine Mammals Only)

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	Sea Turtles
a	1	1.6	1.8	1	2	1.4
b	2	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94	0.077
f_2	19	110	140	30	25	0.44
C	0.13	1.2	1.36	0.75	0.64	2.35
Adjustment (-dB)†	-0.01	-19.74	-26.87	-2.08	-1.15	0.00

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$



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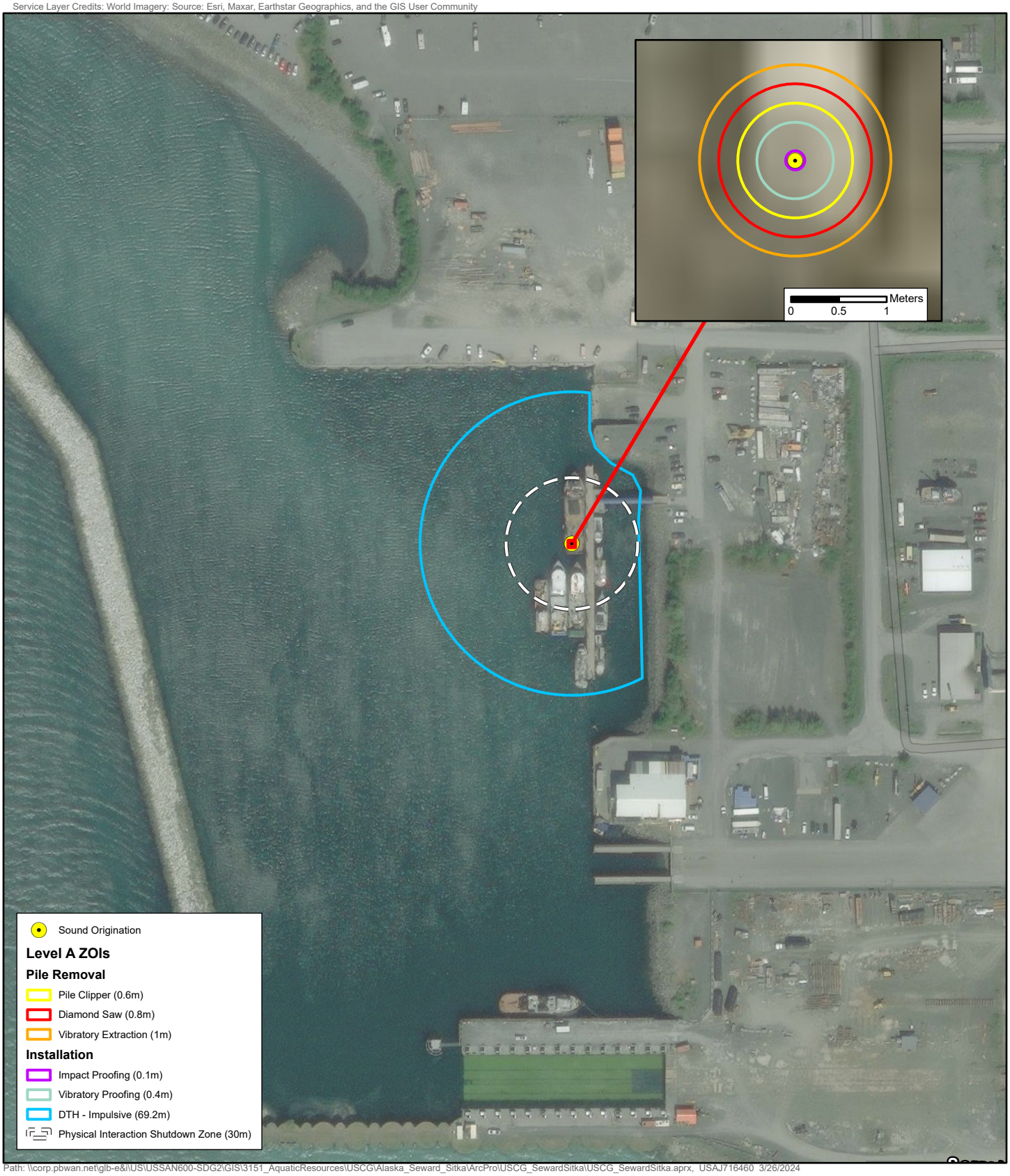
1 inch = 1,000 feet
0 500 1,000 Feet

wsp

FIGURE 3

Level A Zones
Low Frequency Cetaceans
USCG Moorings Seward
Seward, Alaska

Service Layer Credits: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



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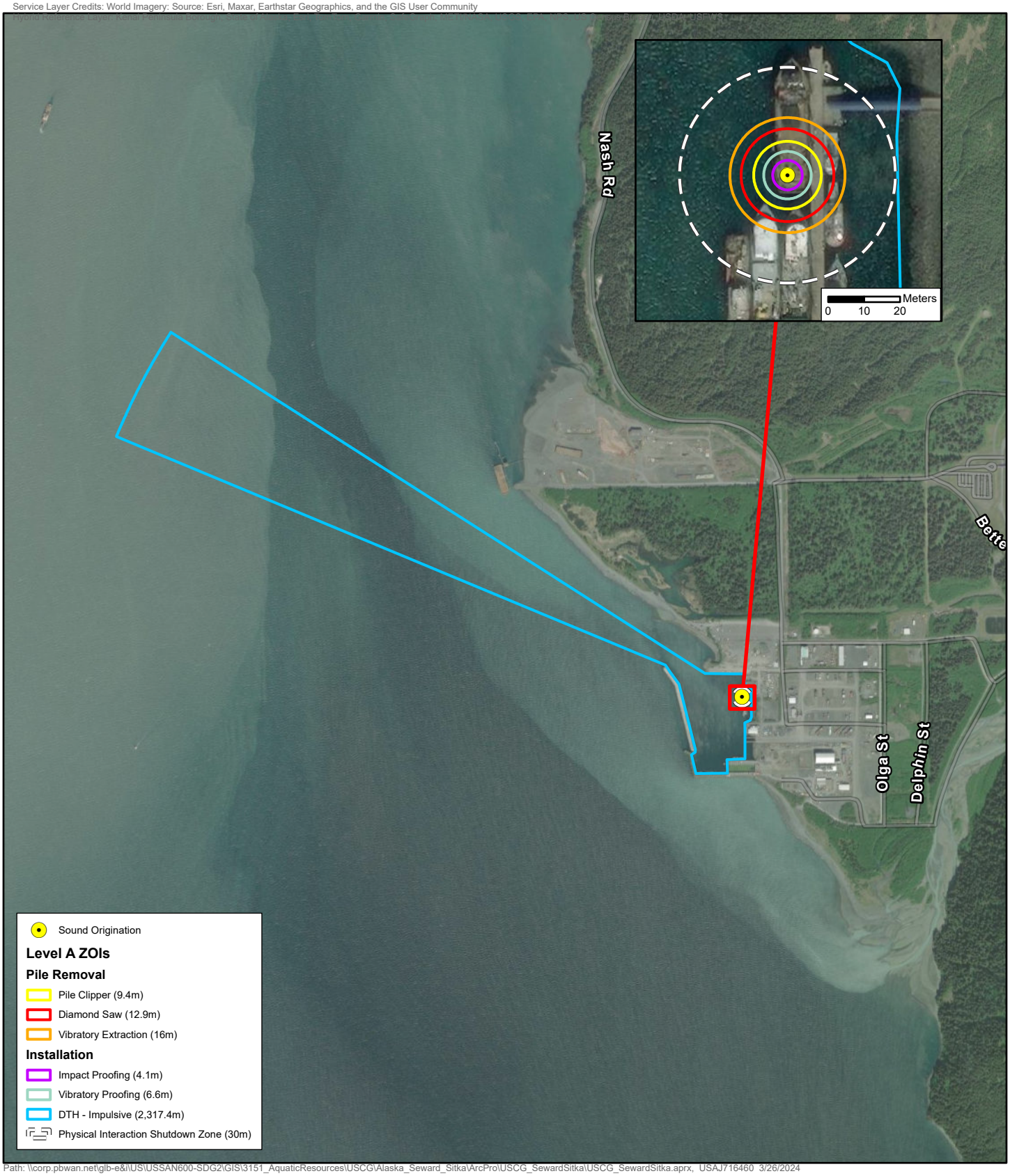
1 inch = 200 feet
0 100 200
Feet

FIGURE 4

Level A Zones
Mid-Frequency Cetaceans
USCG Moorings Seward
Seward, Alaska



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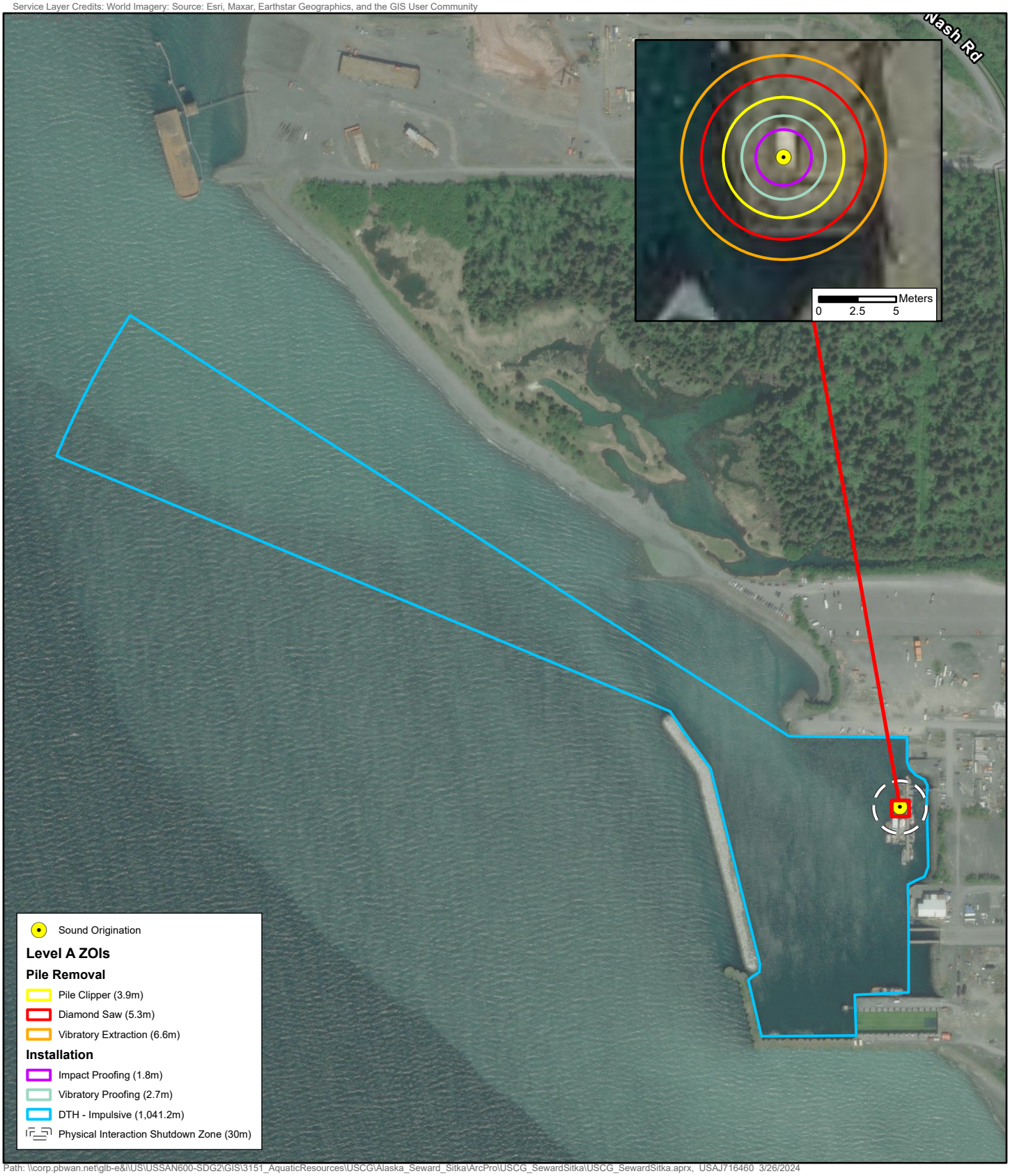
1 inch = 1,500 feet
0 750 1,500 Feet

FIGURE 5

Level A Zones
High Frequency Cetaceans
USCG Moorings Seward
Seward, Alaska

Service Layer Credits: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



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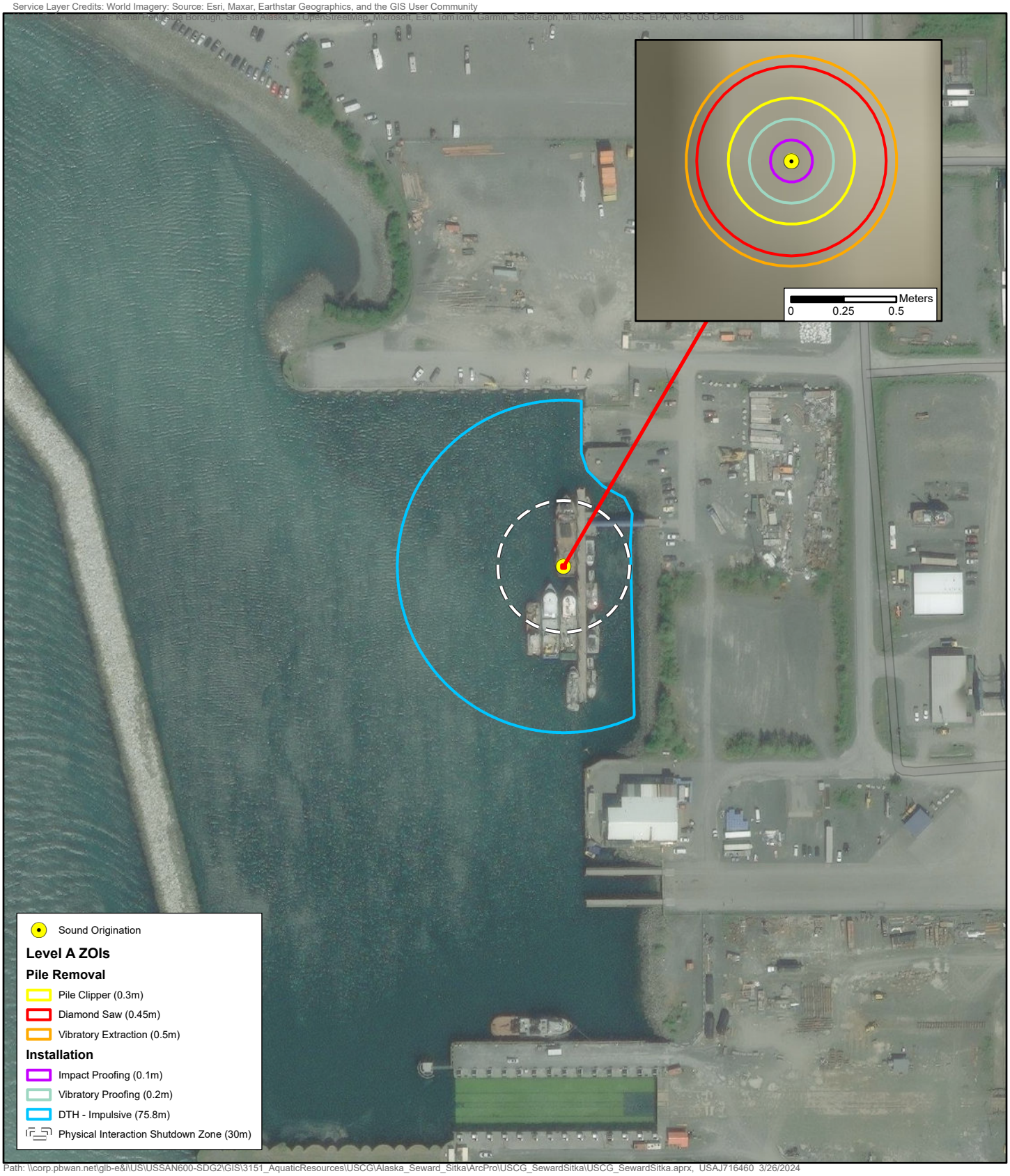
1 inch = 500 feet
0 250 500
Feet

wsp

FIGURE 6

Level A Zones
Phocid Pinnipeds
USCG Moorings Seward
Seward, Alaska



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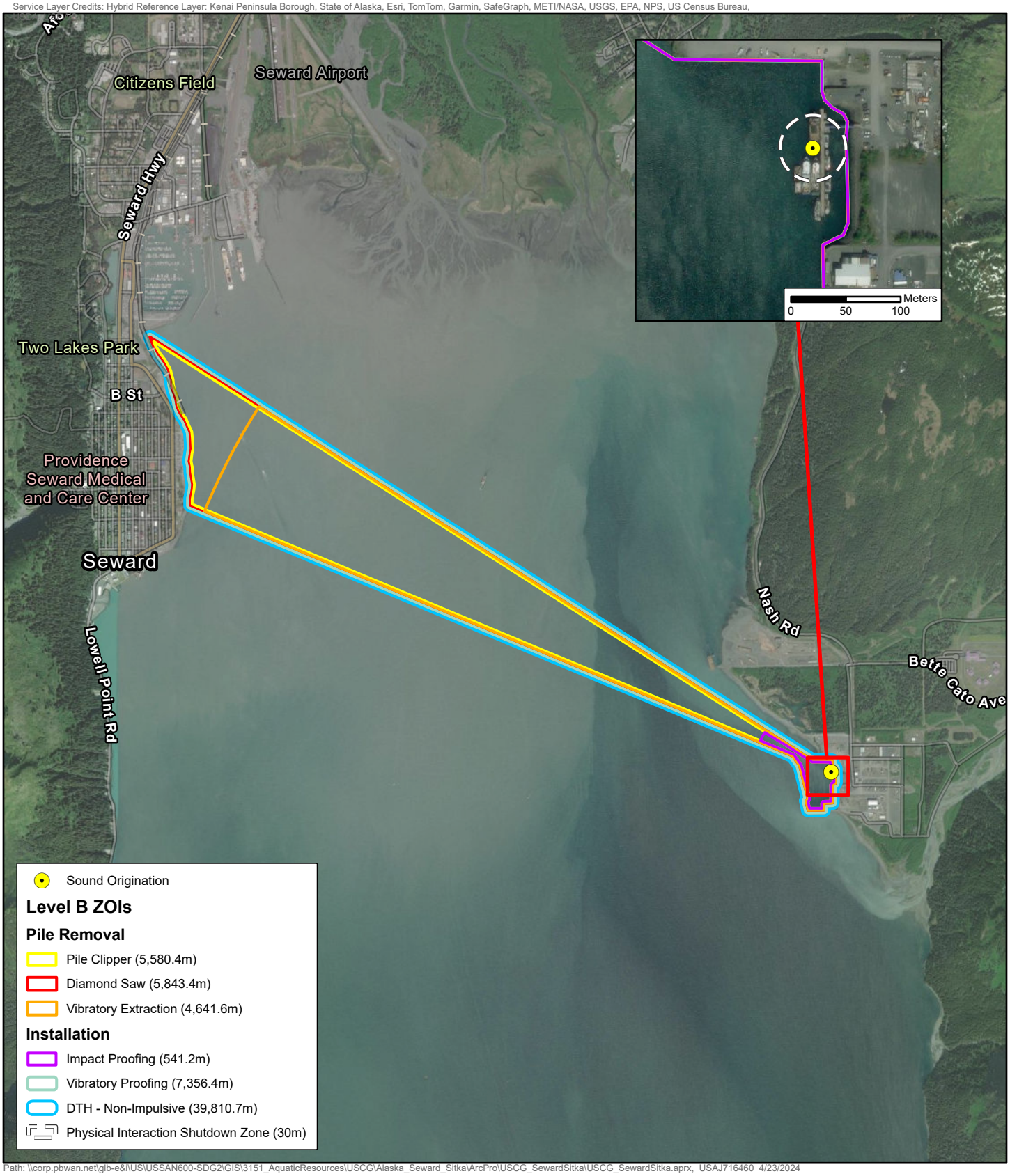
1 inch = 200 feet
0 100 200
Feet

wsp

FIGURE 7

Level A Zones
Otariid Pinnipeds and Sea Otters
USCG Moorings Seward
Seward, Alaska



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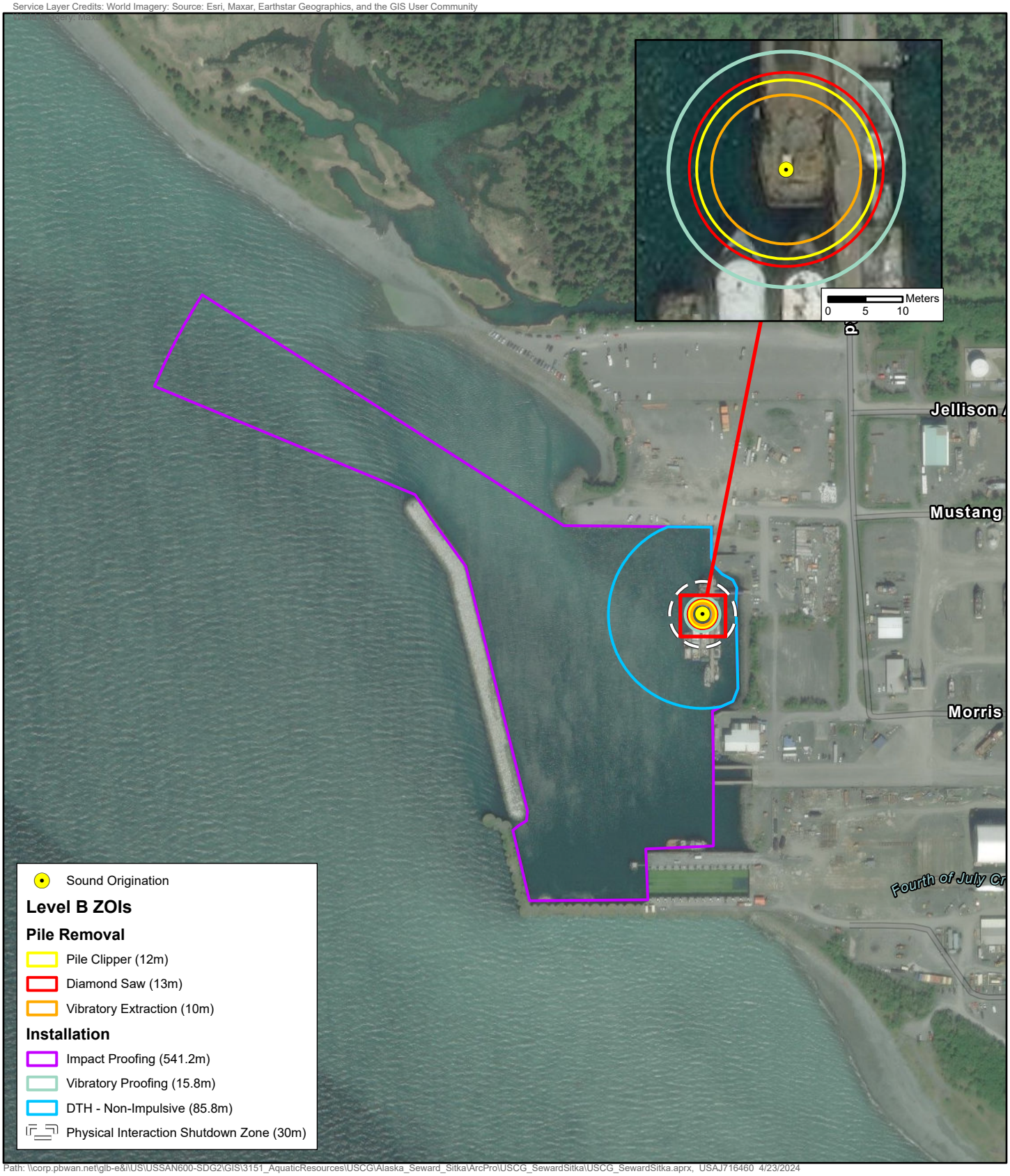
1 inch = 3,000 feet
0 1,500 3,000
Feet

FIGURE 8

Level B Zones
NMFS Species
USCG Moorings Seward
Seward, Alaska



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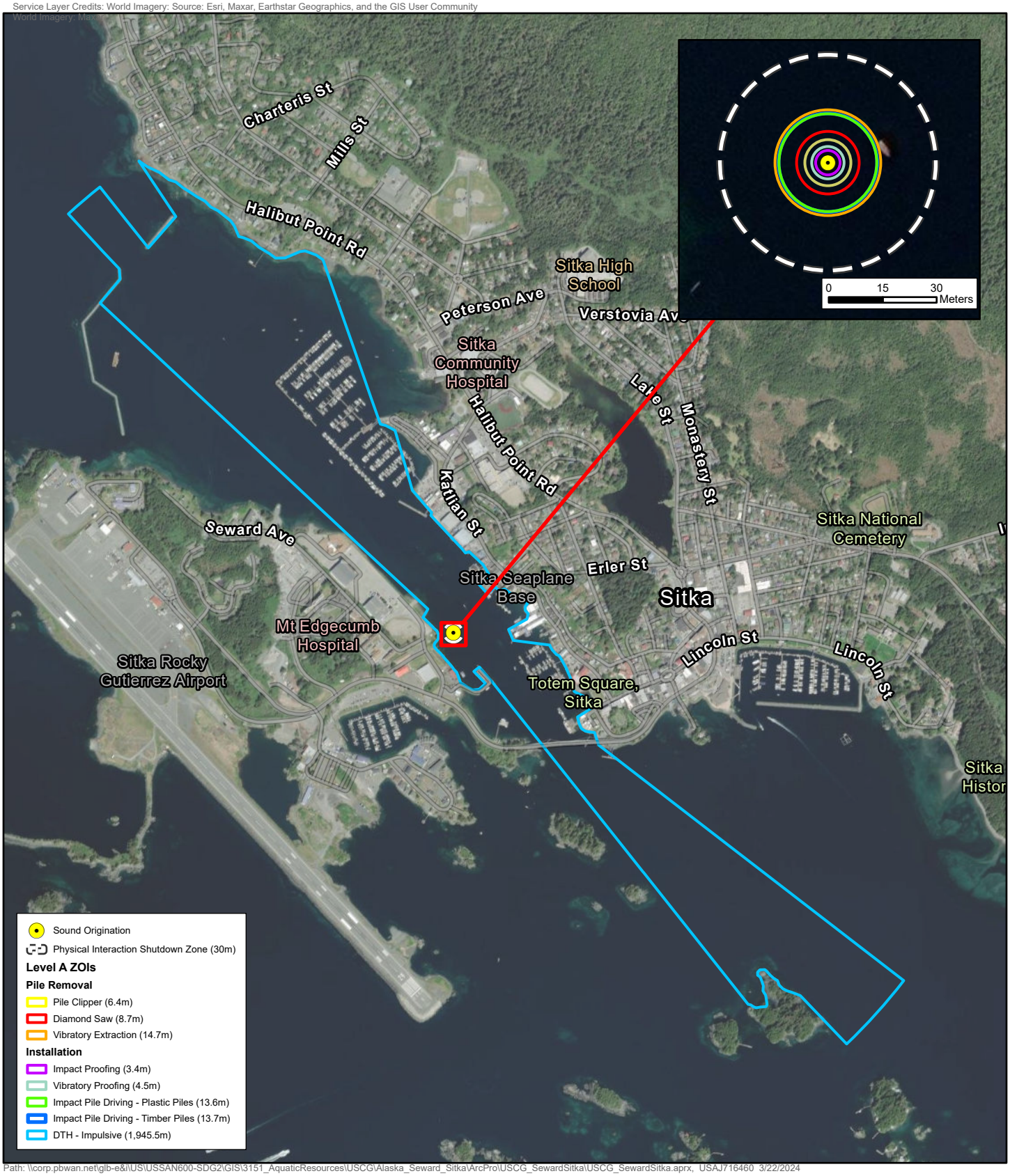
1 inch = 400 feet
0 200 400
Feet

FIGURE 9

Level B Zones
USFWS Species
USCG Moorings Seward
Seward, Alaska



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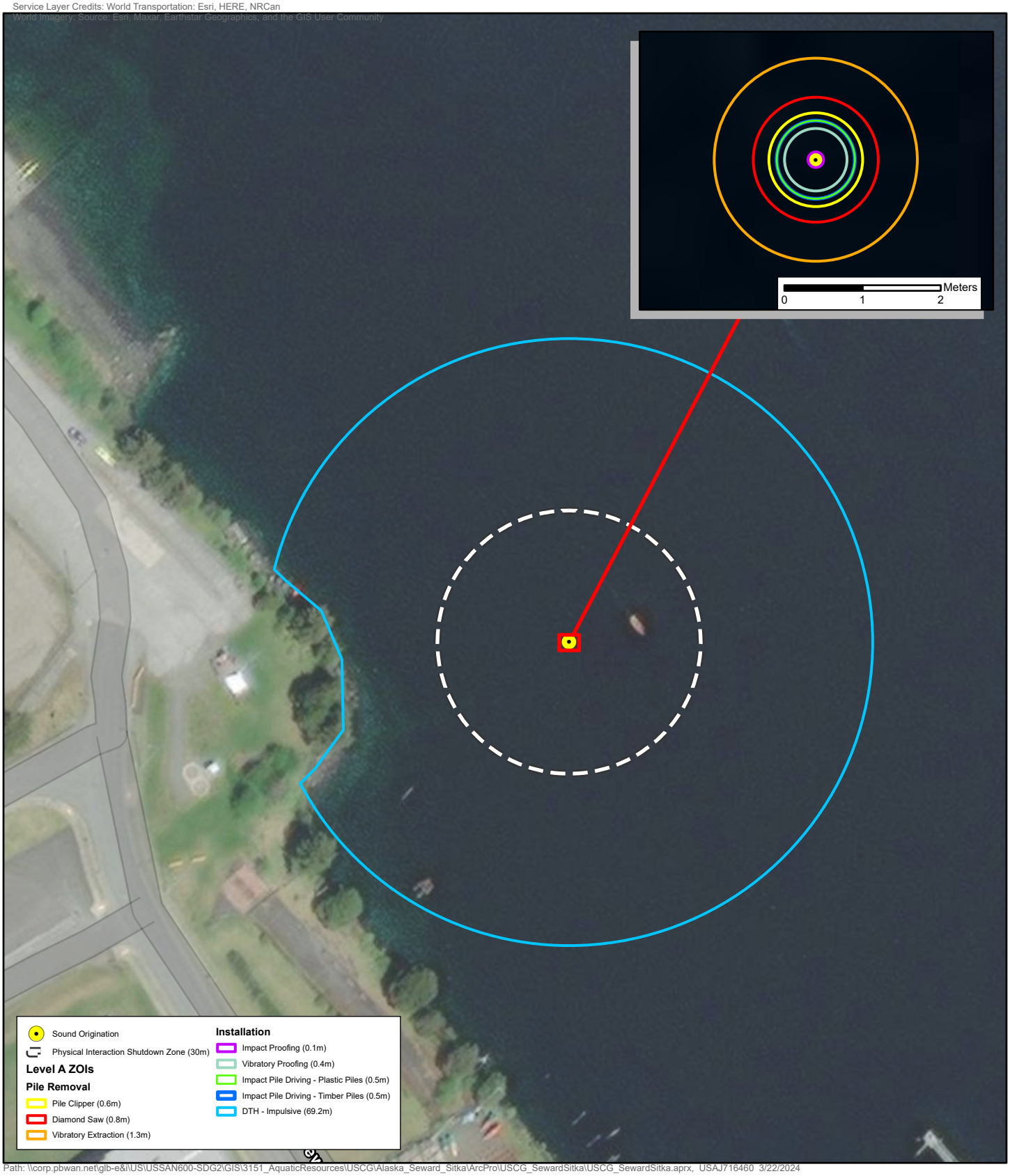
1 inch =1,500 feet
0 750 1,500 Feet

wsp

FIGURE 3

Level A Zones
Low Frequency Cetaceans
USCG Moorings Sitka
Sitka, Alaska



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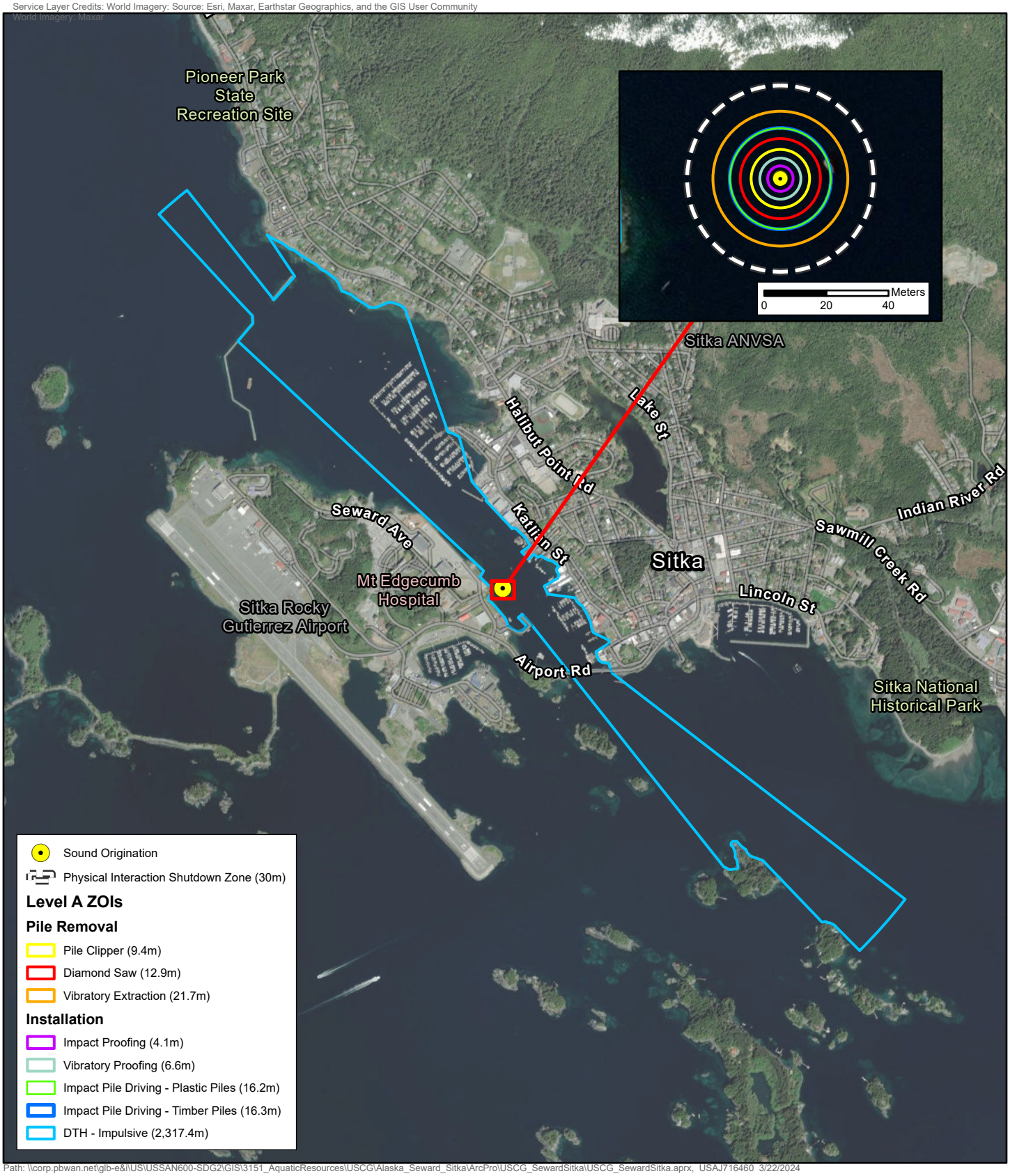
1 inch =100 feet
0 50 100
Feet

wsp

FIGURE 4

Level A Zones
Mid-Frequency Cetaceans
USCG Moorings Sitka
Sitka, Alaska



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1 inch =2,000 feet
0 1,000 2,000 Feet

wsp

FIGURE 5

Level A Zones
High Frequency Cetaceans
USCG Moorings Sitka
Sitka, Alaska

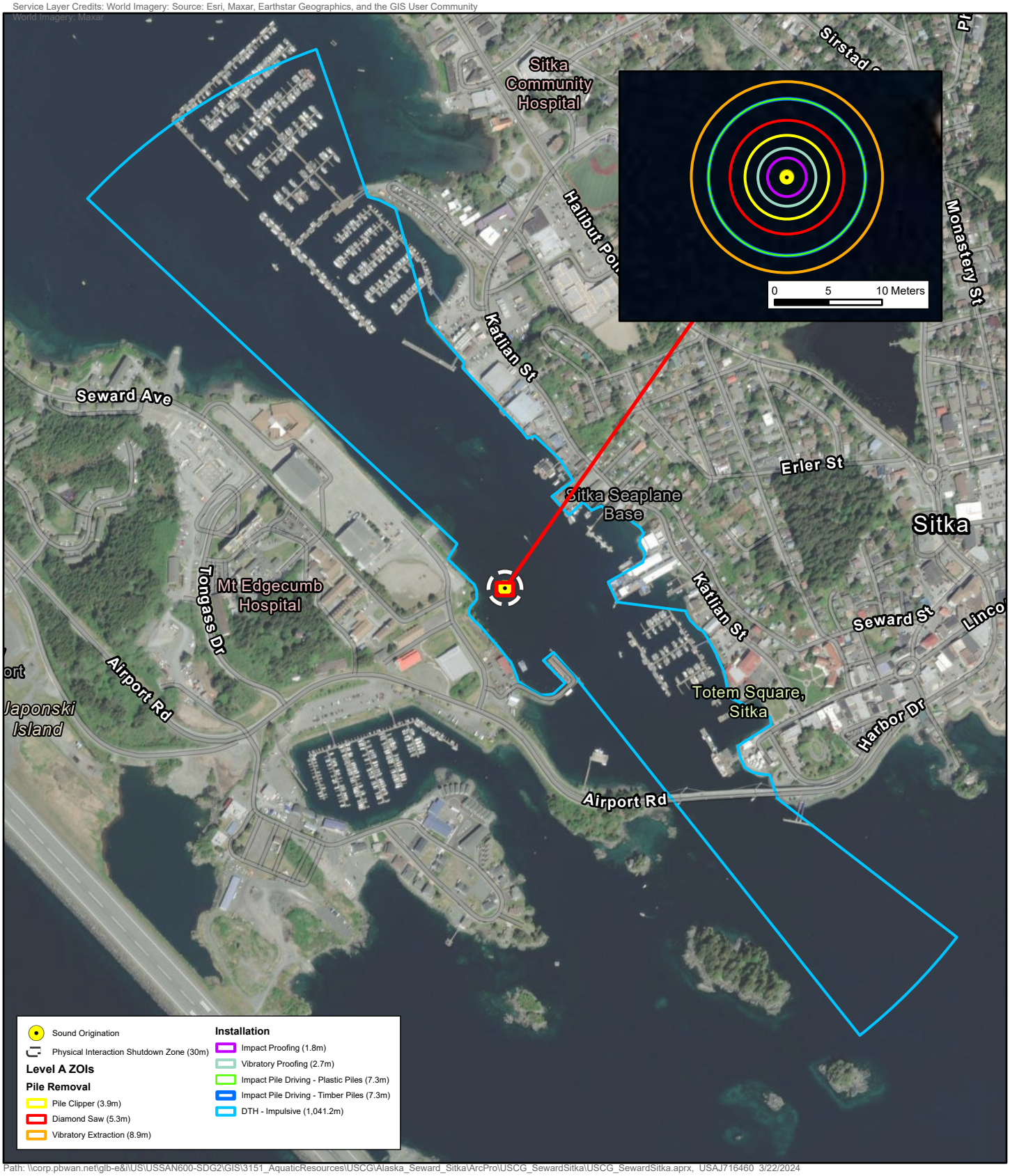

FIGURE 6

Level A Zones
Phocid Pinnipeds
USCG Moorings Sitka
Sitka, Alaska

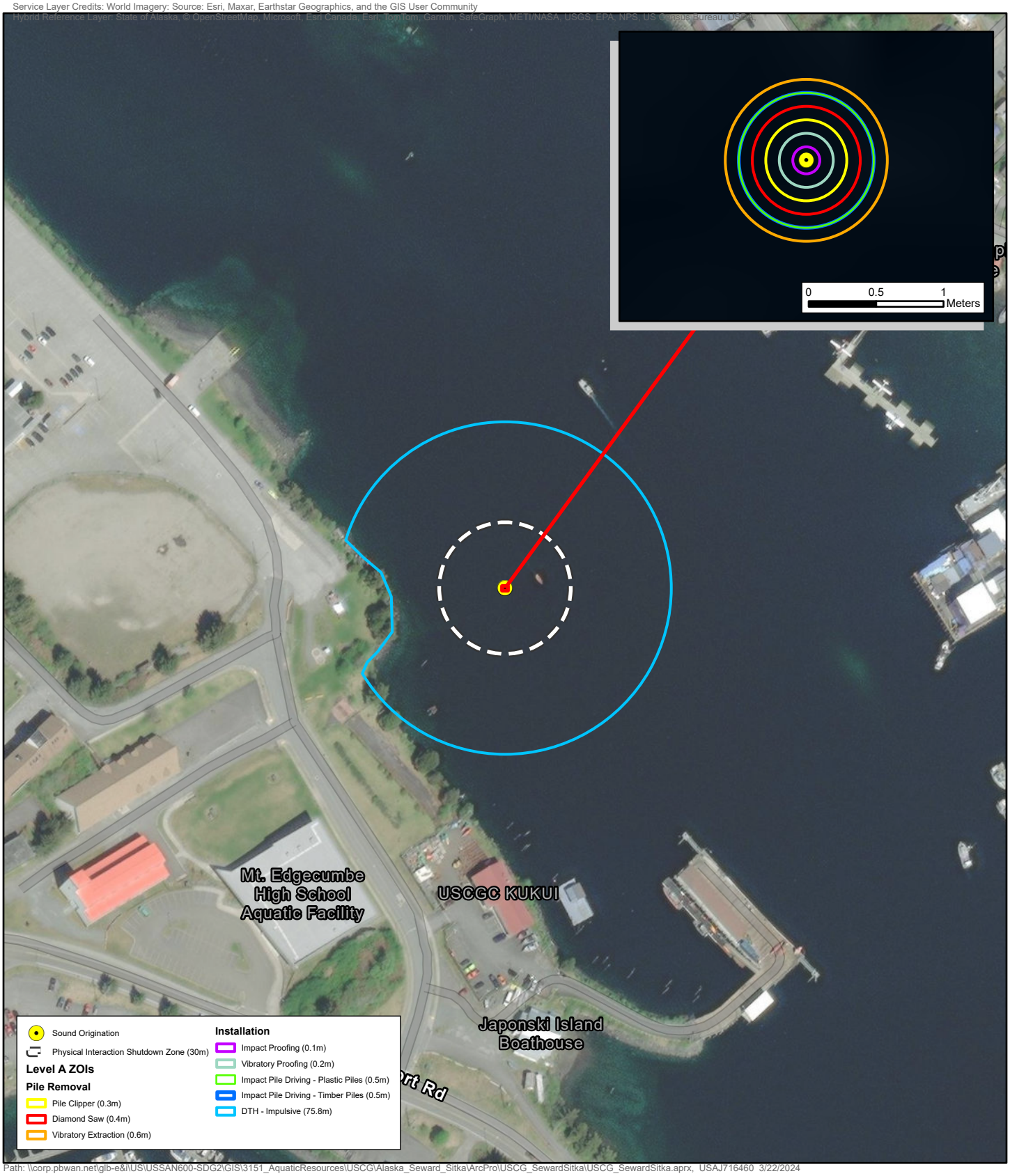

FIGURE 7

Level A Zones
Otariid Pinnipeds/Sea Otters
USCG Moorings Sitka
Sitka, Alaska

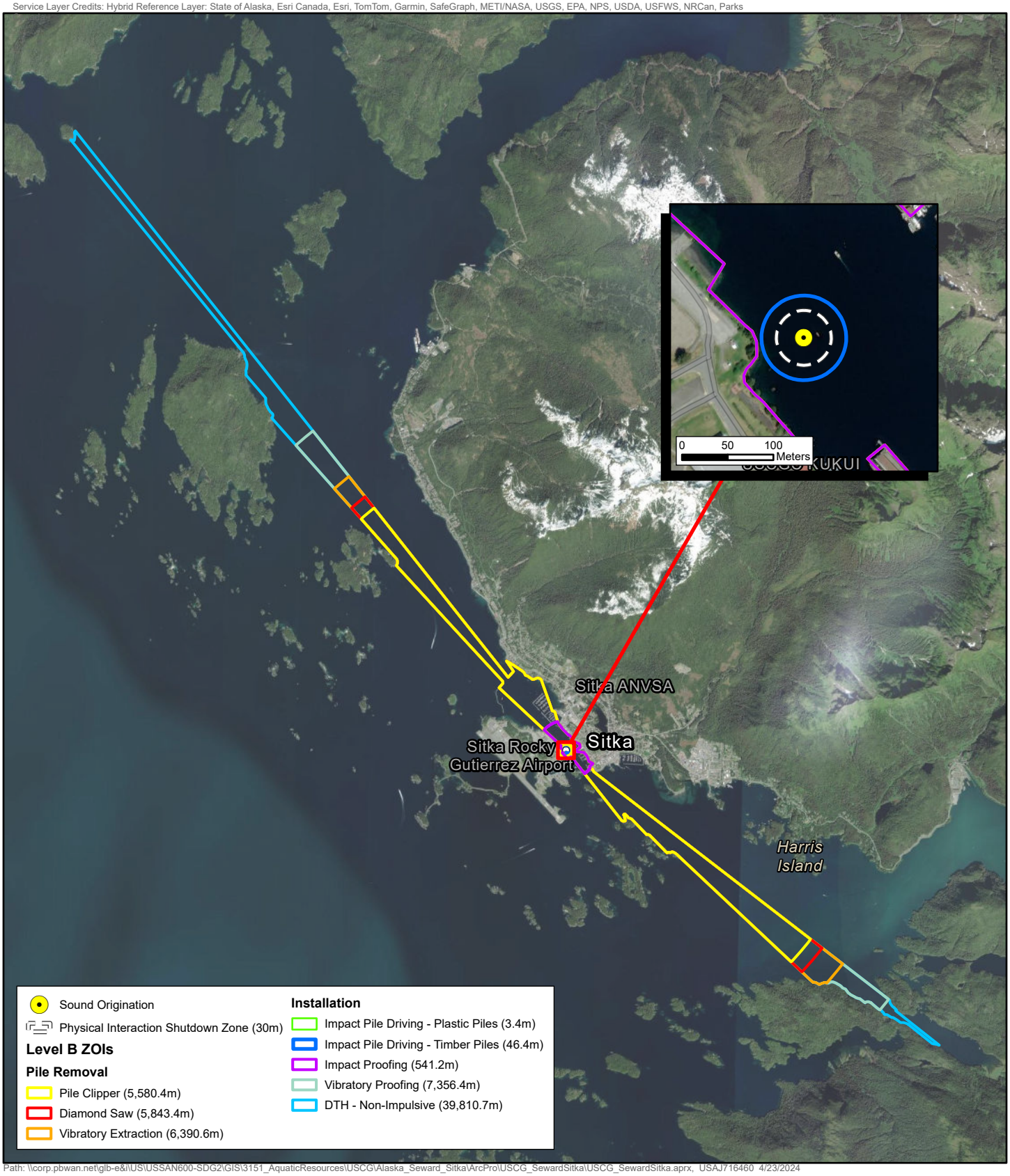

FIGURE 8

Level B Zones - NMFS Species
USCG Moorings Sitka
Sitka, Alaska

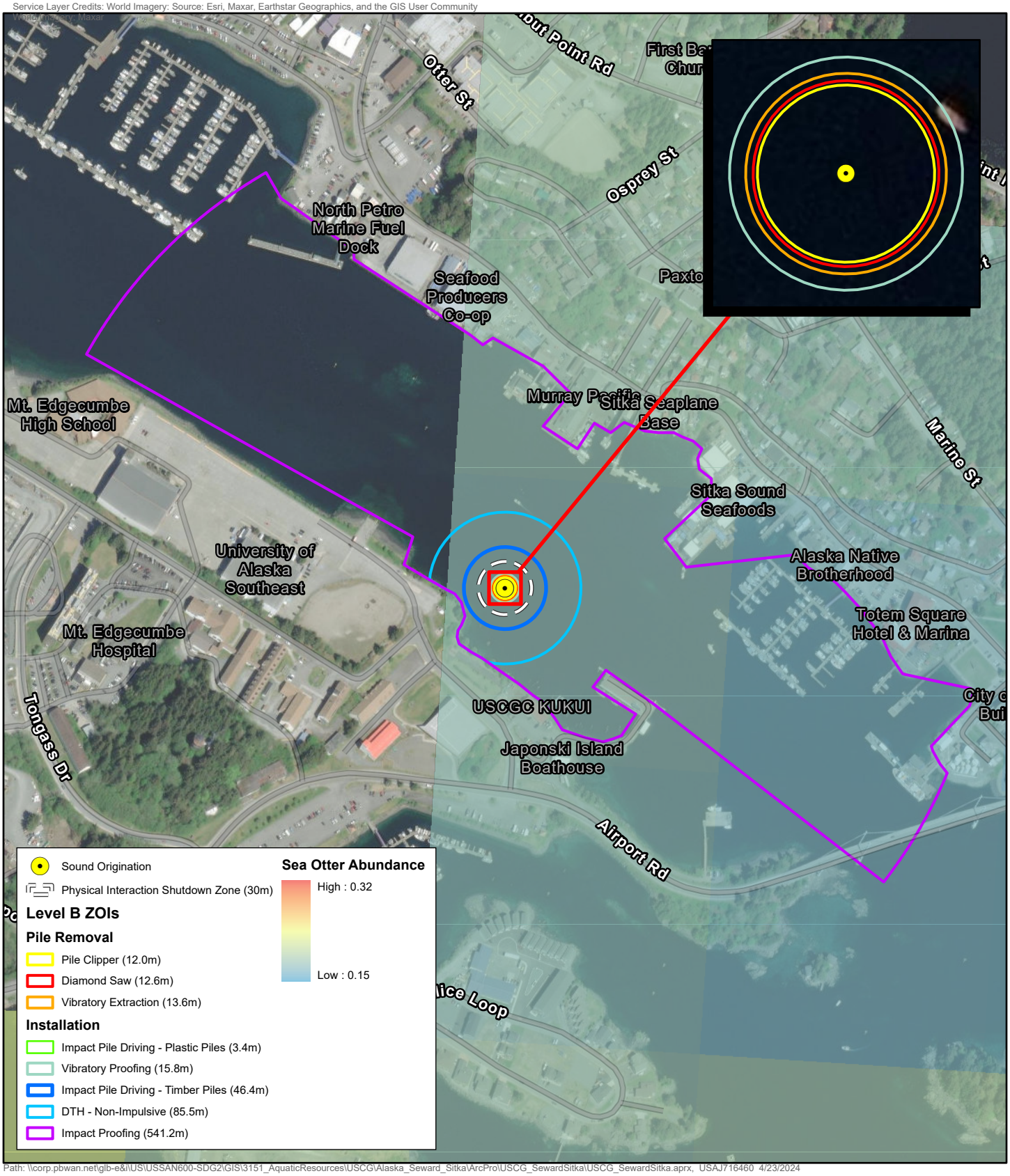

FIGURE 9

Level B Zones - USFWS Species
USCG Moorings Sitka
Sitka, Alaska