LETTER OF AUTHORIZATION APPLICATION FOR PROGRAMMATIC MAINTENANCE, REPAIR, AND REPLACEMENT ACTIVITIES APRIL 1, 2022 TO MARCH 31, 2027

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ACRONYMS AND ABBREVIATIONS

%	percent
µPa	micropascal
AOR	Area of Responsibility
BMP	Best Management Practice
Caltrans	California Department of Transportation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEU	Civil Engineering Unit
CFR	Code of Federal Regulations
cm	centimeter(s)
CWA	Clean Water Act
dB	decibel
dB re 1 µPa	decibels referenced to a pressure of 1 microPascal,
DPS	distinct population segment
DTH	down-the-hole
EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ft	foot/feet
Hz	hertz
HDPE	high-density polyethylene
kHz	kilohertz
km	kilometer(s)
LOA	Letter of Authorization
m	meter(s)
MLLW	mean lower low water
MMPA	Marine Mammal Protection Act
mph	miles per hour
Navy	U.S. Department of the Navy
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PCE	primary constituent element
PSO	protected species observer
PTS	permanent threshold shift
RMS	root mean square
SEL	sound exposure level
SPL	sound pressure level
TL	transmission loss
TSS	temporary suspended sediment
TTS	temporary threshold shift
TSCA	Toxic Substances Control Act
re 1 µPa	referenced to 1 micropascal
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USCG	U.S. Coast Guard
USCGC	U.S. Coast Guard Cutter
USFWS	U.S. Fish and Wildlife Service

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1 DESCRIPTION OF SPECIFIED 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

The United States (U.S.) Coast Guard (USCG) has prepared this Request for Regulations and a Letter of Authorization (LOA) for the incidental taking, as defined Section 5 (*Incidental Taking Authorization Requested*), of marine mammals during in-water maintenance activities at eight USCG facilities (see Figure 1-1), within the USCG Civil Engineering Unit (CEU) Juneau Area of Responsibility (AOR). The USCG maintenance activities to be authorized will occur from April 1, 2022 through March 31, 2027, and the USCG requests this LOA cover this entire five-year period.

Under the Marine Mammal Protection Act (MMPA) of 1972, as amended (Title 16 of the U.S. Code [USC] Section 1371(a)(5)), the Secretary of Commerce through the National Marine Fisheries Services (NMFS) (and/or Secretary of the Interior through the United States Fish and Wildlife Service [USFWS]) shall allow, upon request, the incidental, but not intentional, taking of marine mammals by U.S. citizens who engage in a specified activity during periods of not more than 5 years, if certain findings are made and regulations are issued after notice and opportunity for public comment. The Secretary must find that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses. The regulations must set forth the permissible methods of taking, other means of affecting the least practicable adverse impact on the species or stock(s), and requirements pertaining to the monitoring and reporting of such taking.

The USCG is preparing a Programmatic Environmental Assessment (EA) in support of proposed maintenance actions at each of the eight USCG facilities within the CEU Juneau AOR. For this letter of request, a description of the individual USCG facilities and surrounding area (Study Areas, as identified in Figure 1-1) and proposed maintenance activities is included below and is based on the Proposed Action in the USCG's Programmatic EA.

This document has been prepared in accordance with the applicable regulations of the MMPA, as amended, and its implementing regulations. The request for a LOA is based on: (1) the analysis of spatial and temporal distributions of protected marine mammals in the individual USCG facility Study Areas, (2) the review of proposed maintenance activities that have the potential to incidentally take marine mammals per the USCG Draft Programmatic EA, and (3) a technical risk assessment to determine the likelihood of effects of USCG maintenance activities on marine mammals. This chapter describes those maintenance activities that are likely to result in Level B harassment, Level A harassment, or mortality under the MMPA. Of the USCG maintenance activities analyzed for the USCG Draft Programmatic EA, the USCG has determined maintenance activities, namely pile repair and replacement activities, have the potential to affect marine mammals present within the individual USCG facility Study Areas, and, with monitoring and mitigation measures in place, would rise only to the level of harassment under the MMPA.

Title 50 of the Code of Federal Regulations (CFR) part 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 LOA application.

1.2 Overview of Maintenance Activities

The USCG intends to perform maintenance activities at eight stations located in southcentral and southeastern Alaska, including: 1) Kodiak, 2) Sitka, 3) Ketchikan, 4) Valdez, 5) Cordova, 6) Juneau, 7) Petersburg, and 8) Seward (refer to Figure 1-1). In-water maintenance activities may include pile repair (i.e., sleeve or jacket re/placement), pile replacement (including removal and installation), and deck repair and replacement to maintain safe berthing for currently operating vessels. Details of proposed activities including other maintenance activities such as underwater power washing piles and above-water power washing of deck, fender repair (camel replacement, chain replacement, utility handlers), replacement of rub strips and ladder support (which require hand tools such as drilling), etc. Specific pile types, sizes, and quantities as well as decking types are described for each USCG facility (see Section 1.3 – *Proposed Action Details by Location*).

1.2.1 Pile Repair

Existing piles that show signs of deterioration may be repaired using a protective wrapping system which typically includes installation of grouted fiberglass pile jackets around deteriorated piles. For piles located near the shoreline, any surrounding rock armor will be temporarily removed to access the full pile length down to the mudline. Rock armor will be removed and replaced using an excavator, crane, or similar method to move individual rocks. It may also be necessary to replace wooden bracings during repair activities.

1.2.2 Pile Replacement

Piles that cannot be repaired with sleeves or pile jackets will be replaced. Existing timber, steel, and concrete piles will be replaced with same timber, steel, concrete, or composite of similar diameter and size. Pile replacement will generally proceed along the following steps: 1) remove overlying decking if pile is otherwise inaccessible, 2) remove the damaged pile, 3) install new pile of similar size, and 4) re-install old or install new decking over the replacement pile as necessary. The exact pile extraction and installation methods will be determined by the construction contractor; however, pile extraction will potentially comprise “dead pulling” or vibratory extraction with limited use of pile clipping or cutting as necessary while pile installation will potentially use drilling of rock sockets where shallow bedrock is present. If piles break during extraction, they will be left in place if they would not create a navigational or other safety hazard but would be cut or clipped as necessary. Pile installation would utilize the most appropriate methods for the local area and would include vibratory and/or impact driving as well as down-the-hole drilling.

1.2.3 Deck Repair and/or Replacement

Decking will be replaced in kind (i.e., wood deck will be replaced with wood). If a portion of decking needs to be replaced due to damage or rot, just the section identified for repair will be replaced. For concrete decks, cracked or spalled concrete will be repaired as needed. In order to access piles on a concrete deck, the section above the pile will be removed using a concrete saw. Following pile replacement, a watertight form will be prepared, and uncured concrete will be pumped into the form in order to “patch” the void. Concrete will not be allowed to top the form.

1.2.4 Other Maintenance Activities

Other maintenance activities include fender repair and replacement, gangway repair and replacement, replacement of rub strips and ladder supports, replacement of handrails, bollards, and other minor repairs including pressure washing, cleaning, and scraping of piles and decking.

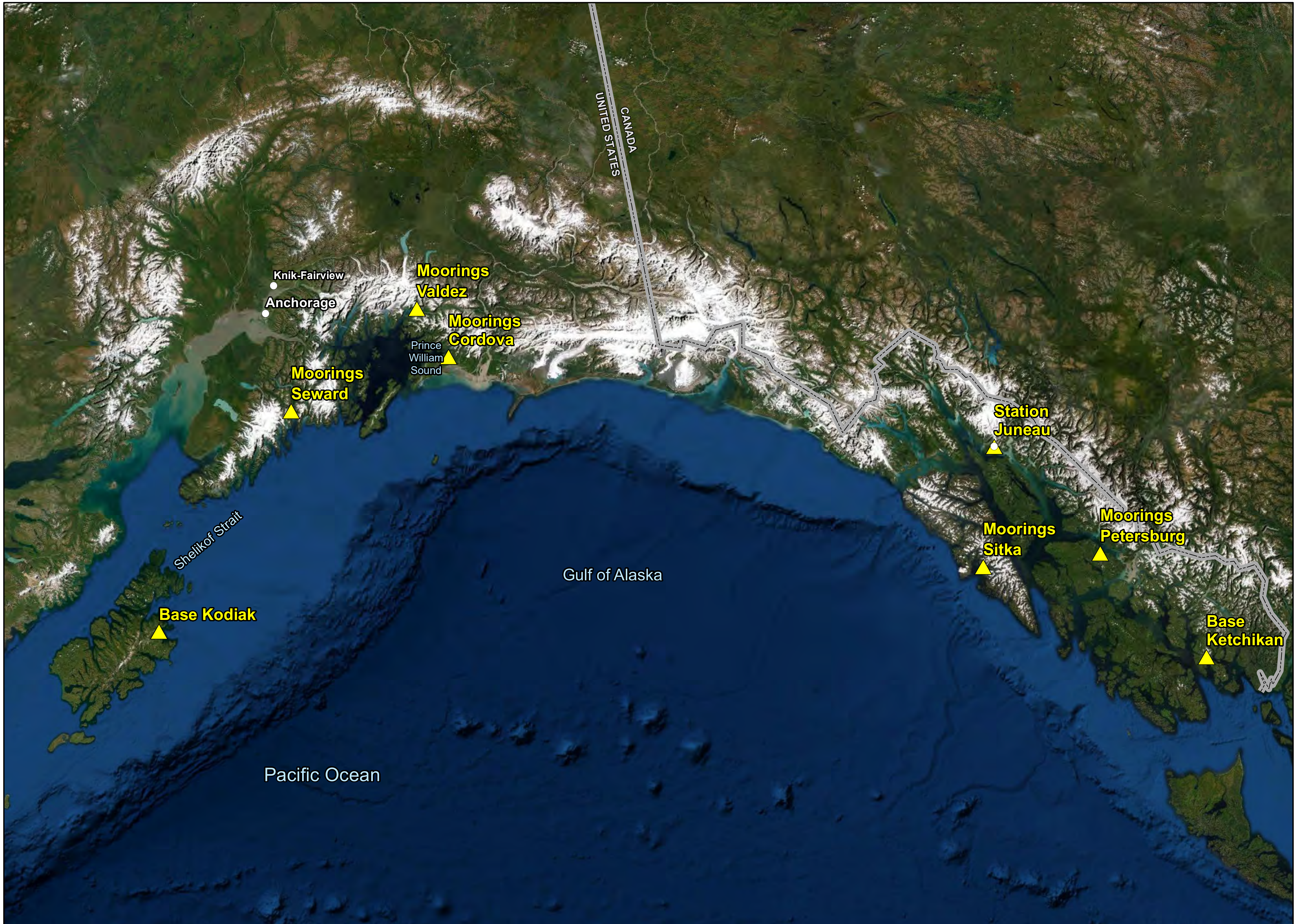

FIGURE 1-1

USCG Sector Alaska
Facilities Included in
Programmatic Maintenance Activities
USCG Sector Alaska

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Fender repair may include fender pile replacement, camel replacement, and camel system repairs. Fender pile replacement will be similar to that described above for replacement of pier piles. Repairs may include replacement of the chain connection and 24-inch (61-centimeters [cm]) diameter high-density polyethylene (HDPE) camel. Utility hangers below the dock would also be replaced as necessary.

1.3 Proposed Action Details by Location

Each of the eight USCG facilities has its own unique array of shoreside and in-water components depending upon the local mission. Further, two of the facilities – Cordova and Seward – are leased by USCG from those municipalities and USCG is responsible for repairs resulting from its operations. The following table provides a summary of activities proposed by location under this programmatic request while detailed descriptions of each USCG facility and its components are provided in the following section and summarized in Table 1-1.

1.3.1 USCG Base Kodiak

Base Kodiak occupies a 25,458-acre upland site with adjacent waterside structures along Seafarer Drive (KIB, 2019). USCG Base Kodiak has three non-recreation piers fronting Womens Bay; they include the Marginal Wharf, which was condemned after the 1964 earthquake; the Fuel Pier, used by Base Kodiak to provide fuel to homeported and visiting cutters, and as temporary berthing for transient vessels; and the Cargo Wharf, which currently provides permanent berthing space for the USCG Cutters (USCGCs) *Alex Haley, Munro*, and *SPAR* as well as visiting vessels. Two of the three piers (the Fuel Pier and Cargo Wharf) at Base Kodiak need periodic maintenance and repair; the Marginal Wharf is currently being evaluated for demolition, but any actions related to the Marginal Wharf would occur under a separate action and would obtain necessary approvals and permits as needed.

The Cargo Wharf is a 1,087-foot-long pier with widths varying 26 ft to 59 ft and a 48 ft catwalk. The pier was constructed in 1967 and modified in 1986, 1990, and 1995. The Cargo Wharf is constructed of timber and steel material and is supported by 64 piles. Existing piles are 24-inches in diameter and consist of treated wood. Two breasting dolphins sit fore and aft of the Cargo Wharf. These dolphins each contain eight 24-inch steel piles.

The Fuel Pier is a 610-ft long, 40-ft wide pier with a 150-ft catwalk. The Fuel Pier was constructed in 1942 and modified in 1965, 1988, and 2010. The Fuel Pier consists of steel and wood piles supporting wood beams, stringers, and decking.

Maintenance activities at Base Kodiak include pile repair and replacement, anticipated to include 12-inch steel piles replaced with in-kind piles; 12-inch and 24-inch treated wood piles will be replaced with 12-inch and 24-inch timber, steel, or composite piles; treated wood deck replacement with treated wood decking; fender replacement; and rub strip and ladder replacement as necessary.

It is estimated that 20 piles will be replaced in any given year over the life of the Program, not to exceed 100 piles total.

Because there is the potential for contaminated sediments at this location, no pressure washing of existing piles will occur and all pile removal and installation activities will be conducted in accordance with the U.S. Environmental Protection Agency's (EPA's) *Best Management Practices for Piling Removal and Placement* (2016).

1.3.2 USCG Moorings Sitka

The shoreside and in-water cutter facilities at the Sitka moorings occupy a 1.13-acre upland site with adjacent waterside structures along Seward Avenue on the southeastern shore of Japonski Island (CBS, 2019). Only one dock is used at this location. During a 2017 inspection, 25 piles with marine borer infestation were identified. In 2019, 17 of those existing piles were repaired by jacketing the piles (i.e., cleaning and wrapping the deteriorated area of the pile with a special form made of fiber reinforced plastic or other material, placing reinforcing inside the form and grouting inside the form to fill all voids).

It is anticipated that other piles damaged by marine borer infestation will be repaired or replaced for a total of 25 pile replacements over the Program duration or approximately 5 piles per year of the authorization.

If required, pile replacement will be conducted by replacing the same size and type of steel pile (maximum pile size of 12 inches) or replacing treated wood piles (maximum pile size of 24 inches) with similar sized wood, steel, or composite piles.

1.3.3 USCG Base Ketchikan

Base Ketchikan occupies a 42.79-acre upland site with adjacent waterside structures along Steadman Street in Ketchikan (KGB, 2019). Shoreside facilities at Base Ketchikan are supported by an array of pile types including 12- and 16- inch timber piles, 8.5- and 16-inch steel piles, and 20-inch concrete piles. Many of the timber piles have served past their service life and are impacted by marine borers and the harsh local environment and are anticipated to be replaced. Additionally, some existing concrete piles exhibit spalling or flaking that would eventually require repair or replacement. It is estimated that between 10-15 piles will be replaced in any given year over the life of the authorization, not to exceed 50 piles total. In addition to pile replacement, it is estimated that five timber piles per year will require repairs including powerwashing and pile jacketing.

Other maintenance activities at Base Ketchikan will include replacement of treated wood decking with in-kind materials, fender replacement, and rub strip and ladder replacement.

1.3.4 USCG Moorings Valdez

The USCG proposes to conduct maintenance on an aged ferry pier used to moor a USCG ship that is critical to Moorings Valdez's mission. The station occupies a 25,458-acre upland site with adjacent waterside structures along Fidalgo Drive in Valdez. The Valdez moorings consist of a timber access trestle and a concrete floating dock with steel guide piles. Maintenance activities anticipated at Valdez moorings include timber pile repair and replacement of timber or steel piles with timber, steel, or composite materials. For the purposes of this analysis, it is anticipated that one steel guide pile (approximately 24 inches in diameter) and five timber piles (approximately 24 inches in diameter; one per year), and five timber pile repairs including powerwashing and pile jacketing over the five-year authorization. However, availability and changing industry standards would be considered over the life of the project and timber piles may be replaced with steel or composite as necessary.

Other maintenance activities at USCG Moorings Valdez will include repair or replacement of decking, as well as concrete framing, gangway, fender replacement, and rub strip and ladder replacement as needed.

1.3.5 USCG Moorings Cordova

The dock used by the USCG at this station is owned by the City of Cordova and is located at the end of Sorrell Road. Because the USCG leases the berth, they are not typically responsible for maintenance and repair of dock features. However, the USCG damaged a 3-pile dolphin associated with the pier during use and is responsible for replacing the structure. The damaged dolphin consists of three steel piles and damage is extensive enough to warrant replacement. Therefore, the USCG is proposing to replace three 12-inch steel piles with similar 12-inch steel piles. The entire damaged dolphin replacement action will occur within a single calendar year. The USCG does not anticipate conducting additional maintenance actions at the Cordova Moorings beyond replacement of the dolphin piles for the remainder of the Program duration.

1.3.6 USCG Station Juneau

The shoreside and in-water facilities at Station Juneau occupy a 1.12-acre upland site with adjacent waterside structures along Egan Drive in Juneau (CBJ, 2019). The timber-decked Station Juneau facilities are supported by approximately 474 14-inch timber piles with accompanying 12-inch timber fender piles. It is estimated that 10-15 piles will be replaced in any given year over the life of the permit, not to exceed 50 piles total.

Other maintenance activities at Station Juneau will include replacement of damaged decking with treated wood decking, gangway replacement, fender replacement, and rub strip and ladder replacement.

1.3.7 USCG Moorings Petersburg

The USCG Petersburg Moorings occupy a small (<1 acre) upland site with nearby shoreside structures along Dock Street in Petersburg (PMV, 2019). In-water components at the Petersburg Moorings include 12.75-inch steel piles, 12-inch timber piles, 16-inch timber fender piles, and treated wood decking. Existing steel piles previously had replaced timber piles while the remaining timber piles had been previously repaired by powerwashing and wrapping in a PVC support. Anticipated maintenance activities at the Petersburg Moorings include replacement of multiple fender piles, up to 10 over the duration of the Program, or approximately two per year.

Other maintenance activities at USCG Petersburg Moorings are likely to include pile repair, repair or replacement of treated wood deck, and rub strip and ladder replacement.

1.3.8 USCG Moorings Seward

The dock, a concrete floating dock with steel guide piles, and hoist crane supported by a timber deck with timber and steel piles used by the USCG at this station are owned by the City of Seward and is located on the eastern side of the Seward Boat Harbor. Because the USCG leases the berth, they are not typically responsible for maintenance and repair of dock features. However, in the event that USCG operations result in damage to the city-owned facilities, USCG will be responsible for repairs. Therefore, for the purposes of project over the five-year maintenance Program period, the USCG is proposing to replace steel (up to 24-inch diameter) pile during one single year of the Program.

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 removal activities to avoid and minimize potential environmental impacts. Additional minimization measures have been added to protect marine mammals as described in Section 11.

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Table 1-1 Estimate In-Water Maintenance Activities at USCG Facilities by Expected Program Year of Completion

Facility	*Year 1*	*Year 2*	*Year 3*	*Year 4*	*Year 5*
Kodiak	Replace 20 timber or steel piles	Replace 20 timber or steel piles	Replace 20 timber or steel piles	Replace 20 timber or steel piles	Replace 20 timber or steel piles
Sitka	Pile Repair/Washing Replace 5 piles	Pile Repair/Washing Replace 5 piles	Pile Repair/Washing Replace 5 piles	Pile Repair/Washing Replace 5 piles	Pile Repair/Washing Replace 5 piles
Ketchikan	Pile Repair/Washing Replace 10 timber piles	Pile Repair/Washing Replace 10 timber piles	Pile Repair/Washing Replace 10 timber piles	Pile Repair/Washing Replace 10 timber piles	Pile Repair/Washing Replace 10 timber piles
Valdez	Pile Repair/Washing Replace 1 timber pile	Pile Repair/Washing Replace 1 timber pile	Pile Repair/Washing Replace 1 timber pile	Pile Repair/Washing Replace 1 timber pile Replace one steel guide pile	Pile Repair/Washing Replace 1 timber pile
Cordova		Replace 3 steel piles (single damaged dolphin)			
Juneau	Pile Repair/Washing Replace 10 timber piles	Pile Repair/Washing Replace 10 timber piles	Pile Repair/Washing Replace 10 timber piles	Pile Repair/Washing Replace 10 timber piles	Pile Repair/Washing Replace 10 timber piles
Petersburg	Pile Repair/Washing Replace 2 fender piles	Pile Repair/Washing Replace 2 fender piles	Pile Repair/Washing Replace 2 fender piles	Pile Repair/Washing Replace 2 fender piles	Pile Repair/Washing Replace 2 fender piles
Seward			Replace 1 steel pile		

Note: Timber piles may be replaced with timber, steel, or composite as necessary.

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2 DATES, DURATION, AND SPECIFIED GEOGRAPHIC REGION

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

Maintenance activities would occur at each installation on an as needed basis for the five-year duration of the Program to ensure the safety and readiness of the individual USCG facilities. The Activity Areas are limited to shore-based facilities that would require in-water work including repair or replacement of pier piles and decking as well as power-washing and painting.

2.1 Dates of Maintenance Activities

The overall duration of the Program is for a five-year period. During each year of the Program, maintenance activities would be minimized during sensitive times for protected species to reduce the potential for seasonally present marine mammals occurring in the individual facility study areas and other ecologically sensitive species. Maintenance activities may occur outside of this time period if necessary for the safety and stability of the USCG facility.

2.2 Duration of Typical Maintenance Activities

The daily duration of maintenance activities will vary based on the type of activity necessary and the daylight hours available. In winter months, shorter 7-hour to 10-hour workdays in available daylight are anticipated and in the early fall and late spring longer workdays of up to 14-hour days are anticipated. While the maintenance contractor may work these hours, not all activity in a workday will generate in-water noise.

To the extent practicable, in-water maintenance 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 and the Marine Mammal Monitoring Plan in Appendix B 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 into the night as needed to either completely remove an in-process pile or to embed a replacement 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 are approximately 7 hours of daylight; however, a portion of those daylight hours consists of civil twilight and it may become darker earlier due to the surrounding topography and cloudy conditions at individual facilities. The maintenance contractor requires available daylight to safely set up operations and clear designated shutdown zones such that pile removal or installation may start a few hours after sunrise. This means that a maintenance contractor might not be able to either fully remove a pile or install a pile to a stable embedment during a day while also meeting post-activity monitoring typically required. The maintenance contractor cannot leave in place equipment overnight due to safety concerns that include large tidal variations at some USCG facilities. As such, it is necessary to either fully removal or safely embed a pile before leaving it overnight.

On any given day, the maintenance contractor may elect to use any/all available pile removal or installation methods (i.e., vibratory extraction, drilling, impact driving, or vibratory driving). Any method, or combination, 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 the day at a single facility, limiting in-water noise generation to single source. The exact pile removal and installation equipment for each component at each facility is unknown and is dependent on the maintenance contractor selected as part of the public bid process.

Table 2-1 Work Windows by Zone and Facility

Facility Name	*In-Water Work Windows*	*Brief Notes for Each Location*
USCG Base Kodiak	No work to occur between May 1st and June 30th	• To minimize impacts to pink salmon fry and coho salmon smolts, pile driving should not occur from May 1 through June 30. • Steller sea lion breeding season extends from late May to early July; Haul out sites used June through September (no haulouts are present in the area) • Sea otters deliver pups in late Spring • Whales present from May to September
USCG Moorings Sitka	No work to occur between March 1st and October 1st	• No in-water construction will take place between March 1 and October 1 to minimize impacts to marine mammals that congregate in Sitka Sound during the herring spawning and summer months to feed on prey.
USCG Base Ketchikan	No work to occur from April 1 through June 30th	• In southeast Alaska, in-water construction is generally restricted from April 1 through June 15 to protect out-migrating juvenile salmon. • Steller sea lion breeding season extends from late May to early July; Haul out sites used June through September. No haulout sites present in the vicinity • The Mexico DPS humpback whale is present in Southeast Alaska from May to September
USCG Moorings Valdez	No work to occur between March 1st and October 1st	• Prince William Sound herring spawning begins in late March to early April. • Steller sea lion breeding season extends from late May to early July; Haul out sites used June through September (no haul-outs present). • Most whales are present in Southcentral Alaska from May to September
USCG Moorings Cordova	No work to occur between March 1st and October 1st	• Prince William Sound herring spawning begins in late March to early April. • Steller sea lion breeding season extends from late May to early July; Haul out sites used June through September (no haul-outs present). • Most whales are present in Southcentral Alaska from May to September
USCG Station Juneau	No work to occur between May 1st and June 30th	• To minimize impacts to pink and chum salmon fry and coho and Chinook salmon smolt, and Douglas Island Pink and Chum, Inc. hatchery net pen species in Auke Bay, contractors will refrain from pile installation and removal activities from May 1 through June 30. • Steller sea lion breeding season extends from late May to early July; Haul out sites used June through September (no haulouts present in area). • The Mexico DPS humpback whale is present in Southeast Alaska from May to September.
USCG Moorings Petersburg	No work to occur from April 1 through June 30th	• In southeast Alaska, in-water construction is generally restricted from April 1 through June 15 to protect out-migrating juvenile salmon • Steller sea lion breeding season extends from late May to early July; Haul out sites used June through September (no haulouts are present in the area) • The Mexico DPS humpback whale is present in Southeast Alaska from May to September.
USCG Moorings Seward	No work to occur between May 1st and June 30th	• To minimize impacts to pink salmon fry and coho salmon smolts, impact pile driving should not occur from May 1 through June 30. • Steller sea lion breeding season extends from late May to early July; Haul out sites used June through September (no haulouts are present in the area) • Most whales are present near the Kenai Peninsula from May to September.

2.2.1 Pile Repair

Divers will inspect in-water facilities using non-destructive integrity test methods (e.g., ultrasound) and perform small in-water maintenance and repairs, as needed such as pile repair. Existing piles that show signs of deterioration may be repaired using a protective wrapping system which typically includes installation of grouted fiberglass pile jackets around deteriorated piles. Prior to installing fiberglass pile jackets, each pile would be cleaned using a pressure washer to remove growth down to the mudline. Cleaning and removal of marine growth from piles allows for better bonding of grout to timber piles as the presence of marine organisms creates voids in the grout, weakening the bond and reducing interlocking that is required for the repair system to work efficiently. After growth has been removed from piles, divers will install fiberglass jackets around existing timber piles. Non-toxic grout will then be placed between existing timber piles and the fiberglass jackets. The composition of the grout will comply with all federal, state, and local regulations as it pertains to hazardous substances under the TSCA, CERCLA, and CWA. A stay-in-place form will be used with sufficient strength to support the fluid pressure of the grout material in order to prevent the loss of grout material during installation.

For piles located near the shoreline, any surrounding rock armor will be temporarily removed to access the full pile length down to the mudline. Rock armor will be removed and replaced using an excavator, crane, or similar method to move individual rocks. It may also be necessary to replace wooden bracings during repair activities. Wooden replacement bracings are generally replaced with wood and may be accomplished using hand tools.

Equipment to be used includes a water jet, or power washer, and/or a zero-thrust water compressor that is used for underwater removal of marine growth and debris. The system operates through a mobile pump which draws water from the location of work. Noise levels emitted from similar pressure washing equipment used on steel were measured in Cook Inlet while cleaning growth off of a leaking underwater pipeline.

Noise generated during the use of water jets will be very short in duration (30 minutes or less at any given time) and intermittent. For the purposes of this analysis, it is estimated that power-washing a single pile would require one hour for an estimated rate of four piles power-washed per day.

2.2.2 Pile Replacement

The exact pile removal and installation methods will be determined by the maintenance contractor and it is estimated that one pile could be removed per day and one pile could be installed per day, resulting in two total days to replace a single pile at each facility. However, each pile removal technique will require differing durations with approximately 10 minutes for vibratory extraction of all pile types and sizes.

Prior to any pile replacement, a floating boom will be placed around the area to capture any splintering that may happen during pile removal.

Existing timber, steel, and concrete piles will generally be replaced in kind (i.e., with same materials and diameter size) but other materials may be employed. Pile replacement will generally proceed along the following steps: 1) remove overlying decking if pile is otherwise inaccessible, 2) remove the damaged pile, 3) install new pile of similar size and material, and 4) re-install old or install new decking over the replacement pile as necessary. The exact pile extraction and installation methods will be determined by the construction contractor; however, pile extraction will potentially comprise “dead pulling” or vibratory extraction while pile installation will potentially use down-the-hole (DTH) drilling of rock sockets where shallow bedrock is present as well as vibratory and/or impact pile driving if the substrate permits. If piles break during extraction, they will be left in place as no further cutting will occur.

Following removal of a damaged pile, it is assumed that its replacement pile will be driven into the bottom to the required depth (approximately 50 ft), which would typically require down-hole drilling to create a socket followed by vibratory pile driving to settle the pile into the socket, and then five impacts to proof the pile. This method has been employed at other in-water development projects in southeastern Alaska. Impact pile driving of an entire pile will only be used for new pilings if vibratory driving and down-hole drilling is not successful and assumed to require up to a range of impact hammer strikes per pile to achieve required depth see Section 6. Proofing of piles will be completed using the "pull" method. However, if piles cannot be proofed using the pull method, an impact hammer will be used to complete the process by "tapping" the pile up to five times per pile. Because differing methods of installation may be used, our evaluation in Section 6 provides an analysis using the techniques with the greatest take estimate for the maximum number, most conservative estimate, of take calculated at each facility.

Construction staging will be from a combination of shoreside, pier, and barge depending on the piling to be replaced (i.e., those piles located further away from shore will be replaced using a barge-mounted crane and those closer to shore will be replaced using a crane staged from the shoreline or pier). Barges will be anchored in placed in a position to allow for the maximum number of pile replacement with minimal readjustment.

2.2.3 Deck Repair and/ or Replacement

Periodic visual inspection of all surfaces is routinely conducted and if damaged decking is identified, or determined necessary for temporary removal to facilitate pile repair and replacement below decking, that section would be replaced. The duration of decking repair and replacement activities would be determined by the material of decking to be replaced with timber decking occurring quickest with replacement of timber components while concrete decking would take longer due to assembling forms, pouring cement, and then allowing concrete to cure.

Decking will be replaced in kind (i.e., wood deck will be replaced with wood). If a portion of decking needs to be replaced due to damage or rot, just the section identified for repair will be replaced. For concrete decks, cracked or spalled concrete will be repaired as needed. In order to access piles on a concrete deck, the section above the pile will be removed using a concrete saw. Following pile replacement, a watertight form will be prepared, and uncured concrete will be pumped into the form in order to "patch" the void. Concrete will not be allowed to top the form.

Generally, deck repair and replacement activities will occur over-water, be consistent with ongoing, typical maintenance and operational activities at each USCG facility, and, therefore, will generate limited underwater noise that would be unlikely to result in harassment of marine mammals.

2.2.4 Other Maintenance Activities

Other necessary maintenance activities that would be likely under the Program at all eight facilities would include repair and replacement of camel systems to protect piles, repair and replacement of utility hangers and systems, replacement of exhausted cathodic protection cells, replacement of rubstrips and ladders/ladder supports. Rubstrip and ladder/ladder support replacement will require drilling small bolt holes in piles (<2.5 cm diameter) underwater with pneumatic drills. It is estimated that use of pneumatic hand drills will occur in periods of 5 minutes per bolt hole and include up to six holes per activity or approximately 30 minutes per day.

Replacement of handrails, bollards, and other above pier features will be conducted using hand tools. Containment will be used for all construction-related activities to avoid materials falling into the water.

Noise levels with this type of work is consistent with other out of water work activities ongoing in the respective facility Study Areas.

2.3 Geographic Regions Where Maintenance Activities Will Occur

The Activity Area includes a total of eight USCG shore facilities within the CEU Juneau AOR that support a range of homeported vessels and missions including search and rescue, maintenance of Aids to Navigation, and law enforcement. The following sections include a description of each facility's in-water characteristics, vessel traffic, and ambient noise levels where available along with estimated quantity and frequency of work to be conducted at each.

2.3.1 Bathymetric Setting

2.3.1.1 USCG Base Kodiak

USCG Base Kodiak is located on Womens Bay, a largely enclosed arm of the larger Chiniak Bay on the northeast side of Kodiak Island, Alaska's largest island. Womens Bay is separated from the rest of Chiniak Bay by Nyman Peninsula providing a protected harbor for USCG vessels. USCG vessels are the primary users of Womens Bay; however, a sea plane runway is present at the mouth of the bay and barges regularly transit Womens Bay to access the nearby Madoc dock.

The bathymetry in Womens Bay ranges from approximately 60 ft mean lower low water (MLLW) at the mouth of the bay to approximately 35 ft MLLW adjacent to the Cargo Wharf and Fuel Pier.

2.3.1.2 USCG Sitka Moorings

The Sitka Moorings are 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.

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 are located.

2.3.1.3 USCG Base Ketchikan

Base Ketchikan is situated Revillagigedo Island which is separated from nearby Pennock Island by the East Channel of the Tongass Narrows. At Base Ketchikan the Tongass Narrows are approximately 2,000 ft across with steep surface bathymetry reaching a maximum mid-channel depth of over 100 ft MLLW. The Tongass Narrows are busy passage frequented by USCG, private, and commercial vehicles including large cruise ships servicing the cruise terminal in Ketchikan north of Base Ketchikan.

2.3.1.4 USCG Moorings Valdez

The Valdez moorings are located west of the entrance to Valdez Harbor located on Port Valdez, itself part of the Valdez Arm of Prince William Sound. Port Valdez is the U.S.' northernmost ice-free port and non-USCG vessel traffic in the immediate vicinity of the Valdez moorings includes private craft and commercial cargo vessels. The Valdez Marine Terminal is located 2.3 miles south of the Valdez moorings the offshoring point for petroleum products transported via the Trans-Alaska Pipeline with the corresponding oil tanker traffic through the area. Depths adjacent to the Valdez moorings fall off steeply from approximately 13 ft at the entrance to Valdez Harbor to over 600 ft along the centerline of the Valdez Arm.

2.3.1.5 Cordova Moorings

The dock used by the USCG at this station is owned by the City of Cordova and is located at the end of Sorrell Road in Cordova. The Cordova waterfront is located on Orca Inlet which separates the mainland from Hawkins Island. Orca Inlet is generally shallow reaching depths of 75 ft at the deepest parts of the channel with significantly more shallow depths closer to Hawkins and Observation islands.

2.3.1.6 USCG Station Juneau

The USCG wharf on the Juneau waterfront is located on the southeast facing portion of the Juneau waterfront on the Gastineau Channel separating the North American mainland (Juneau) and Douglas Island. The Gastineau Channel is accessible to large vessels up to the bridge linking Douglas Island to the mainland (51 ft clearance) and navigable by smaller vessels for its entire length. The Channel is generally shallow in the northern section but up to 35 ft deep adjacent to the wharf frontage and up to 100 ft in the mid-channel south of Station Juneau.

2.3.1.7 USCG Petersburg Moorings

This USCG facility is located within Petersburg Harbor which supports the area’s commercial fishing industry. Petersburg is located at the northern end of the Wrangell Narrows separating Mitkof and Kupreanof islands near the confluence with the Frederick Sound. The Narrows are generally only used by fishing boats and Alaska Marine Highway ferries as it is too shallow and narrow for use by larger vessels including cruise ships using the Inside Passage. Depths adjacent to the Petersburg Moorings are approximately 20 ft.

2.3.1.8 USCG Moorings Seward

The dock used by the USCG here is owned by the City of Seward and is located within Seward Harbor. The Seward Harbor breakwaters separate the harbor and moorings for the USCGC *Mustang* from the main body of Resurrection Bay. Seward Harbor itself serves smaller craft, with larger cruise ships and ferries using facilities just east of the harbor. Depths within the harbor, including the harbor entrance, are maintained at depths ranging between 12 and 15 ft.

2.4 Time Frame

The proposed activities vary in time required to complete and are not expected to be evenly distributed across all eight USCG facilities. Each USCG facility is listed in Table 2-2 below with a projected number of in-water maintenance workdays per year of the 5-year authorization.

Table 2-2 Project Maintenance Activity Days Per Year by Facility

Facility	*Days Per Activity Year*				
	Year 1	*Year 2*	*Year 3*	*Year 4*	*Year 5*
Kodiak	20	20	20	20	20
Sitka	10	10	10	10	10
Ketchikan	20	20	20	20	20
Valdez	3	3	3	3	3
Cordova	-	6	-	-	-
Juneau	20	20	20	20	20
Petersburg	4	4	4	4	4
Seward	-	-	4	-	-

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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 each of the eight USCG facilities, underwater sound generated by maintenance activities (e.g., pile repair [power-washing], removal, and installation) associated with the Proposed Action are anticipated to result in harassment of marine mammals. Additionally, pile driving and down-the-hole drilling can generate airborne sound that could potentially result in disturbance to marine mammals (pinnipeds and sea otters) that are hauled out. Due to the absence of haulouts at each of the eight facilities, the potential for acoustic harassment by airborne sound is considered negligible and is not expected (see Figure 4-1).

Selection of the 14 species reviewed in this application is based on National Oceanic and Atmospheric Administration (NOAA) Alaska Marine Mammal Stock Assessments (Muto, et al., 2020a; Muto, et al., 2020b) and U.S. Fish and Wildlife Service (USFWS) Stock Assessments for the Northern Sea Otter (USFWS, 2014) and include estimated minimum populations of each designated stock of marine mammals that have the potential to occur within the vicinity of each of the eight installations within the Gulf of Alaska at which maintenance activities would occur (Table 3-1)[1].

Descriptions of Steller sea lion (*Eumetopias jubatus*), northern fur seal (*Callorhinus ursinus*), California sea lion (*Zalophus californianus californianus*), harbor seal (*Phoca vituline richardii*), killer whale (*Orcinus orca*), Pacific white-side dolphin (*Lagenorhynchus obliquidens*), harbor porpoise (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides 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*) are provided in Section 4.

The project action area for each marine mammal species is determined by the limits of potential effects, which in this case are defined by acoustic harassment zones relevant for each of the eight individual facilities (see Section 6.6).

1 All marine mammal species considered in this application are managed under the jurisdiction of the National Marine Fisheries Service except for the Northern sea otter under the jurisdiction of the U.S. Fish and Wildlife Service.

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Table 3-1 Marine Mammal Species Status, Abundance, and Occurrence in Southeast Alaska and Gulf of Alaska

Species	*ESA Status*	*MMPA Status*	*Stock Abundance (N_{min})*	*Occurrence by Installation*							
				Kodiak	*Sitka*	*Ketchikan*	*Seward*	*Valdez*	*Cordova*	*Juneau*	*Petersburg*
Family Otariidae											
Steller Sea Lion (*Eumetopias jubatus*)											
Eastern Stock	Delisted	Protected	43,201		X (0.978)	X (1.0)				X (0.986)	X (0.988)
Western Stock	Endangered	Depleted	52,932	X (1.0)	X (0.022)		X (1.0)	X (1.0)	X (1.0)	X (0.014)	X (0.012)
Western Stock – Critical Habitat				X					X		
Northern Fur Seal (*Callorhinus ursinus*)											
Eastern North Pacific Stock	Not Listed	Depleted	514,738	X	X		X	X	X		
California Sea Lion (*Zalophus californianus californianus)*											
US Stock	Not Listed	Protected	233,515		X					X	
Family Phocidae											
Harbor Seal (*Phoca vituline richardii*)											
Prince William Sound Stock	Not Listed	Protected	41,776				X	X	X		
Lynn Canal/Stephens Passage Stock	Not Listed	Protected	11,867							X	
Sitka/Chatham Strait Stock	Not Listed	Protected	11,883		X						
Clarence Strait Stock	Not Listed	Protected	24,854			X					X
South Kodiak	Not Listed	Protected	22,351	X							
Family Delphinidae											
Killer Whale (*Orcinus orca*)											
Alaska Resident Stock	Not Listed	Protected	2,347	X	X	X	X	X	X	X	X
Northern Resident	Not Listed	Protected	302		X	x				X	X
Gulf of Alaska, Aleutian Islands, and Bering Sea Transient Stock	Not Listed	Protected	587	X	X		X	X	X		
AT1 Transient Stock	Not Listed	Depleted	7				X	X	X		
West Coast Transient Stock	Not Listed	Protected	349		X	X				X	X
Pacific White-Sided Dolphin (*Lagenorhynchus obliquidens*)											
North Pacific Stock	Not Listed	Protected	26,880	X	X	X	X	X	X	X	X
Family Phocoenidae (porpoises)											
Harbor Porpoise (*Phocoena phocoena*)											
Southeast Alaska Stock	Not Listed	Protected	896		X	X				X	X
Gulf of Alaska Stock	Not Listed	Protected	25,987	X			X	X	X		

Species	***ESA Status***	***MMPA Status***	***Stock Abundance (N_{min})***	***Occurrence by Installation***							
				Kodiak	***Sitka***	***Ketchikan***	***Seward***	***Valdez***	***Cordova***	***Juneau***	***Petersburg***
Dall's Porpoise (*Phocoenoides dalli*)											
Alaska Stock	Not Listed	Protected	ND	X	X	X	X	X	X	X	X
Family Physeteridae											
Sperm Whale (*Physeter macrocephalus*)											
North Pacific Stock	Endangered	Depleted	ND	X	X					X	X
Family Balaenopteridae											
Humpback Whale (*Megaptera novaeangliae*)											
Western North Pacific Stock	Endangered	Depleted	865	X			X				
Central North Pacific Stock	Endangered	Depleted	7,890	X	X	X	X	X	X	X	X
Gray Whale (*Eschrichtius robustus)*											
Eastern North Pacific	Delisted	Protected	25,849	X	X	X					
Fin Whale (*Balaenoptera physalus*)											
Northeast Pacific Stock	Endangered	Depleted	2,554	X	X	X		X	X		
Minke Whale (*Balaenoptera acutorostrata*)											
Alaska Stock	Not Listed	Protected	ND	X	X	X	X	X	X	X	X
Family Mustelidae											
Northern Sea Otter (*Enhydra lutris kenyoni*)											
Southeast Alaska Stock	Not Listed	Protected	21,798		X	X				X	X
Southcentral Alaska Stock	Not Listed	Protected	14,661				X	X	X		
Southwest Alaska Stock	Threatened	Strategic	45,064	X							

Abbreviations: ESA = Endangered Species Act; MMPA = Marine Mammal Protection Act

4 AFFECTED SPECIES STATUS AND DISTRIBUTION

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

4.1 Fin Whale (*Balaenoptera physalus*)

The fin whale is the second largest species of whale reaching lengths from 72 to 89 ft and weighs 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 [mph]) 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 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 (NOAA, 2019).

Fin whales are generally solitary but can also occur in groups of 2-7 individuals. Larger aggregations are usually due to gatherings at concentrated food sources and individuals display no social bonds (Wiles, 2017). Fin whales live up to 90 years and males reach sexual maturity around 6-10 years, and 7-12 years for females (NOAA, 2019). The gestation period is 11-12 months, and the female gives birth to a single calf in tropical or subtropical waters during the winter months. It has been documented that fin whales can sometimes mate and produce hybrids with blue whales (NOAA, 2019).

4.1.1 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 (35 FR 18319). The fin whale is also protected under the Marine Mammal Protection Act (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 fin whale stock (Muto et al., 2020b). In the North Pacific, pre-whaling estimates of fin whale populations are 42,000-45,000 animals. By 1973, abundance had declined to 13,600-18,700 animals, as harvesting peaked between 1951 and 1972. Recent global estimates populations are lacking but are estimated to be over 100,000 due to the end of whaling (Thomas et al., 2016; Cooke, 2018). The current best estimate of fin whales in the North Pacific stock is a minimum of 2,554 individuals and increasing at a rate of 4.8% annually. It is a minimum estimate due to the survey only covering 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 (BIA) 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.

4.1.2 Population and Distribution

Fin whales are found in oceans worldwide except most of the Arctic Ocean and tropical areas between 20˚N and 20˚S (Wiles 2017). Fin whales are primarily found in deep, offshore waters in temperate to polar latitudes (NOAA, 2019). 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 (NOAA, 2019; Muto et al., 2020b). Information on abundance of fin whales in Alaskan waters has improved, however, the full range of fin whales in these areas has not yet been surveyed (CBD, 2020).

It was formerly believed that fin whale populations around the world migrate annually between higher latitude summer feeding grounds and lower latitude wintering locations; however, recent analysis suggests that a more variable and complex pattern of movements is more accurate (NMFS, 2010; Cooke, 2018). Fin whales occur in a wide range of latitudes year-round, but their densities vary seasonally. Seasonal migration may be largely driven by prey abundance within northern latitudes where prey resources are generally greater (NOAA, 2010). In summer, they migrate as far north as the Chukchi Sea to their summer feeding grounds in the Gulf of Alaska, Prince William Sound along the Aleutian Islands, and west of Kodiak Island (ADFG, 2008). The Alaska Northeast Pacific stock is thought to be more migratory than the other U.S. Pacific stocks, but the wintering areas are not well known and require further study (Muto et. al., 2020b). Mating and calving usually takes place during the winter months (Wiles, 2017).

4.1.3 Site-Specific Occurrence

Of the eight USCG facilities, fin whales have the potential to occur at six, namely Kodiak, Sitka, Ketchikan, Seward, Valdez, and Cordova and are unlikely to occur at the more inland Southeast Alaska facilities (i.e., Juneau and Petersburg).

4.1.4 Acoustic Ecology

Fin whales are low frequency cetaceans (LF) that produce short-duration, down sweep calls between 15 and 30 Hz, typically termed “20-Hz” pulses” used in long-range communication as well as tonal calls up to 150 Hz (Sciacca et al., 2015). The sound pressure level (SPL) of the fin whale vocalizations can reach 189 dB re 1 µPa at 1 m, making it one of the most powerful biological sounds in the ocean (Weirathmueller et al., 2013). Per the NMFS Marine Mammal Hearing Technical Guidance (2018) the Low-frequency marine mammal hearing group is characterized by generalized hearing range between 7 Hz and 35 kilohertz (kHz).

4.2 Humpback Whale (*Megaptera novaeangliae*)

Humpback whales are migratory baleen whales, recognized by their long pectoral fins, which can reach up to 15 ft in length. Female humpback whales are larger than the males, reaching up to 60 ft 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 (NOAA, 2018).

The lifespan of humpback whales is thought to be 80-90 years. Females reach sexual maturity at 5 years, and males at 7 years (ADFG, 2019). Humpback whales breed during the winter months, and after 11-12 months of gestation, a single calf is born every 1-3 years when the females return to their wintering/birthing area (NOAA, 2018). Calves nurse for 6-10 months on high-fat milk (ADFG, 2019).

Humpback whales are rarely found in long-term groups; however, groups may temporarily form for during foraging behaviors (Hain et al., 1982).

Humpbacks spend most of the summer months feeding to building up fat stores for winter. These whales filter their food through baleen, consuming up to 3,000 pounds of food per day. They eat crustaceans (mostly krill), plankton, and occasionally small fish. Humpbacks use many different hunting methods involving bubbles. Bubble-netting is a unique hunting method where a group of whales circle underwater, expelling air in a continuous stream. The air bubbles form a ring, while confusing and collecting prey in the middle of the ring. The whales then move from below, breaching the surface of the water in the center of the bubble net with their mouth agape, capturing the prey (Hain et al., 1982; NOAA, 2018).

4.2.1 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. However, October 11, 2016 the globally listed endangered species was divided into 14 distinct population segments (DPS), 4 of which are endangered, 1 of which is threatened and 9 DPSs which do not warrant listing based on current population status. Three populations can be found in the Alaskan waters of the North Pacific Ocean: the Mexican DPS, Hawaii DPS, and the Western North Pacific DPS (NOAA, 2018). The Western North Pacific DPS is one of the four endangered populations and the Mexico DPS is the only threatened population (Volume 81 of the Federal Register [FR] 62260). The Hawaii DPS is not listed. In 2021, critical habitat was designated for the Mexican DPS and Western North Pacific DPS (Volume 86 of FR 21082).

4.2.2 Population and Distribution

Prior to commercial whaling, the population of humpback whales in the North Pacific was estimated at 15,000 individuals (Muto et al., 2020b). In 1965, whales were 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, and subsistence harvesting by indigenous peoples in several countries around the world (e.g., West Indies, Greenland) (Thomas et al., 2016).

Globally, the population of humpback whales is approximately 84,000 and increasing (Cooke, 2018). The most recent data for population estimates of the Western North Pacific stock is from 2003-2004 (Note: stock designation by the MMPA does not coincide directly with DPS designations). The minimum population estimate of the Western North Pacific stock is 865 individuals with an annual rate of increase of 6.7% (Muto et al., 2020b). The Central North Pacific stock consists of individuals that mostly winter in Hawaii (Hawaiian DPS), Mexico (Mexico DPS), and Western North Pacific (Western North Pacific DPS). Within the Gulf of Alaska, 89 percent of humpback whales are from the Hawaiian DPS, 11 percent are from the Mexico DPS, and less than 1 percent are from the Western North Pacific DPS; whereas, in Southeastern Alaska, 98 percent of humpback whales are from the Hawaiian DPS and 2 percent from the Mexico DPS (Wade 2021). The most recent minimum population estimate for the Central North Pacific stock is 7,891 individuals and a rate of increase of 7% (Zerbini et al., 2006; Muto et al., 2020b).

4.2.3 Site-Specific Occurrence

Members of the Western North Pacific stock have the potential to occur at Base Kodiak and in the vicinity of Resurrection Bay (Seward moorings). Members of the Central North Pacific stock have the potential to occur at any of the eight USCG facilities.

Table 4-1 Humpback Whale Hawaii/Mexico DPS Distribution by USCG Facility

USCG Facility	*Hawaii DPS*	*Mexico DPS*	*Western North Pacific DPS*
Kodiak	0.89	0.11	0.01
Sitka	0.98	0.02	---
Ketchikan	0.98	0.02	---
Valdez	0.89	0.11	0.01
Cordova	0.89	0.11	0.01
Juneau	0.98	0.02	---
Petersburg	0.98	0.02	---
Seward	0.89	0.11	0.01

4.2.4 Acoustic Ecology

Humpbacks produce a variety of vocalizations ranging from 20 Hz to 10 kHz to locate prey, coordinate communal feeding efforts, attract mates, and for mother-calf communication (Au et al., 2006; Vu et al., 2012). 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).

4.2.5 Humpback Whale Critical Habitat

In April 2021, critical habitat was designated for the Western North Pacific DPS, Central America DPS, and Mexico DPS of the humpback whale in 19 specific areas or units. This designation included U.S. waters within Alaska, Washington, Oregon, and California (NMFS, 2019). Critical habitat areas were identified to support one or more physical and biological features that are essential to humpback life history needs and support conservation. One feature is adequate prey resources within their feeding grounds, and areas are primarily based on the non-regulatory BIAs that have been identified by Ferguson et al. (2015). Other features considered are migratory corridors and passage features that allow individuals to migrate with low incidence of vessel strikes or entanglement, sound or soundscape feature for individuals to communicate and sense their surroundings (NMFS, 2019a). Per the NMFS, Protected Resources App GIS mapping system, Critical Habitat areas for the Mexico DPS are mapped around Kodiak Island and within, and immediately offshore of, Prince William Sound excluding not including the Valdez Arm (NMFS 2021a). Of the eight USCG facilities, only Base Kodiak is located within designated critical habitat while the Cordova Moorings are located over 3 miles north of Cordova Moorings.

4.3 Minke Whale (*Balaenoptera acutorostrata*)

Minke whales are the smallest of the Balaenopteridae and characterized by their small size of up to about 35 ft in length and up to 20,000 pounds. Minke whales are a fairly tall, 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, as well as a white underside.

Minke Whales are filter feeders. In Alaska, the diet of minke whales consists primarily of euphausiids, copepods, larger schooling fish such as herring, pollock, and salmon, and squid (Stewart and Leatherwood, 1985; ADFG, 2020). They breed year-round, and breeding activity appears to peak in January and June (Omura and Sakiura, 1956).

4.3.1 Status

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

4.3.2 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 (Muto et al., 2020a). Surveys for Minke whales in the waters off of Alaska reported a majority of 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 water in low numbers (Dahlheim et al., 2009).

4.3.3 Site-Specific Occurrence

Based on their broad distribution throughout Alaskan waters, it is assumed that minke whales have the potential to occur in the vicinity of any of the eight USCG facilities.

4.3.4 Acoustic Ecology

National Marine Fisheries Service (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 hertz (Hz) and 35 kHz.

4.4 Gray Whale (*Eschrichtius robustus*)

Gray whales can grow to approximately 49 feet in length and weight 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.

4.4.1 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.

4.4.2 Population and Distribution

Gray whales are found throughout the coastal waters of the North Pacific Ocean. Member 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 only commonly found in the North Pacific, have been extirpated from the Atlantic in the early 1700s. Gray whales in Alaska are typically feeding 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.

4.4.3 Site-Specific Occurrence

Members of the Eastern North Pacific stock have the potential to occur at the USCG facilities closest to the Gulf of Alaska (Kodiak, Sitka, and Ketchikan) while avoiding the more inland facilities. Summer, in gray whales' case July to November, gray whale occurrence likely consists of local feeding groups with an estimated density of 0.0155 individuals/km^2 between the coast and 10km offshore. During other time periods, present individuals are likely migrating at approximately seven whales on average per day in the "potential presence" area or migration corridor for a density of 0.00015 individuals/km^2 (Navy 2019). The higher 0.0155 individuals/km^2 summer feeding density is used here as a conservative value.

4.4.4 Acoustic Ecology

National Marine Fisheries Service (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 hertz (Hz) and 35 kHz.

4.5 Sperm Whale (*Physeter macrocephalus*)

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

Sperm whales feed primarily on medium- to large-sized squid but also consume substantial quantities of large demersal and mesopelagic sharks, skates, and fishes (Rice, 1989). Food is obtained on deep dives reaching up to 2,000 ft and lasting 45 minutes.

4.5.1 Status

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

4.5.2 Population and Distribution

The sperm whale is one of the most widely distributed marine mammal species, perhaps exceeded in its global range only 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 a hundred years, and the species was the primary target of illegal Soviet whaling in the second half of the 20th century (Ivashchenko et al., 2013, 2014). Systematic illegal catches were also made on a large scale by Japan in both the North Pacific and Antarctic in at least the 1960s (Ivashchenko and Clapham, 2015; Clapham and Ivashchenko, 2016).

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 late 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 (Muto et al., 2020b). 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. There is no reliable information on trends in abundance for this stock (Braham, 1992).

4.5.3 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 Inside waters, specifically in Chatham where a few individuals probably followed a longliner in and figured out that there are sablefish in there, as well as squid. In the fall of 2018 and spring of 2019, three sperm whales were seen repeatedly in the Inside waters of Chatham Strait and Lynn Canal, and in March 2019 a dead sperm whale washed up north of Berners Bay between Juneau and Haines (ADFG, 2020). 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 any of the Southeastern Alaska USCG facilities including Sitka, Juneau, Petersburg, and Ketchikan in addition to Base Kodiak.

4.5.4 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 direction in that off-axis observations show much lower sound levels (Madsen et al., 2002).

4.6 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 ft.

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

4.6.1 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, five of which may occur at one or more of the eight USCG facilities included in the Program. 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
- *Northern Resident* - not designated as depleted under the MMPA or listed as threatened or endangered under the ESA
- *Gulf of Alaska, Aleutian Islands, and Bering Sea Transient Stock* - not designated as depleted under the MMPA or listed as threatened or endangered under the ESA
- *AT1 Transient Stock* – designated as depleted under the MMPA (69 FR 31321, 3 June 2004) and therefore classified as strategic but not 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

4.6.2 Population and Distribution

Killer whales have been observed in all oceans and seas of the world (Leatherwood and Dahlheim, 1978) with higher densities occurring in colder and more productive waters of both hemispheres with the greatest densities found at high latitudes (Mitchell, 1975; Leatherwood and Dahlheim, 1978, Forney and Wade 2006). Killer whales occur along the entire Alaskan coast (Braham and Dahlheim, 1982).

Killer whales have been labeled as resident (fish-eating), transient (mammal-eating), and offshore types which have been demonstrated to be genetically distinct (Hoelzel and Dover, 1991; Hoelzel et al., 1998, 2002; Barrett-Lennard, 2000). 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, five of which may occur at one or more of the eight USCG facilities included in the Program including:

- *Eastern North Pacific Alaska Resident Stock*, occurring from southeastern Alaska to the Aleutian Islands and Bering Sea
- *Eastern North Pacific Northern Resident*, occurring from Washington State through parts of southern British Columbia, but also in coastal waters from southeastern Alaska through California
- *Eastern North Pacific Gulf of Alaska, Aleutian Islands, and Bering Sea Transient Stock*, occurring mainly from Prince William Sound through the Aleutian Islands and Bering Sea
- *AT1 Transient Stock*, occurring from California through southeastern Alaska
- *West Coast Transient Stock*, occurring from California through southeastern Alaska

Table 4-2 Population Abundance and Trends of Killer Whale Stocks in Study Area

Stock	***Population Size***	***Minimum Population Estimate***	***Population Trend***
Alaska Resident	2,347	2,084	Increasing +3.2% (1990-2005)
Northern Resident	302	302	Increasing +2.9% (2002-2014)
Gulf of Alaska, Aleutian Islands, Bering Sea Transient	587	587	Stable Data Unreliable
AT1 Transient[1]	7	7	Decreasing[1] -68% (1989-2003)
West Coast Transient	243	243	Increasing No quantification provided

[1] AT1 Transient stock significantly impacted by 1989 *Exxon Valdez* spill, with 9 individuals of 22 pre-spill missing since 1990 and no recruitment in this populations since 1984.

4.6.3 Site-Specific Occurrence

At least one or more stocks of killer whale has the potential to be present at each of the eight USCG facilities (Table 4-2). Members of the fish-eating resident stocks are the most commonly seen in nearshore waters with members of the Alaska Resident stock having the potential to occur at any of the facilities while Northern Resident individuals have the potential to occur at all of the Southeast Alaska facilities but not the other facilities which are north of their delineated range (Muto et al., 2020a; Muto et al., 2020b). Transient killer whales of the Gulf of Alaska, Aleutian Islands, and Bering Sea stock have the potential to occur at all facilities except those facilities along the Inside Passage (i.e., Base Ketchikan, Petersburg Moorings, and Station Juneau). Members of the AT1 Transient stock are limited geographically to Prince William Sound and the surrounding area including Resurrection Bay and Seward moorings. Southeast Alaska is at the northern limit of the West Coast Transient stock and individuals of this population are only anticipated to appear at Station Sitka, Base Ketchikan, Station Juneau, and Petersburg Moorings.

Table 4-3 Site-Specific Occurrence of Killer Whale Stocks at USCG Facilities

Stock	*Kodiak*	*Sitka*	*Ketchikan*	*Valdez*	*Cordova*	*Juneau*	*Petersburg*	*Seward*
Alaska Resident	X	X	X	X	X	X	X	X
Northern Resident		X	X			X	X	
Gulf of Alaska, Aleutian Islands, and Bering Sea Transients	X	X		X	X			X
AT1 Transients				X	X			X
West Coast Transients		X	X			X	X	

4.6.4 Acoustic Ecology

Killer whales are highly social and pod members communicate with one another via underwater sounds such as clicks, whistles, and pulsed calls. Each pod possesses a unique set of sounds that are learned and culturally transmitted between individuals within the group. These sounds help keep groups together and allow pods to coordinate hunting strategies.

Acoustic observations of killer whales recorded a wide range of signals transmitted by killer whales including short-duration echolocation clicks (224 dB re 1 µPa at 1 m peak-to-peak source level), whistles (193 dB re 1 µPa at 1m, 1-36 kHz), and burst-pulse sounds (131-176 dB re 1 µPa at 1 m; 500 Hz to 25 kHz) (Wellard et al., 2015). 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.

4.7 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 ft 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.

4.7.1 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.

4.7.2 Population and Distribution

Previous population size estimates for the North Pacific stock of Pacific white-sided dolphin have provided an estimated population size of 931,000 dolphins; whereas, surveys of the Gulf of Alaska alone estimated 15,200 dolphins. However, given the age and geographic focus of these respective surveys they are unreliable estimates of the abundance of the North Pacific stock (Muto et al., 2020a). Likewise, available minimum population estimates and population trends are unreliable for this stock of Pacific white-sided dolphin.

4.7.3 Site-Specific Occurrence

Pacific white-sided dolphins range throughout the temperate North Pacific and the North Pacific stock of these dolphins has one of the widest ranges of any marine mammal considered in this LOA application (Dalheim et al. 2019; Muto et al., 2020a). Pacific white-sided dolphins have the potential to occur at all eight of the USCG facilities.

4.7.4 Acoustic Ecology

Whistles are in the frequency range of 2 to 20 Hz (Richardson et al., 1995). Peak frequencies of the pulse trains for echolocation fall between 50 and 80 kHz; the peak amplitude is 170 dB re 1µPa m (Fahner et al., 2004). Tremel et al. (1998) measured the underwater hearing sensitivity of the Pacific white-sided dolphin from 75 Hz through 150 kHz with the greatest sensitivities from 4 to 128 kHz. NMFS 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.

4.8 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, with a 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 varying by region. Harbor porpoises mate approximately 1.5 months after calving, with a gestation period of 10.5 months. Calves being to forage on solid food within a few months of birth and are weaned before they are a year old (Bjorge and Tolley, 2009).

4.8.1 Status

Harbor porpoises, like all marine mammals, are protected under the MMPA, but are not listed as either threatened or endangered under the ESA. Of the three designated stocks of harbor porpoise, two occur within the Alaska AOR; Southeast Alaska and Gulf of Alaska stocks (the Bering Sea stock is not discussed in this application) (Muto et al., 2020b).

4.8.2 Population and Distribution

The current population estimates for the harbor porpoise stocks are 896 for the Southeast Alaska stock and 31,046 porpoises for the Gulf of Alaska stock. For the inland water of Southeast Alaska, the minimum population estimate for harbor porpoise is 1,224 individuals and 26,064 porpoises for the Gulf of Alaska stock. For inland waters of Southeast Alaska, population trends for harbor porpoise were negative between 1991 and 2010 but then positive through 2012 (Muto et al., 2020b). There is no reliable information on trends for the abundance for the Gulf of Alaska stock of harbor porpoise.

4.8.3 Site-Specific Occurrence

Of the two stocks of harbor porpoise in the greater Study area, members of the Southeast Alaska stock are likely to occur at Base Ketchikan, Station Sitka, Station Juneau, and Petersburg Mooring while members of the Gulf of Alaska stock would potentially occur at Base Kodiak, Valdez moorings, Station Cordova, and Seward moorings.

4.8.4 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.

4.9 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 mph.

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.

4.9.1 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.

4.9.2 Population and Distribution

Because available survey data are greater than 8 years old at this time, there are no reliable estimates of the total abundance, minimum population estimate, or current population trends for the Alaska stock of Dall's porpoise (Muto et al 2020a). 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).

4.9.3 Site-Specific Occurrence

Dall's porpoises are widely distributed across the entire North Pacific and members of the Alaska stock have the potential to occur at any of the eight USCG facilities.

4.9.4 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.

FIGURE 4-1
Stellar Sea Lion
Haulouts and Rookeries
Programmatic Maintenance Activities
USCG Sector Alaska

wood.

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4.10 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 ft and weighing up to 800 pounds.

4.10.1 Status

The Steller sea lion was originally listed as threatened under the ESA in 1990 following rookery population declines (55 FR 12645). In 1997 two DPSs of Steller sea lion were identified based on differences in genetics, distribution, phenotypic traits, and population trends (Fritz et al., 2013; 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 CFR 30772; Angliss and Allen, 2010).

The Eastern DPS (Eastern Stock) is still protected under the MMPA but is not designated as either strategic or depleted. The Western DPS (Western Stock) remains listed as endangered under the ESA and is designated as a depleted, strategic stock under the MMPA.

4.10.2 Population and Distribution

Steller sea lions range throughout the North Pacific from Japan, across the Alaska Coastline, southward as far as central California (Muto et al., 2020a; Muto et al., 2020b). The current population estimate for Steller sea lion stocks in Alaska is 94,941 sea lions with estimated minimum population sizes of the two stocks as 53,303 sea lions in the Western stock and 41,638 sea lions in the Eastern stock (Muto et al., 2020a; Muto et al., 2020b).

4.10.3 Site-Specific Occurrence

Steller sea lions are anticipated to occur at all 8 USCG facilities with some combination of both Eastern and Western DPS/stock members occurring at all other facilities. The dividing line between Eastern and Western stocks/DPS's is not hard and fast and mixing of the two populations occurs with some percentage of the Steller sea lions present at three of the facilities (Sitka, Juneau, and Petersburg) are likely to include varying proportions of the two stocks/DPS's (Hastings et al. 2021; Table 4-4).

Table 4-4 Percentage Distribution of Eastern and Western Stocks of Steller Sea Lions by Facility

USCG Facility	*Western Stock*	*Eastern Stock*
Kodiak	1.0	0.0
Sitka	0.022	0.978
Ketchikan	0.0	1.0
Valdez	1.0	0.0
Cordova	1.0	0.0
Juneau	0.014	0.986
Petersburg	0.012	0.988
Seward	1.0	0.0

4.10.4 Acoustic Ecology

Maximum hearing sensitivity for Steller sea lions differs between sexes with males at 1 kHZ and females at 25 kHz (Kastelelein et al. 2005). The reason for the differences in hearing capability between male and female adult Steller sea lions is unknown. 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 kHz.

4.10.5 Critical Habitat

NMFS has designated critical habitat for Steller sea lion including 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 (58 FR 45273). Haulouts in the vicinity of USCG facilities include:

- Two haulouts within 20 nautical miles of Base Kodiak
- Two haulouts within 20 nautical miles of the Seward Moorings at the mouth of Resurrection Bay
- One haulout within 20 nautical miles of the Cordova Moorings

4.11 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 pounds and 5 inches length while males can grow to 600 pounds and 7 ft long. Northern fur seals are opportunistic forages, consuming a wide variety of midwater shelf fish and squid species.

4.11.1 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 (Muto et al., 2020).

4.11.2 Population and Distribution

The estimated abundance of the Eastern Pacific stock of northern fur seals is 620,660 individuals based on pup production estimates on Sea Lion Rock, St. Paul and St. George Islands, and Bogoslof Island (Muto et al., 2020a). The estimated minimum population size of the Eastern Pacific stock of northern fur seals is 525,333. Estimated pup production for the Eastern Pacific stock has been declining 2.21% per year from 1998 to 2016 (Muto et al., 2020a).

4.11.3 Site-Specific Occurrence

Northern fur seals are anticipated to occur at the five westernmost USCG facilities included in this application (i.e., Base Kodiak, Seward moorings, Valdez moorings, Station Cordova, and Station Sitka). These fur seals are not anticipated to occur at the more inland USCG facilities in Southeast Alaska (i.e., Station Juneau, Base Ketchikan, and Petersburg Moorings.

4.11.4 Acoustic Ecology

The northern fur seal can hear sounds in the range of 500 Hz to 40 kHz (Babushina et al. 1991; Moore and Schusterman 1987), with their best hearing range from 2 and 12 kHz (Gentry, 2009). Moor and Schusterman (1987) measured the in-air hearing sensitivity of the northern fur seal as 500 Hz to 32 kHz and the in-water sensitivity from 2 to 32 kHz. Babushina et al. (1991) report that underwater hearing sensitivity is 15 to 20 decibels (dB) better than in-air hearing sensitivity. 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 kHz.

4.12 Harbor Seal (*Phoca vitulina*)

Harbor seals, which 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 1.8 meters ([m] 6 ft) in length with males slightly larger than females (NMFS 2021b).

Based on data regarding association patterns, acoustics, movements, and genetic differences, 5 harbor seal stocks which may occur at one or more of the eight USCG facilities included in the Program including:

- *South Kodiak*, occurring on the south and eastern side of Kodiak Island (Base Kodiak);
- *Prince William Sound*, occurring in mainland coastal waters of southcentral Alaska including Resurrection Bay (Seward moorings) and Prince William Sound (Station Cordova and Valdez moorings);
- *Lynn Canal/Stephens Passage,* occurring mainly in the northern inland portions of Southeast Alaska (Station Juneau);
- *Sitka/Chatham Strait*, occurring on the outer coastal portions of Southeast Alaska and Stephens Passage (Station Sitka)
- *Clarence Strait*, occurring the southeasternmost inland waters of Alaska (Base Ketchikan and Petersburg Mooring)

4.12.1 Status

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

4.12.2 Population and Distribution

The current statewide abundance estimate for Alaska harbor seals is 243,938 (Boveng et al., 2019) based on aerial survey data from 1996 to 2018 (as summarized in Muto et al. 2020a; Table 4-5).

Table 4-5 Population Abundance and Trends for Harbor Seal Stocks in Study Area

Stock	*Population Size*	*Minimum Population Estimate*	*Population Trend*[1]
South Kodiak	26,448	22,351	Increasing (+1,234 over 8 years)
Prince William Sound	44,756	41,776	Decreasing (-200 over 8 years)
Lynn Canal / Stephens Passage	13,388	11,867	Decreasing (-114 over 8 years)
Sitka / Chatham Strait	13,289	11,883	Increasing (+71 over 8 years)
Clarence Strait	27,659	24,854	Increasing (+138 over 8 years)

[1] Values based on 8-year trend estimate reported in Muto et al., 2020a.

4.12.3 Site-Specific Occurrence

Harbor seals from five designated stocks are expected to occur at all eight USCG facilities included in this application:

- *South Kodiak Stock* - Base Kodiak

- *Prince William Sound Stock* - Seward Moorings, Valdez moorings, Station Cordova
- *Lynn Canal / Stephens Passage* - Station Juneau
- *Sitka / Chatham Strait Stock* – Station Sitka
- *Clarence Strait Stock* - Base Ketchikan, Petersburg Mooring

4.12.4 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.

4.13 California Sea Lion (*Zalophus californianus*)

The California sea lion is now considered to be a full species, separated from the Galapagos sea lion (*Z. wollebaeki*) and the extinct Japanese sea lion (*Z. japonicus*) (Carretta et al. 2019). The California sea lion is sexually dimorphic. Males may reach 453 kilograms (kg; 1,000 pounds) and 2.4 m (8 ft) in length; females grow to 136 kg (300 pounds) and 1.8 m (6 ft) in length. Their color ranges from chocolate brown in males to a lighter, golden brown in females. At around 5 years of age, males develop a bony bump on top of the skull called a sagittal crest. The crest is visible in the “dog-like” profile of male California sea lion heads, and hair around the crest gets lighter with age.

4.13.1 Status

California sea lions are protected under the MMPA and are not listed under the Endangered Species Act (ESA). The NOAA Fisheries has defined one stock for California sea lions (U.S. Stock), with five genetically distinct geographic populations: Pacific Temperate, Pacific Subtropical, Southern Gulf of California, Central Gulf of California, and Northern Gulf of California. The Pacific Temperate population includes rookeries within U.S. waters and the Coronado Islands just south of the U.S.-Mexico border. Animals from the Pacific Temperate population range north into Canadian waters, and movement of animals between U.S. waters and Baja California waters has been documented. The U.S. stock is not considered strategic or depleted under the MMPA.

4.13.2 Population and Distribution

The entire population cannot be counted because all age and sex classes are never ashore at the same time. In lieu of counting all California sea lions, pups are counted when all are ashore, in July during the breeding season, and the number of births is estimated from pup counts (Carretta et al. 2019). The size of the population is then estimated from the number of births and the proportion of pups in the population. Based on these censuses, the U.S. stock has generally increased from the early 1900s, to the most recent estimate of 257,606, with a minimum estimate of 233,515 (Carretta et al. 2019). There are indications that the California sea lion may have reached or is approaching carrying capacity, although more data are needed to confirm that leveling in growth persists (Carretta et al. 2019).

4.13.3 Site-Specific Occurrence

California sea lions have been observed at Sitka and Juneau and are not expected to occur at the other locations

4.13.4 Acoustic Ecology

On land, California sea lions make incessant, raucous barking sounds with most of the energy at less than 2 kHz (Schusterman et al. 1967). Males vary both the number and rhythm of their barks depending on the social context; the barks appear to control the movements and other behavior patterns of nearby conspecifics (Schusterman 1977). Females produce barks, squeals, belches, and growls in the frequency range of 0.25 to 5 kHz, while pups make bleating sounds at 0.25 to 6 kHz. California sea lions produce two types of underwater sounds: clicks (or short-duration sound pulses) and barks (Schusterman et al. 1966, 1967, Schusterman and Baillet 1969), both of which have most of their energy below 4 kHz (Schusterman et al. 1967). The functional hearing range for California sea lions on land is 50 Hz to 75 kHz (Schusterman 1981) and in-water is 60 Hz to 39 kHz.

4.14 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 adult males live for 10-15 years and average 4.3 ft long and 66 pounds, and females live 15-20 years and average 3.9 ft long and 44 pounds (USFWS, 2005). Northern sea otters do not have blubber like other marine mammals, but depend on insulation from their thick, water-resistant coat of fur which is very dense, has the greatest number of hair follicles per square inch than any other mammal (ICUN, 2015). The extremely fine and dense underfur is underneath the outer flattened and protective guard hairs. The density of this fur ranges on the region of the body from 170,000-1,000,000 per square inch (Riedman and Estes, 1990). Frequent grooming is essential to maintain its insulative properties. The fur coat also provides buoyancy by trapping air within the fur. The fur color ranges in shades of brown. For some individual as they age, the fur on the head may lighten, called “light-headed”, the hairs on their head, neck, chest, and forelimbs lose some pigment. This “light-headed” condition may be observed in males after 6 years and females after 8-9 years of age (Riedman and Estes, 1990).

4.14.1 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; the southwest stock (lower west of Cook Inlet to the Aleutian Islands) including over 11,000 miles of coastline, the southcentral stock (east side of the Cook Inlet to Cape Yakataga including the Prince William Sound), and the southeast stock from Cape Yakataga to Dixon Entrance (Muto et al., 2019). While all subpopulations of the northern sea otter are protected under the MMPA, only the Southwest Alaska DPS is protected under the ESA since its listing as threatened in 2005 (70 FR 46366).

4.14.2 Population and Distribution

Prior to commercial hunting in the mid-1700s, the population of northern sea otters was between 150,000 and 300,000 individuals ranging throughout the coastal waters of the northern Pacific basin from Japan, through Alaska, to the Baja Peninsula in Mexico (USFWS, 2005). From the mid-1700s until 1911, Russian and American hunters nearly decimated the species to individuals with hunting for their fur. In 1911, the International Fur Seal Treaty, protected the northern sea otter from commercial hunting. In Alaska, sea otter populations have recolonized most of their range. 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, 13,661 Southcentral Alaska stock sea otters, and 45,064 Southwest Alaska stock sea otters.

4.14.3 Site-Specific Occurrence

Given their projected territories it is anticipated that members of the Southwest stock of northern sea otter would occur at Base Kodiak; Southcentral stock at the Cordova, Seward, and Valdez moorings; and Southeast stock at Stations Sitka and Juneau, Petersburg Moorings, and Base Ketchikan.

Site specific occurrence of sea otters throughout the Program area have been assessed by the USFWS via various surveys and models including density evaluation 2.44 individuals/km^2 at Base Kodiak (Heather Patterson comm. 2021a), or abundance mapping based on 400 m by 400 m cells in Southeast Alaska (Eisaguirre et al. 2021), 2.31 individuals/km2 at Moorings Valdez and Seward (Heather Patterson comm. 2021b, and 21.15 individuals/km2 at Moorings Cordova (Heather Patterson comm. 2021b).

4.14.4 Acoustic Ecology

Sea otter-specific criteria have not been established by NOAA Fisheries; 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.

4.14.5 Critical Habitat

In October 2009, the USFWS designated about 15,000 square kilometers of critical habitat for the Southwest Alaska DPS of the northern sea otter 74 FR 51988). This critical habitat is divided into five units that correspond to the Management Units identified in the USFWS Recovery Plan. The critical habitat designation was based largely on the presence of shallow, rocky areas, the presence of nearshore waters to serve as refuge, the presence of kelp forests, and sufficient prey resources to support sea otter populations. Within these units, only areas that support at least one primary constituent element (PCE) are designated as critical habitat.

The PCEs for the designated critical habitat include:

1. Space for individual and population growth and for normal behavior;
2. Food, water, air, light, minerals, or other nutritional or physiological requirements;
3. Cover or shelter;
4. Sites for breeding, reproduction, or rearing (or development) of offspring; and
5. Habitats that are protected from disturbance or are representative of the historical, geographical, and ecological distributions of a species (USFWS 2009).

5 INCIDENTAL TAKING 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.

The USCG requests one five-year LOA for the take of marine mammal incidentals related to the Proposed Action at eight USCG facilities in the CEU Juneau AOR for the period from April 1, 2022 to March 31, 2027.

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). The proposed activities are not anticipated to result in any Level A harassment due to anticipated small harassment zones generated from in-water maintenance activities and implementation of marine mammal monitoring and a 50-m (165-ft) Shutdown Zone.

5.1 Incidental Take Request for Maintenance Activities

A detailed analysis of effects on marine mammals related to noise exposures from in-water maintenance activities including pile repair, removal, and installation, along with other maintenance activities at each of the eight USCG facilities in the greater Study Area is presented in Section 6 (*Take Estimates for Marine Mammals*). Supporting data for marine mammal geographic ranges, abundances, and proxy site-specific densities are taken from NMFS Stock Assessment Reports (Muto et al., 2020a; Muto et al., 2020b) as well as geographically diverse marine mammal assessments and LOA applications submitted by the U.S. Department of the Navy (Navy) for the Gulf of Alaska and Pacific Northwest, including Southeast Alaska. 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 maintenance, removal, or installation activities as well as monitoring and reporting requirements. The USCG believes that these mitigation measures would be effective in avoiding exposure of marine mammals to sound levels that would constitute Level A harassment with the exception of harbor and 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 PSO can observe them and call for a work stoppage. The USCG is proposing to request annual Level A of harbor and Dall’s porpoises and harbor seal (Table 5-1). As described in greater detail in Section 6, not all USCG installations included in this analysis are expected to generated Level A take due to the methods and materials to be used or the local geography that would restrict Level A areas, or access by marine mammals these areas, to the degree that PSO monitors would successfully be able to shutdown work in timely fashions such that Level A take would be unlikely.

Table 5-1 Level A Take of Harbor Porpoise, Dall's Porpoise and Harbor Seal by USCG Installation and Year

Species	Stock	Kodiak	Ketchikan	Valdez	Cordova
		20 days/year (Years 1-5)	20 days/year (Years 1-5)	3 days/year (Years 1-5)	6 days (Year 2)
Harbor Porpoise	Southeast Alaska (896)	--	0.5/day 20/year (2.2% of stock)	--	--
	GOA (31,046)	2/day 40/year (0.1% of stock)	--	5/day 15/year (0.05% stock)	5/day 30 Year 2 (0.1% of stock)
Dall's Porpoise	Alaska (15,432)	2/day 40/year (0.3% of stock)	2/day 40/year (0.3% of stock)	2/ day 6/year (0.04% of stock)	2/ day 12 in Year 2 (0.08% of stock)
Harbor Seal	South Kodiak (22,351)	1/day 20/year (0.2% of stock)	--	--	--
	Clarence Strait (24,854)	--	1/day 20/year (0.1% of stock)	--	--

Table 5-2 summarizes the USCG's total Level A take request for in-water maintenance activities for the entire 5-year program for harbor porpoise, Dall's porpoise, and harbor seals.

Table 5-2 Program-Wide Total Level A Take of Harbor Porpoise, Dall's Porpoise, and Harbor Seal by USCG Installation

Species	Stock	Kodiak	Ketchikan	Valdez	Cordova
		Years 1-5	Years 1-5	Years 1-5	Year 2 Only
Harbor Porpoise	Southeast Alaska (896)	--	100	--	--
	GOA (31,046)	200	--	65	30
Dall's Porpoise	Alaska (15,432)	200	200	30	12
Harbor Seal	South Kodiak (22,351)	100	--	--	--
	Clarence Strait (24,854)	--	100	--	--

Table 5-3 summarizes the USCG's Level B take request for in-water maintenance activities by species per year over the duration of the requested five-year authorization period. Maintenance activities will not occur at all facilities every year of the authorization period and it is anticipated that maintenance actions at some facilities will occur only during a single year while others may span multiple years.

This analysis predicts 16,685 exposures (see Section 6, *Take Estimates for Marine Mammals*) from in-water maintenance activities that could be classified as Level B harassment under the MMPA over the course of the 5-year Program.

Table 5-3 Program-Wide Requested Level B Harassment Take by Year

Species - Stock	*Year 1*	*Year 2*	*Year 3*	*Year 4*	*Year 5*	*Total*
Fin Whale – Northeast Pacific	21	31	21	21	21	115
Humpback Whale						
Hawaii DPS	164	176	168	164	164	836
Mexico DPS	6	8	6	6	6	32
Western North Pacific DPS	0	0	0	0	0	0
Minke Whale – Alaska	15	16	15	15	15	76
Gray Whale – Eastern North Pacific	10	10	10	10	10	50
Killer Whale						
Alaska Resident	106	130	110	106	106	558
Northern Resident						
Gulf of Alaska, Aleutian Islands, Bering Sea Transient						
AT1 Transient						
West Coast Transient						
Pacific White-Sided Dolphin – North Pacific	224	242	236	224	224	1,150
Harbor Porpoise						
Southeast Alaska	72	72	72	72	72	360
Gulf of Alaska	133	201	134	133	133	734
Dall's Porpoise – Alaska	132	165	133	132	132	694
Steller Sea Lion						
Western DPS	19	29	27	19	19	113
Eastern DPS	436	436	436	436	436	2,180
Northern Fur Seal – Eastern North Pacific	42	56	54	42	42	236
Harbor Seal						
Prince William Sound	147	441	343	147	147	1,225
Lynn Canal / Stephens Passage	860	860	860	860	860	4,300
Sitka / Chatham Strait	230	230	230	230	230	1,150
Clarence Strait	412	412	412	412	412	2,060
South Kodiak	23	23	23	23	23	115
California Sea Lion – US Stock	11	11	11	11	11	55
Northern Sea Otter						
Southeast Alaska	71	71	71	71	71	355
Southcentral Alaska	11	212	15	11	11	256
Southwest Alaska	7	7	7	7	7	35
Total	**3,152**	**3,839**	**3,394**	**3,152**	**3.152**	**16,685**

6 TAKE ESTIMATES FOR MARINE MAMMALS

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

The NOAA Fisheries application for a LOA 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 takes and Section 6 (below) presents how these definitions were relied on to develop the quantitative acoustic analysis methodologies used to assess the potential for the Proposed Action to affect marine mammals.

The proposed project activities as outlined in Sections 1 and 2 have the potential to take marine mammals by harassment only, primarily through maintenance activities involving in-water pile repair, removal, and installation, along with other minor maintenance, repair, and replacement activities. Of all Project-related activities, only impact pile driving is anticipated to generate airborne noise beyond 50m from any project location (see Section 6.6.1).

In-water maintenance activities including pile repair (power-washing); pile removal; and pile installation via vibratory pile driving, down-the-hole drilling, or impact pile driving would temporarily increase the local underwater noise environment in the vicinity of each of the eight USCG facilities. Pile driving and maintenance activities can also generate airborne noise that could potentially result in disturbance to marine mammals that are hauled out; however, due to the absence of haulouts in immediate proximity to any of the USCG facilities, the potential for acoustic harassment by airborne noise is considered negligible as the largest airborne harassment zone, associated with pile driving, extends approximately 50 m beyond a given impact pile driving site (see Section 6.6.1 for consideration of airborne noise). The nearest haulout to any facility is a Steller sea lion haulout near Petersburg Moorings, located 9.7 km from that USCG facility.

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. Although it is known that sound is important for marine mammal communication, navigation, and foraging (NRC, 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.

Non-impulsive sound sources associated with pile repair (power washing), pile removal, and pile installation via vibratory driving with incorporated mitigation including monitoring and shutdown zones would not result in Level A exposure of marine mammals as defined under the MMPA while DTH drilling and impact driving of steel piles, with implementation of appropriate shutdown zones, may result in Level A exposures of harbor seals, harbor porpoises, and Dall’s porpoises. Further, 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 6.6.1)
- Evaluating the potential presence of marine mammals based on historical occurrence or density or by site-specific survey as outlined in (Section 6.8)
- Estimating potential harassment exposures by multiplying the density or site-specific abundance of marine mammals calculated in the area by their probable duration during construction (Section 6.9).

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 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 µPa.

Due to the wide range of pressure and intensity encountered during measurements of sound, a logarithmic scale is used, based on the dB, which, for sound intensity, is 10 times the $\log_{10}$ of the ratio of the measurement to reference value. For SPL, the amplitude ratio in dB is 20 times the $\log_{10}$ 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 Navy testing and training effects, but have not been adopted for pile driving and other non-explosive impulsive sounds (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) SPL. The peak pressure is the instantaneous maximum or minimum overpressure 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 time 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 Acoustic 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. Cycles per second are commonly referred to as hertz. 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 time 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 μPa2 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 ($\mu Pa^2/Hz$) 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. Known noise levels and frequency ranges associated with anthropogenic sources similar to those that would be used for this project are summarized in Table 6-2. Details of each of the sources are described in the following text.

Table 6-2 Representative Levels of Underwater Anthropogenic Noise Sources

Noise Source	*Frequency Range (Hz)*	*Source Level*	*Reference*
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 µPa²sec 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

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

6.3.1 Ambient Noise

Ambient noise by definition is background noise, and it has no single source or point. Ambient noise varies with location, season, time of day, and frequency. Ambient noise is continuous, but with much variability on time scales ranging from less than one second to one year (Richardson et al., 1995). Ambient underwater noise at the eight USCG facilities is highly variable, largely due to wide variation in natural characteristics (i.e., bathymetry) as well as anthropogenic sources that include varying numbers of vessel engines and cranes, generators, and other types of mechanized equipment on piers and wharves or the adjacent shoreline. Because there is no consistent measure of ambient sound across all eight facilities, this application uses the conservative 120 dB RMS non-impulsive noise threshold (described below) as a proxy for ambient noise. At distances where Project-related sounds would approach the 120 dB threshold distance they would also become undetectable with regards to potential monitoring and verification of sound levels and that it would not be perceived by marine mammals as louder or significantly different than regularly occurring background noise. As such it would be 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 (and a portion of DTH drilling) produces impulsive sounds, while the equipment used to repair or remove piles (i.e., vibratory driver, pile clippers, underwater saws, power-washer, or the non-impulsive portion of DTH drilling) produces 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 (Ward, 1997).

Impulsive sounds (e.g., explosions, seismic air gun pulses, 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 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, NOAA Fisheries 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 NOAA Fisheries 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 temporary threshold shift [TTS]) harassment (NMFS, 2018). NOAA Fisheries has developed acoustic threshold levels for determining the onset of permanent threshold shift (PTS) in marine mammals in response to underwater impulsive and non-impulsive sound sources (Table 6-3). NOAA Fisheries 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 (NMFS, 2005) (Table 6-3). 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 marine mammals are exposed to sounds at or above 160 dB RMS for impulse sounds (e.g., impact pile driving) and 120 dB RMS for continuous noise (e.g., pile clipping or cutting), but below injurious thresholds. Level B harassment may or may not be result in a stress response. The application of the 120 dB RMS threshold can sometimes be problematic because this threshold level can be either at or below the ambient noise level of certain locations or where the ambient environment is consistently in exceedance of the 120 dB RMS threshold prior to any pile installation or removal activities. As a result, these levels are considered precautionary (74 FR 41684). Given that, because site-specific ambient noise levels are not available for any of the eight USCG facilities, the 120-db RMS threshold is used for the assessment of potential Level B harassment exposures.

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	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
Sea Otter (USFWS)[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 Proposed Action 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 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]USFWS has jurisdiction over sea otters and uses 160 dB RMS as the Level B disturbance threshold for both impulsive and non-impulsive noise

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

Similar to the NOAA Fisheries, the USFWS uses the 160 dB RMS Level B disturbance threshold for assessing impulsive noise impacts on sea otters while also using 160 dB RMS as the Level disturbance threshold for assessing non-impulsive noise impacts on sea otters.

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. However, airborne noise levels generated by in-water maintenance activities (e.g., pile driving) would not extend 6 miles from any USCG facility, or the distance to the nearest pinniped haulout to any one facility.

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	100 dB re 20 µPa

6.5 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 band 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 & 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 & 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 removal 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 removal activities, and which have already been taken into account in this exposure analysis.

6.6 Modeling Potential Noise Impacts from Pile Removal

In this LOA application, the USCG has used NOAA Fisheries Technical Guidance, NOAA Fisheries User Spreadsheet, simple practical spreading loss models (NMFS 2018, 2020), and acoustic data recorded during previous in-water projects including pile repair, removal, and installation at other shoreside facilities on the U.S. West Coast to identify the Level A (injury) and Level B (behavior) harassment zones that would result from pile repair, removal, and installation, as outlined below.

6.6.1 Sound Propagation

Pile repair, removal, and installation activities would generate underwater noise that potentially could result in disturbance to marine mammals swimming by the Project Area. Transmission loss (TL) underwater is the decrease in sound intensity due to sound spreading as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. The general formula for transmission loss 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).

6.6.2 Airborne Sounds

Above-water repair activities (e.g., deck cutting, use of power hand tools) along with the above-water component of in-water activities (e.g., the vibratory hammer mounted at the top of the pile being removed/installed or impact hammer) would generate airborne noise that would propagate over water and land in the immediate vicinity of these activities at each of the eight USCG facilities.

Average maximum airborne noise levels for common construction equipment range from about 73 to 101 dBA measured at 50 feet (WSDOT 2020 reporting average maximum values included in Federal Highway Administration [FHWA] 2011; Table 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
Grinder	73
Impact Wrench	74
Hammer Drill	75
Rock Drill (airborne analogue for socket drill)	93
Impact Pile Driver	105
Vibratory Pile Driver (no size specified)	80

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

Table 6-6 Calculated Distances of Airborne Noise Exceedance for Harbor Seals (90 dB), Other Pinnipeds and Sea Otters (105 dB)

Equipment	*Harbor Seals (m)*	*Other Pinnipeds Including Sea Otters(m)*
Concrete Saw	5.6	1.0
Grinder	1.4	0.2
Impact Wrench	1.6	0.2
Hammer Drill	1.8	0.2
Rock Drill (airborne analogue for socket drill)	14.1	3.4
Impact Pile Driver	56.2	21.5
Vibratory Pile Driver (no size specified)	2.2	0.5

6.6.3 Non-Impulsive Sounds

Non-impulsive noise generating activities produce sounds that can be broadband, narrowband or tonal, brief or prolonged (continuous or intermittent), and typically do not have a high peak sound pressure with rapid rise/decay time that is characteristic of impulsive sounds.

Non-impulsive sound sources for the proposed Program are associated with power washing as part of pile jacket installation/repair operations; vibratory removal of timber, steel, and concrete piles; clipping of steel piles; cutting of piles using a hydraulic chainsaw or diamond wire saw; and vibratory installation of new replacement piles.

The intensity of pile removal 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 removal, activities with similar properties to the proposed project were evaluated. Table 6-7 presents received SPLs at a distance of 10 m (33 ft) from the pile.

Source levels associated with non-impulsive sources, including use of a hydraulic chainsaw or diamond wire saw as shown in Table 6-7. Data from the most similar activities reported in a variety of other applications submitted to NMFS or monitoring summaries and compendia by other government agencies including the Navy, and the Departments of Transportation for California, Washington, and Alaska have been used as proxies for the proposed activities at the eight USCG facilities.

6.6.3.1 Power-Washing Piles

Hilcorp Alaska conducted underwater measurements using a CaviBlaster in April 2017. This study measured the sound of power washing on a steel pipeline while this Program would include power washing of timber piles. Received sound levels were measured up to 143 dB at 170m and up to 127 dB at 1,200m (Austin, 2017; 84 FR No 62, Monday April 1, 2019). Based on these far-field measurements, the 1-m source level was estimated as 176 dB re 1 µPa or about 161 re 1 µPa at 10 m (33 ft). It is anticipated that use of water jet/power-washer would be limited in duration to 30 minutes at a time.

6.6.3.2 Vibratory Pile Extraction and Installation

Vibratory removal and installation of piles of the same size and type are generally expected to be similar to one another and proxy data are used interchangeably based on the best/nearest data available to the USCG Sector Juneau AOR.

Measurements of vibratory removal of 14-inch timber piles at the Pier 62 Project in Seattle, Washington were reported by the Greenbusch Group (2018). Sound source monitoring of vibratory removal of timber piles recorded values at 152 dB RMS at 10 m (33 ft; using transmission loss factor of 15). Vibratory extraction of timber piles is expected to require 10 minutes per pile.

Measurements of vibratory removal and driving of 24-inch steel piles (used here as a general conservative proxy for all steel piles given the wide range in size of these piles across all 8 facilities with 24-inch piles being the largest [breasting dolphins at Base Kodiak]) were reported by WSDOT. Sound source monitoring recorded an average RMS value of 162 dB RMS at the Friday Harbor Terminal (Laughlin 2010, WSDOT 2020). Vibratory extraction and installation of steel piles is expected to require 10 minutes per pile.

6.6.3.3 Pile Clipping

Measurements of pile clipping of 13-inch polycarbonate (used as a proxy for timber piles here) and 24-inch concrete piles using a 24-inch pile clipper were reported by the Navy during demolition of the former fuel pier at Naval Base Point Loma in San Diego Bay as 153.8 dB RMS for timber and 161.2 dB RMS for concrete piles. Sound source monitoring recorded the mean of maximum (db RMS) values for the clipping of these pile types and size and clipping activities required, on average, 2:22 minutes for polycarbonate piles and 10:22 minutes to clip each concrete pile (NAVFAC SW 2020).

6.6.3.4 Pile Cutting Via Hydraulic Chainsaw or Diamond Wire Saw

Measurements of pile cutting using a hydraulic chainsaw were reported by the Navy during demolition of the former fuel pier at Naval Base Point Loma in San Diego Bay. Sound source monitoring recorded an average RMS value of 151 dB RMS and required, on average, less than 5 minutes to cut each pile (NAVFAC SW 2020).

Measurements of pile cutting using a diamond wire saw were reported by the Navy during demolition of the former fuel pier at Naval Base Point Loma in San Diego Bay. Sound source monitoring recorded an average RMS value of 161.5 dB RMS for removal of large concrete caissons (larger than any concrete piles at Base Ketchikan, the only facility with concrete piles) and required, on average, 15:30 mm:ss to remove (NAVFC SW 2020).

6.6.3.5 Down-the-Hole Drilling Non-Impulsive Component

Down-the-hole drilling has both impulsive and non-impulsive components where the impulsive component is used to calculate the Level A distance by marine mammal hearing group using the NMFS User Spreadsheet and the non-impulsive component is used to calculate the Level B harassment zone. Based on Hayvaert and Reyff 2021, a generalized value for the non-impulsive component for DTH drilling is 167 dB RMS.

Table 6-7 Observed Source Data for Non-Impulsive Noise-Generating Activities

Activity	*Pile Size and Type*	*Observed Mean RMS SPL (dB re 1 µPa at 10 m)*	*Estimated Duration per Pile (mm:ss)*	*Proxy Data Source*
Power Washing	For use on timber and steel piles	161[1]	30:00	Austin 2017; FR12336 Vol 84 No 62
Vibratory Extraction/ Installation	All sizes of timber piles	152	10:00	Greenbusch Group 2018
Vibratory Extraction/ Installation	All sizes of steel piles	162	10:00	Laughlin 2010; WSDOT 2020
Clipper	Timber	153.8	2:22	NAVFAC SW 2020
Clipper	Concrete	161.2	10:22	NAVFAC SW 2020
Hydraulic chainsaw	For use on timber piles	151	4:50	NAVFAC SW 2020
Diamond wire saw	For use on concrete piles	161.5	15:30	NAVFAC SW 2020
DTH Drill	Steel and concrete	167	60:00	Hayvaert and Reyff 2021

[1] Austin 2017 reported water jet produced sound levels of 176 dB RMS at 1m or 161 dB RMS at 10m using spreading loss TL factor of 15

6.6.4 Impulsive Sounds

Impulsive noise generating activities produce sounds that are typically transient, brief (less than 1 second), broadband, and consist of high peak sound pressure with rapid rise and decay times. Impulsive sound sources for the proposed Program are associated with impact driving of new timber, steel, and concrete piles as well as down-the-hole (DTH) driving used to install steel or concrete piles and are summarized in Table 6-8.

6.6.4.1 Impact Pile Driving

Measurements for impact driving from other projects where the installed pile size and material type most closely matched the pile sizes and types expected to be installed as part of pile replacement activities at each of the eight USCG facilities have used as proxies to estimate the underwater noise-related impacts of these activities.

Measurements for impact driving of 12-inch timber piles were recorded during installation of four 12-inch timber piles at the Ballena Bay Marina and reported by the California Department of Transportation (Caltrans, 2020; and WSDOT, 2020). Piles took approximately 30 minutes to drive, but pile strikes were infrequent since a drop hammer was used and strikes typically occurred at a rate of 1-2 per minute and conservatively assumed here to require 100 strikes. Reported sound levels generated by impact driving of 12-inch timber piles include an RMS value of 170 dB RMS and a single-strike SEL of 160 dB SEL.

Measurements for impact driving of 24-inch steel piles is used in this application as a conservative estimate for steel piles (24-inch piles are largest of this type at any of the eight USCG facilities) and were recorded in Yurk et al. 2015 based on Caltrans data. Each 24-inch steel pile required on average 400 strikes to drive and reported sound levels generated during this activity included an RMS value of 190 dB RMS and single-strike SEL value of 177 dB SEL.

Measurements for impact driving of 24-inch concrete piles are conservatively used in this application for impact driving of all sizes of concrete pile at Base Ketchikan, the only facility of the 8 considered in this application to include this pile type. These proxy measurements were recorded during pile installation at the Mukilteo Ferry Terminal in Washington state (WSDOT, 2020). Each 24-inch concrete pile required an average of 184 strikes to drive and reported sound levels generated during this activity included an RMS value of 170 dB RMS and single-strike SEL of 159 dB SEL.

6.6.4.2 Down-Hole Drilling

DTH driving has been previously assessed as both non-impulsive, continuous noise source but recent updates to NMFS guidance (2018) incorporated DTH also as an impulsive source and these tools were used for this application (84 CFR 64847). Reported impulsive sound levels generated by DTH hammering include a single-strike SEL of 169 dB SEL for 24-inch piles recorded at 10 m (33 ft) from the source.

Table 6-8 Observed Source Data for Impulsive Noise Generating Activities

Removal Method	*Pile Size and Type*	*Observed Mean (at 10 m)*		*Source*
		RMS SPL (dB re 1 µPa)	*Single Strike SEL (dB SEL_{s-s})*	
Impact Drive	All timber piles (12-inch proxy)	170	160	Ballena Bay Marina (Caltrans 2020; WSDOT 2020)
Impact Drive	All steel piles (24-inch proxy)	190	177	Yurk et al. 2015
Impact Drive	All concrete piles (24-inch proxy)	170	159	Mukilteo Terminal (WSDOT 2020)
DTH Drill	All pile types and sizes	167	159	Heyvaert and Reyff 2021

6.6.5 Noise Modeling Results for Level A and B Harassment Zones

For the analyses that follow, the TL model described above was used to calculate the expected noise propagation from pile removal and installation using the previously observed source levels and durations identified in Tables 6-7 and 6-8 at relevant selections of the eight USCG facilities considered in this application (i.e., at facilities were appropriate pile types occur).

6.6.5.1 Level A Threshold Distances

Distances to Level A (onset PTS) thresholds have been calculated as shown in Appendix A using the NMFS User Spreadsheets (NMFS 2020) and identified in Table 6-9.

Table 6-9 Projected Level A Harassment Zones by Marine Mammal Hearing Group

Pile Removal/Installation Activity	*Projected Distances to Level A Thresholds (m)[1]*				
	LF	*MF*	*HF*	*PW*	*OW*
Power washing of timber and steel piles 161.0 dB RMS for 9,000 seconds per day	1.3	0.1	1.9	0.8	0.1
Vibratory Extraction/Installation – Timber 152 dB RMS for 3,000 seconds per day	1.8	0.2	2.6	1.1	0.1
Vibratory Extraction/Installation - Steel 162.0 dB RMS for 3,000 seconds per day	7.1	0.6	10.4	4.3	0.3
Pile Clipper – Timber 153.8 dB RMS for 710 seconds per day	0.1	0.0	0.1	0.0	0.0
Pile Clipper – Concrete 161.2 dB RMS for 3,110 seconds per day	0.6	0.1	0.9	0.4	0.0
Hydraulic Chainsaw 151.0 dB RMS for 1,455 seconds per day	0.1	0.0	0.1	0.0	0.0
Diamond Wire Saw Pile Cutting – Concrete 161.5 dB RMS for 4,650 seconds per day	0.9	0.1	1.3	0.5	0.0
Impact Drive – Timber 170 dB RMS, 160 dB SEL_{s-s} 100 strikes per pile, 5 piles/day	18.4	0.7	21.9	9.9	0.7
Impact Drive – Steel 190 dB RMS, 177 dB SEL_{s-s} 400 strikes per pile, 5 piles/day	215.8	7.7	257.1	115.5	8.4
Impact Drive – Concrete 170 dB RMS, 160 dB SEL_{s-s}, 184 strikes per pile, 5 piles per day	27.7	1.0	33.0	14.8	1.1
DTH Drilling – All pile types and sizes 167 dB RMS, 159 dB SEL_{s-s}, 7,200 seconds / day and 10 strikes / second, 2 piles per day	434.1	15.4	517.1	232.3	16.9

Notes:
[1]All Level A distances calculated using NOAA Fisheries User Spreadsheets (NOAA Fisheries 2020) utilizing a Weighting Factor of 2.5 kilohertz for non-impulsive sounds and 2.0 kilohertz for impulsive sounds and Propagation Factor of 15

Of the calculated Level A injury harassment distances, only those associated with impact driving of steel piles and DTH drilling have the intensity and duration to generate cumulative noise levels in exceedance of thresholds significantly beyond the 20 m (66 ft) physical interaction shutdown zone larger zones would be implemented as needed (Table 6-10).

Table 6-10 Level A Shutdown Zones by USCG Facility and Activity

Activity	*Kodiak*	*Sitka*	*Ketchikan*	*Valdez*	*Cordova*	*Juneau*	*Petersburg*	*Seward*
Physical Interaction	20m	20m	20m	20m	20m	20m	20m	20m
Impact Timber	HF – 30m	HF – 30m	HF – 30m	HF – 30m	N/A	HF – 30m	HF – 30m	N/A
Impact Steel	LF – 220m HF – 260m PW –120m	LF – 220m HF – 260m PW –120m	LF – 220m HF – 260m PW –120m	LF – 220m HF – 260m PW –120m	LF – 220m HF – 260m PW –120m	N/A	LF – 220m HF – 260m PW –120m	LF – 220m HF – 260m PW –120m
Impact Concrete	N/A	N/A	LF – 30m HF – 40m	N/A	N/A	N/A	N/A	N/A
DTH Drill	LF – 440m HF – 520m PW –240m	N/A	LF – 440m HF – 520m PW –240m	N/A	N/A	N/A	N/A	N/A

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, for facilities where sound transmission would be physically constrained such as locations within an enclosed harbor (i.e., Kodiak and Seward) or narrow channel (i.e., Petersburg and Ketchikan) would permit pre-activity monitoring of the Level A shutdown zone, and beyond, that would 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 Level A shutdown zone. For instance, for impact driving of steel piles or DTH drilling at Base Kodiak, the Level A ensonification would occur within Womens Bay. Pre-activity monitoring by one or more monitors would determine if any high or low frequency cetaceans are present within Womens Bay while during activities a monitor located at the point at the entrance of Womens Bay would be able to see if one of these marine mammals were approaching the mouth of the Bay and could communicate a shutdown order if it appears the animal is going to continue into the Bay.

Figures 6-1 through 6-9 depict the Level A harassment zones at the facilities where impact driving of steel piles and DTH drilling would occur over the course of the Program.

6.6.5.2 Level B Threshold Distances

The calculated radial distances to Level B behavioral disturbance thresholds and corresponding areas within the Harassment Zones are summarized in Table 6-11. Level B threshold distance are determined by the point at which the maximum sound from the project source diminishes to 120 dB re 1 µPa for non-impulsive sources and 160 dB re 1 µPa for impulsive sources for all marine mammals except northern sea otters. USFWS uses the 160 dB re 1 µPa threshold for both non-impulsive and impulsive sounds to assess Level B distances for northern sea otters. Figures 6-10 through 6-25 depict the Level B harassment zones for each of the noise generating uses likely to occur at each individual facility.

Table 6-11 Calculated (Transmission Loss and Extrapolated) Distance(s) to Level B Underwater Noise Thresholds and Harassment Zones Within the Thresholds from Pile Repair, Removal, and Installation

Activity Description/ Source Sound Levels at 10-m (33-ft)	*Distance from Source to Reach 160 dB re 1 µPa (m)*	*Distance from Source to reach 120 dB re 1 µPa (m)*
	Maximum Radial Distance (m)	*Maximum Radial Distance (m)*
Power washing of timber and steel piles 161.0 dB RMS for 9,000 seconds per day	12	**5,412**
Vibratory Extraction/Installation – Timber 153 dB RMS for 3,000 seconds per day	3	**1,359**
Vibratory Extraction/Installation - Steel 162.0 dB RMS for 3,000 seconds per day	14	**6,310**
Pile Clipper – Timber 153.8 dB RMS for 710 seconds per day	4	**1,792**
Pile Clipper – Concrete 161.2 dB RMS for 3,110 seconds per day	12	**5,580**
Hydraulic Chainsaw 151.0 dB RMS for 291 seconds per day	3	**1,166**
Diamond Wire Saw 161.5 dB RMS for 930 seconds per day	13	**5,843**
Impact Drive – Timber 170 dB RMS, 160 dB SEL_{s-s}, 100 strikes	**46**	--
Impact Drive – Steel 190 dB RMS, 177 dB SEL_{s-s}, 400 strikes	**1,000**	--
Impact Drive – Concrete 170 dB RMS, 160 dB SEL_{s-s}, 184 strikes	**46**	--
DTH Drive – All pile types and sizes 167 dB RMS, 154 dB SEL_{s-s}, 7,200 seconds / day and 10 strikes / second	29	**13,594**

Notes:

Distances to Level B underwater noise thresholds were calculated using acoustic data as sourced above along with the practical spreading loss model including transmission loss factor of 15.

Distances to Level B threshold distances for impulsive noise sources calculated to 160 dB threshold distance (bolded radial distance values).

Distances to Level B threshold distances for non-impulsive noise sources calculated to 120 dB threshold distance (bolded radial values) for all marine mammals excluding northern sea otters.

Distances to Level B threshold distances for non-impulsive noise sources calculated to 160 dB threshold distance are used for northern sea otters per USFWS.

Abbreviations:
dB re 1 µPa = decibels referenced to a pressure of 1 microPascal,
km^2 = square kilometers, m = meters,
PTS = permanent threshold shift, RMS = root mean square, SEL = sound exposure level.

6.7 Basis for Estimating Take by Harassment

The USCG is seeking authorization for the potential taking of small numbers of marine mammals in proximity to the eight individual USCG facilities over the course of the five-year authorization period resulting from in-water maintenance activities as described in this application. Marine mammals of varying types are present to varying degrees in the water surrounding the eight USCG facilities year-round (see Section 4, *Affected Species Status and Distribution*). The takes requested are expected to have no more than a minor effect on individual animals and no effect on the various marine mammal populations in general. Any effects experienced by individual marine mammals are anticipated to be limited to short-term disturbance of normal behavior or temporary displacement of animals near the source of the noise.

The likelihood of a given individual of a marine mammal species to be present in the vicinity of a USCG facility including in this LOA while in-water pile repair, removal, or installation activities are occurring is based on two datasets as depicted in Table 6-12:

- Site-specific species occurrences observed during construction projects reported to NMFS by construction contractors as part of relevant marine mammal monitoring programs. Because observation data are inconsistent (e.g., some locations have not had any recent projects where observations were recorded or recorded observations recorded a limited number of species out of those with potential to occur at a location) across the eight USCG facilities and their surrounding areas, observation data (and the USCG facilities).
- Local species densities, measured as individuals per square kilometer, derived from a range of surveys compiled in the Navy's Marine Species Density Database Phase III for the Northwest Training and Testing Study Area (Navy 2020) Gulf of Alaska Temporary Maritime Activities Area (Navy 2021), and for Northern sea otters managed by USFWS (Eisaguirre 2021).

Table 6-12 Marine Mammal Density or Local Daily Occurrence at USCG Facilities

Species	Stock / DPS	Kodiak[2,3] 20 day/year All 5 years	Sitka[1,2] 10 day/year All 5 years	Ketchikan[1,2] 20 day/year All 5 years	Valdez[2,3] 3 day/year All 5 years	Cordova[2,3] 6 days Year 2 only	Juneau[1,2] 20 days/year All 5 years	Petersburg[1,2] 4 days/year All 5 years	Seward[2,3] 4 days Year 3 only
Fin Whale	Northeast Pacific	0.068 /km^2	0.0001 /km^2	0.0001 /km^2	0.068 /km^2	0.068 /km^2	0.0001 /km^2	0.0001 /km^2	0.068 /km^2
Humpback Whale	Hawaii DPS Mexico DPS Western North Pacific DPS	0.093 /km^2	5 /day	0.571 /day	0.093 /km^2	0.093 /km^2	4 /day	0.0017 /km^2	1 /day
Steller Sea Lion	Western DPS	0.083 /day	16 /day		4.2 /day	0.0678 /km^2	0.316 /km^2		2 /day
	Eastern DPS			10 /day (NOAA)				16 /day (Old Sitka Dock)	
Minke Whale	Alaska	0.006 /km^2	1 /day (O'Connell Bridge)	0.024 /day (Gravina)	0.25 /day (NOAA Comm.)	0.006 /km^2	0.024 /day (Gravina - Ketchikan)	0.024 /day (Gravina - Ketchikan)	0.006 /km^2
Gray Whale	Eastern North Pacific	0.04857 /km^2	0.1 /day (Old Sitka Dock)	0.067 /day (NOAA)					
Sperm Whale[4]	North Pacific	0.002 /km^2	0.002 /km^2				0.002 /km^2	0.002 /km^2	
Killer Whale[5]	Alaska Resident	0.05 /km^2 (AK and GOA)	8 /day	0.4 /day (Gravina/Tongass)	0.0349 (AK)/km^2	4 /day (NOAA Comm.)	0.4 /day (Gravina - Ketchikan)	0.4 /day (Gravina - Ketchikan)	1 /day (NOAA comm.)
	Northern Resident								
	Gulf of Alaska, Aleutian Islands, Bering Sea Transient								
	AT1 Transient								
	West Coast Transient		8 /day	0.4 /day (Gravina/Tongass)					
Pacific White-Sided Dolphin	North Pacific	3 /day (NOAA comm.)	2.86 /day (Ketchikan - NOAA)	2.86 /day (NOAA)	3 /day (NOAA comm.)	3 /day (NOAA comm.)	2.86 /day (NOAA - Ketchikan)	2.86 /day (NOAA - Ketchikan)	3 /day (NOAA comm.)

Species	Stock / DPS	Kodiak	Sitka	Ketchikan	Valdez	Cordova	Juneau	Petersburg	Seward
Harbor Porpoise	Southeast Alaska		5 /day (O'Connell Bridge)	0.5 /day (NOAA)			0.5 /day (NOAA - Ketchikan)	0.5 /day (NOAA - Ketchikan)	
	Gulf of Alaska	0.4547 /km²			0.4547 /km²	0.4547 /km²			0.4547 /km²
Dall's Porpoise	Alaska	0.0218 /km²	0.121 /km²	2 /day (NOAA)	0.218 /km²	0.218 /km²	2 /day (NOAA - Ketchikan)	2/day (NOAA - Ketchikan)	0.25 /day
Northern Fur Seal	Eastern North	0.0901 /km²	0.27633 /km²		0.0901 /km2	0.0901 /km2			3/day (NOAA comm.)
Harbor Seal	Prince William Sound				48.95 /day (NOAA - Valdez)	48.95 /day (NOAA - Valdez)			48.95 /day (NOAA - Valdez)
	Lynn Canal / Stephens Passage						43 /day (NOAA comm.)		
	Sitka / Chatham Strait		23 /day (O'Connell Bridge)						
	Clarence Strait			12 /day (NOAA)				43 /day (NOAA)	
	South Kodiak	0.1689 /km²							
California Sea Lion[6]			1 /day (Gary Paxton Ind. Park)				0.0251 /km²		
Northern Sea Otter[7]	Southeast Alaska		Survey	Survey			Survey	Survey	
	Southcentral Alaska				2.31 /km²	21.15 /km²			2.31 /km²
	Southwest Alaska	2.44 /km²							

[1] Southeast Alaska density values from Western Behm Canal values reported in Navy 2020 except Killer Whale (General) which is not used for these facilities and Northern sea otter

[2] Where species density values reported in the Navy 2020 and Navy 2021 vary by time of year, the greatest value is used

[3] GOA/Prince William Sound species density values include inshore or within the 500-1000m isobath values in Navy 2021

[4] GOA densities reported in Navy 2021 are used here in place of 0 individuals per kilometer density reported for Southeast Alaska (Navy 2020) and conservatively applied to near-shore facilities including Southeast Alaska inland waters where sperm whales have been increasingly observed as reported by ADGF

[5] Killer whales of differing stocks are generally indistinguishable from stock to stock in the context of monitoring, estimated Level B take by installation are given as a total number of killer whales impacted by Level B noise at each facility by year based on the expected occurrence or density of the stock most likely to be present (shown in Alaska Resident row)

[6] Navy 2020 density values for California sea lion do not include Western Behm Canal and the value used here is from the San Juan Islands, the next closest zone to the project area

[7] Northern sea otter based on species densities at Kodiak, Seward, Cordova, and Valdez (H. Patterson per. comm 2021), and survey-based abundances in SE AK (Eisaguirre 2021)

6.7.1 Basis for Estimating Level A Take

Level A (PTS onset) takes, as well as risks of physical injury, would only potentially result from in-water maintenance activities which would generate underwater noise in exceedance of Level A thresholds for marine mammal hearing groups beyond the 20 m (66 ft) physical interaction shutdown zone put in place to prevent physical contact between maintenance equipment and any marine mammals. In order to prevent Level A takes to the extent practicable, larger, marine mammal hearing group-specific shutdown zones for high frequency cetaceans (porpoises), low frequency cetaceans (baleen whales), and phocid pinnipeds would be implemented at USCG locations during in-water maintenance actions that would generate underwater noise in exceedance of Level A thresholds (Table 6-13).

Table 6-13 Shutdown Zone for In-Water Activities by USCG Facility

Activity	Shutdown Radius (m)	Kodiak	Sitka	Ketchikan	Valdez	Cordova	Juneau	Petersburg	Seward
Physical Interaction Shutdown Zone Power-washing Vibratory Extraction Vibratory Installation Pile Clipping Pile Cutting	20	All Species	All Species	All Species	All Species	All Species	All Species	All Species	All Species
Impact Pile Driving - Timber	20	All Species	All Species	All Species	All Species	All Species	All Species	All Species	All Species
	30	HF	HF	HF	HF	-	NF	NF	-
Impact Pile Driving – Steel	20	All Species	All Species	All Species	All Species	All Species	All Species	All Species	All Species
	225	LF	LF	LF	LF	LF	-	LF	LF
	260	HF	HF	HF	HF	HF	-	HF	HF
	125	PW	PW	PW	PW	PW	-	PW	PW
Impact Pile Driving – Concrete	20	All Species	All Species	All Species	All Species	All Species	All Species	All Species	All Species
	40	-	-	LF	-	-	-	-	-
Down-the-hole Drilling	20	All Species	All Species	All Species	All Species	All Species	All Species	All Species	All Species
	445	LF	-	LF	-	-	-	-	-
	525	HF	-	HF	-	-	-	-	-
	240	PW	-	PW	-	-	-	-	-

HF – High Frequency Cetaceans, LF – Low Frequency Cetaceans, PW – Phocid Pinnipeds

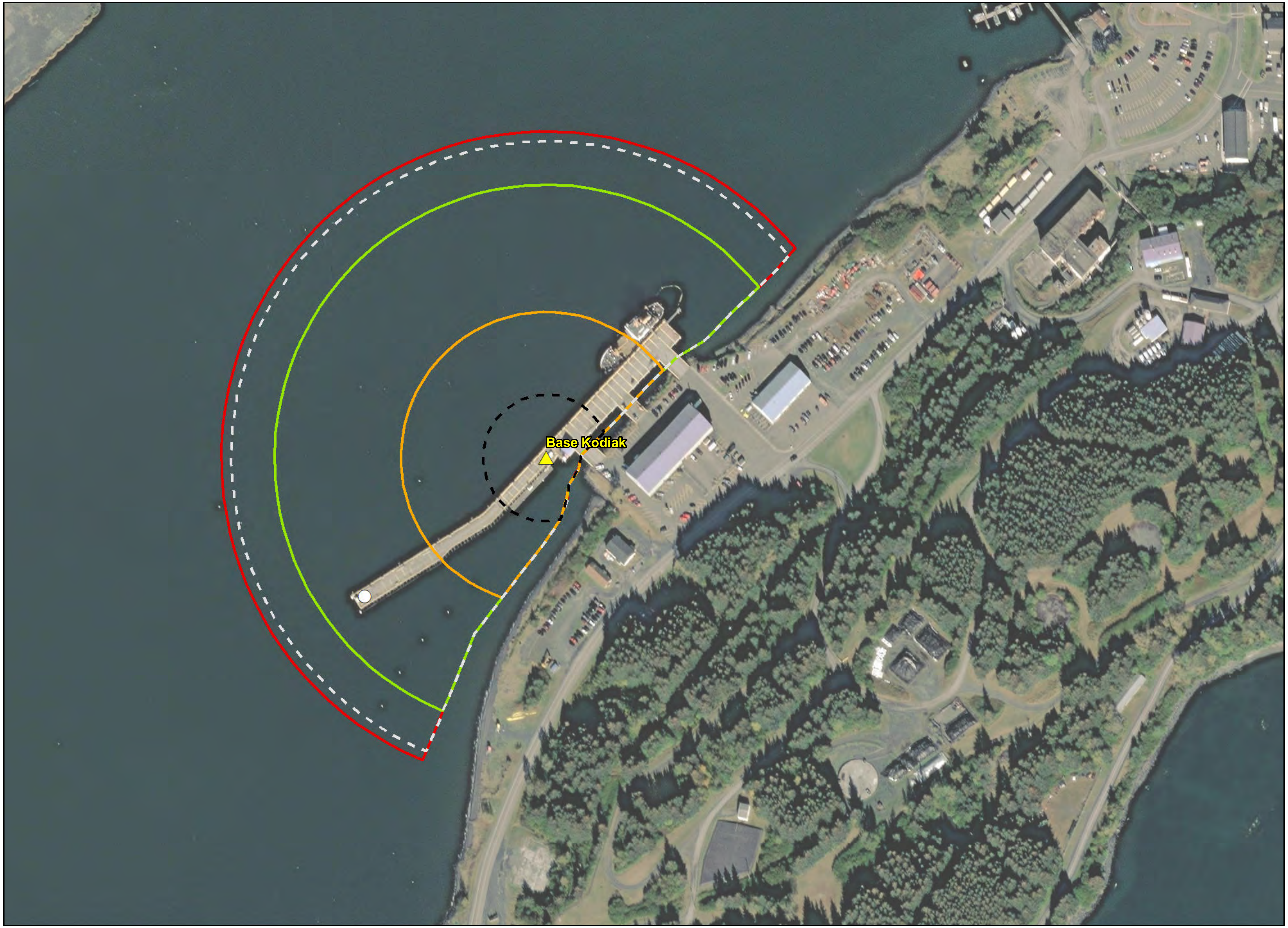

FIGURE 6-1

Level A Injury Zones for Impact Driving of Steel Piles at USCG Base Kodiak for Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
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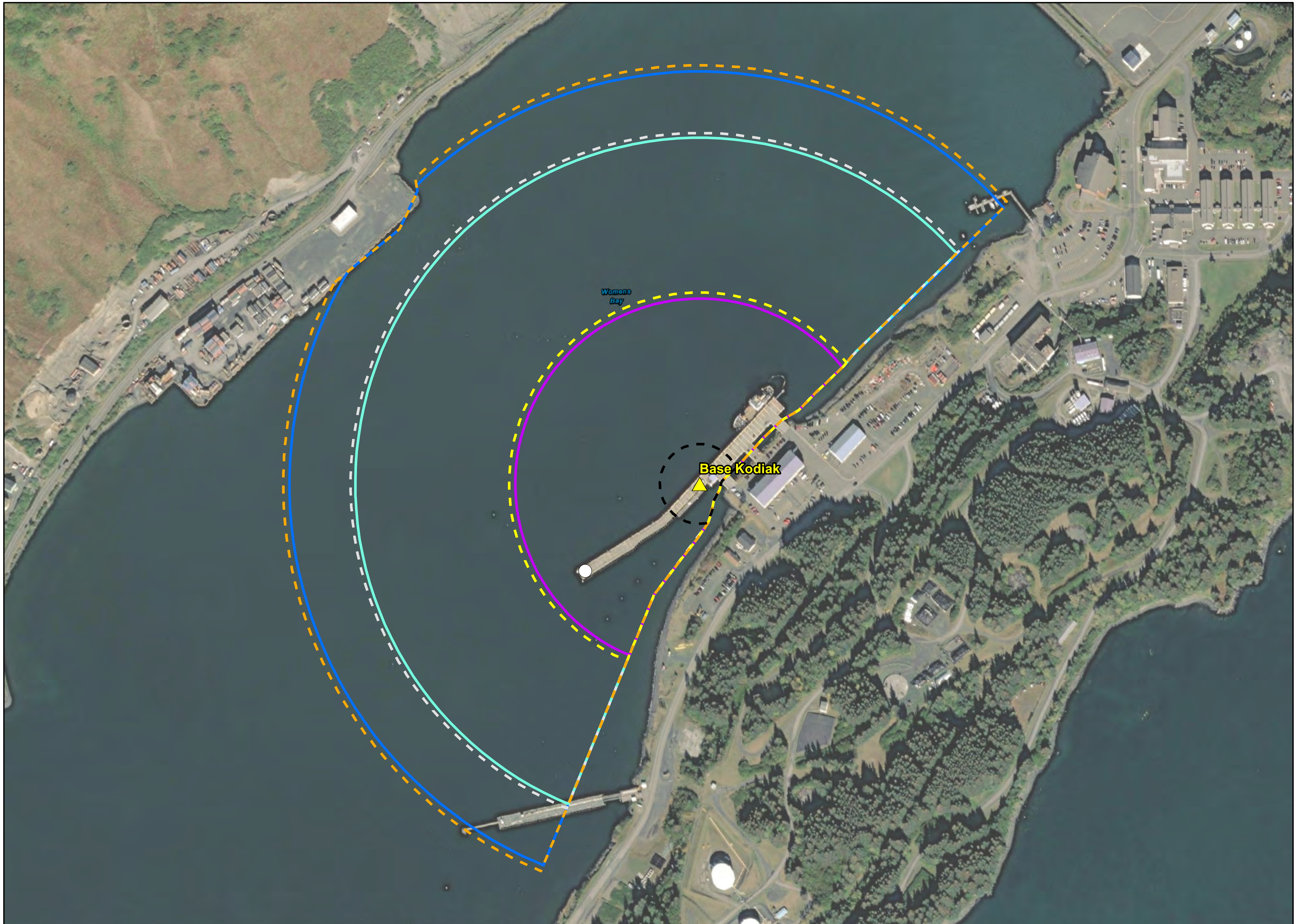

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Down-the-Hole Drilling

High Frequency Cetaceans: 517.1m

Low Frequency Cetaceans: 434.1m

Phocid Pinnipeds: 232.3m

Example Shutdown Zone

High Frequency Cetaceans: 525m

Low Frequency Cetaceans: 440m

Phocid Pinnipeds: 240m

Physical Interaction: 20m

Notes:
* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level A ZOI to be monitored.

1 inch = 400 feet

0 400 Feet

FIGURE 6-2

Level A Injury Zones for Down-the-Hole Drilling at USCG Base Kodiak for Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
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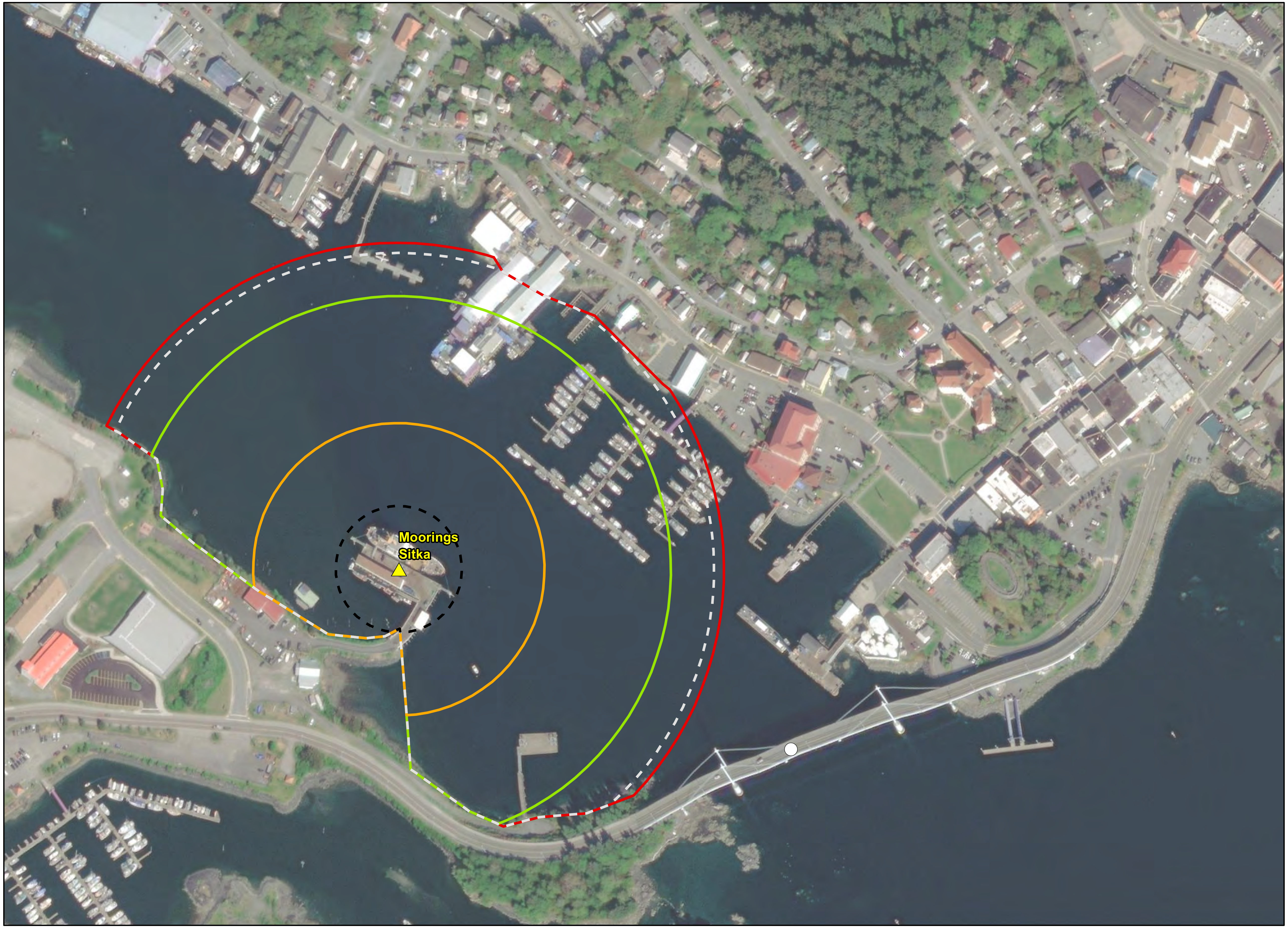

FIGURE 6-3

Level A Injury Zones for Impact Driving of Steel Piles at UCSG Moorings Sitka for Programmatic Maintenance Activities

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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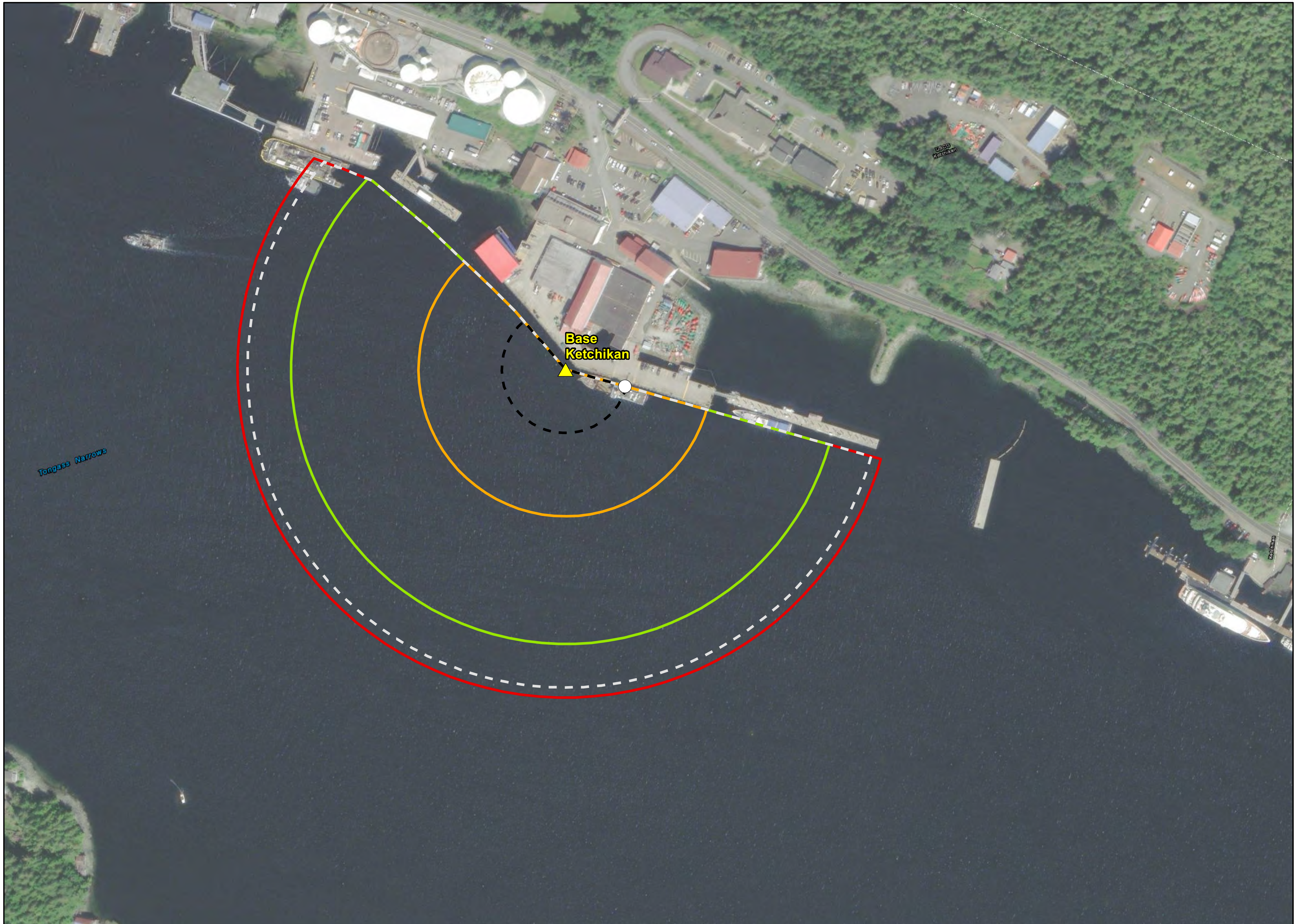

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Impact Driving- Steel Piles

High Frequency Cetaceans: 257.9m

Low Frequency Cetaceans: 215.8m

Phocid Pinnipeds: 115.5m

Notes:
* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level A ZOI to be monitored.

1 inch = 250 feet

0 250 Feet

FIGURE 6-4

Level A Injury Zones for Impact Driving of Steel Piles at USCG Base Ketchikan for Programmatic Maintenance Activities

wood.

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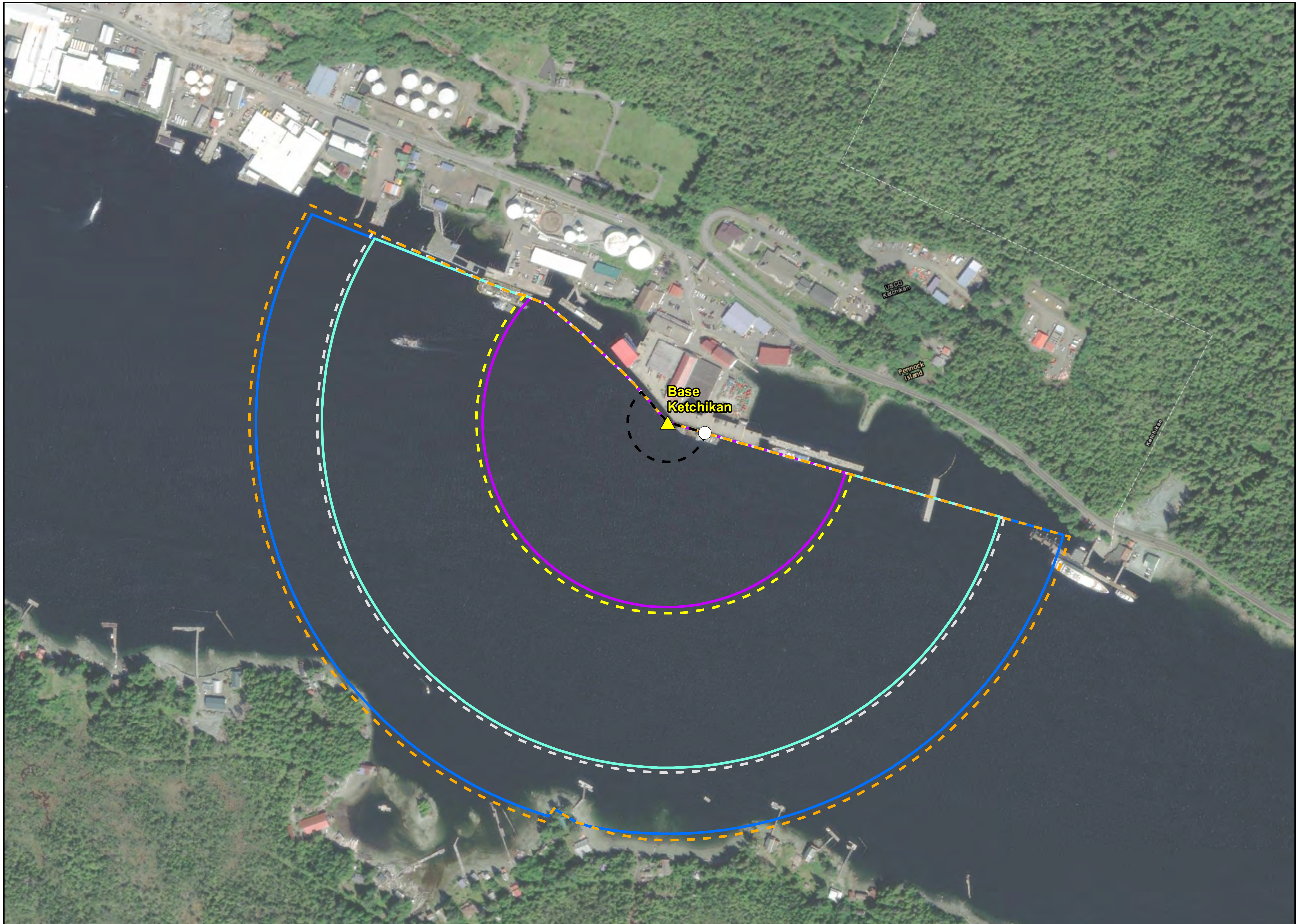

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Down-the-Hole Drilling

High Frequency Cetaceans: 517.1m

Low Frequency Cetaceans: 434.1m

Phocid Pinnipeds: 232.3m

Notes:
* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level A ZOI to be monitored.

1 inch = 400 feet

0 400 Feet

FIGURE 6-5

Level A Injury Zones for Down-the-Hole Drilling at USCG Base Ketchikan for Programmatic Maintenance Activities

wood.

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FIGURE 6-6

Level A Injury Zones for Impact Driving of Steel Piles at UCSG Moorings Valdez for Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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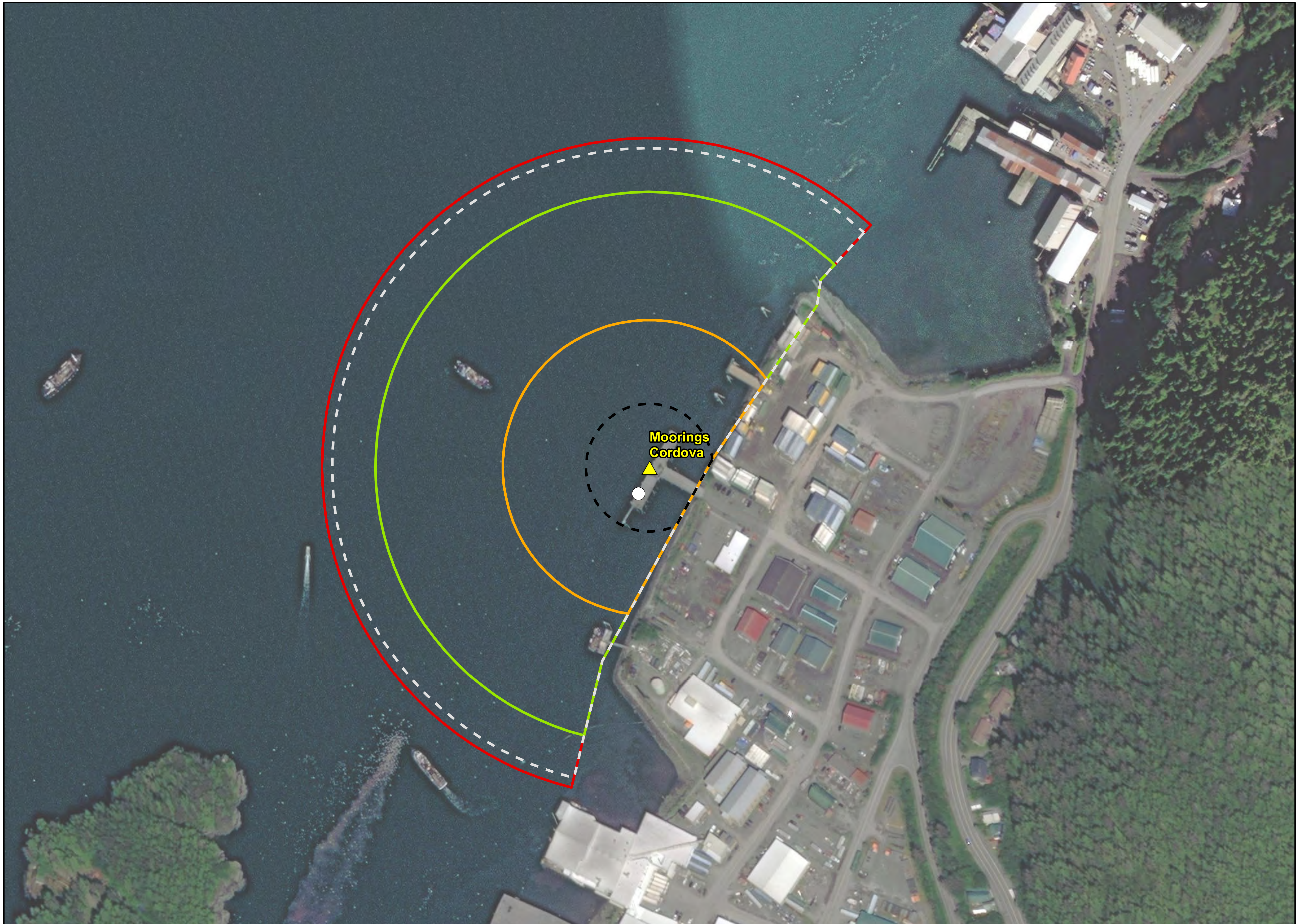

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Impact Driving- Steel Piles

High Frequency Cetaceans: 257.9m

Low Frequency Cetaceans: 215.8m

Phocid Pinnipeds: 115.5m

Notes:
* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level A ZOI to be monitored.

1 inch = 250 feet

0 250 Feet

FIGURE 6-7

Level A Injury Zones for Impact Driving of Steel Piles at UCSG Moorings Cordova for Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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FIGURE 6-8

Level A Injury Zones for Impact Driving of Steel Piles at UCSG Moorings Petersburg for Programmatic Maintenance Activities

Notes:
* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level A ZOI to be monitored.

FIGURE 6-9

Level A Injury Zones for Impact Driving of Steel Piles at UCSG Moorings Seward for Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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6.7.2 Basis for Estimating Level B Take

Potential Level B exposures would occur throughout pile repair and replacement activities if marine mammals are present within the harassment zones identified using the calculated radii (Table 6-11) and applied to the geography of each facility with exposed land, breakwaters, and other solid in-water structures creating noise shadows where sound is not transmitted. Based on this geographic analysis, site-specific areas in which Level B harassment exposures would occur vary significantly by facility. For instance, facilities located within enclosed harbors (e.g., Seward, Kodiak) have Level B harassment zones that are constrained by natural topography or human-made breakwaters, while facilities located in narrow passages (e.g., Ketchikan, Juneau) may have long, narrow harassment zones up and down their respective channels. Site-specific harassment zones for potential pile repair, removal, and installation methods are provided in the summary sections, and Figures 6-10 through 6-25 (below).

6.7.3 Base Kodiak

Base Kodiak's location within Womens Bay and separation from the larger Chiniak Bay by the Nyman Peninsula isolates sound within that waterbody and limits long-distance transmission of all sound types. Noise generated by in-water activities would generally be intercepted by the sides of Womens Bay before the sound has distance to fall off to the ambient sound level except to the southeast towards the open end of Womens Bay (Table 6-14; Figures 6-10 through 6-13).

Table 6-14 Level B Harassment Zone Areas for Pile Repair, Removal, and Installation Activities at Base Kodiak

Activity Description	***Calculated Level B Threshold Maximum Radial Distance (m)***	***Level B Harassment Zone Areal Extent (square kilometers [km²])***
Non-Impulsive[1,2]		
Vibratory Extraction/Installation – Timber	1,359	1.30
Vibratory Extraction/Installation – Timber	*3*	*0.00003*
Vibratory Extraction/Installation – Steel	6,310	4.51
Vibratory Extraction/Installation – Steel	*14*	*0.0006*
Clipper - Timber	1,792	1.65
Clipper - Timber	*4*	*0.0001*
Hydraulic Chainsaw	1,166	1.15
Hydraulic Chainsaw	*3*	*0.00003*
Impulsive[3]		
Impact Drive – Timber	46	0.006
Impact Drive – Steel	1,000	1.03
DTH Drilling – All Pile Types/Sizes[4]	13,594	4.51
DTH Drilling – All Pile Types/Sizes[4]	*29*	*0.003*

Notes:

[1] Non-impulsive distances calculated to 120 dB

[2] Italicized non-impulsive distances calculated to 160 dB for sea otter per USFWS

[3] Impulsive distances calculated to 160 dB

[4] DTH Drilling calculated to 120 dB (NMFS) and 160 dB (USFWS [gray shaded]) thresholds

6.7.4 Moorings Sitka

The Sitka moorings' location within Sitka Harbor between Japonski and Baranof islands isolates sound within that waterbody and limits long-distance transmission of all sound types. Noise generated by in-water activities would generally be intercepted to the northeast at the entrance to Sitka Harbor before the sound has distance to fall off to the ambient sound level except to the southeast towards the passage between Japonski and Baranof islands (Table 6-15; Figures 6-14 through 6-17).

Table 6-15 Level B Harassment Zone Areas for Pile Repair, Removal, and Installation Activities at Moorings Sitka

Activity Description	***Calculated Level B Threshold Maximum Radial Distance (m)***	***Level B Harassment Zone Areal Extent (square kilometers [km²])***
Non-Impulsive[1]		
Power-washing of timber and steel piles	5,412	4.5
Power-washing of timber and steel piles	*12*	*0.0005*
Vibratory Extraction/Installation – Timber	1,359	0.87
Vibratory Extraction/Installation – Timber	*3*	*0.00003*
Vibratory Extraction/Installation – Steel	6,310	5.67
Vibratory Extraction/Installation – Steel	*14*	*0.0006*
Clipper – Timber	1,792	1.29
Clipper – Timber	*4*	*0.0001*
Hydraulic Chainsaw – Timber	1,166	0.69
Hydraulic Chainsaw – Timber	*3*	*0.00003*
Impulsive[2]		
Impact Drive – Timber	46	0.007
Impact Drive – Steel	1,000	0.56

Notes:

[1] *Non-impulsive distances calculated to 120 dB*

[2] *Italicized non-impulsive distances calculated to 160 dB for sea otter per USFWS*

[3] *Impulsive distances calculated to 160 dB*

6.7.5 Base Ketchikan

Base Ketchikan's location along the East Channel of the Tongass Narrows isolates sound within that waterbody and long-distance transmission of all sound types except along the axis of the Narrows to the north and south. Noise generated by in-water activities would generally be intercepted by the opposite side of the Tongass Narrows (Pennock Island) but would propagate until falling off to ambient levels along the Narrows to the north and south (Table 6-16; Figures 6-18 through 6-21).

Table 6-16 Level B Harassment Zone Areas for Pile Repair, Removal, and Installation Activities at Base Ketchikan

Activity Description	***Calculated Level B Threshold Maximum Radial Distance (m)***	***Level B Harassment Zone Areal Extent (square kilometers [km^2])***
Non-Impulsive[1,2]		
Power-washing of timber and steel piles	5,412	6.51
Power-washing of timber and steel piles	*12*	*0.0003*
Vibratory Extraction/Installation – Timber	1,359	1.45
Vibratory Extraction/Installation – Timber	*3*	*0.00003*
Vibratory Extraction/Installation – Steel	6,310	7.29
Vibratory Extraction/Installation – Steel	*14*	*0.0004*
Clipper – Timber	1,792	1.9
Clipper – Timber	*4*	*0.00003*
Clipper - Concrete	5,580	6.66
Clipper – Concrete		
Hydraulic Chainsaw – Timber	1,166	1.26
Hydraulic Chainsaw – Timber	*3*	*0.00003*
Diamond Wire Saw – Concrete	5,843	6.88
Diamond Wire Saw - Concrete	*13*	*0.0003*
Impulsive[3]		
Impact Drive – Timber	46	0.004
Impact Drive – Steel	1,000	1.06
Impact Drive – Concrete	46	0.004
DTH Drilling – All Pile Types/Sizes[4]	13,594	10.1
DTH Drilling – All Pile Types/Sizes[4]	*29*	*0.002*

Notes:

[1] *Non-impulsive distances calculated to 120 dB*

[2] *Italicized non-impulsive distances calculated to 160 dB for sea otter per USFWS*

[3] *Impulsive distances calculated to 160 dB*

[4] *DTH Drilling calculated to 120 dB (NMFS) and 160 dB (USFWS [gray shaded]) thresholds*

6.7.6 Moorings Valdez

The Valdez moorings' location outside Valdez Harbor, directly on the Valdez Arm of Prince William Sound allows for all sound to propagate out into the Valdez Arm up to distances where it falls off to ambient levels (Table 6-17; Figures 6-22 through 6-25).

Table 6-17 Level B Harassment Zone Areas for Pile Repair, Removal, and Installation Activities at Moorings Valdez

Activity Description	*Calculated Level B Threshold Maximum Radial Distance (m)*	*Level B Harassment Zone Areal Extent (square kilometers [km^2])*
Non-Impulsive[1,2]		
Power-washing of timber and steel piles	5,412	34.38
Power-washing of timber and steel piles	*12*	*0.0005*
Vibratory Extraction/Installation – Timber	1,359	2.62
Vibratory Extraction/Installation – Timber	*3*	*0.00003*
Vibratory Extraction/Installation – Steel	6,310	40.21
Vibratory Extraction/Installation – Steel	*14*	*0.0006*
Clipper – Timber	1,792	4.48
Clipper – Timber	*4*	*0.0001*
Hydraulic Chainsaw – Timber	1,166	1.95
Hydraulic Chainsaw - Timber	*3*	*0.00003*
Impulsive[3]		
Impact Drive – Timber	46	0.007
Impact Drive – Steel	1,000	1.43

Notes:

[1] *Non-impulsive distances calculated to 120 dB*

[2] *Italicized non-impulsive distances calculated to 160 dB for sea otter per USFWS*

[3] *Impulsive distances calculated to 160 dB*

6.7.7 Moorings Cordova

The Cordova moorings' location on Orca Inlet immediately across the Inlet from Hawkins Island restricts in-water sound transmission to the axis of the inlet. Noise generated by in-water activities would generally be intercepted by Hawking Island directly across Orca Inlet before the sound has distance to fall off to the ambient sound level except to the north and south where sound would be propagated until it fell off to ambient levels (Table 6-18; Figures 6-26 through 6-29).

Table 6-18 Level B Harassment Zone Areas for Pile Repair, Removal, and Installation Activities at Moorings Cordova

Activity Description	*Calculated Level B Threshold Maximum Radial Distance (m)*	*Level B Harassment Zone Areal Extent (square kilometers [km²])*
Non-Impulsive[1,2]		
Vibratory Extraction/Installation – Steel	6,310	23.42
Vibratory Extraction/Installation - Steel	*14*	*0.0006*
Impulsive[3]		
Impact Drive – Steel	1,000	1.57

Notes:

[1] *Non-impulsive distances calculated to 120 dB*

[2] *Italicized non-impulsive distances calculated to 160 dB for sea otter per USFWS*

[3] *Impulsive distances calculated to 160 dB*

6.7.8 Station Juneau

Station Juneau's location on the south side of the City of Juneau and the north side of the Gastineau Channel isolates sound generally within Juneau Harbor which limits long-distance transmission of all sound types. Noise generated by in-water activities would generally be intercepted by the sides of the Gastineau Channel before the sound can fall off to the ambient sound level except to the southeast along the axis of the Gastineau Channel (Table 6-19; Figures 6-30 through 6-33).

Table 6-19 Level B Harassment Zone Areas for Pile Repair, Removal, and Installation Activities at Station Juneau

Activity Description	*Calculated Level B Threshold Maximum Radial Distance (m)*	*Level B Harassment Zone Areal Extent (square kilometers [km²])*
Non-Impulsive[1,2]		
Power-washing of timber and steel piles	5,412	3.31
Power-washing of timber and steel piles	*12*	*0.0002*
Vibratory Extraction/Installation – Timber	1,359	1.62
Vibratory Extraction/Installation – Timber	*3*	*0.00001*
Clipper – Timber	1,792	1.95
Clipper – Timber	*4*	*0.00003*
Hydraulic Chainsaw – Timber	1,166	1.43
Hydraulic Chainsaw – Timber	*3*	*0.00001*
Impulsive[3]		
Impact Drive – Timber	46	0.003

Notes:

[1] *Non-impulsive distances calculated to 120 dB*

[2] *Italicized non-impulsive distances calculated to 160 dB for sea otter per USFWS*

[3] *Impulsive distances calculated to 160 dB*

6.7.9 Moorings Petersburg

The Petersburg moorings' location southwest of the meeting of the Wrangell Narrows and Frederick Sound generally isolates sound within that waterbody except for some sound which would transit into the Frederick Sound (Table 6-20; Figures 6-34 through 6-37).

Table 6-20 Level B Harassment Zone Areas for Pile Repair, Removal, and Installation Activities at Moorings Petersburg

Activity Description	*Calculated Level B Threshold Maximum Radial Distance (m)*	*Level B Harassment Zone Areal Extent (square kilometers [km²])*
Non-Impulsive[1,2]		
Power-washing of timber and steel piles	5,412	2.59
Power-washing of timber and steel piles	*12*	*0.0005*
Vibratory Extraction/Installation – Timber	1,359	1.63
Vibratory Extraction/Installation – Timber	*3*	*0.00003*
Vibratory Extraction/Installation – Steel	6,310	2.89
Vibratory Extraction/Installation – Steel	*14*	*0.0006*
Clipper – Timber	1,792	1.78
Clipper – Timber	*4*	*0.0001*
Hydraulic Chainsaw – Timber	1,166	1.48
Hydraulic Chainsaw - Timber	*3*	*0.00003*
Impulsive[3]		
Impact Drive – Timber	46	0.006
Impact Drive – Steel	1,000	1.33

Notes:

[1] *Non-impulsive distances calculated to 120 dB*

[2] *Italicized non-impulsive distances calculated to 160 dB for sea otter per USFWS*

[3] *Impulsive distances calculated to 160 dB*

6.7.10 Moorings Seward

The Seward moorings' location within Seward Harbor and separation from the larger Resurrection Bay by the harbor walls/breakwaters isolates sound within the harbor and limits long-distance transmission of all sound types, intercepting sound before it has distance to fall off to ambient sound levels (Table 6-21; Figures 6-38 through 6-41).

Table 6-21 Level B Harassment Zone Areas for Pile Repair, Removal, and Installation Activities at Moorings Seward

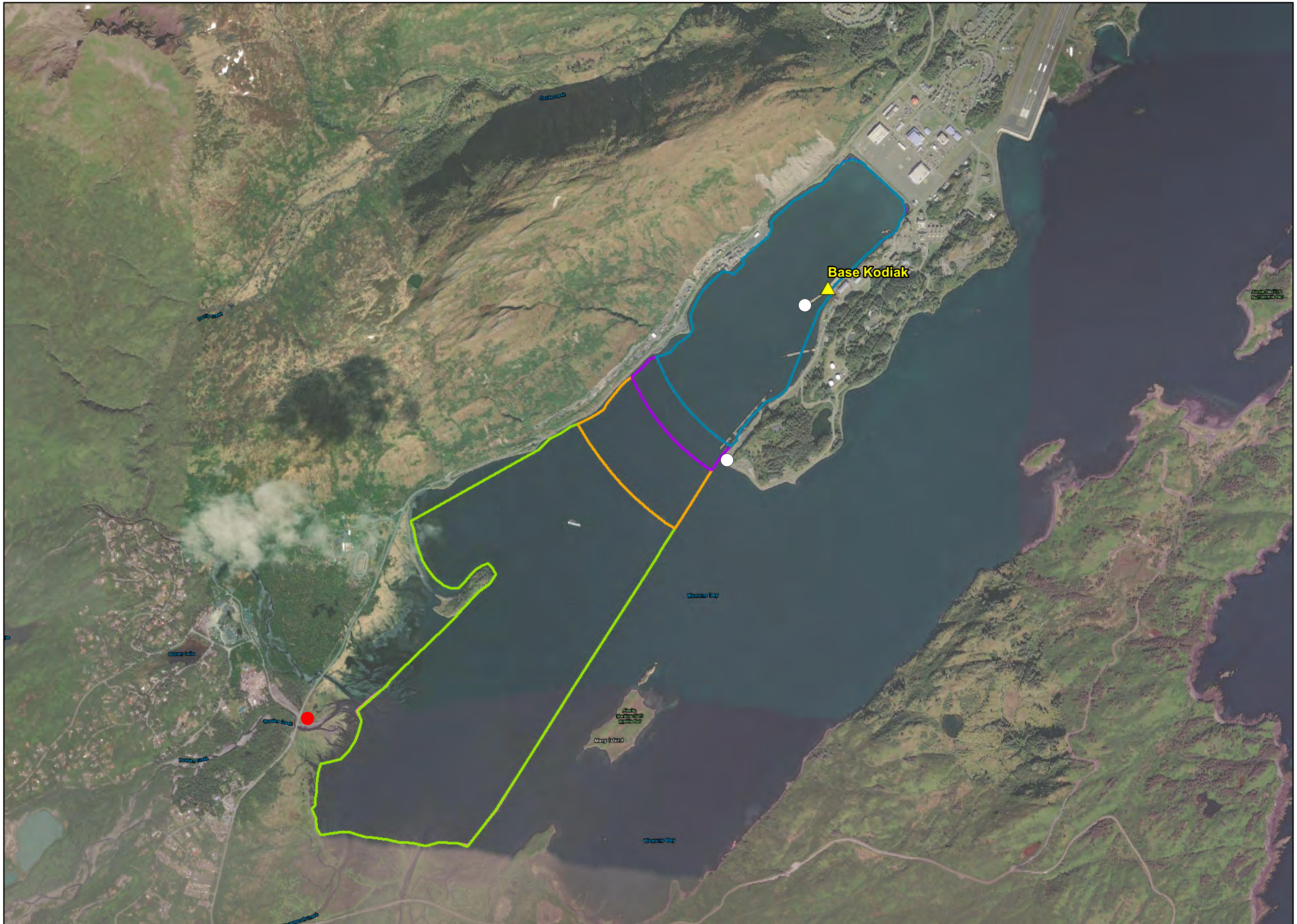
Activity Description	*Calculated Level B Threshold Maximum Radial Distance (m)*	*Level B Harassment Zone Areal Extent (square kilometers [km²])*
Non-Impulsive[1,2]		
Vibratory Extraction/Installation – Steel	6,310	0.24
Vibratory Extraction/Installation - Steel	*14*	*0.0002*
Impulsive[3]		
Impact Drive – Steel	1,000	0.24

Notes:

[1] *Non-impulsive distances calculated to 120 dB*

[2] *Italicized non-impulsive distances calculated to 160 dB for sea otter per USFWS*

[3] *Impulsive distances calculated to 160 dB*



Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Power Washing/Pile Removal

24-inch Pile Clipper- Timber: 1,792m (153.8 dB RMS)

Hydraulic Chainsaw: 1,166m (151 dB RMS)

Power Washing of Timber and Steel Piles: 5,412m (161 dB RMS)

Vibratory Extraction and Installation- Steel: 6,310m (162 dB RMS)

Vibratory Extraction and Installation- Timber: 1,359m (152 dB RMS)

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 2,000 feet

0 2,000 Feet

FIGURE 6-10

USCG Base Kodiak Pile Removal
Distance to Level B Threshold for
NMFS-Managed Species for
Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
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FIGURE 6-11

USCG Base Kodiak Pile Removal Distance to Level B Threshold for USFWS-Managed Species for Programmatic Maintenance Activities

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
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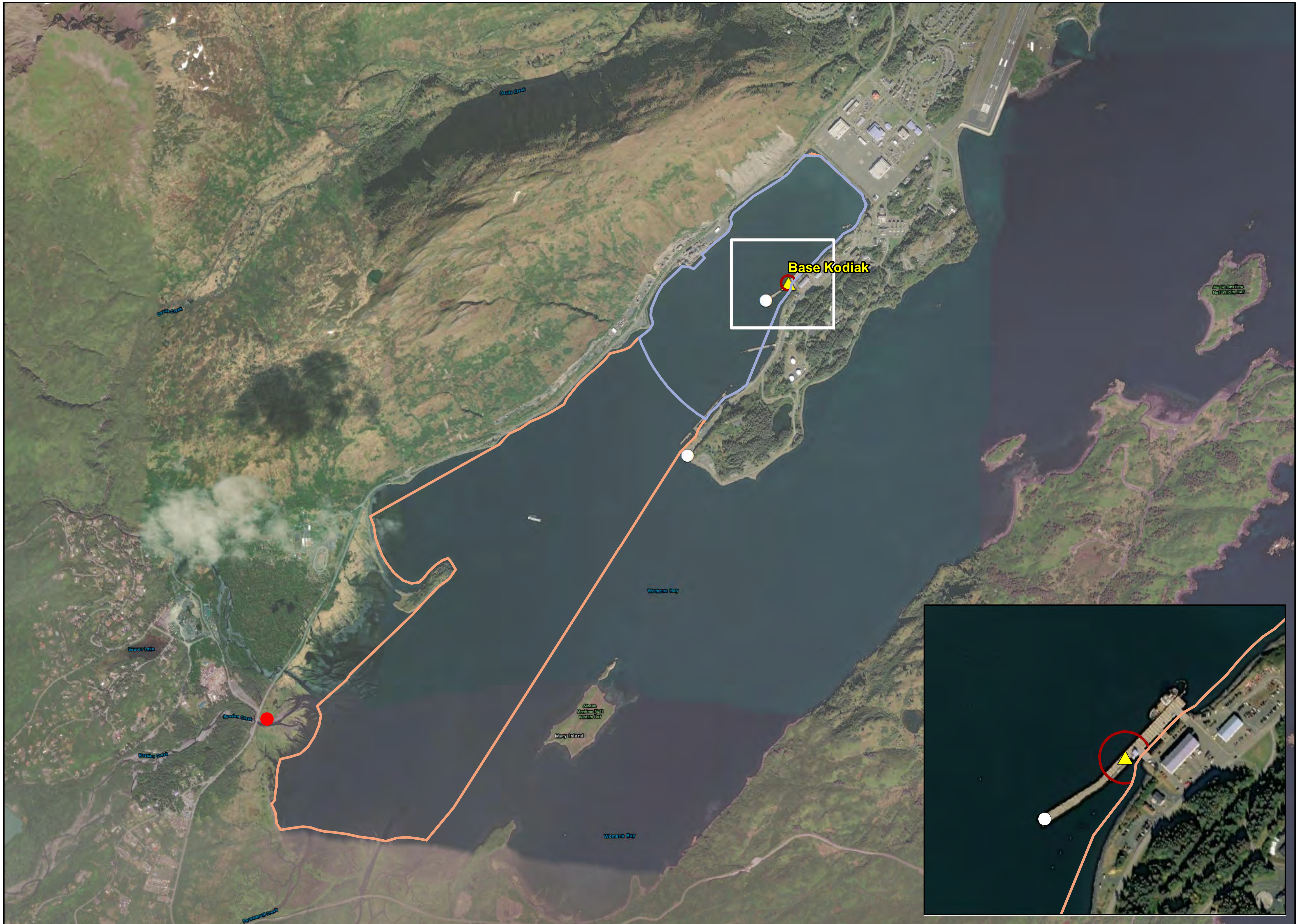

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Pile Installation

DTH Drill- Non-Impulsive: 13,594m (167 dB RMS)

Impact Driver- Steel: 1,000m (190 dB RMS)

Impact Driver- Timber: 46m (170 dB RMS)

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 2,000 feet

0 2,000 Feet

FIGURE 6-12

USCG Base Kodiak Pile Installation Distance to Level B Threshold for NMFS-Managed Species for Programmatic Maintenance Activities

wood.

Path: \\sdg1-fs1\GIS\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\Fig6_2_NoiseZOI_PileInstallation_Kodiak.mxd, catharine.harwin, 5/19/2021

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Physical Interaction Shutdown Zone

Pile Installation

DTH Drive- All Pile Types and Sizes: 29.3m (167 dB RMS)

Impact Driver- Steel: 1,000m (190 dB RMS)

Impact Driver- Timber: 46m (170 dB RMS)

Notes:
* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 1,000 feet

0 1,000 Feet

FIGURE 6-13

USCG Base Kodiak Pile Installation
Distance to Level B Threshold
Biological Assessment for
Programmatic Maintenance Activities

wood.

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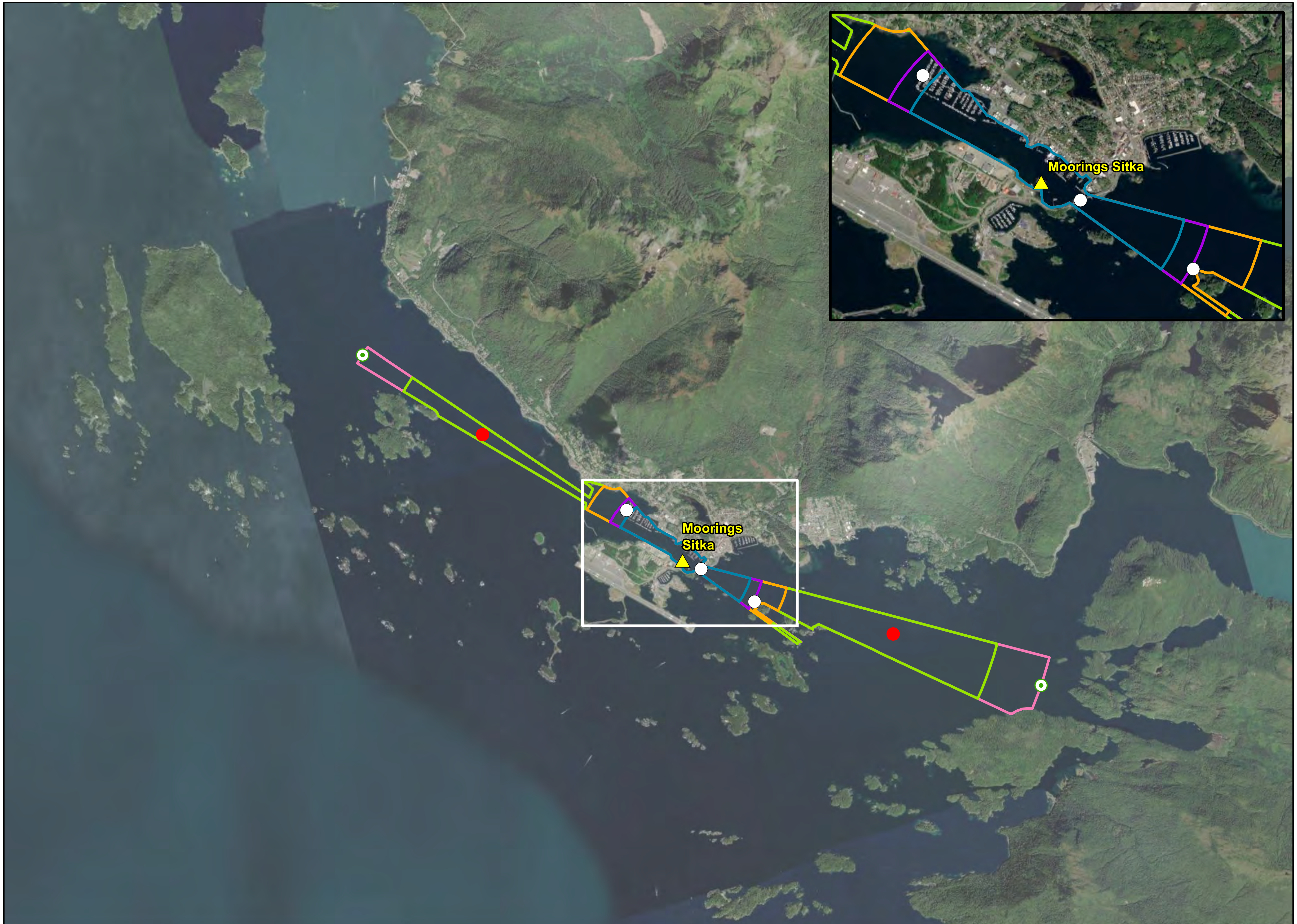

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Provisional PSO Location **

Power Washing/Pile Removal

24-inch Pile Clipper- Timber: 1,792m (153.8 dB RMS)

Hydraulic Chainsaw: 1,166m (151 dB RMS)

Power Washing of Timber and Steel Piles: 5,412m (161 dB RMS)

Vibratory Extraction and Installation- Steel: 6,310m (162 dB RMS)

Vibratory Extraction and Installation- Timber: 1,359m (152 dB RMS)

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

** Use of provisional PSOs would be limited only to those noise generating, in-water activities thatwould result in the largest ZOI's (i.e., power washing of piles to facilitate repairs).

1 inch = 1 miles

0 1 Miles

FIGURE 6-14

USCG Moorings Sitka Pile Removal Distance to Level B Threshold for NMFS-Managed Species for Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Physical Interaction Shutdown Zone

Power Washing/Pile Removal

24-inch Pile Clipper - Timber: 4m (153.8 db RMS)

Power Washing of Timber and Steel Piles: 12m (161.0 dB RMS)

Vibratory Extraction and Installation - Steel: 14m (162.0 dB RMS)

Vibratory Extraction and Installation - Timber: 3m (153 dB RMS)

Hydraulic Chainsaw: 3m (151.0 dB RMS)

Sea Otter Abundance

High : 0.322442

Low : 0.1464

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

** Use of provisional PSOs would be limited only to those noise generating, in-water activities thatwould result in the largest ZOI's (i.e., power washing of piles to facilitate repairs).

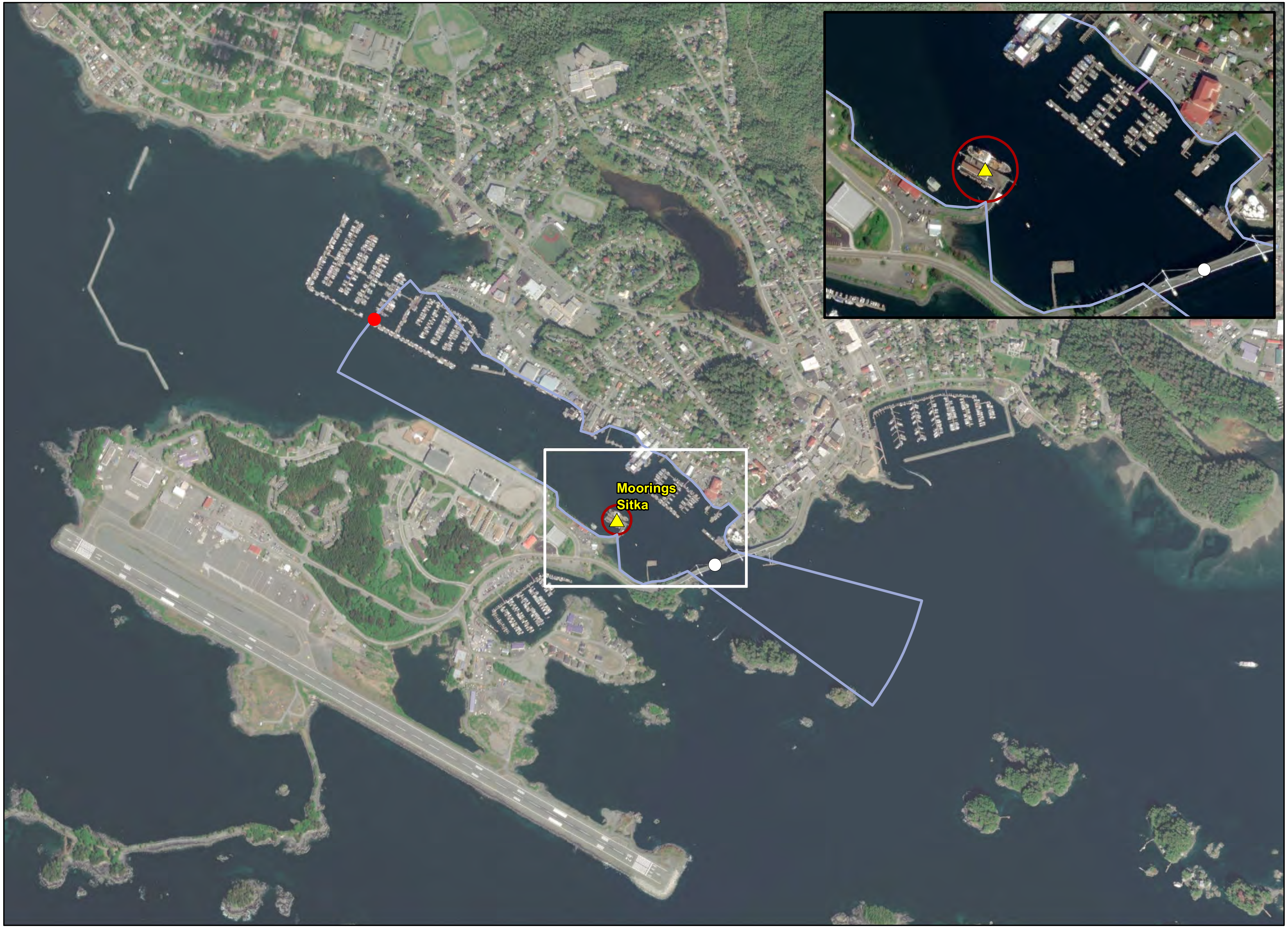
1 inch = 500 feet

0 500 Feet

FIGURE 6-15

USCG Moorings Sitka Pile Removal Distance to Level B Threshold for USFWS-Managed Species for Programmatic Maintenance Activities

Path: \\sdg1-fs1\gis\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\SeaOtter_ZOI\Fig6_28_NoiseZOI_PileRemoval_Sitka.mxd, aaron.johnson, 9/17/2021



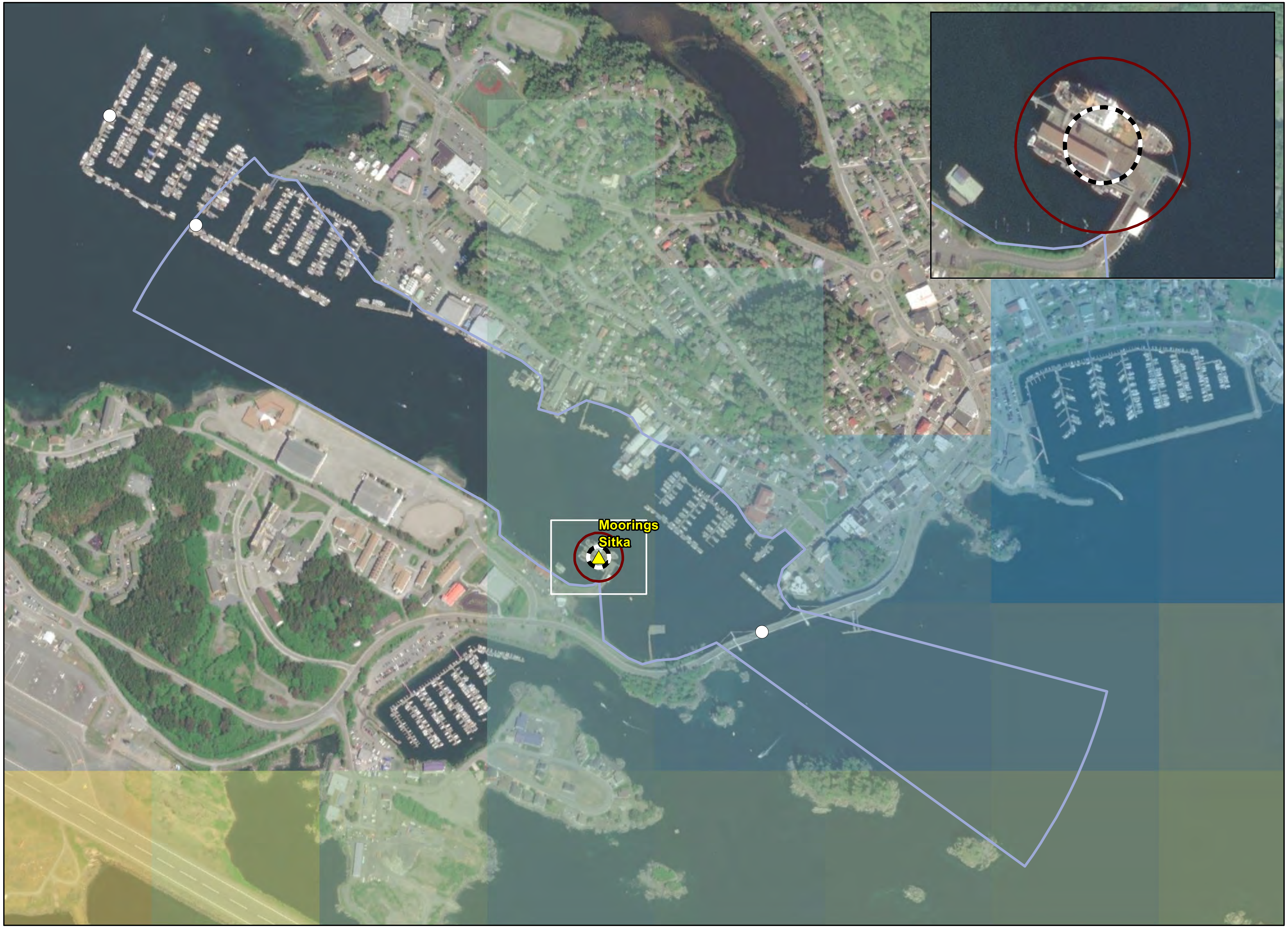
Notes:
* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

FIGURE 6-16

USCG Moorings Sitka Pile Installation Distance to Level B Threshold for NMFS-Managed Species for Programmatic Maintenance Activities

wood.

Path: \\sdg1-fs1\GIS\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\Fig6_4_NoiseZOI_PileInstallation_Sitka.mxd, catharine.harwin, 2/16/2021



Notes:
* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

FIGURE 6-17
USCG Moorings Sitka Pile Installation Distance to Level B Threshold for USFWS-Managed Species for Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\sdg1-fs1\gis\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\SeaOtter_ZOI\Fig6_29_NoiseZOI_PileInstallation_Sitka.mxd, aaron.johnson, 9/17/2021

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Provisional PSO Location **

Power Washing/Pile Removal

24-inch Pile Clipper- Timber: 1,792m (153.8 dB RMS)

30-inch Pile Clipper- Concrete: 5,580m (161.2 dB RMS)

Diamond Wire Saw: 5,843m (161.5 dB RMS)

Hydraulic Chainsaw: 1,166m (151 dB RMS)

Power Washing of Timber and Steel Piles: 5,412m (161 dB RMS)

Vibratory Extraction and Installation- Steel: 6,310m (162 dB RMS)

Vibratory Extraction and Installation- Timber: 1,359m (152 dB RMS)

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

** Use of provisional PSOs would be limited only to those noise generating, in-water activities thatwould result in the largest ZOI's (i.e., power washing of piles to facilitate repairs).

1 inch = 1 miles

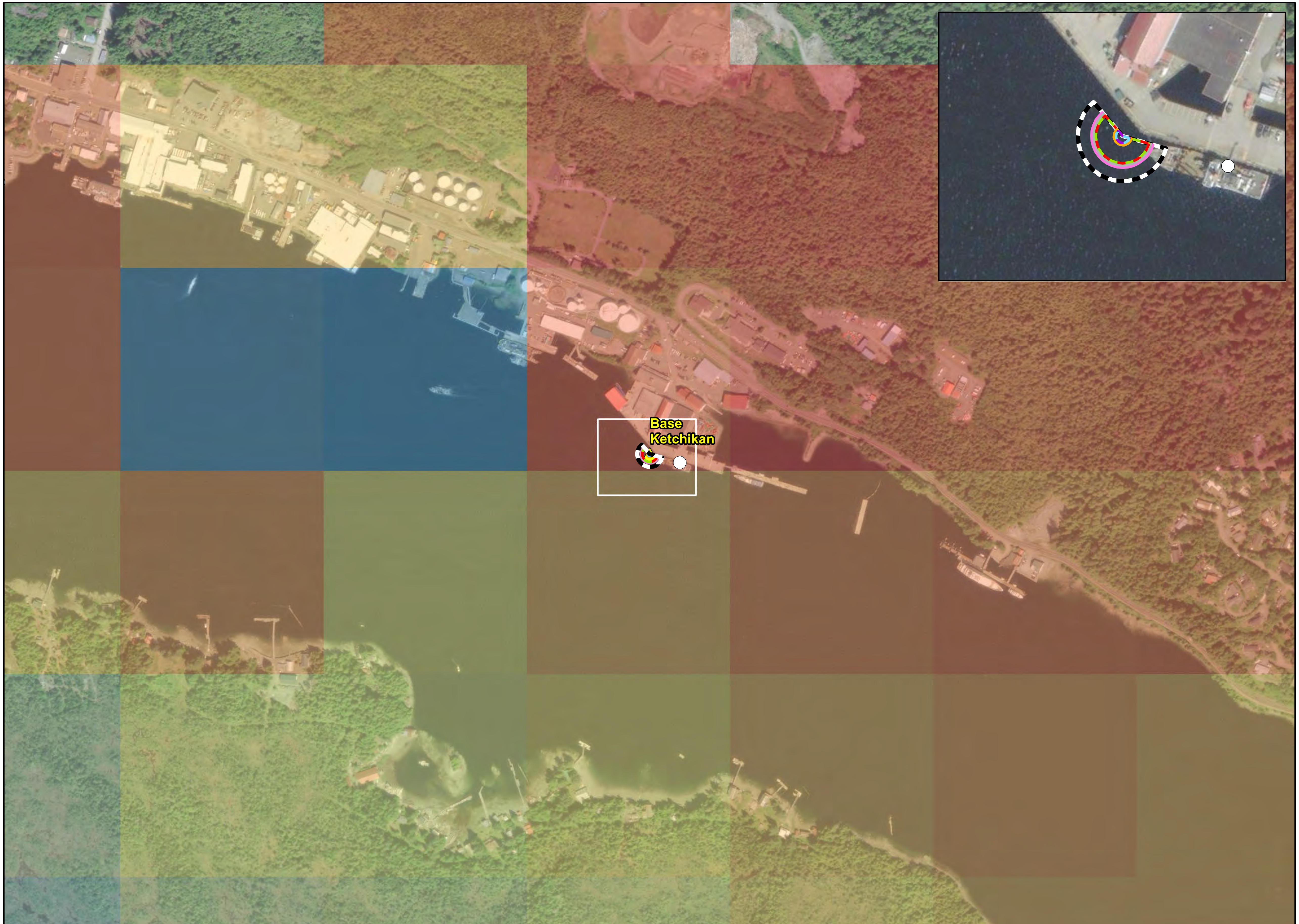
0 1 Miles

FIGURE 6-18

USCG Base Ketchikan Pile Removal
Distance to Level B Threshold for
NMFS-Managed Species for
Programmatic Maintenance Activities

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\sdg1-fs1\GIS\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\Fig6_5_NoiseZOI_PileRemoval_Ketchikan.mxd, catharine.harwin, 5/19/2021



Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Physical Interaction Shutdown Zone

Power Washing/Pile Removal

24-inch Pile Clipper - Timber: 4m (153.8 db RMS)

Diamond Wire Saw: 13m (161.5 dB RMS)

Power Washing of Timber and Steel Piles: 12m (161.0 dB RMS)

Vibratory Extraction and Installation - Steel: 14m (162.0 dB RMS)

Vibratory Extraction and Installation - Timber: 3m (153 dB RMS)

30-inch Pile Clipper- Concrete: 12m (161.2 dB RMS)

Hydraulic Chainsaw: 3m (151.0 dB RMS)

Sea Otter Abundance

High : 0.271961

Low : 0.134922

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

** Use of provisional PSOs would be limited only to those noise generating, in-water activities thatwould result in the largest ZOI's (i.e., power washing of piles to facilitate repairs).

1 inch = 500 feet

0 500 Feet

FIGURE 6-19

USCG Base Ketchikan Pile Removal Distance to Level B Threshold for USFWS-Managed Species for Programmatic Maintenance Activities

wood.

Path: \\sdg1-fs1\gis\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\SeaOtter_ZOI\Fig6_30_NoiseZOI_PileRemoval_Ketchikan.mxd, aaron.johnson, 9/17/2021

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Pile Installation

DTH Drill- Non-Impulsive: 13,594m (167 dB RMS)

Impact Driver- Concrete: 46m (170 dB RMS)

Impact Driver- Steel: 1,000m (190 dB RMS)

Impact Driver- Timber: 46m (170 dB RMS)

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 1 miles

0 1 Miles

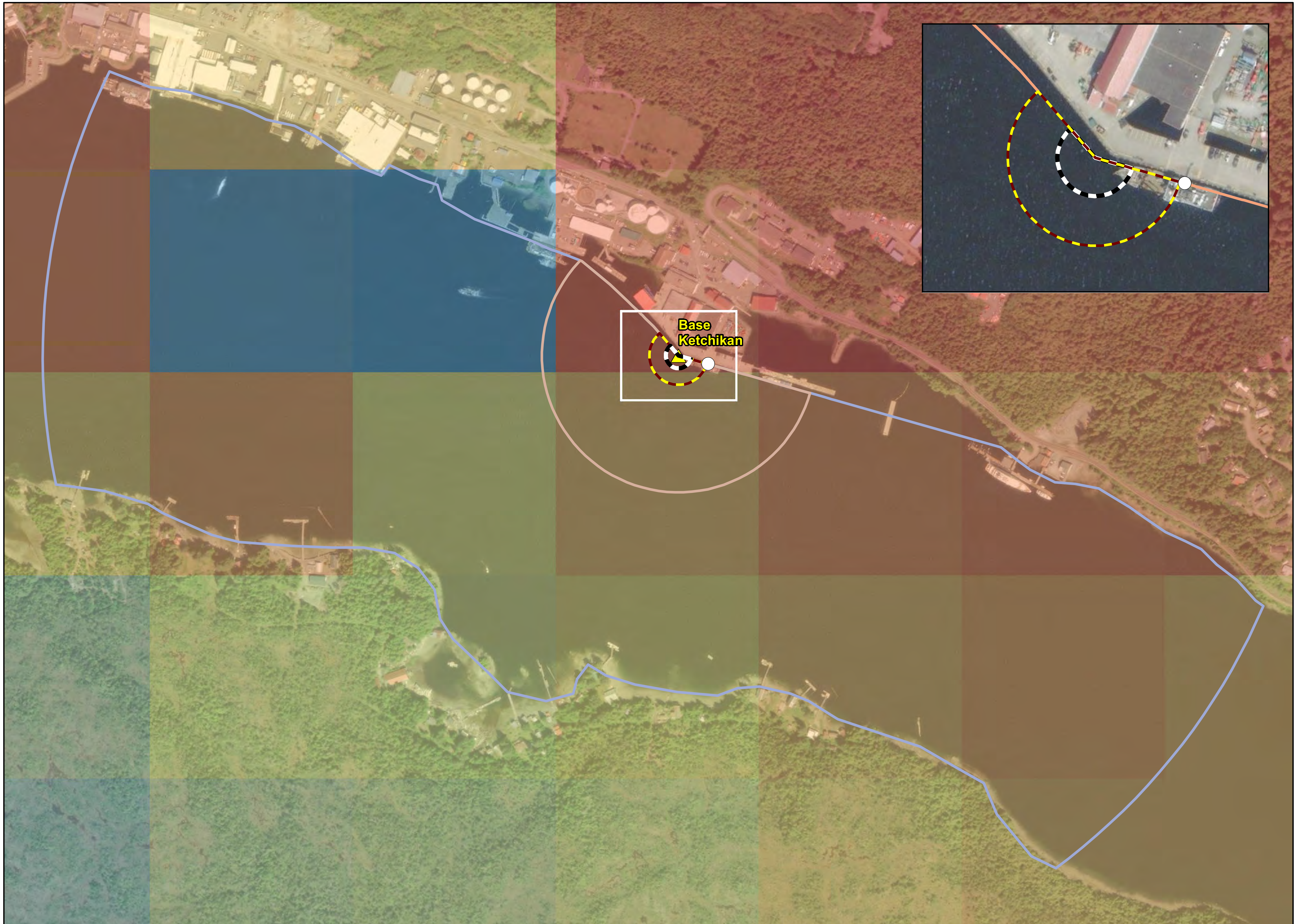
FIGURE 6-20

USCG Base Ketchikan Pile Installation Distance to Level B Threshold for NMFS-Managed Species for Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\sdg1-fs1\GIS\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\Fig6_6_NoiseZOI_PileInstallation_Ketchikan.mxd, catharine.harwin, 5/19/2021



Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Physical Interaction Shutdown Zone

Pile Installation

DTH Drive - All Pile Types and Sizes: 215m (166 dB RMS)

Impact Driver - Steel: 1,000m (190 dB RMS)

Impact Driver - Timber: 46m (170 dB RMS)

Impact Driver - Concrete: 46m (170dB RMS)

Sea Otter Abundance

High : 0.271961

Low : 0.134922

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 500 feet

0 500 Feet

FIGURE 6-21

USCG Base Ketchikan Pile Installation Distance to Level B Threshold for USFWS-Managed Species for Programmatic Maintenance Activities

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\sdg1-fs1\gis\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\SeaOtter_ZOI\Fig6_31_NoiseZOI_PileInstallation_Ketchikan.mxd, aaron.johnson, 9/17/2021

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Power Washing/Pile Removal

24-inch Pile Clipper- Timber: 1,792m (153.8 dB RMS)

Hydraulic Chainsaw: 1,166m (151 dB RMS)

Power Washing of Timber and Steel Piles: 5,412m (161 dB RMS)

Vibratory Extraction and Installation- Steel: 6,310m (162 dB RMS)

Vibratory Extraction and Installation- Timber: 1,359m (152 dB RMS)

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

** Use of provisional PSOs would be limited only to those noise generating, in-water activities thatwould result in the largest ZOI's (i.e., power washing of piles to facilitate repairs).

1 inch = 3,500 feet

0 3,500 Feet

FIGURE 6-22

USCG Moorings Valdez Pile Removal Distance to Level B Threshold for NMFS-Managed Species for Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user

Path: \\sdg1-fs1\GIS\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\Fig6_7_NoiseZOI_PileRemoval_Valdez.mxd, catharine.harwin, 2/16/2021

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Physical Interaction Shutdown Zone

Power Washing/Pile Removal

24-inch Pile Clipper - Timber: 4m (153.8 db RMS)

Power Washing of Timber and Steel Piles: 12m (161.0 dB RMS)

Vibratory Extraction and Installation - Steel: 14m (162.0 dB RMS)

Vibratory Extraction and Installation - Timber: 3m (153 dB RMS)

Hydraulic Chainsaw: 3m (151.0 dB RMS)

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

** Use of provisional PSOs would be limited only to those noise generating, in-water activities thatwould result in the largest ZOI's (i.e., power washing of piles to facilitate repairs).

1 inch = 700 feet

0 700 Feet

FIGURE 6-23

USCG Moorings Valdez Pile Removal
Distance to Level B Threshold
Biological Assessment for
Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user

Path: \\sdg1-fs1\gis\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\SeaOtter_ZOI\Fig6_32_NoiseZOI_PileRemoval_Valdez.mxd, aaron.johnson, 9/17/2021

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Pile Installation

Impact Driver- Steel: 1,000m (190 dB RMS)

Impact Driver- Timber: 46m (170 dB RMS)

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 600 feet

0 800 Feet

FIGURE 6-24

USCG Moorings Valdez Pile Installation Distance to Level B Threshold for NMFS-Managed Species for Programmatic Maintenance Activities

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user

Path: \\sdg1-fs1\GIS\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\Fig6_8_NoiseZOI_PileInstallation_Valdez.mxd, catharine.harwin, 5/19/2021

Waterfront Facilities

Protected Species Observer (PSO) Location *

Physical Interaction Shutdown Zone

Pile Installation

Impact Driver - Steel: 1,000m (190 dB RMS)

Impact Driver - Timber: 46m (170 dB RMS)

Notes:
* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 1,000 feet

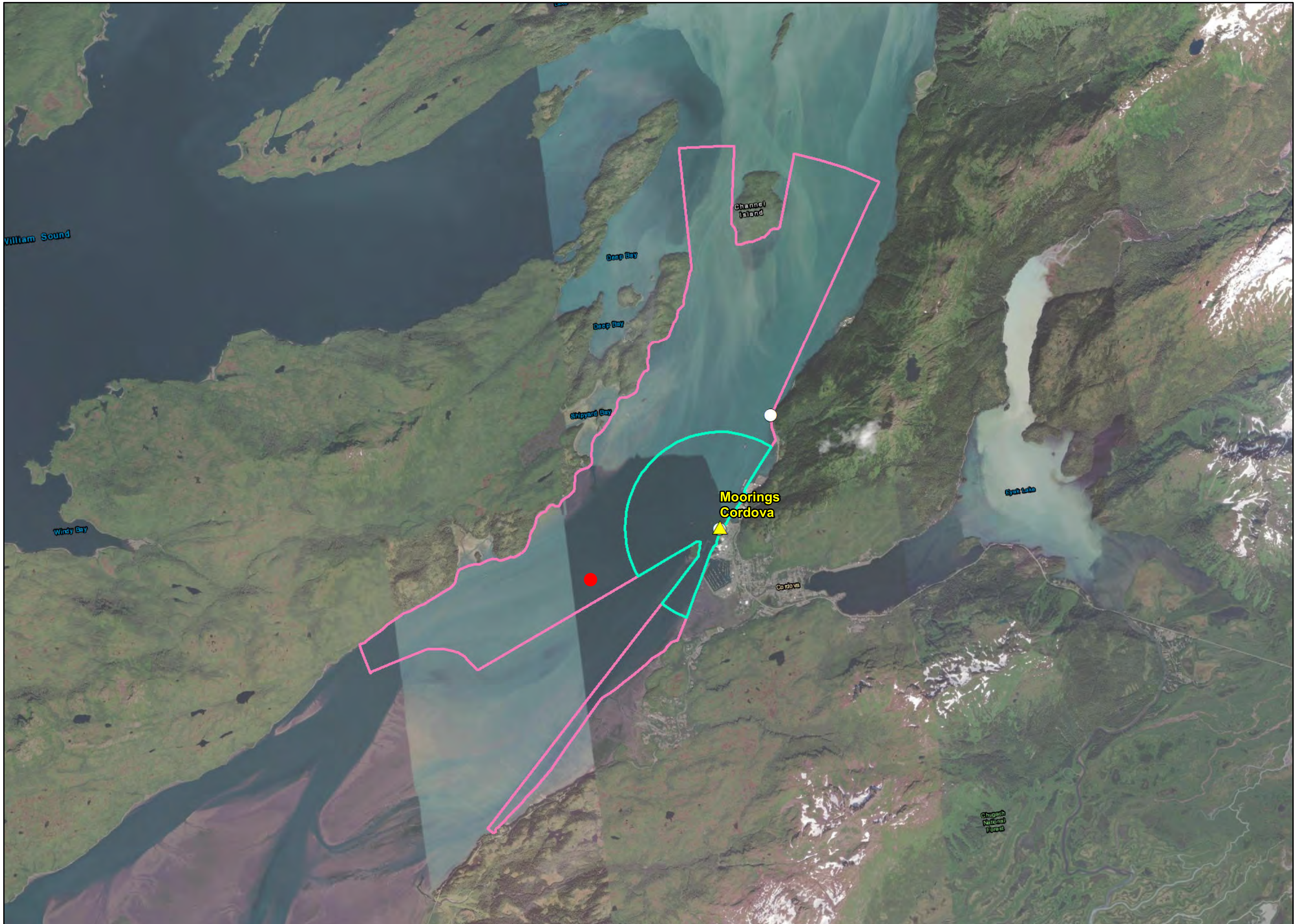
0 1,000 Feet

FIGURE 6-25

USCG Moorings Valdez Pile Installation Distance to Level B Threshold for Programmatic Maintenance Activities

wood.

Path: \\sdg1-fs1\gis\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\SeaOtter_ZOI\Fig6_33_NoiseZOI_PileInstallation_Valdez.mxd, aaron.johnson, 9/17/2021



Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Power Washing/Pile Removal

Vibratory Extraction and Installation- Steel H-Pile: 1,585m (153 dB RMS)

Vibratory Extraction and Installation- Steel: 6,310m (162 dB RMS)

Notes:
* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 1 miles

0 1 Miles

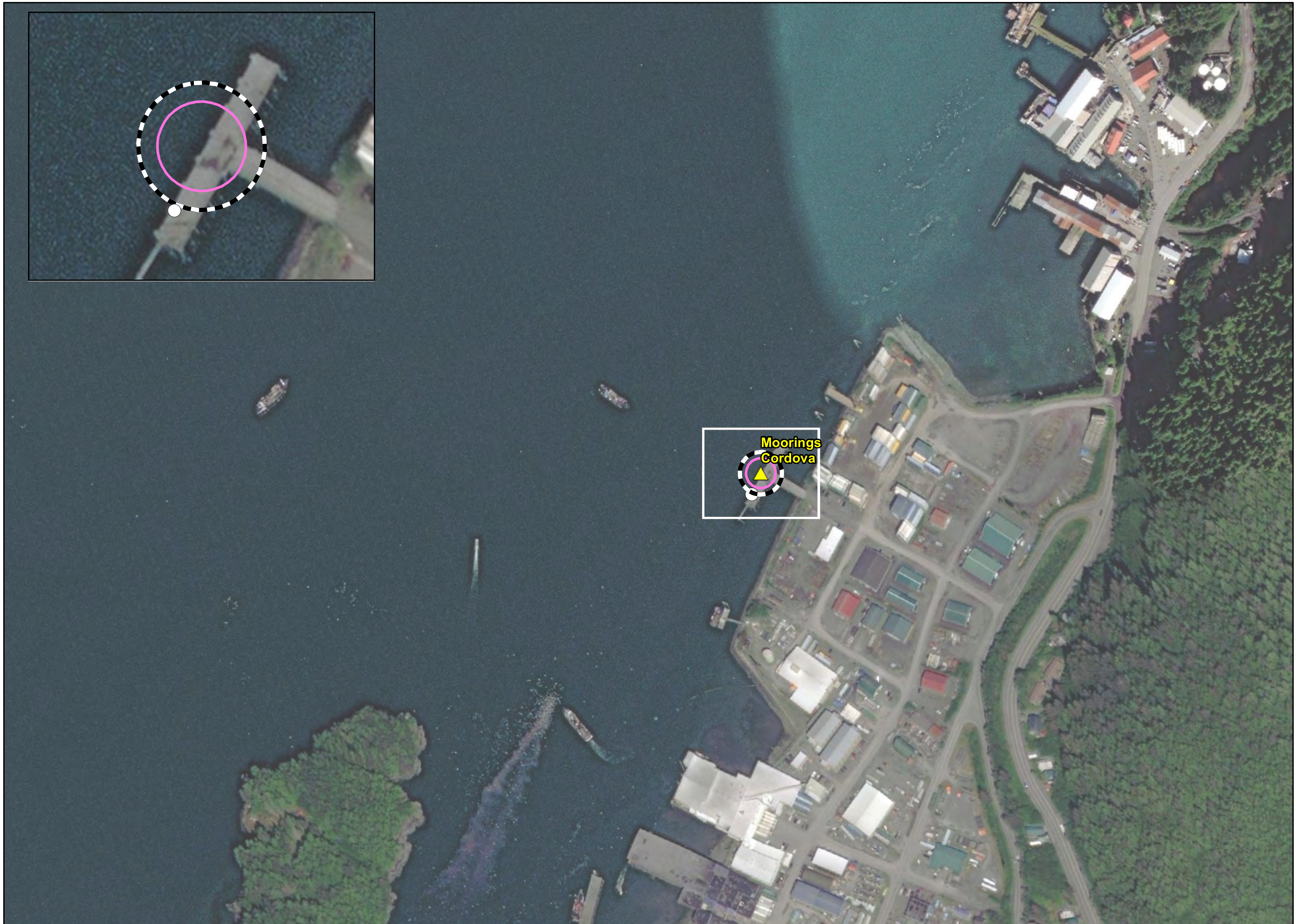
FIGURE 6-26

USCG Moorings Cordova Pile Removal Distance to Level B Threshold for NMFS-Managed Species for Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user

Path: \\sdg1-fs1\GIS\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\Fig6_9_NoiseZOI_PileRemoval_Cordova.mxd, catharine.harwin, 5/19/2021



Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Physical Interaction Shutdown Zone

Power Washing/Pile Removal

Vibratory Extraction and Installation - Steel: 14m (162.0 dB RMS)

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 300 feet

0 300 Feet

FIGURE 6-27

USCG Moorings Cordova Pile Removal Distance to Level B Threshold for USFWS-Managed Species for Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user

Path: \\sdg1-fs1\gis\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\SeaOtter_ZOI\Fig6_34_NoiseZOI_PileRemoval_Cordova.mxd, aaron.johnson, 9/17/2021

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Pile Installation

Impact Driver- Steel: 1,000m (190 dB RMS)

Impact Driver- Steel H-Pile: 136m (177 dB RMS)

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 800 feet

0 800 Feet

FIGURE 6-28

USCG Moorings Cordova Pile Installation Distance to Level B Threshold for NMFS-managed species for Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user

Path: \\sdg1-fs1\GIS\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\Fig6_10_NoiseZOI_PileInstallation_Cordova.mxd, catharine.harwin, 2/16/2021

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Physical Interaction Shutdown Zone

Pile Installation

Impact Driver - Steel: 1,000m (190 dB RMS)

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 800 feet

0 800 Feet

FIGURE 6-29

USCG Moorings Cordova Pile Installation Distance to Level B Threshold for USFWS-Managed Species for Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user

Path: \\sdg1-fs1\gis\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\SeaOtter_ZOI\Fig6_35_NoiseZOI_PileInstallation_Cordova.mxd, aaron.johnson, 9/17/2021

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Power Washing/Pile Removal

24-inch Pile Clipper- Timber: 1,792m (153.8 dB RMS)

Hydraulic Chainsaw: 1,166m (151 dB RMS)

Power Washing of Timber and Steel Piles: 5,412m (161 dB RMS)

Vibratory Extraction and Installation- Timber: 1,359m (152 dB RMS)

Notes:
* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 2,000 feet

0 2,000 Feet

FIGURE 6-30

USCG Station Juneau Pile Removal Distance to Level B Threshold for NMFS-Managed Species for Programmatic Maintenance Activities

wood.

Path: \\sdg1-fs1\GIS\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\Fig6_11_NoiseZOI_PileRemoval_Juneau.mxd, catharine.harwin, 5/19/2021

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Physical Interaction Shutdown Zone

Power Washing/Pile Removal

24-inch Pile Clipper - Timber: 4m (153.8 db RMS)

Power Washing of Timber and Steel Piles: 12m (161.0 dB RMS)

Vibratory Extraction and Installation - Timber: 3m (153 dB RMS)

Hydraulic Chainsaw: 3m (151.0 dB RMS)

Sea Otter Abundance

High : 0.18562

Low : 0.0265418

Notes:
* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

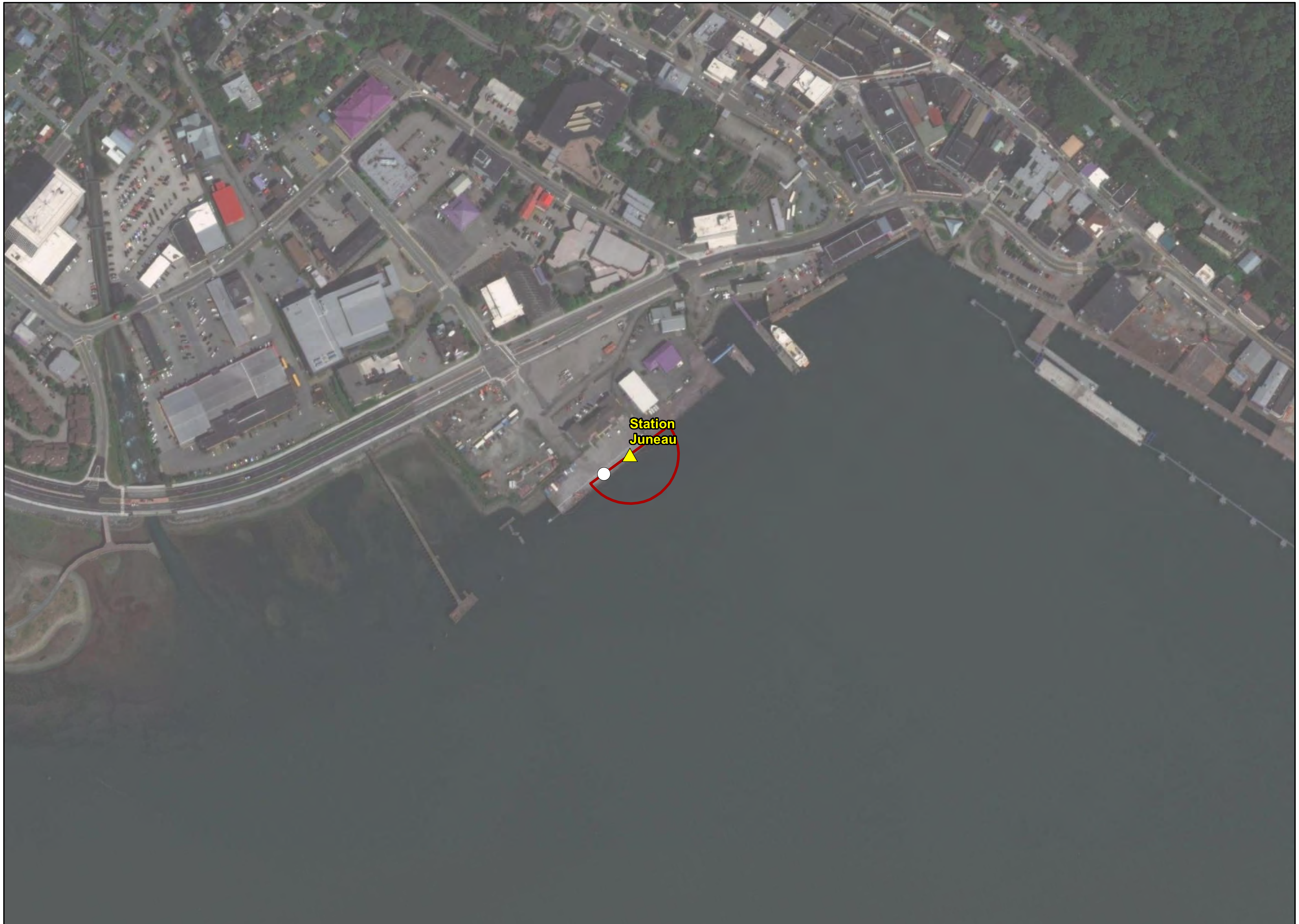
1 inch = 600 feet

0 600 Feet

FIGURE 6-31

USCG Station Juneau Pile Removal Distance to Level B Threshold for USFWS-managed species for Programmatic Maintenance Activities

Path: \\sdg1-fs1\gis\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\SeaOtter_ZOI\Fig6_36_NoiseZOI_PileRemoval_Juneau.mxd, aaron.johnson, 9/17/2021



Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Pile Installation

Impact Driver- Timber: 46m (170 dB RMS)

Notes:
* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 300 feet

0 300 Feet

FIGURE 6-32

USCG Station Juneau Pile Installation Distance to Level B Threshold for NMFS-Managed Species for Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\sdg1-fs1\GIS\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\Fig6_12_NoiseZOI_PileInstallation_Juneau.mxd, catharine.harwin, 5/19/2021

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Physical Interaction Shutdown Area

Pile Installation

Impact Driver - Timber: 46m (170 dB RMS)

Sea Otter Abundance

High : 0.18562

Low : 0.0265418

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 600 feet

0 600 Feet

FIGURE 6-33

USCG Station Juneau Pile Installation Distance to Level B Threshold for USFWS-Managed Species for Programmatic Maintenance Activities

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\sdg1-fs1\gis\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\SeaOtter_ZOI\Fig6_37_NoiseZOI_PileInstallation_Juneau.mxd, aaron.johnson, 9/17/2021

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Provisional PSO Location **

Power Washing/Pile Removal

24-inch Pile Clipper- Timber: 1,792m (153.8 dB RMS)

Hydraulic Chainsaw: 1,166m (151 dB RMS)

Power Washing of Timber and Steel Piles: 5,412m (161 dB RMS)

Vibratory Extraction and Installation- Steel: 6,310m (162 dB RMS)

Vibratory Extraction and Installation- Timber: 1,359m (152 dB RMS)

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

** Use of provisional PSOs would be limited only to those noise generating, in-water activities thatwould result in the largest ZOI's (i.e., power washing of piles to facilitate repairs).

1 inch = 3,000 feet

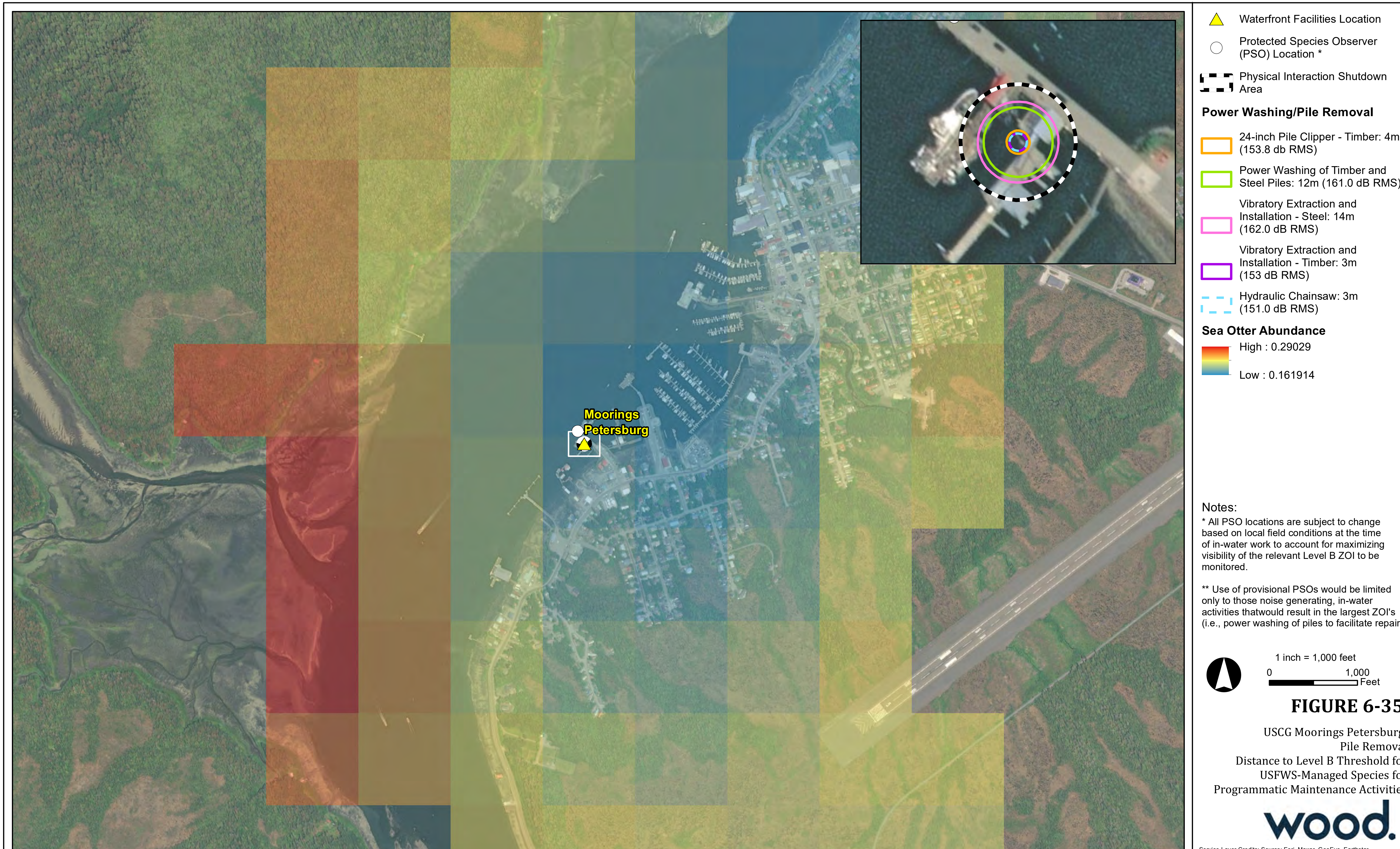
0 3,000 Feet

FIGURE 6-34

USCG Moorings Petersburg
Pile Removal
Distance to Level B Threshold for
NMFS-Managed Species for
Programmatic Maintenance Activities

wood.

Path: \\sdg1-fs1\GIS\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\Fig6_13_NoiseZOI_PileRemoval_Petersburg.mxd, catharine.harwin, 5/19/2021



Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

** Use of provisional PSOs would be limited only to those noise generating, in-water activities thatwould result in the largest ZOI's (i.e., power washing of piles to facilitate repairs).

FIGURE 6-35

USCG Moorings Petersburg
Pile Removal
Distance to Level B Threshold for
USFWS-Managed Species for
Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\sdg1-fs1\gis\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\SeaOtter_ZOI\Fig6_38_NoiseZOI_PileRemoval_Petersburg.mxd, aaron.johnson, 9/17/2021

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Pile Installation

Impact Driver- Steel: 1,000m (190 dB RMS)

Impact Driver- Timber: 46m (170 dB RMS)

Notes:
* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 1,500 feet

0 1,500 Feet

FIGURE 6-36

USCG Moorings Petersburg
Pile Installation
Distance to Level B Threshold for
NMFS-Managed Species for
Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\sdg1-fs1\GIS\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\Fig6_14_NoiseZOI_PileInstallation_Petersburg.mxd, catharine.harwin, 2/16/2021

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Physical Interaction Shutdown Area

Pile Installation

Impact Driver - Steel: 1,000m (190 dB RMS)

Impact Driver - Timber: 46m (170 dB RMS)

Sea Otter Abundance

High : 0.29029

Low : 0.161914

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 1,000 feet

0 1,000 Feet

FIGURE 6-37

USCG Moorings Petersburg
Pile Installation
Distance to Level B Threshold for
USFWS-Managed Species for
Programmatic Maintenance Activities

wood.

Path: \\sdg1-fs1\gis\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\SeaOtter_ZOI\Fig6_39_NoiseZOI_PileInstallation_Petersburg.mxd, aaron.johnson, 9/17/2021

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Power Washing/Pile Removal

Vibratory Extraction and Installation- Steel: 6,310m (162 dB RMS)

Notes:

* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 500 feet

0 500 Feet

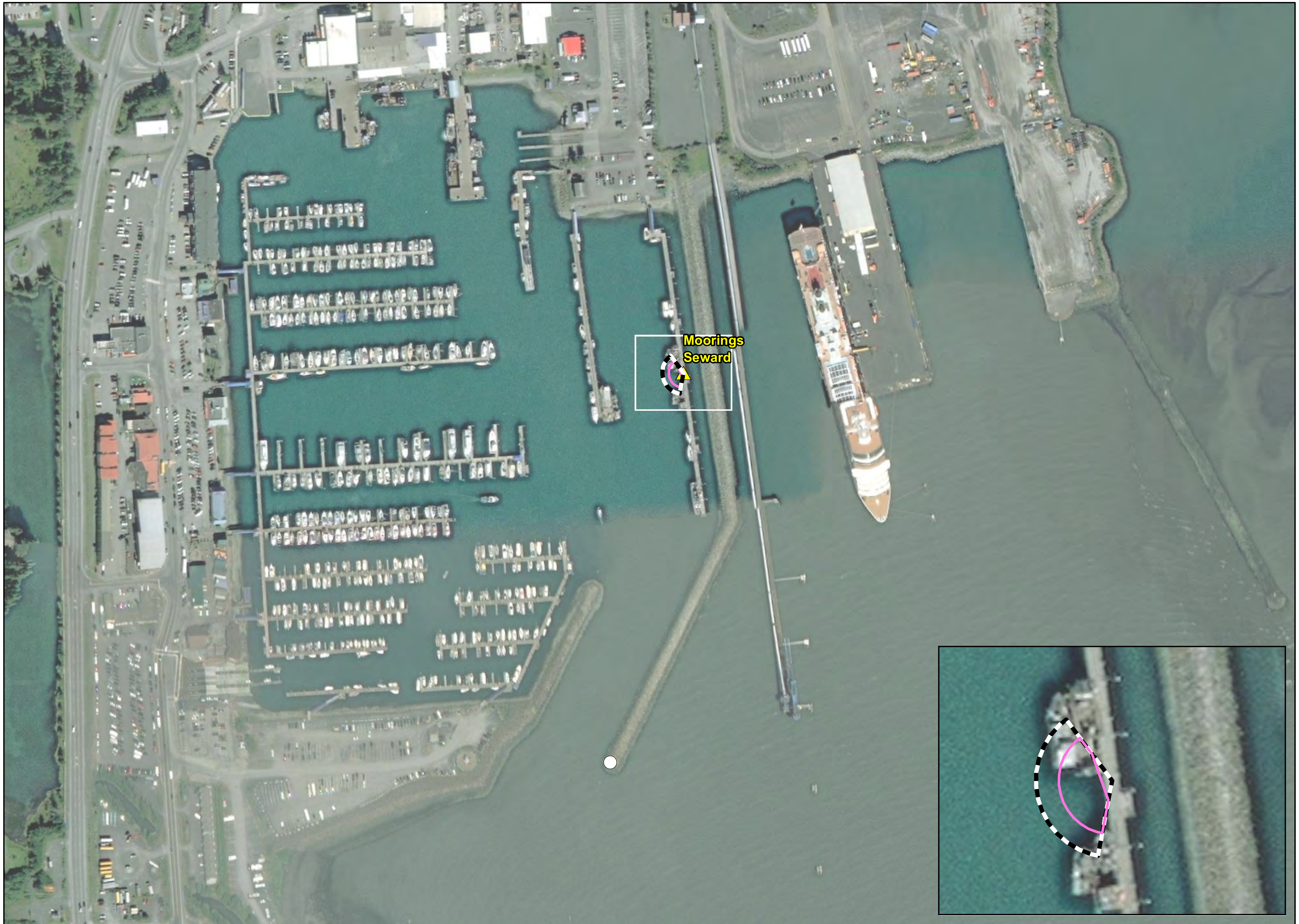
FIGURE 6-38

USCG Moorings Seward Pile Removal Distance to Level B Threshold for NMFS-Managed Species for Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\sdg1-fs1\GIS\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\Fig6_15_NoiseZOI_PileRemoval_Seward.mxd, catharine.harwin, 2/16/2021



Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Physical Interaction Shutdown Zone

Power Washing/Pile Removal

Vibratory Extraction and Installation - Steel: 14m (162.0 dB RMS)

Notes:
* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 300 feet

0 300 Feet

FIGURE 6-39

USCG Moorings Seward Pile Removal Distance to Level B Threshold for USFWS-Managed Species for Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\sdg1-fs1\gis\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\SeaOtter_ZOI\Fig6_40_NoiseZOI_PileRemoval_Seward.mxd, aaron.johnson, 9/17/2021

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Pile Installation

Impact Driver- Steel: 1,000m (190 dB RMS)

Notes:
* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 500 feet
0 500 Feet

FIGURE 6-40

USCG Moorings Seward Pile Installation Distance to Level B Threshold for NMFS-Managed Species for Programmatic Maintenance Activities

wood.

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\sdg1-fs1\GIS\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\Fig6_16_NoiseZOI_PileInstallation_Seward.mxd, catharine.harwin, 2/16/2021

Waterfront Facilities Location

Protected Species Observer (PSO) Location *

Physical Interaction Shutdown Zone

Pile Installation

Impact Driver - Steel: 1,000m (190 dB RMS)

Notes:
* All PSO locations are subject to change based on local field conditions at the time of in-water work to account for maximizing visibility of the relevant Level B ZOI to be monitored.

1 inch = 500 feet

0 500 Feet

FIGURE 6-41

USCG Moorings Seward Pile Installation Distance to Level B Threshold for USFWS-Managed Species for Programmatic Maintenance Activities

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\sdg1-fs1\gis\3151_AquaticResources\USCG\Alaska_BA\MXD\ReportFigures\SeaOtter_ZOI\Fig6_41_NoiseZOI_PileInstallation_Seward.mxd, aaron.johnson, 9/17/2021

6.8 Description of Level A and Level B Calculation and Exposure Estimates

The following assumptions were used to calculate potential Level B exposures to pile repair, removal, and/or installation activity noise for each species:

- Level A and Level B exposures are assessed on an annual basis across the 5-year period of the requested authorization.
- Each animal can be "taken" via Level A or Level B harassment once every 24 hours.
- Facilities are sufficiently distant from one another that activities occurring on the same day at individual facilities would not result in takes of the same animals.
- **Occurrence-Based.** For species where observation data are available either from the immediate vicinity or from a nearby site, the number of individuals by species is the estimated daily occurrence of that species multiplied by the annual days of operation at that facility.
- **Density-Based.** For species where observation data are not available, the number of individuals by species is the site-specific species density multiplied by the maximum area by maximum harassment zone area by activity multiplied by the number of days by activity at each facility. Density-Based Exposure Estimate by Activity = (Pile repair/removal/installation workday * Species Density * Harassment Zone Area for most impactful pile repair, removal, or installation activities])

Level A Estimates

Based on their relatively small Level A radii (less than 40m for all species), power-washing, vibratory extraction and installation, pile clipping, and pile cutting, impact pile driving of timber and concrete piles are not anticipated to result in Level A takes at any facility because a single monitor at the work site responsible for the Physical Interaction Shutdown Zone would be able to monitor, and shutdown work as needed, in the Level A shutdown zone implemented for these activities. Likewise, the Level A shutdown zone for phocid pinnipeds during impact driving of steel piles (125 m) would be visible to a single PSO at the work site such that an animal approaching the shutdown zone boundary would be observable well before it crossed into the shutdown zone. Therefore, no Level A takes are requested resulting for these activities.

Based on the topography of the individual facilities, Level A underwater noise associated with impact driving of steel piles and DTH drilling may not reach its maximum distance contained with the established shutdown zone (e.g., activities at Seward would occur wholly within Seward Harbor whose harbor walls would restrict Level A sound beyond the harbor and to a lesser distance that calculated). In the cases where the topography of a facility would restrict Level A sound within an enclosed basin, harbor, or channel such that PSOs could easily monitor the Level A shutdown distances including positioning PSOs at entry points to pre-clear the activity area and then provide shutdown warnings and commands if a designated species approaches the entry to ensure no Level A takes would occur. Given their topography and restricted Level A sound areas, it is anticipated that PSOs positioned at Sitka, Petersburg, and Seward would be able to observe any marine mammals approaching the activity area and Level A shutdown zone with enough warning that work could be stopped before a Level A take would occur. Therefore, no Level A takes are anticipated or requested for these facilities.

The Kodiak and Ketchikan facilities are also topographically restricted but less so than the facilities described above (e.g., Kodiak confined to Womens Bay and Ketchikan laterally restricted along the

Tongass Narrows). Strategic positioning of PSOs, at all facilities including Kodiak and Ketchikan, such that required pre-activity monitoring confirms that no marine mammals are present within the relevant Level A shutdown zones and then employing a PSO at the "entrance" to each of these locations (i.e., the entrance to Womens Bay where the channel is narrowest and the northwestern and southwestern approaches to Base Ketchikan within the Tongass Narrows) would provide sufficient warning to stop work prior to an animal being exposed to underwater noise in exceedance of Level A thresholds. The estimated daily Level A take are based on the fact that while porpoises tend to travel in groups (Dall's porpoise in groups between 2 and 12; harbor porpoises in groups of up to 10 [NMFS 2021b]), they are more easily observed in larger groups and that a single individual is most difficult for a PSO to observe and shutdown work before an animal is exposed to underwater noise in exceedance of the relevant Level A threshold. Therefore, a small group size of 0.5 to 2 porpoises per day is utilized to estimate potential takes of both harbor and Dall's porpoise.

With regard to more open-water conditions at Valdez and Cordova, Level A sound would cover distances beyond a single PSO's capability to monitor from the work site and would require additional PSOs potentially located on vessels, already planned for to monitor larger Level B Harassment Zones, to provide full visual coverage of the Level A shutdown zone. The greater the open-water exposure, the greater opportunity for smaller, more cryptic marine mammals such as porpoises or seals could enter the Level A shutdown zone before being detected resulting in a Level A take of the individual. For these sites, larger group sizes are used to estimate Level A take for harbor porpoises and the observed daily occurrence at Valdez is used for Dall's porpoise.

Table 6-22 Estimated Level A Annual Take of Porpoise and Harbor Seal

Species	Stock	Kodiak	Ketchikan	Valdez	Cordova
		20 days/year (Years 1-5)	20 days/year (Years 1-5)	3 days/year (Years 1-5)	6 days (Year 2)
Harbor Porpoise	Southeast Alaska (896)	--	0.5/day 20/year (2.2% of stock)	--	--
	GOA (31,046)	2/day 40/year (0.1% of stock)	--	5/day 15/year (0.05% stock)	5/day 30 Year 2 (0.1% of stock)
Dall's Porpoise	Alaska (15,432)	2/day 40/year (0.3% of stock)	2/day 40/year (0.3% of stock)	2/ day 6/year (0.04% of stock)	2/ day 12 in Year 2 (0.08% of stock)
Harbor Seal	South Kodiak (22,351)	1/day 20/year (0.2% of stock)	--	--	--
	Clarence Strait (24,854)	--	1/day 20/year (0.1% of stock)	--	--

Table 6-23 Five-Year Program Total Level A Takes

Species	Stock	Kodiak	Ketchikan	Valdez	Cordova
		20 days/year (Years 1-5)	20 days/year (Years 1-5)	3 days/year (Years 1-5)	6 days (Year 2)
Harbor Porpoise	Southeast Alaska	0	100	--	--
	GOA	200	--	75	30
Dall's Porpoise	Alaska	200	200	30	12
Harbor Seal	South Kodiak	100	--	--	--
	Clarence Strait	--	100	--	--

Level B Estimates

Level B harassment exposures for both NMFS-managed species are assessed based on the facility-specific and activity-specific area in which the noise generated by a given maintenance activity exceeds the relevant Level B threshold as defined in Table 6-11 compared against a given species site-specific density. Similar activities would generate similar calculated distances for noise to fall off below the relevant Level B threshold but local topography/bathymetry will affect the total area where Level B exposure would occur. For instance, maintenance activities at Base Ketchikan would generate noise that would be restricted to the Tongass Narrows while activities at Mooring Valdez would radiate outward into the Valdez Arm of Prince William Sound and activities at Moorings Seward would be restricted to Seward Harbor due to intersection with various natural or manmade shorelines.

The USFWS has used two methods to assess the expected abundance of northern sea otters in Southeast Alaska and Southcentral/Southwest Alaska. In Southeast Alaska, an expected abundance model has been created based on 400m by 400m survey blocks (Eisaguirre 2021). To assess Level B harassment exposures of sea otters at the four Southeast Alaska facilities (Ketchikan, Sitka, Petersburg, and Juneau), the Level B harassment zones are overlain with the survey data blocks and the abundance value of each survey block that falls partially or wholly within the Level B harassment zone is added to arrive at the expected number of sea otters likely to occur each day within the relevant Level B zone.

6.8.1 Base Kodiak

Pile repair, removal, and installation activities at Base Kodiak are expected to be consistent across each of the five years including in this LOA application. Because there is a potential for presence of unexploded ordinance and contaminated sediments at Base Kodiak, power-washing, which would potentially result in resuspension of contaminated sediments will not be used at this facility. Piles at Base Kodiak include timber and steel piles, and variety of removal and installation techniques were assessed for potential takes; however, use of vibratory extraction/installation and DTH drilling are the most likely methods to be used and are included in the typical year Level B exposure calculations for NMFS-managed species are summarized in Table 6-24 and USFWS-managed sea otters in Table 6-32.

6.8.2 Moorings Sitka

Pile repair, removal, and installation activities at the Sitka moorings are expected to be consistent across each of the five years including in this LOA application. Piles at the Sitka Moorings include timber and steel piles, and variety of removal and installation techniques were assessed for potential takes; however, use of a power-washer, vibratory extraction/installation are the most likely methods to be used and are included in the typical year Level B exposure calculations for NMFS-managed species summarized in Table 6-25 and USFWS-managed sea otters in Table 6-33.

6.8.3 Base Ketchikan

Pile repair, removal, and installation activities at Base Ketchikan are expected to be consistent across each of the five years included in this LOA application. Because there is a potential for presence of contaminated sediments at Base Ketchikan, power-washing, which would potentially result in resuspension of contaminated sediments will not be used at this facility. Piles at Base Ketchikan include timber, steel, and concrete piles; and a variety of removal and installation techniques were assessed for potential takes; however, use of vibratory extraction/installation and DTH drilling are the most likely methods to be used and are included in the typical year Level B exposure calculations for NMFS-managed species summarized in Table 6-26 and USFWS-managed sea otters in Table 6-34.

6.8.4 Moorings Valdez

Pile repair, removal, and installation activities at the Valdez moorings are expected to be consistent across each of the five years included in this LOA application with one year (assigned to Year 4 in this application) including additional work to remove and install a steel pile. Piles at Station Valdez include timber and steel piles, and variety of removal and installation techniques were assessed for potential takes; however, use of a power-washer, vibratory extraction/installation, and impact driving are the most likely methods to be used and are included in the typical year Level B exposure calculations for NMFS-managed species summarized in Table 6-27 and USFWS-managed sea otters in Table 6-35.

6.8.5 Moorings Cordova

Potential in-water maintenance activities at the Cordova moorings are limited to replacement of steel piles that are part of damaged dolphin. Replacement activities (removal and installation of three steel piles similar to existing) have been assigned to Year 3 for this LOA request but this effort could potentially occur in any one single year of the requested 5-year authorization. While a range of pile removal and installation activities have been assessed for potential Level A and Level B noise exposures within Orca Inlet, vibratory extraction and impact installation is the most likely methods to be used and are included in the Year 3 Level B exposure calculations for NMFS-managed species summarized in the Table 6-28 and USFWS-managed sea otters in Table 6-36.

6.8.6 Station Juneau

Pile repair, removal, and installation activities at Station Juneau are expected to be consistent across each of the five years including in this LOA application. Piles at Station Juneau include timber and steel piles, and variety of removal and installation techniques were assessed for potential takes; however, use of a power-washer and vibratory extraction/installation are the most likely methods to be used and are included in the typical year Level B exposure calculations for NMFS-managed species in Table 6-29 and USFWS-managed sea otters in Table 6-37. Because Station Juneau only includes timber piles, and Level A distances associated with activities involving these piles are less than the typical proposed shutdown zone, no Level A takes are calculated or anticipated at this facility.

6.8.7 Moorings Petersburg

Pile repair, removal, and installation activities at Petersburg moorings are expected to be consistent across each of the five years including in this LOA application. Piles at Petersburg Moorings include timber and steel piles, and variety of removal and installation techniques were assessed for potential takes; however, use of a power-washer, vibratory extraction/installation, and impact driving are the most likely methods to be used and are included in the typical year Level B exposure calculations for NMFS-managed species summarized in Table 6-30 and USFWS-managed sea otters in Table 6-38.

6.8.8 Moorings Seward

Potential in-water maintenance activities at Seward moorings are limited to any repairs required in the event the USCG activities damage the City-owned / USCG-leased facility. Potential replacement activities (removal and installation of a single steel pile similar to existing) have been assigned to a single year (Year 3) for this LOA request. While a range of pile removal and installation activities have been assessed for potential Level A and Level B noise exposures within Seward Harbor and a portion of Resurrection Bay, vibratory extraction and impact driving are the most likely methods to be used and are included in the Year 3 Level B exposure calculations for NMFS-managed species summarized in Table 6-31 and USFWS-managed sea otters in Table 6-39.

Table 6-24 Estimated Annual Level B Take at Kodiak (Years 1 through 5)

Species	Stock/DPS	Density Ind/km^2	Encounter Ind/day	Vibratory		Clipper	Chainsaw	DTH	Total	Encounter	Total
				Timber 1.3 km^2 10 days	Steel 4.51 km^2 10 days	Timber 1.65 km^2 10 days	Timber 1.65 km^2 10 days	All 4.5 km^2 10 days		20 day	
Fin Whale	Northeast Pacific	0.068	-	0.884	3.0668	1.122	1.122	3.0668	**9**	-	9
Humpback Whale	Hawaii DPS (89%)	0.093	-	1.209	4.1943	1.5345	1.5345	4.1943	**12**	-	12
	Mexico DPS (11%)								**1**		1
	WN Pac DPS (1%)								**0**		0
Minke Whale	Alaska	0.006	-	0.0078	0.2706	0.099	0.099	0.2706	**1**	-	1
Gray Whale	EN Pacific	0.04857	-	0.63141	2.190507	0.0801405	0.0801405	2.18565	**7**	-	7
Sperm Whale		0.002	-	0.026	0.0902	0.033	0.033	0.09	**0**	-	0
Killer Whale	Alaska Resident	0.005	-	0.065	0.2255	0.0825	0.0825	0.2255		-	
	Northern Resident	-	-	-	-	-	-	-		-	
	GOA, Aleutian Islands, Bering Sea Transient	0.005	-	0.065	0.2255	0.0825	0.0825	0.2255	**2**	-	2
	AT1 Transient	-	-	-	-	-	-	-		-	
	West Coast Transient	-	-	-	-	-	-	-		-	
Pacific White-Sided Dolphin	North Pacific	0.02	3/day	0.26	0.902	0.33	0.33	0.902	3	**60**	60
Harbor Porpoise	Southeast Alaska	-	-	-	-	-	-	-	-	-	0
	GOA	0.4547	-	5.9	20.5	7.5	7.5	20.5	**62**	-	62
Dall's Porpoise	Alaska	0.0218		0.28	0.98	0.36	0.36	0.98	**3**	-	3
Steller Sea Lion	Western DPS	0.0678	0.083	0.88	3.1	1.1	1.1	3.1	9	**2**	2
	Eastern DPS	-	-	-	-	-	-	-	-	-	0
Northern Fur Seal	Eastern North Pacific	0.0901	-	1.2	4.1	1.5	1.5	4.1	**12**	-	12
Harbor Seal	Prince William Sound	-	-	-	-	-	-	-	-	-	0
	Lynn Canal / Stephens	-	-	-	-	-	-	-	-	-	0
	Sitka / Chatham Strait	-	-	-	-	-	-	-	-	-	0
	Clarence Strait	-	-	-	-	-	-	-	-	-	0
	South Kodiak	0.1689	-	2.2	7.6	2.8	2.8	7.6	**23**	-	23
California Sea Lion		-	-	-	-	-	-	-	-	-	0

Table 6-25 Estimated Level B Take at Sitka (Years 1 through 5)

Species	Stock/DPS	Density Ind/km^2	Encounter Ind/day	Power Washing	Vibratory		Impact		Total	Encounter	Total
				All 4.5 km2 5 days	Timber 0.87 km2 5 days	Steel 5.67 km2 5 days	Timber 0.007 km2 5 days	Steel 0.56 km2 5 days		10 days	
Fin Whale	Northeast Pacific	0.0001	-	0.00225	0.000435	0.002835	0.0000035	0.00028	0	-	0
Humpback Whale	Hawaii DPS (98%)	0.0018	5	0.0405	0.00783	0.05103	0.000063	0.00504	0	**50**	49
	Mexico DPS (2%)										1
	WN Pac DPS (0%)										0
Minke Whale	Alaska	0.0008	1	0.018	0.00348	0.02268	0.000028	0.00224	0	10	10
Gray Whale	EN Pacific	0.0155	0.1	0.34875	0.067425	0.439425	0.0005425	0.0434	1	**1**	1
Sperm Whale		0.002	-	0.045	0.0087	0.00567	0.00007	0.0056	0	-	0
Killer Whale	Alaska Resident	0.0349	8	0.78525	0.151815	0.989415	0.0012215	0.09772	2	**80**	80
	Northern Resident	0.0349		0.78525	0.151815	0.989415	0.0012215	0.09772	2		
	GOA, Aleutian Islands, Bering Sea Transient	0.0057		0.12825	0.024795	0.161595	0.0001995	0.01596	0		
	AT1 Transient	-		-	-	-	-	-	-		
	West Coast Transient	0.0057		0.12825	0.024795	0.161595	0.0001995	0.01596	0		
Pacific White-Sided Dolphin	North Pacific	0.0849	2.86	1.9	0.37	2.41	0.003	0.234	5	**29**	29
Harbor Porpoise	Southeast Alaska	0.01	5	0.225	0.0435	0.2835	0.00007	0.028	1	**50**	50
	GOA	-	-	-	-	-	-	-	-	-	0
Dall's Porpoise	Alaska	0.121	-	2.7225	0.52635	3.43035	0.004235	0.3388	**7**	-	7
Steller Sea Lion	Western DPS (2.2%)	-	16	-	-	-	-	-	-	**160**	4
	Eastern DPS (97.8%)	0.31616		7.1136	1.375296	8.963136	0.0110656	0.885248	18		156
Northern Fur Seal	Eastern North Pacific	0.27633	-	6.217425	1.2020355	7.833956	0.0096716	0.773724	**16**	-	16
Harbor Seal	Prince William Sound	-	-	-	-	-	-	-	-	-	0
	Lynn Canal / Stephens	-	-	-	-	-	-	-	-	-	0
	Sitka / Chatham Strait	1.7267	23	38.85075	7.511145	48.95195	0.0604344	4.83476	100	**230**	230
	Clarence Strait	-	-	-	-	-	-	-	-	-	0
	South Kodiak	-	-	-	-	-	-	-	-	-	0
California Sea Lion		0.0251	1	0.56475	0.109185	0.711585	0.00088	0.07028	1	**10**	10

Table 6-26 Estimated Level B Take at Base Ketchikan (Years 1 through 5)

Species	Stock/DPS	Density Ind/km^2	Encounter Ind/day	Power Washing	Vibratory	Vibratory	DTH	Total	Encounter	Total
				All 6.51 km^2 10 days	Timber 1.45 km^2 10 days	Steel 7.3 km^2 10 days	All 10.06 km^2 10 days		20 days	
Fin Whale	Northeast Pacific	0.0001	-	0.00651	0.00145	0.00733	0.01006	**0**	-	0
Humpback Whale	Hawaii DPS (98%)									12
	Mexico DPS (2%)	0.0017	0.571	0.11067	0.02465	0.1241	0.17102	0	**12**	0
	WN Pac DPS (0%)									0
Minke Whale	Alaska	0.0008	0.024	0.05208	0.0116	0.0584	0.08048	0	**1**	1
Gray Whale	EN Pacific	0.0155	0.067	1.00905	0.22475	1.1315	1.5593	4	**2**	2
Sperm Whale		0.002	-	0.1302	0.029	0.146	0.2012	**0**	-	0
Killer Whale	Alaska Resident	0.0349		2.27199	0.50605	2.5477	3.51094	9		
	Northern Resident	0.0349		2.27199	0.50605	2.5477	3.51094	9		
	GOA, Aleutian Islands, Bering Sea Transient	-	0.4	-	-	-	-	-	8	8
	AT1 Transient	-		-	-	-	-	-		
	West Coast Transient	0.0057		0.37107	0.08265	0.4161	5.57342	1		
Pacific White-Sided Dolphin	North Pacific	0.0849	2.86	5.52699	1.23105	6.1977	8.54094	21	**57**	57
Harbor Porpoise	Southeast Alaska	0.01	0.5	0.651	0.145	0.73	1.006	3	**10**	10
	GOA	-	-	-	-	-	-	-	-	0
Dall's Porpoise	Alaska	0.121	2	7.8771	1.7545	8.833	12.1726	31	**40**	40
Steller Sea Lion	Western DPS	-	-	-	-	-	-	-	-	0
	Eastern DPS	0.31616	10	20.582016	4.58432	23.07968	31.805696	80	**200**	200
Northern Fur Seal	Eastern North Pacific	-	-	-	-	-	-	**-**	-	0
Harbor Seal	Prince William Sound	-	-	-	-	-	-	-	-	0
	Lynn Canal / Stephens	-	-	-	-	-	-	-	-	0
	Sitka / Chatham Strait	-	-	-	-	-	-	-	-	0
	Clarence Strait	1.7267	12	112.40817	25.03715	126.0491	173.70602	437	**240**	240
	South Kodiak	-	-	-	-	-	-	-	-	0
California Sea Lion		-	-	-	-	-	-	-	-	0

Table 6-27 Estimated Level B Take at Valdez (Years 1 through 5)

Species	Stock/DPS	Density Ind/km²	Encounter Ind/day	Power Washing	Vibratory	Vibrator	Impact	Impact	Total	Encounter	Total
				All 34.3 km² 2	Timber 2.62 km² 2	Steel 40.21 km² 2	Timber 0.007 km² 1	Steel 1.45 km² 1		3 days	
Fin Whale	Northeast Pacific	0.068	-	5.889	0.35632	5.46856	0.000476	0.0986	**12**	-	12
Humpback Whale	Hawaii DPS (89%)	0.093	-	6.3798	0.48732	7.47906	0.000651	0.13485	**15**	-	13
	Mexico DPS (11%)										2
	WN Pac DPS (1%)										0
Minke Whale	Alaska	0.006	0.25	0.4116	0.03144	0.48252	0.000042	0.0087	**1**	0.75	1
Gray Whale	EN Pacific	-	-	-	-	-	-	-	-	-	0
Sperm Whale		-	-	-	-	-	-	-	-	-	-
Killer Whale	Alaska Resident	0.0349	-	2.39414	0.182876	2.806658	0.0002443	0.050605	**5**	-	6
	Northern Resident	-		-	-	-	-	-	-		
	GOA, Aleutian Islands, Bering Sea Transient	0.0041		0.28126	0.021484	0.329722	0.0000287	0.005945	**1**		
	AT1 Transient	-		-	-	-	-	-	-		
	West Coast Transient	-		-	-	-	-	-	-		
Pacific White-Sided Dolphin	North Pacific	0.02	-	1.372	0.1048	1.6084	0.00014	0.029	**3**	-	9[1]
Harbor Porpoise	Southeast Alaska	-	-	-	-	-	-	-	-	-	0
	GOA	0.4547	-	31.19242	2.382628	36.566974	0.0031829	0.659315	**71**	-	71
Dall's Porpoise	Alaska	0.218	0.25	14.9548	1.1423	17.53156	0.001526	0.3161	**34**	0.7	34
Steller Sea Lion	Western DPS	0.0678	4.2	4.65108	0.355272	5.452476	0.0004746	0.09831	11	**13**	13
	Eastern DPS	-	-	-	-	-	-	-	-	-	0
Northern Fur Seal	Eastern North Pacific	0.0901	-	6.18086	0.472124	7.245842	0.0006307	0.130645	**14**	-	14
Harbor Seal	Prince William Sound	0.1689	48.95	11.58654	0.885036	13.582938	0.0011823	0.244905	26	**147**	147
	Lynn Canal / Stephens	-	-	-	-	-	-	-	-	-	0
	Sitka / Chatham Strait	-	-	-	-	-	-	-	-	-	0
	Clarence Strait	-	-	-	-	-	-	-	-	-	0
	South Kodiak	-	-	-	-	-	-	-	-	-	0
California Sea Lion		-	-	-	-	-	-	-	-	-	0

[1] Annual Level B take estimate elevated to account for 3 individual / day group size

Table 6-28 Estimated Level B Take at Base Cordova (Year 2 Only)

Species	Stock/DPS	Density Ind/km^2	Encounter Ind/day	Vibratory Steel 23.42 km^2 6 days	Impact Steel 1.57 km^2 6 days	Total	Encounter 6 days	Total
Fin Whale	Northeast Pacific	0.068	-	9.55536	0.64056	**10**	-	10
Humpback Whale	Hawaii DPS (89%)							12
	Mexico DPS (11%)	0.093	-	13.06836	0.87606	**14**	-	2
	WN Pac DPS (1%)							0
Minke Whale	Alaska	0.006	-	0.847312	0.05652	1	-	1
Gray Whale	EN Pacific	-	-	-	-	-	-	0
Sperm Whale		-	-	-	-	-	-	0
Killer Whale	Alaska Resident	0.005		0.7026	0.0471	1		
	Northern Resident	-		-	-	-		
	GOA, Aleutian Islands, Bering Sea Transient	0.005	-	0.7026	0.0471	1	-	24[1]
	AT1 Transient	-		-	-	-		
	West Coast Transient	-		-	-	-		
Pacific White-Sided Dolphin	North Pacific	0.02	-	2.8104	0.1884	3	-	18[2]
Harbor Porpoise	Southeast Alaska	-	-	-	-	-	-	0
	GOA	0.4547	-	63.8944	4.283274	**68**	-	68
Dall's Porpoise	Alaska	0.218	-	30.63336	2.05356	**33**	-	33
Steller Sea Lion	Western DPS	0.0678	-	9.527256	0.638676	**10**		10
	Eastern DPS	-	-	-	-	-	-	0
Northern Fur Seal	Eastern North Pacific	0.0901	-	12.660852	0.848742	**14**	-	14
Harbor Seal	Prince William Sound	0.1689	48.95	23.733828	1.591038	25	**294**	294
	Lynn Canal / Stephens	-	-	-	-	-	-	0
	Sitka / Chatham Strait	-	-	-	-	-	-	0
	Clarence Strait	-	-	-	-	-	-	0
	South Kodiak	-	-	-	-	-	-	0
California Sea Lion		-	-	-	-	-	-	0

[1] Annual Level B take estimate elevated to account for 4 individual / day group size

[2] Annual Level B take estimate elevated to account for 3 individual / day group size

Table 6-29 Estimated Level B Take at Juneau (Years 1 through 5)

Species	Stock/DPS	Density Ind/km²	Encounter Ind/day	Power Washing All 3.31 km² 10 days	Vibratory Timber 1.62 km² 10	Impact Timber 0.003 km² 10	Total	Encounter 20 days	Total
Fin Whale	Northeast Pacific	0.0001	-	0.00331	0.00162	0.000003	0	-	0
Humpback Whale	Hawaii DPS (98%)	0.002	4	0.05627	0.02754	0.000051	0	80	78
	Mexico DPS (2%)								2
	WN Pac DPS (0%)								0
Minke Whale	Alaska	0.0008	0.024	0.02648	0.01296	0.000024	0	1	1
Gray Whale	EN Pacific	0	-	-	-	-	-	-	0
Sperm Whale		0.002	-	0.0662	0.0324	0.00006	0	-	0
Killer Whale	Alaska Resident	0.0349	0.4	1.15519	0.56538	0.001047	2	8	8
	Northern Resident	0.0349		1.15519	0.56538	0.001047	2		
	GOA, Aleutian Islands, Bering Sea Transient	-		-	-	-	-		
	AT1 Transient	-		-	-	-	-		
	West Coast Transient	0.0057		0.18867	0.09234	0.000171	0		
Pacific White-Sided Dolphin	North Pacific	0.0849	2.86	2.81019	1.37538	0.002547	4	57	57
Harbor Porpoise	Southeast Alaska	0.01	0.5	0.331	0.162	0.0003	1	10	10
	GOA	0	-	-	-	-	-	-	0
Dall's Porpoise	Alaska	0.121	2	4.0051	1.9602	0.00363	6	40	40
Steller Sea Lion	Western DPS (1.4%)	-	-	-	-	-	-	-	0
	Eastern DPS (98.6%)	0.316	-	10.4596	5.1192	0.00948	16	-	16
Northern Fur Seal	Eastern North Pacific	-	-	-	-	-	-	-	0
Harbor Seal	Prince William Sound	-	-	-	-	-	-	-	0
	Lynn Canal / Stephens	1.7267	43	57.15377	27.97254	0.051801	85	860	860
	Sitka / Chatham Strait	-	-	-	-	-	-	-	0
	Clarence Strait	-	-	-	-	-	-	-	0
	South Kodiak	-	-	-	-	-	-	-	0
California Sea Lion		0.0251	-	0.83081	0.40662	0.000753	1	-	1

Table 6-30 Estimated Level B Take at Base Petersburg (Years 1 through 5)

Species	Stock/DPS	Density Ind/km^2	Encounter Ind/day	Power Washing	Vibratory	Vibratory	Impact	Impact	Total	Encounter	Total
				All 2.59 km^2 4 days	Timber 1.63 km^2 4 days	Steel 2.88 km^2 4 days	Timber 0.006 km^2 4 days	Steel 1.33km^2 4 days		4 days	
Fin Whale	Northeast Pacific	0.0001	-	0.001036	0.000652	0.001152	0.0000024	0.000532	0	-	0
Humpback Whale	Hawaii DPS (98%)										
	Mexico DPS (2%)	0.0017	-	0.017612	0.011084	0.019584	0.0000408	0.009044	0	-	0
	WN Pac DPS (0%)										
Minke Whale	Alaska	0.0008	0.024	0.008288	0.005216	0.009216	0.0000192	0.004256	0	1	1
Gray Whale	EN Pacific	-	-	-	-	-	-	-	-	-	0
Sperm Whale		0.002	-	0.02072	0.01304	0.02304	0.000048	0.01064	0	-	0
Killer Whale	Alaska Resident	0.0349		0.361564	0.227585	0.402048	0.0008376	0.185688	1		
	Northern Resident	0.0349		0.361564	0.227545	0.402048	0.0008376	0.185668	1		
	GOA, Aleutian Islands, Bering Sea Transient	-	0.4	-	-	-	-	-	-	2	2
	AT1 Transient	-		-	-	-	-	-	-		
	West Coast Transient	0.0057		0.059052	0.037164	0.065664	0.0001368	0.030324	0		
Pacific White-Sided Dolphin	North Pacific	0.0849	2.86	0.087956	0.553548	0.978048	0.0020376	0.451668	3	12	12
Harbor Porpoise	Southeast Alaska	0.01	0.5	0.1036	0.0652	0.1152	0.00024	0.0532	0	2	2
	GOA	-	-	-	-	-	-	-	-	-	0
Dall's Porpoise	Alaska	0.121	2	1.25356	0.78892	1.39392	0.002904	0.64372	4	8	8
Steller Sea Lion	Western DPS	-	-	-	-	-	-	-	-	-	0
	Eastern DPS	0.31616	16	3.275418	2.061363	3.642163	0.00759	1.681971	11	64	64
Northern Fur Seal	Eastern North Pacific	-	-	-	-	-	-	-	-	-	0
Harbor Seal	Prince William Sound	-	-	-	-	-	-	-	-	-	0
	Lynn Canal / Stephens	-	-	-	-	-	-	-	-	-	0
	Sitka / Chatham Strait	-	-	-	-	-	-	-	-	-	0
	Clarence Strait	1.7267	43	17.88861	11.25808	19.89158	0.041441	9.18604	58	172	172
	South Kodiak										
California Sea Lion	-	-	-	-	-	-	-	-	-	-	0

Table 6-31 Estimated Level B Take at Base Seward (Year 3)

Species	Stock/DPS	Density Ind/km^2	Encounter Ind/day	Vibratory Steel 0.24 km^2 4 days	Impact Steel 0.24 km^2 4 days	Density	Encounter 4 days	Total
Fin Whale	Northeast Pacific	0.068	0.143	0.06528	0.06528	0	0.572	0
Humpback Whale	Hawaii DPS (89%)							4
	Mexico DPS (11%)	0.093	1	0.08928	0.08928	0	4	0
	WN Pac DPS (1%)							0
Minke Whale	Alaska	0.006	-	0.00576	0.00576	0	-	0
Gray Whale	EN Pacific	-	-	-	-	-	-	0
Sperm Whale		-	-	-	-	-	-	0
Killer Whale	Alaska Resident	0.005	-	0.0048	0.0048	0	-	
	Northern Resident	-	-	-	-	-	-	
	GOA, Aleutian Islands, Bering Sea Transient	0.005	-	0.0048	0.0048	0	-	4[1]
	AT1 Transient	-	-	-	-	-	-	
	West Coast Transient	-	-	-	-	-	-	
Pacific White-Sided Dolphin	North Pacific	0.02	-	0.0192	0.0192	-	-	12[2]
Harbor Porpoise	Southeast Alaska	-	-	-	-	-	-	0
	GOA	0.4547	-	0.436512	0.436512	1	-	1
Dall's Porpoise	Alaska	0.218	0.25	0.20928	0.20928	0	-	1
Steller Sea Lion	Western DPS	0.0678	2	0.065088	0.065088	0	8	8
	Eastern DPS	-	-	-	-	-	-	0
Northern Fur Seal	Eastern North Pacific	0.0901	-	0.086496	0.086496	0	-	12[2]
Harbor Seal	Prince William Sound	0.1689	48.95	0.162144	0.162144	0	196	196
	Lynn Canal / Stephens	-	-	-	-	-	-	0
	Sitka / Chatham Strait	-	-	-	-	-	-	0
	Clarence Strait	-	-	-	-	-	-	0
	South Kodiak	-	-	-	-	-	-	0
California Sea Lion		-	-	-	-	-	-	0

[1] Annual Level B take estimate elevated to account for 1 individual / day group size

[2] Annual Level B take estimate elevated to account for 3 individual / day group size

Table 6-32 Estimates of Potential Level B Exposures for Northern Sea Otter at Base Kodiak

Activity		***Facility-Specific Level B Area (square km)***	***Northern Sea Otter SW Alaska Density***
			Year Round
			2.44
Take Per Day Estimate			
Non-Impulsive			
Vibratory Extraction/Installation	Timber	0.000028	0.00006832
Vibratory Extraction/Installation	Steel	0.000613	0.00149572
Clipper	Timber	0.00005	0.000122
Hydraulic Chainsaw	Timber	0.000028	0.00006832
Impulsive			
Impact Drive	Timber	0.0056	0.013664
Impact Drive	Steel	1.0318	2.517592
DTH Drill	All Types/Sizes	0.0884	0.215696
Typical Year Estimate			
Activity		Days	Exposures
Vibratory Extraction/Installation	Timber	10	1
Vibratory Extraction/Installation	Steel	10	1
Clipper	Timber	10	1
Hydraulic Chainsaw		10	1
DTH Drill	All Types/Sizes	10	3
		Annual Exposures	**7**

Table 6-33 Estimates of Potential Level B Exposures for Northern Sea Otter at Moorings Sitka

Activity			***Northern Sea Otter SW Alaska Abundance***
			Individuals
			per Survey Cell
Take Per Day Estimate			
Non-Impulsive			
Power-Washing	Timber/Steel		0.179174
Vibratory Extraction/Installation	Timber		0.179174
Vibratory Extraction/Installation	Steel		0.179174
Clipper	Timber		0.179174
Hydraulic Chainsaw	Timber		0.179174
Impulsive			
Impact Drive	Timber		0.179174
Impact Drive	Steel		1.593015
Typical Year Estimate			
Activity		Days	Exposures
Power-Washing	Timber/Steel	5	1
Vibratory Extraction/Installation	Timber	5	1
Vibratory Extraction/Installation	Steel	5	1
Impact Drive	Timber	5	1
Impact Drive	Steel	5	8
		Annual Exposures	**12**

Table 6-34 Estimates of Potential Level B Exposures for Northern Sea Otter at Base Ketchikan

Activity			***Northern Sea Otter SW Alaska Abundance***
			Individuals
Take Per Day Estimate			
Non-Impulsive			
Power-Washing	Timber/Steel		0.254697
Vibratory Extraction/Installation	Timber		0.254697
Vibratory Extraction/Installation	Steel		0.254697
Clipper	Timber		0.254697
Clipper	Concrete		0.254697
Hydraulic Chainsaw	Timber		0.254697
Impulsive			
Impact Drive	Timber		0.475403
Impact Drive	Steel		4.33443
Impact Drive	Concrete		0.475403
DTH Drill	All Types/Sizes		1.084841
Typical Year Estimate			
Activity		Days	Exposures
Vibratory Extraction/Installation	Timber	10	3
Vibratory Extraction/Installation	Steel	10	3
Clipper	Timber	10	3
Hydraulic Chainsaw		10	3
DTH Drill	All Types/Sizes	10	11
		Annual Exposures	**23**

Table 6-35 Estimates of Potential Level B Exposures for Northern Sea Otter at Moorings Valdez

Activity		***Facility-Specific Level B Area (square km)***	***Northern Sea Otter SW Alaska Density***
			2.31 / km^2
Take Per Day Estimate			
Non-Impulsive			
Power-Washing	Timber/Steel	0.00045	0.0010395
Vibratory Extraction/Installation	Timber	0.000028	0.00006468
Vibratory Extraction/Installation	Steel	0.000613	0.001414603
Clipper	Timber	0.0001	0.000231
Hydraulic Chainsaw	Timber	0.000028	0.00006468
Impulsive			
Impact Drive	Timber	0.0056	0.015246
Impact Drive	Steel	1.0318	3.352965
Typical Year Estimate (1,2,3,5)			
Activity		Days	
Power-Washing	Timber/Steel	2	1
Vibratory Extraction/Installation	Timber	2	1
Impact Drive	Steel	1	4
		Annual Exposures	**6**
Typical Year Estimate (4)			
Power-Washing	All Types/Sizes	2	1
Vibratory Extraction/Installation	Timber	2	1
Vibratory Extraction/Installation	Steel	2	1
Impact Drive	Timber	2	1
Impact Drive	Steel	2	7
		Annual Exposures	**11**

Table 6-36 Estimates of Potential Level B Exposures for Northern Sea Otter at Moorings Cordova

Activity		***Facility-Specific Level B Area (square km)***	***Northern Sea Otter SW Alaska Density***
			21.15 / km^2
Take Per Day Estimate			
Non-Impulsive			
Vibratory Extraction/Installation	Steel	0.0006	0.01269
Impulsive			
Impact Drive	Steel	1.5737	33.283755
Year 1 Estimate			
Activity		Days	
Vibratory Extraction/Installation	Timber	6	1
Impact Drive	Timber	6	200
		Year 2 Exposures	**201**

Table 6-37 Estimates of Potential Level B Exposures for Northern Sea Otter at Station Juneau

Activity			***Northern Sea Otter SE Alaska Abundance***
Take Per Day Estimate			
Non-Impulsive			
Power-washing	Timber		0.179145
Vibratory Extraction/Installation	Timber		0.179145
Clipper	Timber		0.179145
Hydraulic Chainsaw	Timber		0.179145
Impulsive			
Impact Drive	Timber		0.475403
Typical Year Estimate			
Activity		Days	Exposures
Power-Washing	Timber	10	2
Vibratory Extraction/Installation	Timber	10	2
Impact Drive	Timber	10	5
		Annual Exposures	**9**

Table 6-38 Estimates of Potential Level B Exposures for Northern Sea Otter at Moorings Petersburg

Activity			***Northern Sea Otter SE Alaska Abundance***
Take Per Day Estimate			
Non-Impulsive			
Power-washing	Timber/Steel		0.176168
Vibratory Extraction/Installation	Timber		0.176168
Vibratory Extraction/Installation	Steel		0.176168
Clipper	Timber		0.176168
Hydraulic Chainsaw	Timber		0.176168
Impulsive			
Impact Drive	Timber		0.347151
Impact Drive	Steel		5.358508
Typical Year Estimate			
Activity		Days	Exposures
Power-Washing	Timber	4	1
Vibratory Extraction/Installation	Timber	4	1
Vibratory Extraction/Installation	Steel	4	1
Impact Drive	Timber	4	2
Impact Drive	Steel	4	22
		Annual Exposures	**27**

Table 6-39 Level B Harassment Takes of Northern Sea Otter at Moorings Seward

Activity		***Facility-Specific Level B Area (square km)***	***Northern Sea Otter Southcentral Alaska Density***
			2.31 / km^2
Take Per Day Estimate			
Non-Impulsive			
Vibratory Extraction/Installation	Steel	0.0002	0.000462
Impulsive			
Impact Drive	Steel	0.2386	0.551166
Typical Year Estimate			
Activity		Days	Exposures
Vibratory Extraction/Installation	Steel	4	1
Impact Drive	Steel	4	3
		Annual Exposures	**4**

7 ANTICIPATED IMPACT OF THE ACTIVITY

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

7.1 Potential Effects of In-Water Pile Removal Activities on Marine Mammals

7.1.1 Potential Effects Resulting from Underwater Noise

The effects of in-water maintenance activities on marine mammals are dependent on several factors, including species, size, and depth of the animal; depth, intensity, and duration of sound-generating activity; depth of the water column; substrate of the habitat; distance between sound generator and the animal; and sound propagation properties of the environment. Impacts to marine mammals from in-water maintenance 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 the source, the less intense the exposure should be. The substrate and depth of 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 sound more readily than hard substrates (e.g., rock), which may reflect the acoustic wave.

Potential impacts to 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 type and severity of these effects are more difficult to define due to limited studies addressing 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 ears are the most sensitive organ 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 in or near an intense source (Ketten, 1995). Sub-lethal damage to the ear from a pressure wave can rupture the tympanum, fracture 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 referred to as *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. 2005; Finneran et al. 2015). While injuries to other sensitive organs are possible, they are less likely since pile driving impacts are almost entirely acoustically mediated. Based on the conservative modeling assumptions discussed in Section 6, marine mammals may be present. Therefore, marine mammals that are present during in-water maintenance activities may experience auditory effects, but 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. A number of 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 affect the type of response as well. 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; NRC, 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 would indicate disturbance or discomfort. Pinnipeds may increase their haulout 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; Finneran et al., 2012) 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 the review in 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 range tolerated this noise level and did not seem unwilling to dive and did not react 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 haulout 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 and California sea lion) foraging behaviors decreased slightly during construction periods involving impact and vibratory pile driving, and both pinnipeds and harbor porpoises 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 maintenance operations over the Program's authorization period would likely avoid affected areas in which they experience noise-related discomfort, limiting their ability to forage or rest there. As described in the section above, individual responses to in-water maintenance activity noise are expected to vary. Some individuals may occupy a project area during pile replacement without apparent discomfort, but others may be displaced with undetermined effects. Avoidance of the affected area during pile removal 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 the Gulf of Alaska, or local area immediate to the eight facilities, in general. 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 response. Since maintenance activities will only occur during daylight hours, marine mammals swimming, foraging, or resting in a project area at night will not be affected. Effects of in-water maintenance 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 maintenance activities at any of the eight USCG facilities may result in Level B Behavioral harassment. 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 would likely have only a minor effect on individuals and no effect on the population. Mitigation is likely to avoid most potential adverse underwater impacts to marine mammals from in-water maintenance 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, survival, or recovery.

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8 ANTICIPATED IMPACTS ON SUBSISTENCE USES

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

Of the 13 species, including 26 identified stocks, considered in this application, 5 species have been taken as part of subsistence harvests in the Southeast Alaska and the Gulf of Alaska (Table 8-1): minke whale, Steller sea lion, northern fur seal, harbor seal, and northern sea otter.

As stated in Sections 5 and 6, no Level A (injury) takes of marine mammals are anticipated or requested under this LOA through implementation of a defined shutdown zone during all in-water maintenance activities that would require cessation of noise-generating activities should a marine mammal enter the defined shutdown zone. Therefore, in-water maintenance activities would not result in injury or death of any marine mammals that would directly remove individuals from availability for subsistence harvests.

Because in-water maintenance activities to occur at the eight USCG facilities under the Program may result in harassment of marine mammals (Section 6) including near areas where subsistence harvests occur, it is anticipated that these activities may temporarily result in marine mammals briefly avoiding the maintenance areas and surrounding harassment zones of noise-generating activities during maintenance activities. However, these activities would be restricted to the closed and secured waterfronts of the USCG facilities and would neither displace any subsistence uses nor place physical barriers between marine mammals and subsistence hunters.

None of the eight USCG facilities or the projected harassment zones related to noise-generating, in-water maintenance activities associated with the facilities occur within the traditional range of bowhead whales and their typical subsistence hunting grounds in the Bering, Chukchi, and Beaufort seas.

Therefore, in-water maintenance activities at the USCG facilities would not lead to unmitigable adverse impacts on the availability of marine mammal species or stocks for subsistence uses.

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

Marine Mammal	*Stock*	*Subsistence Take Summary*
Fin whale	Northeast Pacific Stock	Subsistence hunters in Alaska and Russia have not been reported to take fin whales from this stock (Muto et al. 2020b)
Gray whale	Eastern North Pacific Stock	In US waters, the Makah Indian Tribe have requested authorization from NMFS and International Whaling Commission for the limited ceremonial and subsistence harvest of gray whales in their usual and accustomed fishing grounds off Washington State (Muto et al. 2020b). No subsistence take of gray whales has been authorized or reported in Alaskan waters.
Humpback whale	Western North Pacific	An intentional unauthorized take of a humpback whale by Alaska Natives in 2016 in Toksook Bay (Muto et al. 2020b)
	Central North Pacific	Subsistence hunters in Alaska are not authorized to take from this stock and no takes were reported between 2013 and 2017. (Muto et al. 2020b)
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. (Muto et al. 2020a)
Cuvier's beaked whale	Alaska	There is no known subsistence harvest of Cuvier's beaked whale. (Muto et al. 2020a)
Sperm whale	North Pacific	Sperm whales have never been reported to be taken by subsistence hunters (Rice 1989; Muto et al. 2020b)
Killer whale	Alaska Resident	There are no reports of subsistence harvest of killer whales in Alaska (Muto et al., 2020a; Muto et al., 2020b)
	Northern Resident	
	Gulf of Alaska, Aleutian Islands, and Bering Sea Transient	
	AT1 Transient	
	West Coast Transient	
Pacific white-sided dolphin	North Pacific	There are no reports of subsistence takes of Pacific white-sided dolphins in Alaska (Muto et al. 2020a)
Dall's porpoise	Alaska	There are no reports of subsistence takes of Dall's porpoise in Alaska (Muto et al. 2020a).
Harbor porpoise	Southeast Alaska	There are no reports of subsistence takes from this stock of harbor porpoise (Muto et al. 2020b)
	Gulf of Alaska	Subsistence hunters have not been reported to harvest from this stock of harbor porpoise since the early 1900s (Shelden et al. 2014; Muto et al. 2020b)

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 (Wolfe et al. 2013), 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) will be used of calculating an annual mortality and serious injury estimate. The average number of animals harvested, plus struck and lost, is 11 animals per year during that 5-year period (Muto et al., 2020a).
	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 Steller sea lions (Muto et al., 2020b citing others)
Northern fur seal	Eastern Pacific	Alaska Natives residing on the Pribilof Islands, in the Bering Sea, outside of the AOR, are allowed an annual subsistence harvest of northern fur seals, with a 3-year take range based on historical local needs (Muto et al., 2020b)
Harbor seal	Prince William Sound	Average annual harvest (2004-2008): 439 Annual harvest 2011: 255 Annual harvest 2014: 387
	Lynn Canal/Stephens Passage	Average annual harvest (2004-2008): 30 Annual harvest 2011: 50
	Sitka/Chatham Strait	Average annual harvest (2004-2008): 222 Annual harvest 2011: 77
	Clarence Strait	Average annual harvest (2004-2008): 164 Annual harvest 2011: 40
	South Kodiak	Average annual harvest (2004-2008): 78 Annual harvest 2011: 126
Northern sea otter	Southeast Alaska	Average annual harvest (2006-2010): 447 Up from previous 5-year period of 322 (USFWS 2014)
	Southcentral Alaska	Average annual harvest (2006-2010): 293 (USFWS 2014)
	Southwest Alaska	Average annual harvest (2006-2010): 76 (USFWS 2014)

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9 ANTICIPATED IMPACTS ON HABITAT

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

The proposed activities at the eight USCG facilities are expected to have little if any effect on the distribution of marine mammals within the individual project areas. Only small numbers of marine mammals are expected to be present during in-water maintenance activities and there are no haulout locations within the project area available to seals, sea lions, or sea otters. Therefore, the main impact issue associated with the proposed activity will be temporarily elevated noise levels and the associated direct effects on marine mammals, as discussed in Sections 6 and 7. The most likely impact to habitat will occur from pile repair and/or replacement effects on likely marine mammal prey (i.e., fish) and minor impacts to the immediate substrate during the removal or installation of piles.

9.1 Maintenance Activity Effects on Potential Prey (Fish)

This LOA application addresses non-impulsive and impulsive sounds associated with the machinery used to clean, remove, and install piles of varying types and sizes at the eight USCG facilities. Fish react to sounds which are especially strong and/or intermittent low-frequency sounds. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. Hastings and Popper (2005) and Popper and Hastings (2009) identified several studies that suggest fish may relocate to avoid certain areas of noise energy. Additional studies have documented effects of pile driving (or other types of continuous sounds) on fishes, although several are based on studies in support of large, multiyear bridge construction projects (Scholik and Yan 2001, 2002; Govoni et al. 2003; Hawkins, 2005; Hastings, 1990; Popper et al. 2006, Popper and Hastings, 2009). The most likely impact to fish from in-water maintenance activities at a Project Area would be temporary behavioral avoidance of the immediate area. The duration of fish avoidance of this area after activity stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. In general, impacts to marine mammal prey species are expected to be minor and temporary.

Injury noise levels are defined by NOAA Fisheries as those non-impulsive noise levels above 234 dB SEL for fish at, and over, 102 grams and above 191 dB SEL for fish under 102 grams and for impulsive noise levels above 187 dB SEL for fish greater than 2 grams and above 183 dB SEL for fish less than 2 grams. Use of a threshold dB value for behavioral responses is not supported, although a threshold of 150 dB RMS dB re 1 µPa has been used (Caltrans 2020). The likelihood of behavioral responses is qualitatively considered to be high within tens of meters, intermediate within hundreds of meters, and low at thousands of meters (Popper et al. 2014).

Table 9-1 presents the calculated SEL_{cum} values for each pile repair and replacement activity as well as details regarding exceedance of mortality, injury, TTS, or behavior values.

For non-impulsive sources, SEL_{cum} at the 10-meter source distance is calculated as:

SEL_{cum} = One-second RMS SPL + 10 log (number of seconds of operation per day)

For impulsive sources, SEL_{cum} at the 10-meter source distance is calculated using the single-strike SEL as:

$SEL_{cum} = SEL_{S\text{-}S}$ + 10 log (number of pile strikes)

Table 9-1 General SELcum Values (10-meter source distance) for Non-Impulsive In-Water Maintenance Activities and Fish Injury/Avoidance Thresholds

Activity Type	*SEL_{cum} (dB at 10m)*	*Injury Threshold for Fish >102g (234 dB SEL)*	*Injury Threshold for Fish <102g (191 dB SEL)*	*Behavior (150 dB RMS)*
Power washing of timber and steel piles 161.0 dB RMS for 9,000seconds per day	201	< 1 m	47 m	54 m
Vibratory Extraction/Installation – Timber 152 dB RMS for 3,000 seconds per day	167	< 1 m	2 m	14 m
Vibratory Extraction/Installation - Steel 162.0 dB RMS for 3,000 seconds per day	197	0.01 m	8 m	63 m
Pile Clipper – Timber 153.8 dB RMS for 710 seconds per day	182	< 1 m	2 m	18 m
Pile Clipper – Concrete 161.2 dB RMS for 3,110 seconds per day	196	< 1 m	24 m	56 m
Hydraulic Chainsaw 151.0 dB RMS for 1,455 seconds per day	183	< 1 m	< 1 m	12 m
Diamond Wire Saw Pile Cutting – Concrete 161.5 dB RMS for 4,650 seconds per day	198	< 1 m	10 m	58 m

Table 9-2 General SEL_{cum} Values (10-meter source distance) for Impulsive In-Water Maintenance Activities and Fish Injury/Avoidance Thresholds

Activity Type	*SEL_{cum} (dB at 10m)*	*Injury Threshold for Fish >2g (187 dB SEL)*	*Injury Threshold for Fish <2g (183 dB SEL)*	*Behavior (150 dB RMS)*
Impact Drive – Timber 170 dB RMS, 160 dB SELs-s, 500 strikes / day	180	< 1 m	2 m	215 m
Impact Drive – Steel 190 dB RMS, 177 dB SELs-s, 2,000 strikes / day	203	< 1 m	63 m	4,642 m
Impact Drive – Concrete 170 dB RMS, 160 dB SELs-s, 920 strikes / day	183	< 1 m	3 m	215 m
DTH Drive – All pile types and sizes 167 dB RMS, 154 dB SELs-s, 14,400 seconds / day and 5 strikes / second, 36,000 strikes / pile, 72,000 strikes / day	203	< 1 m	59 m	136 m

Relatively small portions of the individual maintenance areas would be affected, and the effects on fish would be temporary, limited to the duration of sound-generating activities.

9.2 Maintenance Activity Effects on Potential Foraging Habitat

The areas likely to be impacted by in-water maintenance activities at the eight USCG facilities are relatively small compared to the total available habitat in the CEU Juneau AOR. As a result, repair and replacement of damaged pilings, substrate disturbance, and high levels of activity at individual project sites would be inconsequential in terms of long-term effects on marine mammal foraging.

Previous observations have consistently shown that sediment dissipates in the short-term from much larger bottom disturbing activities such as dredging. As pile driving will resuspend sediments at a much smaller scale in comparison, we can assume that sediment plums will be smaller and settle out quicker than the following references:

USACE 2009 and 2012: “*Elevated turbidity levels and associated resuspended sediments would decrease to background levels within a period of several hours after dredging activities cease*”.

Navy 2014 and 2020: *Based on observations of turbidity caused by bottom disturbances in areas similar to the project site (e.g., sandy bottoms), turbidity plumes are expected to persist for less than one hour following disturbance.*

NOAA NMFS 2021c: *The installation of the steel pipe piles will disturb bottom sediments and may cause a temporary increase in suspended sediment in the action area. Using available information collected from the Tappan Zee Bridge Replacement Project (FHWA 2012) over the Hudson River, we expect pile driving activities to produce total suspended solids (TSS) concentrations of approximately 5 to 10 mg/L above background levels within approximately 300 feet (91 meters) of the pile being driven. The small resulting sediment plume is expected to settle out of the water column within a few hours*.

9.3 Summary of Impacts to Marine Mammal Habitats

Given that the project area and the affected area have limited use as foraging habitat for mammals, the repair and replacement of pilings, substrate disturbance, and high levels of activity at the individual project sites would be inconsequential in terms of effects on marine mammal foraging. Therefore, in-water maintenance activities are not likely to have a permanent, adverse effect on marine mammal foraging habitat at any of the eight USCG facilities.

10 ANTICIPATED IMPACTS OF HABITAT IMPACTS ON MARINE MAMMALS

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

The proposed activities at any of the eight USCG facilities 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. All actions to be undertaken under this Program are maintenance activities only and would not result in the expansion or intensification of any in-water activities at any of the eight USCG facilities. Based on the discussions in Section 9, there will be no impacts to marine mammals resulting from loss or modification of marine mammal habitat.

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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. USCG proposes to employ a number of mitigation measures, discussed below, in an effort to minimize the number of marine mammals potentially affected.

11.1 Mitigation for In-Water Maintenance Activities

11.1.1 Proposed Measures

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 would occur outside of the time window specified in this letter, 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 tidal cycle feasible (e.g., if in-water work would 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 into the environment, thus 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 pile repair, removal, and installation activities at each of the 8 USCG facilities.
7. For each in-water activity, PSOs will monitor all marine waters within the indicated shutdown zone radius for that activity (Table 11-1).

Table 11-1 Shutdown Zones for In-Water Activities by USCG Facility

Activity	Shutdown Radius (m)	Kodiak	Sitka	Ketchikan	Valdez	Cordova	Juneau	Petersburg	Seward
Physical Interaction Shutdown Zone Power-washing Vibratory Extraction Vibratory Installation Pile Clipping Pile Cutting	20	All Species	All Species	All Species	All Species	All Species	All Species	All Species	All Species
Impact Pile Driving - Timber	20	All Species	All Species	All Species	All Species	All Species	All Species	All Species	All Species
	30	HF	HF	HF	HF	-	NF	NF	-
Impact Pile Driving – Steel	20	All Species	All Species	All Species	All Species	All Species	All Species	All Species	All Species
	225	LF	LF	LF	LF	LF	-	LF	LF
	260	HF	HF	HF	HF	HF	-	HF	HF
	125	PW	PW	PW	PW	PW	-	PW	PW
Impact Pile Driving – Concrete	20	All Species	All Species	All Species	All Species	All Species	All Species	All Species	All Species
	40	-	-	LF	-	-	-	-	-
Down-the-hole Drilling	20	All Species	All Species	All Species	All Species	All Species	All Species	All Species	All Species
	445	LF	-	LF	-	-	-	-	-
	525	HF	-	HF	-	-	-	-	-
	240	PW	-	PW	-	-	-	-	-

HF – High Frequency Cetaceans, LF – Low Frequency Cetaceans, PW – Phocid Pinnipeds

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 the USFWS on the placement of PSOs prior to commencing in-water work.
9. Prior to commencing in-water activities including pile repair, removal, and installation, PSOs will scan water within the relevant activity-specific shutdown zone and confirm no listed species are within the shutdown zone for at least 30 minutes immediately prior to initiation of the in-water activity. If one or more listed species are observed within the relevant shutdown zone, the in-water activity will not begin until the listed species exits the shutdown zone of their own accord, or the shutdown zone has remained clear of listed species for 30 minutes immediately prior start of activities.
10. The on-duty PSO will continuously monitor the relevant shutdown zone and adjacent waters during in-water maintenance activities operations for the presence of listed species.
11. In-water activities will take place only:
    a. Between civil dawn and civil dusk;
    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 shutdown zone remains devoid of listed species during in-water maintenance 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 listed species for 30 minutes.

13. The PSO will order the in-water maintenance activities to immediately cease if one or more listed species has entered, or appears likely to enter, the associated shutdown zone.

14. If the in-water maintenance activities are shutdown for less than 30 minutes due to the presence of a listed species in the shutdown zone, in-water maintenance activities may commence when the PSO provides assurance that listed species were observed exiting the shutdown zone. Otherwise, the activities may only commence after the PSO provides assurance that listed species 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 maintenance activities of more than 30 minutes, the PSO will authorize resumption of activities (using soft-start procedures for impact pile driving if applicable) only after the PSO provides assurance that listed species have not been present in the shutdown zone for at least 30 minutes immediately prior to the resumption of operations.

16. If a listed species 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 applicable, using the contact information in Table 11-2.

Protected Species Observer Requirements

17. PSOs must be independent (i.e., not construction personnel) and have no other assigned tasks during monitoring periods.

18. The USCG or its designated non-federal representative will provide resumes or qualifications of PSO candidates to the NMFS or USFWF consultation biologist or Section 7 coordinator for approval at least one week prior to in-water work. NMFS or USFWS will provide a brief explanation of lack of approval in instances where an individual is not approved.

19. At least one PSO will have prior experience performing the duties of a PSO during construction activities.

20. 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/). The 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.

21. Where a team of three or more PSOs are required, a lead observer or monitoring coordinator will be designated.
22. PSOs will:
    a. Have vision correctable to 20/20;
    b. Have the ability 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;
    e. Have writing skills sufficient to create understandable records of observations.
23. 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.
24. PSOs will have the ability and authority to order appropriate mitigation response, including shutdowns, to avoid takes of all listed species.
25. 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 higher 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 LOA and all appendices including the Marine Mammal Monitoring Program;
    h. Legible and fillable observation record form allowing for required PSO data entry.
26. 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 listed species 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 Driving and Down-the-Hole Drilling

Please see the Table 11-1 for required shutdown zones by in-water activity type, location, and marine mammal hearing group.

27. If no listed species are observed within the impact pile driving or down-the-hole drilling shutdown zone 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 pile driving or down-the-hole drilling, any time these activities have been shutdown or delayed due to the presence of a listed species, and following cessation of these activities for a period of 30 minutes or longer.
28. Following this soft-start procedure, operational impact pile driving and down-the-hole drilling may commence and continue prov9ided listed species remain absent from the relevant shutdown zones.

Vibratory Pile Driving

29. If no listed species are observed within the vibratory pile driving 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 listed species, and following cessation of pile driving for a period of 30 minutes or longer.

Vessels

30. Vessel operators will:
    a. Maintain a watch for marine mammals at all times while underway;
    b. Stay at least 91m (100 yds) away from listed marine mammals, except they will remain at least 460m (500 yds) from endangered North Pacific right whales;
    c. Travel at less than 5 knots (9 km/hour) when within 274m (300yds) of a whale;
    d. Avoid changes in direction and speed when within 274m (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;
    g. Reduce vessel speed to less than 10 knots or less when weather conditions reduce visibility to 1.6 km (1 mile) or less
31. Vessel operators will adhere to the 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 91m (100 yds) of any humpback whale;

   b. Cause a vessel or other object to approach within 91m (100 yds) of a humpback whale;
   c. Disrupt the normal behavior or prior activity of a whale by any other act or omission.

32. 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 91m (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 vessels will remain 460m (500 yds) from North Pacific right whales.
33. Vessels will take reasonable steps to alert other vessels in the vicinity of whale(s).
34. 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 – Western DPS Steller Sea Lions, and their Critical Habitat

35. Vessels will not approach within 5.5km (3 nm) of rookery sites listed in 50 CFR §224.103(d).
36. Vessels will not approach within 914m (3,000 ft) of any Steller sea lion haulout or rookery.

General Data Collection and Reporting

Data Collection

37. PSOs will record observations on data forms or into electronic data sheets.
38. 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).
39. PSOs will record the following:
    a. Date, shift start time, shift stop time, and PSO identifier;
    b. Date and time of each reportable event (e.g., a marine mammal observation, operation shutdown, reason for operational shutdown, change in weather);
    c. Weather parameters (e.g., percent cloud cover, percent glare, visibility) and sea state where the Beaufort Wind Force Scale will be used to determine sea state (https://www.weather.gov/mfl/beaufort);
    d. Species, numbers, and if possible, sex and age class of observed marine mammals, and observation date, time, and location and 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 impact pile driving and down-the-hole drilling, species or high 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;

j. Geographic coordinates for the observed animals, with the position recorded by using the most precise coordinates practicable (coordinates will be recorded in decimal degress, or similar standard and defined coordinate system).

Data Reporting

40. 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;

    c. Environmental conditions as they existed during each observation event, including sea conditions, weather conditions, visibility, lighting conditions, and percent ice cover.

41. When project vessels are travelling within North pacific right whale critical habitat in a manner that requires the use of PSOs (i.e., Vessel is travelling within North Pacific right whale critical habitat at greater than 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 AKR.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;

    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 defined) coordinate system);

    e. Environmental conditions 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.

42. 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 the most precise coordinators practicable (coordinates will be recorded in decimal degrees, or similar standard (and defined) coordinate system);

c. Number of humpback whales observed, including number of adults/juveniles, claves observed (if determinable);

d. Environmental conditions as they existed during each observation event, including sea conditions, weather conditions, visibility, lighting conditions and percent ice cover.

Unauthorized Take

43. If a listed 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 and USFWS at R7mmmregulatory@fws.gov. These PSO records will include:

    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, of each event (provide geographic coordinates);

    d. Description of the event;

    e. The time the animal(s) was first observed or entered the shutdown zone, and, if known, the time the animal was last seen or exited the zone, and the fate of the animal;

    f. Mitigation measures implemented prior to and after the animal was taken; and

    g. If a vessel struck a marine mammal, the contact information for the POS on duty, or the contact information for the individual piloting the vessel if there was no PSO on duty;

    h. Photographs or video footage of the animal(s) (if available).

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

44. 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. The PSOs will submit photos and available data to aid NMFS and USFWS in determining how to respond to the stranded animal. If possible, data submitted to NMFS and USFWS 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.

Illegal Activities

45. 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 USFWS Enforcement.

46. Data submitted to NMFS and USFWS will include date/time, location, description of the event, and any photos or videos taken.

Annual Report

47. Submit interim annual 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.

48. Annual reports will be submitted to AKR.section7@noaa.gov and USFWS at R7mmmregulatory@fws.gov within 90 calendar days the completion of the project activities for the year.

Final Report

49. 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 USFWS at R7mmmregulatory@fws.gov. The report will summarize all in-water activities associated with the proposed action, and results of PSO monitoring conducted during the in-water project activities.

50. The final report will include:

    a. Summaries of monitoring efforts, including dates and times of construction, dates and times of monitoring, dates and times and duration of shutdowns due to marine mammal presence;

    b. Date and time of marine mammal observations, geographic coordinates of marine mammals at their closest 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.

Reason for Contact	**Contact Information**
Consultation Questions & Unauthorized Take	Greg Balogh: greg.balogh@noaa.gov & Jenna Malek: jenna.malek@noaa.gov Heather Patterson: heather_patterson@fws.gov Sara Piccolomini: sara_piccolomini@fws.gov
Reports & Data Submittal	AKR.section7@noaa.gov (please include NMFS AKRO tracking number in subject line) R7mmmregulatory@fws.gov
Stranded, Injured, or Dead Marine Mammal *(not related to project activities)*	Stranding Hotline (24/7 coverage) 877-925-7773
Oil Spill & Hazardous Materials Response	U.S. Coast Guard National Response Center: 1-800-424-8802 & AKRNMFSSpillResponse@noaa.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): 1-800-853-1964 USFWS Violations Hotline: 1-800-478-3377
In the event that this contact information becomes obsolete	NMFS Anchorage Main Office: 907-271-5006 Or NMFS Juneau Main Office: 907-586-7236 USFWS Anchorage Field Office: (907) 271-2888

51. Time Restriction – In-water maintenance 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). Further, construction windows will be limited, to the extent possible for maintenance of the USCG mission, to those specified in Table 2-1, found in Section 2.1.
52. General Vessel and Machinery Stoppage – For in-water maintenance 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 to remove pile armoring to provide access to repair or replace pile) 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 20 m (66 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 20 meters (66 ft) of such activity, operations must cease.

53. Pre-Construction Briefing – Prior to the start of all in-water maintenance activities, briefings will be conducted for construction supervisors and crews and the monitoring team when new personnel join the work or a new activity at an individual USCG facility begins, in order to explain responsibilities, communication procedures, the marine mammal protocols, and operations procedures.
54. Establishment of Level A and Level B Harassment Zones During In-Water Maintenance Activities
    a. During all in-water maintenance activities, regardless of predicted SPLs, a physical interaction shutdown zone of 20 m (66 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 repair or replacement activity would 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. Activity and species-specific Level A shutdown zones include:
        a. 250 m (820 ft) low frequency cetaceans during impact driving of steel piles (Kodiak, Sitka, Ketchikan, Valdez, Cordova, Petersburg, and Seward) and DTH drilling (Kodiak and Ketchikan)
        b. 200 m (656 ft) high frequency cetaceans during impact driving of steel piles (Kodiak, Sitka, Ketchikan, Valdez, Cordova, Petersburg, and Seward) and DTH drilling (Kodiak and Ketchikan)
        c. 120 m (394 ft) phocid pinnipeds during impact driving of steel piles (Kodiak, Sitka, Ketchikan, Valdez, Cordova, Petersburg, and Seward) and DTH drilling (Kodiak and Ketchikan)
        d. 35 m (115 ft) high and low frequency cetaceans during impact driving of concrete piles (Ketchikan)
    b. To the maximum extent practicable, the relevant activity and species-specific Level A shutdown zone (250 m – Low Frequency cetaceans, 200 m – High Frequency cetaceans, and 120 m – Phocid pinnipeds during DTH drilling and steel pile impact driving; and 35 m – Low and High Frequency cetaceans during concrete pile impact driving) to power wash, remove, or install a pile. Based on the size of the Level A zones (except those for High Frequency cetaceans), the whole of the shutdown zone will be monitored during all in-water maintenance 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) or 30 minutes (cetaceans). For High Frequency cetaceans, the 200 m (656 ft) shutdown zone will be monitored and then an extrapolation of Level A take will be calculated based on the application of the listed species density for harbor and Dall's porpoises to the difference between the total Level A area for a given in-water activity and the 200 m (656 ft) radius area observed by the Protected Species Observer (PSO) (i.e., Local Species Density X [Total Level A Area – Observed 200 m Shutdown Zone Area]).
    c. To the maximum extent practicable the Level B harassment zones will be monitored throughout the time required to power wash, remove, or install a pile. Because many of the Level B harassment zones (depending on the activity and specific USCG facility) may be outside the visual range of 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 in-water activity and the area observed by the PSO (i.e., Local Species Density X [Total Level B Area – Observed Area] = Inferred 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 maintenance activity shall be halted.

5. Visual Monitoring

   a. In-Water Maintenance: Monitoring will be conducted for a 20 m (66 ft) physical interaction shutdown zone and relevant Level A shutdown and Level B harassment zones identified for the specific maintenance activity at the identified USCG facility, and to the greatest visual extent possible before, during, and after maintenance activities. Monitoring will take place from 30 minutes prior to initiation through 30 minutes post-completion of removal activities. PSOs must record all observations of marine mammals, regardless of distance from the in-water maintenance activity being conducted, as well as the additional data indicated in Section 6 of this LOA.

   b. Monitoring will be conducted by qualified, independent PSOs approved by NMFS and USFWS. All PSOs would 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, the pile removal barge, on shore, or any other suitable location) to monitor for marine mammals and implement shutdown/delay procedures, when applicable, by notifying the operator of a need for a shutdown of construction.

   c. Up to five PSOs will be deployed on land or vessel with a clear view of the shutdown and harassment zones.

   d. PSOs will work in shifts lasting no longer than 4 hours with at 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.

   d. Prior to the start of an in-water maintenance activity, the relevant activity-specific shutdown zone and relevant Level B harassment zone will be monitored for 30 min 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.

   e. If a marine mammal approaches/enters the activity-specific shutdown zone during the course of in-water maintenance activities, 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 min for pinnipeds or 30 minutes for cetaceans have passed without a re-detection of the animal(s) from the last observation time.

   f. If a marine mammal species not covered in this LOA enters the Level B harassment zone, all in-water maintenance activities shall be halted until the animal(s) has been observed to have left the Level B harassment zone. NMFS and USFWS, as appropriate, will be notified immediately with information regarding the species and precautions made during the encounter. In-water maintenance activities will be allowed to proceed if the above measures are fulfilled for non-LOA species.

g. In the event of conditions (such as heavy fog) that prevent visual detection of marine mammals within the Physical Interaction Shutdown Zone or render the Physical Interaction Shutdown Zone not completely visible once in-water maintenance activities have been initiated, activities will be delayed until the full zone is once again visible.

h. If the take of a marine mammal species approaches take limits specified in the LOA, NMFS or USFWS will be notified, and appropriate steps will be discussed.

6. 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 be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of thirty minutes or longer.

7. 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).

11.1.2 Measures Considered but not Proposed

Silt curtains were considered but rejected as a mitigation measure for turbidity because 1) sediments of the project sites are sandy and will settle out rapidly when disturbed; 2) fines that do remain suspended would be rapidly dispersed by tidal currents; and 3) tidal currents would tend to collapse the silt curtains and make them ineffective.

11.1.3 Mitigation Effectiveness

All PSOs utilized for mitigation activities will be experienced biologists with training in marine mammal detection and behavior. Due to their specialized training, USCG expects that visual mitigation will be highly effective. Visual detection conditions are anticipated to vary widely across the eight USCG facilities and throughout the calendar year. However, observers will be positioned in locations which provide the best vantage point(s) for monitoring, such as on nearby piers or on a small boat to maximize visual coverage of the Physical Interaction Shutdown Zone and Level B harassment zone. As such, proposed mitigation measures are likely to be very effective.

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12 MINIMIZATION OF ADVERSE EFFECTS ON SUBSISTENCE USE

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 in-water maintenance activities anticipated to occur over the five-year term of this LOA at the eight USCG facilities would occur within or adjacent to developed harbors or waterfronts and potential noise-related impacts are not anticipated to extend beyond the immediate vicinity of each facility. Of the marine mammals considered in this LOA application, only Steller sea lions, harbor seals, and northern sea otters are known to be taken as part of subsistence harvests in the immediate vicinity of any of the eight USCG facilities. Mitigation measures described in Section 11 would ensure that noise generating in-water maintenance activities would not kill or injure marine mammals, including those important for local subsistence harvests.

As part of ongoing National Environmental Policy Act government-to-government coordination in support of the Programmatic Environmental Assessment of the proposed in-water maintenance program, USCG has contacted Alaska Native tribes in Southeast Alaska and along the Gulf of Alaska. If any Alaska Native tribes express concerns regarding the Proposed Project impacts to subsistence harvests of marine mammals, further coordination with USCG will occur, including provision of additional Proposed Project information and clarification of any mitigation and minimization measures that may reduce potential impacts to marine mammals.

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13 MONITORING AND REPORTING

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 would be implemented along with the mitigation measures (refer to Section 11) in order to reduce impacts to marine mammals to the least extent practicable during the period of this LOA. A marine mammal monitoring plan will be developed further and submitted to NMFS and USFWS for approval well in advance of the start of construction during the LOA period. The monitoring plan includes only visual observations.

13.1.1 Visual Marine Mammal Observations

The USCG will collect sightings data and behavioral responses to construction for marine species observed in the region of activity during the period of in-water maintenance activities. All PSOs will be trained in marine mammal identification and behaviors and meet the requirements defined in Section 11.

13.1.1.1 Methods of Monitoring

The USCG will monitor the 20 m (66 ft) physical interaction shutdown zone and relevant activity and species-specific shutdown zones (Table 11-1), Level B harassment zones, and greatest visual extent possible given conditions, before, during, and after in-water maintenance activities. Based on NMFS requirements, the Marine Mammal Monitoring Plan would 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 PSOs (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 *curriculae vitae* must be submitted to NMFS, and USFWS as appropriate, for review and approval prior the onset of in-water maintenance 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 20 m (66 ft) physical interaction shutdown zone effectively or relevant Level A shutdown zones(see Table 11-1), in-water maintenance activities will not be allowed to start (or continue) until conditions improve.
- For each type of in-water maintenance activities (repair, removal, and installation of piles), PSOs will be placed at the best vantage point(s) practicable (e.g., from a small boat, construction barges, on shore).

- 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 the 5-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). See Figures 6-10 through 6-25 for PSO locations by USCG facility and in-water maintenance activity.
- 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 maintenance activities. Pile-driving activities include the time to remove a single pile or series of piles, as long as the time elapsed between use of the pile driving equipment is no more than 30 minutes.
- During all observation periods, the PSOs will use binoculars and/or the naked eye to search continuously for marine protected species.
- A 20-m (66-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. Beyond the physical interaction shutdown zone, activity and marine mammal hearing group specific shutdown zones will be implemented (see Table 11-1).
- If a marine protected species enters the relevant shutdown zone(s), all in-water maintenance 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. Work will be allowed to restart once the animal has been observed either leaving the shutdown area, or 15 minutes (pinnipeds) or 30 minutes (cetaceans) have elapsed since the last observation without re-detection of the animal.
- 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 and then transferred to searchable electronic documentation (i.e., scans of hardcopies are not acceptable).
- If an injured, sick, or dead marine mammal is observed, procedures outlined in Chapter 11 will be followed.

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 construction.
  - If a marine mammal is present within the 20-m (66-ft 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) 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 maintenance 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 for 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 maintenance activities will not need to be delayed.
- During Activity Monitoring:
  - If any marine protected species approaches, or appears to be approaching, the 20-m (66-ft) 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 Physical Interaction Shutdown Zone.
  - If the marine protected species enters the 20-m (66-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) 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 immediately. For non-LOA species, pile repair, removal, and installation 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 (repaired, 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 for the required to power wash, remove, or install a pile. Based on the size of the Level A zones (see Table 11-1), the whole of the shutdown zone will be monitored during all in-water maintenance 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) or 30 minutes (cetaceans). If visibility degrades such that PSOs can no longer ensure that the entire shutdown zone remains devoid of relevant species, the crew will cease in-water work until the entire shutdown zone is visible to PSOs and the PSOs have indicated that the zone has remained devoid of relevant species for 30 minutes.
- To the maximum extent practicable the Level B harassment zones will be monitored throughout the time required to power wash, remove, or install a pile. Because many of the Level B harassment zones (depending on the activity and specific USCG facility) may be outside the visual range of a PSO, an extrapolation of take will be calculated based on the application of the listed species density to the difference between the total Level B area for a given in-water activity and the area observed by the PSO (i.e., Local Species Density X [Total Level B Area – Observed Area]). 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 maintenance activity shall be halted.

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 period and will focus on observing and reporting unusual or abnormal behaviors.

13.1.2 Data Collection

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

- Date and time that in-water maintenance activity begins or ends;
- In-water maintenance 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.

13.2 Reporting

A draft annual report will be submitted to NMFS and USFWS within 90 calendar days of the completion of the first year of the Program, and within 90 days of every subsequent anniversary of LOA start date. The results of marine mammal monitoring of in-water maintenance activities at the relevant USCG facilities 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 marine mammal report shall contain informational elements including, but not limited to:

- Dates and times (begin 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 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 down-the-hole 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.

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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 would occur, ongoing in-water maintenance activities across all 8 facilities will continue to be conducted in compliance with all relevant federal, state, and local laws and regulations. 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 LOA period, within Southeast Alaska and the Gulf of Alaska. Updated or improved mitigation measures that can be implemented to further eliminate or minimize impacts from in-water maintenance to the extent possible. USCG will make available its field data and behavioral observations of marine mammals that occur in the vicinity of the individual facilities during in-water maintenance activities. Annual results of the monitoring efforts will be provided to NMFS as a draft annual report, as described in Section 13, within 90 days of the conclusion of each year of the LOA 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.

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Appendix A
Marine Mammal Monitoring Plan

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Appendix B
NMFS User Spreadsheets

A: STATIONARY SOURCE: Non-Impulsive, Continuous

VERSION 2.2: 2020

KEY

(green)	**Action Proponent Provided Information**
(pink)	**NMFS Provided Information (Technical Guidance)**
(blue)	**Resultant Isopleth**

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	CEU Juneau - Maintenance Program - 8 USCG Facilities
PROJECT/SOURCE INFORMATION	Power washing of timber and steel piles prior to pile jacket installation/repair at 161 dB RMS at 10m for 1,800 seconds per piles and 5 piles per day (9,000 seconds per day)
Please include any assumptions	
PROJECT CONTACT	

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value.
Weighting Factor Adjustment (kHz)¥	2.5	

¥ Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 47), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Source Level (L_{rms})	161
Duration of Sound Production (hours) within 24-h period	2.5
Duration of Sound Production (seconds)	9000
10 Log (duration of sound production)	39.54
Propagation loss coefficient	15

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	1.3	0.1	1.9	0.8	0.1

WEIGHTING FUNCTION CALCULATIONS

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

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

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

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.1: 2020

KEY

(green)	**Action Proponent Provided Information**
(pink)	**NMFS Provided Information (Technical Guidance)**
(blue)	**Resultant Isopleth**

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	CEU Juneau - Maintenance Program - 8 USCG Facilities
PROJECT/SOURCE INFORMATION	Vibratory pile extraction/installation of 12-inch timber piles. 153 dB RMS (at 10 m from source) reported by WSDOT (2011) at Port Townsend Terminal. No duration listed in source, assumed 10 minutes per pile and 5 piles per day.

Please include any assumptions

PROJECT CONTACT	

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)¥	2.5	

¥ Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	153
Number of piles within 24-h period	5
Duration to drive a single pile (minutes)	10
Duration of Sound Production within 24-h period (seconds)	3000
10 Log (duration of sound production)	34.77
Transmission loss coefficient	15
Distance of sound pressure level (L_{rms}) measurement (meters)	10

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	**1.8**	**0.2**	**2.6**	**1.1**	**0.1**

WEIGHTING FUNCTION CALCULATIONS

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

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

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

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.1: 2020

KEY

(green)	**Action Proponent Provided Information**
(pink)	**NMFS Provided Information (Technical Guidance)**
(blue)	**Resultant Isopleth**

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	CEU Juneau - Maintenance Program - 8 USCG Facilities
PROJECT/SOURCE INFORMATION	Vibratory pile driving of steel piles. 162 dB RMS (at 10 m from source) reported by WSDOT (2020) at the Friday Harbor Terminal. No duration listed in source, assumed 10 minutes.

Please include any assumptions

PROJECT CONTACT	

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)¥	2.5	

¥ Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B30)	162
Number of piles within 24-h period	5
Duration to drive a single pile (minutes)	10
Duration of Sound Production within 24-h period (seconds)	3000
10 Log (duration of sound production)	34.77
Transmission loss coefficient	15
Distance of sound pressure level (L_{rms}) measurement (meters)	10

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	**7.1**	**0.6**	**10.4**	**4.3**	**0.3**

WEIGHTING FUNCTION CALCULATIONS

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

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

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

A: STATIONARY SOURCE: Non-Impulsive, Continuous

VERSION 2.1: 2020

KEY

(green)	**Action Proponent Provided Information**
(pink)	**NMFS Provided Information (Technical Guidance)**
(blue)	**Resultant Isopleth**

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	USCG CEU 5-Year Maintenance Program LOA
PROJECT/SOURCE INFORMATION	12-inch timber pile removal via pile clipper as reported in San Diego Bay Acoustic Compendium (2020). 153.8 dB RMS (Mean of Maximum values) measured at 10m from source. Average of 2mm:22ss duration per pile (2.4min per pile) with 5 piles/per day
Please include any assumptions	
PROJECT CONTACT	Matt Sauter matthew.sauter@woodplc.com

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value.
Weighting Factor Adjustment (kHz)¥	2.5	

¥ Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 47), and enter the new value directly. However, they must provide additional support and documentation supporting this modificatio

STEP 3: SOURCE-SPECIFIC INFORMATION

Source Level (L_{rms})	153.8
Duration of Sound Production (hours) within 24-h period	0.2
Duration of Sound Production (seconds)	720
10 Log (duration of sound production)	28.57
Propagation loss coefficient	15

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	**0.1**	**0.0**	**0.1**	**0.0**	**0.0**

WEIGHTING FUNCTION CALCULATIONS

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

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

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

A: STATIONARY SOURCE: Non-Impulsive, Continuous

VERSION 2.1: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	USCG CEU 5-Year Maintenance Program LOA
PROJECT/SOURCE INFORMATION	24-inch concrete pile removal via pile clipper as reported in San Diego Bay Acoustic Compendium (2020). 161.2 dB RMS (Mean of Maximum values) measured at 10m from source. Average of 10:22 duration per pile with 5 pile/per day
Please include any assumptions	
PROJECT CONTACT	Matt Sauter matthew.sauter@woodplc.com

STEP 2: WEIGHTING FACTOR ADJUSTMENT

Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value.

Weighting Factor Adjustment (kHz)[¥]	2.5	

[¥] Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 47), and enter the new value directly However, they must provide additional support and documentation supporting this modificatio

STEP 3: SOURCE-SPECIFIC INFORMATION

Source Level (L_{rms})	161.2
Duration of Sound Production (hours) within 24-h period	0.87
Duration of Sound Production (seconds)	3132
10 Log (duration of sound production)	34.96
Propagation loss coefficient	15

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	**0.6**	**0.1**	**0.9**	**0.4**	**0.0**

WEIGHTING FUNCTION CALCULATIONS

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

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

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

A: STATIONARY SOURCE: Non-Impulsive, Continuous

VERSION 2.1: 2020

KEY

(green)	**Action Proponent Provided Information**
(pink)	**NMFS Provided Information (Technical Guidance)**
(blue)	**Resultant Isopleth**

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	USCG CEU 5-Year Maintenance Program LOA
PROJECT/SOURCE INFORMATION	Pile removal via underwater chainsaw as reported in San Diego Bay Acoustic Compendium (2020). 151 dB RMS measured at 10 m from source. Average of 4:51 duration per pile with 5 piles/per day
Please include any assumptions	
PROJECT CONTACT	Matt Sauter matthew.sauter@woodplc.com

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value.
Weighting Factor Adjustment (kHz)[¥]	2.5	

[¥] Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 47), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Source Level (L_{rms})	151
Duration of Sound Production (hours) within 24-h period	0.41
Duration of Sound Production (seconds)	1476
10 Log (duration of sound production)	31.69
Propagation loss coefficient	15

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	**0.1**	**0.0**	**0.1**	**0.0**	**0.0**

WEIGHTING FUNCTION CALCULATIONS

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

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

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

A: STATIONARY SOURCE: Non-Impulsive, Continuous

VERSION 2.1: 2020

KEY

(green)	**Action Proponent Provided Information**
(pink)	**NMFS Provided Information (Technical Guidance)**
(blue)	**Resultant Isopleth**

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	USCG CEU 5-Year Maintenance Program LOA
PROJECT/SOURCE INFORMATION	Diamond wire saw cutting of all pile types (NAVFAC SW 2020) at 161.5 dB RMS at 930 seconds per pile and 5 piles per day
Please include any assumptions	
PROJECT CONTACT	Matt Sauter matthew.sauter@woodplc.com

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value.
Weighting Factor Adjustment (kHz)[¥]	2.5	

[¥] Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 47), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Source Level (L_{rms})	161.5
Duration of Sound Production (hours) within 24-h period	1.29
Duration of Sound Production (seconds)	4644
10 Log (duration of sound production)	36.67
Propagation loss coefficient	15

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	**0.9**	**0.1**	**1.3**	**0.5**	**0.0**

WEIGHTING FUNCTION CALCULATIONS

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

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

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

E.1: IMPACT PILE DRIVING (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.1: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	USCG CEU Juneau 5-Year Maintenance Plan LOA
PROJECT/SOURCE INFORMATION	Impact pile driving of 12-inch timber piles reported by Caltrans (2015) Ballena Bay Marina. 170 dB RMS and 160 dB single-strike SEL (both at 10m from source). No strike count provided but assumed to be 100.

Please include any assumptions

PROJECT CONTACT	Matt Sauter matthew.sauter@woodplc.com

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)[¥]	2	

[¥] Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 73), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

NOTE: METHOD E.1-1 is PREFERRED method when SEL-based source levels are available (because pulse duration is not required). Only use method E.1-2 if SEL-based source levels are not available.

E.1-1: METHOD TO CALCULATE PK AND SEL_{cum} (SINGLE STRIKE EQUIVALENT) **PREFERRED METHOD (pulse duration not needed)**

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**187.0**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B32)	160
Number of strikes per pile	100
Number of piles per day	5
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G29)	180
Distance of $L_{p,0\text{-}pk}$ measurement (meters)*	10
$L_{p,0\text{-}pk}$ Source level	195.0

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**18.4**	**0.7**	**21.9**	**9.9**	**0.7**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**NA**	**NA**	**NA**	**NA**	**NA**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

E.1-2: METHOD TO CALCULATE PK AND SEL_{cum} (USING RMS SPL SOURCE LEVEL)

SEL_{cum}

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B53)	170
Number of piles per day	5
Strike (pulse) Duration[^] (seconds)	0.1
Number of strikes per pile	100
Duration of Sound Production (seconds)	50
10 Log (duration of sound production)	16.99
Transmission loss coefficient	15
Distance of sound pressure level (L_{rms}) measurement (meters)	10

[^]Window that makes up 90% of total cumulative energy (5%-95%) based on Madsen 2005

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G47)	180
Distance of $L_{p,0\text{-}pk}$ measurement (meters)*	10
$L_{p,0\text{-}pk}$ Source level	195.0

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**18.4**	**0.7**	**21.9**	**9.9**	**0.7**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**NA**	**NA**	**NA**	**NA**	**NA**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

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

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

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

E.1: IMPACT PILE DRIVING (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.1: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	USCG CEU Juneau 5-Year Maintenance Plan LOA
PROJECT/SOURCE INFORMATION	Impact pile driving of 24-inch steel piles as reported in Yurk et al. 2015 based on California values (177 dB SELs-s, 190 dB RMS, 203 dB Peak at 10m) assumed 400 strikes per pile and one pile per day.

Please include any assumptions

PROJECT CONTACT	Matt Sauter matthew.sauter@woodplc.com

STEP 2: WEIGHTING FACTOR ADJUSTMENT

Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value

Weighting Factor Adjustment (kHz)[¥]	2	

[¥] Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 73), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

NOTE: METHOD E.1-1 is PREFERRED method when SEL-based source levels are available (because pulse duration is not required). Only use method E.1-2 if SEL-based source levels are not available.

E.1-1: METHOD TO CALCULATE PK AND SEL_{cum} (SINGLE STRIKE EQUIVALENT) **PREFERRED METHOD (pulse duration not needed)**

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**203.0**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B32)	177
Number of strikes per pile	400
Number of piles per day	1
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G29)	203
Distance of $L_{p,0\text{-}pk}$ measurement (meters)*	10
$L_{p,0\text{-}pk}$ Source level	218.0

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**215.8**	**7.7**	**257.1**	**115.5**	**8.4**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**NA**	**NA**	**11.7**	**NA**	**NA**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

E.1-2: METHOD TO CALCULATE PK AND SEL_{cum} (USING RMS SPL SOURCE LEVEL)

SEL_{cum}

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B53)	170
Number of piles per day	1
Strike (pulse) Duration[^] (seconds)	0.1
Number of strikes per pile	207
Duration of Sound Production (seconds)	20.7
10 Log (duration of sound production)	13.16
Transmission loss coefficient	15
Distance of sound pressure level (L_{rms}) measurement (meters)	10

[^] Window that makes up 90% of total cumulative energy (5%-95%) based on Madsen 2005

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G47)	206
Distance of $L_{p,0\text{-}pk}$ measurement (meters)*	10
$L_{p,0\text{-}pk}$ Source level	221.0

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**10.2**	**0.4**	**12.2**	**5.5**	**0.4**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**1.4**	**NA**	**18.5**	**1.6**	**NA**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

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

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

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

E.1: IMPACT PILE DRIVING (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.1: 2020

KEY

	Action Proponent Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	USCG CEU Juneau 5-Year Maintenance Plan LOA
PROJECT/SOURCE INFORMATION	Impact pile driving of 24-inch concrete piles reported by WSDOT (2018) Mukilteo Terminal. 170 dB RMS and 160 dB single-strike SEL (both at 10m from source). 184 strikes.

Please include any assumptions

PROJECT CONTACT	Matt Sauter matthew.sauter@woodplc.com

STEP 2: WEIGHTING FACTOR ADJUSTMENT

		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value
Weighting Factor Adjustment (kHz)¥	2	

¥ Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 73), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

NOTE: METHOD E.1-1 is PREFERRED method when SEL-based source levels are available (because pulse duration is not required). Only use method E.1-2 if SEL-based source levels are not available.

E.1-1: METHOD TO CALCULATE PK AND SEL_{cum} (SINGLE STRIKE EQUIVALENT) **PREFERRED METHOD (pulse duration not needed)**

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**189.6**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\ single\ strike}$) specified at "x" meters (Cell B32)	160
Number of strikes per pile	184
Number of piles per day	5
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\ single\ strike}$) measurement (meters)	10

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G29)	184
Distance of $L_{p,0\text{-}pk}$ measurement (meters)*	10
$L_{p,0\text{-}pk}$ Source level	199.0

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**27.7**	**1.0**	**33.0**	**14.8**	**1.1**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**NA**	**NA**	**NA**	**NA**	**NA**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

E.1-2: METHOD TO CALCULATE PK AND SEL_{cum} (USING RMS SPL SOURCE LEVEL)

SEL_{cum}

Sound Pressure Level (L_{rms}), specified at "x" meters (Cell B53)	170
Number of piles per day	5
Strike (pulse) Duration^ (seconds)	0.1
Number of strikes per pile	184
Duration of Sound Production (seconds)	92
10 Log (duration of sound production)	19.64
Transmission loss coefficient	15
Distance of sound pressure level (L_{rms}) measurement (meters)	10

^Window that makes up 90% of total cumulative energy (5%-95%) based on Madsen 2005

PK

$L_{p,0\text{-}pk}$ specified at "x" meters (Cell G47)	184
Distance of $L_{p,0\text{-}pk}$ measurement (meters)*	10
$L_{p,0\text{-}pk}$ Source level	199.0

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**27.7**	**1.0**	**33.0**	**14.8**	**1.1**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**NA**	**NA**	**NA**	**NA**	**NA**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

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

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

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

E.2: DTH PILE DRIVING/INSTALLATION (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.2: 2020

KEY

(green)	**Action Proponent Provided Information**
(pink)	**NMFS Provided Information (Technical Guidance)**
(blue)	**Resultant Isopleth**

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	CEU Juneau - Maintenance Program - 8 USCG Facilities
PROJECT/SOURCE INFORMATION	DTH Drilling of Pile: 159 dB SELss, 184 dBPeak, 167 dB RMS for 20-24" piles (Heyvaert & Reyff 2021)

Please include any assumptions

PROJECT CONTACT	Matt Sauter matthew.sauter@woodplc.com

STEP 2: WEIGHTING FACTOR ADJUSTMENT

Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value

Weighting Factor Adjustment (kHz)*	2	

* Broadband: 95% frequency contour percentile (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 50), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

STEP 3: SOURCE-SPECIFIC INFORMATION

Unweighted SEL_{cum} (at measured distance) = SEL_{ss} + 10 Log (# strikes)	**207.6**

SEL_{cum}

Single Strike SEL_{ss} ($L_{E,p,\text{ single strike}}$) specified at "x" meters (Cell B30)	159
Strike rate (average strikes per second)	10
Duration to drive pile (minutes)	60
Number of piles per day	2
Transmission loss coefficient	15
Distance of single strike SEL_{ss} ($L_{E,p,\text{ single strike}}$) measurement (meters)	10
Total number of strikes in a 24-h period	72000

PK

$L_{p,0\text{-pk}}$ specified at "x" meters (Cell G26)	
Distance of $L_{p,0\text{-pk}}$ measurement (meters)	
$L_{p,0\text{-pk}}$ Source level	#NUM!

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**434.1**	**15.4**	**517.1**	**232.3**	**16.9**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**

"NA": PK source level is ≤ to the threshold for that marine mammal hearing group.

WEIGHTING FUNCTION CALCULATIONS

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

NOTE: If user decided to override these Adjustment values, they need to make sure to download another copy to ensure the built-in calculations function properly.

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

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