INCIDENTAL HARASSMENT AUTHORIZATION APPLICATION FOR THE NAVY'S FUEL PIER INBOARD PILE REMOVAL AND DREDGING PROJECT AT NAVAL BASE POINT LOMA

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Submitted to:

Office of Protected Resources,
National Marine Fisheries Service,
National Oceanic and Atmospheric Administration

Prepared by:

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For:

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ACRONYMS AND ABBREVIATIONS

BMP(s)	best management practice(s)
°C	Celsius
Caltrans	California Department of Transportation
CFR	Code of Federal Regulations
CLT	California least tern
CI	confidence interval
CV	coefficient of variation
cm	centimeter
CTR	California Toxic Rule
cy	cubic yards
dB	decibel
dBA	A-weighted sound level
EA	Environmental Assessment
ESA	Endangered Species Act
ESTCP	Environmental Security Technology Certification Program
°F	Fahrenheit
FR	Federal Register
ft	foot/feet
>	greater than
ha	hectare
Hz	hertz
IHA	Incidental Harassment Authorization
in	inch(es)
kg	kilogram
kHz	kilohertz
km	kilometer(s)
km^2	square kilometer(s)
lb(s)	pound(s)
LMR	Living Marine Resources
m	meter(s)
mL/L	milliliter per liter
MLLW	mean lower low water
MMPA	Marine Mammal Protection Act
MOU	memorandum of understanding
µg/L	microgram per liter
µPa	microPascal
NAVFAC	Naval Facilities Engineering Systems Command (SW = Southwest)
Navy	U.S. Department of the Navy
NBPL	Naval Base Point Loma
NDBC	National Data Buoy Center
NEPA	National Environmental Policy Act
nmi	nautical miles
NMSDD	National Marine Species Density Database
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Service
NRC	National Research Council
ONR	Office of Naval Research
Pa	Pascal
POSD	Port of San Diego
ppm	parts per million
Project	Fuel Pier Inboard Pile Removal and Dredging Project
PSO	protected species observer
PTS	permanent threshold shift
R&D	research and development
RMS	root mean square
s	second(s)
SEL	sound exposure level
SERDP	Strategic Environmental Research and Development Program
SPL	sound pressure level
SPL_{PEAK}	peak sound pressure level
TL	transmission loss
TTS	temporary threshold shift
re 1 µPa	referenced to 1 micropascal
U.S.	United States
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WSDOT	Washington State Department of Transportation
ZOI	Zone of Influence

EXECUTIVE SUMMARY

In accordance with the Marine Mammal Protection Act (MMPA) of 1972, as amended, the United States (U.S.) Navy (Navy) is applying for an Incidental Harassment Authorization (IHA) for activities associated with the Fuel Pier Inboard Pile Removal and Dredging Project (Project) in the northern part of San Diego Bay at Naval Base Point Loma (NBPL). For this IHA application, the Navy determined that underwater noise from pile removal in advance of dredging within the NBPL Fuel Pier's Inboard Berth has the potential to result in incidental harassment under the MMPA. This IHA application is intended to cover an approximately 12 month window during which 84 days of pile removal activity would occur. A subsequent Continuation IHA application will be submitted for any remaining in-water demolition activities that are necessary to complete the project that extend beyond the planned one-year IHA period.

Six species of marine mammals have a reasonable likelihood of occurrence during the project's timeline and could thereby be exposed to sound pressure levels (SPLs) and sound exposure levels (SELs) associated with non-impulsive pile removal of existing pilings:

- California sea lion (*Zalophus californianus*)
- Harbor seal (*Phoca vitulina*)
- Northern elephant seal (*Mirounga angustirostris*)
- Bottlenose dolphin (*Tursiops truncatus*)
- Common dolphin including long- and short-beaked (*Delphinus capensis* and *D. delphis*)
- Pacific white-sided dolphin (*Lagenorhynchus obliquidens*)

NBPL is located on the peninsula of Point Loma near the mouth and along the northern edge of San Diego Bay. NBPL provides berthing and support services to Navy submarines and other fleet assets. The entirety of NBPL is restricted from general public access, although the adjacent waters of San Diego Bay are heavily used by the public as well as the Navy. The Project involves removal of approximately 409 partial piles (predominantly 16-inch concrete), performance of associated dredging of the Fuel Pier Inboard area to approximately -6.7 meters (m; -22 feet [ft]) mean lower low water (MLLW), and the beneficial reuse or offshore disposal of dredged sediments. Section 1.3 describes in detail the proposed activities to be conducted during this IHA period. The proposed activities with the potential to affect marine mammals within the waterways adjacent to NBPL that could result in harassment under the MMPA are pile removal by clipping and cutting with an underwater chainsaw or diamond wire saw.

The recently constructed NBPL Defense Fuel Support Point, "Fuel Pier," is critical to the mission of the Navy and is the only active Navy fueling facility in Southern California. The Fuel Pier serves as a fuel depot for loading and unloading tankers, Navy underway replenishment vessels that refuel ships at sea ("oilers") fueling Navy, Department of Homeland Security, Department of Defense, and foreign Navy vessels, as well as transferring fuel to local replenishment vessels and other small craft operating in San Diego Bay. .

The Proposed Action is needed to provide adequate ship berthing capability, including water depth, to support modern Navy ships and ultimately, Fleet readiness as part of the Navy's overall mission to maintain, train, and equip combat-ready Naval forces. Unless the Navy dredges the currently too-shallow inboard area of the Fuel Pier, NBPL will not be able to properly support fueling operations of the widest variety of vessels.

No new ship homeporting actions are specifically planned as a part of the Proposed Action. Ongoing fuel loading at the NBPL Fuel Pier was previously analyzed in the NBPL Fuel Pier Replacement and Dredging

Environmental Assessment (EA; Navy 2013a). Therefore, fuel-loading operations associated with the Proposed Action are not addressed in this IHA which is limited to in-water pile removal activities.

In this IHA application, the Navy has used National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NOAA Fisheries) Technical Guidance (NOAA Fisheries 2018) and User Spreadsheet (NOAA Fisheries 2020a), and acoustic data recorded during the previous Fuel Pier Replacement Project to identify the Level A (injury) and Level B (behavior) zones of influence (ZOIs) that would result from pile removal, as outlined in Section 6 and presented in Table ES-1. Recently proposed changes to the criteria and thresholds (Southall et al. 2019) have not been formally adopted as of the date of this application and are not used here. Empirically measured source levels from similar pile removal events as reported in the literature (Naval Facilities Engineering Systems Command Southwest [NAVFAC SW] 2020) were used to estimate sound source levels for this project. Source levels for pile removal are typically measured at 10 m (33 ft) from a pile in order to standardize sound measurement data. For pile removal activities, underwater sound transmission loss is estimated using the simple spreading loss model and compared against acoustic data reported during the previous Fuel Pier Replacement Project. Ambient underwater sound levels for the project area (NAVFAC SW 2020) are used as appropriate in the analysis.

Table ES-1 Noise Model Used to Calculate Level A and B ZOI by Pile Removal Method and Pile Type

<table>
<tr><th>Removal Method</th><th>Pile Type</th></tr>
<tr><td colspan="2">Level A ZOIs: NOAA Fisheries Technical Guidance (2018) and User Spreadsheet (2020a)
Level B ZOIs: Real-time data collected during the previous Fuel Pier Replacement Project (NAVFAC SW 2020) or City of Seattle Pier 62 Project (Greenbusch Group 2018)</td></tr>
<tr><td>Pile clipper</td><td>13-inch polycarbonate fender piles
14-inch and 16-inch concrete piles</td></tr>
<tr><td>Two pile clippers[1]</td><td rowspan="4">14-inch and 16-inch concrete piles</td></tr>
<tr><td>Underwater chainsaw</td></tr>
<tr><td>Diamond wire saw[2]</td></tr>
<tr><td>Vibratory hammer[3]</td></tr>
</table>

Notes:
[1] Two pile clippers to be used to simultaneously clip up to two concrete piles
[2] Diamond wire saw, as reported in the San Diego Noise Compendium for removal of 66-inch and 84-inch caissons which have similar observed noise profiles (NAVFAC SW 2020)
[3] Vibratory hammer for removal of timber piles, as reported for City of Seattle Pier 62 Project Acoustic Monitoring Season 1 Report (Greenbusch Group 2018)

Potential exposures that would constitute takes under the MMPA are calculated and described in Section 6 and, based on this analysis, no mortality or serious injuries are anticipated. When Level A ZOIs are small, a 10 m (33 ft) “Physical Interaction Shutdown Zone” is generally used to reduce the risk of physical interaction between marine mammals and in-water equipment. However, because there are large numbers of pinnipeds in the Project area, an additional 10 m (33 ft) buffer has been added to the “Physical Interaction Shutdown Zone.” This would provide a 20 m (66 ft) buffered shutdown zone for all marine species observed in the Project area. This would further reduce the likelihood of Level A harassment (minor injury due to the onset of a permanent threshold shift [PTS]), which could only occur if an animal were to remain well inside of 10 m (33 ft) for a prolonged period. Previously established

acoustic data and a simple spreading loss model are used to determine the extent of the Level B ZOIs for these activities.

The Project will include continued observational monitoring of marine mammal occurrences within established ZOIs.

Pursuant to the MMPA Section 101(a)(5)(D)[1], the Navy submits this application to the NOAA Fisheries for an IHA for the incidental, but not intentional, taking of 2,275 marine mammals during approximately 84 days of pile removal activities as part of the Fuel Pier Inboard Pile Removal and Dredging Project occurring during the one year period beginning January 1, 2022 and ending December 31, 2022. The anticipated take of marine mammals would be in the form of non-lethal, temporary harassment behavioral disturbance and is expected to have a negligible impact on the species. If in-water activities do not occur within the anticipated project window, a request for renewal will be submitted and received by NOAA Fisheries no later than 60 days prior to the expiration of this IHA. The renewal request will include an explanation that the activities to be conducted under the requested renewal are identical to the activities analyzed under the initial IHA, are a subset of the activities, or include changes so minor that the changes do not affect the previous analyses, mitigation and monitoring requirements, or take estimates (with the exception of reducing the type or amount of take because only a subset of the initially analyzed activities remain to be completed under the renewal). The renewal request will also include a preliminary monitoring report showing the results of required monitoring to date and an explanation showing that the monitoring results do not indicate impacts of a scale or nature not previously analyzed or authorized.

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

[1] 16 U.S.C. § 1371(a)(5); 50 CFR Part 216, Subpart I.

1 DESCRIPTION OF ACTIVITIES

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

1.1 Introduction

Pursuant to the Marine Mammal Protection Act (MMPA) of 1972, as amended in 1994, Section 101(a)(5)(D), the United States Navy (Navy) submits this application to the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NOAA Fisheries) for an Incidental Harassment Authorization (IHA) for the incidental taking of marine mammal species during pile removal and dredging activities associated with the Fuel Pier Inboard Pile Removal and Dredging Project at Naval Base Point Loma (NBPL), California (Figure 1-1). This application is intended to cover in-water pile removal associated with the old Fuel Pier footprint that may result in takes of marine mammals for the one-year period between January 1, 2022 through December 31, 2022. In-water pile removal activities would be limited to between September 16 and March 31 (196 days) per the Navy/United State Fish and Wildlife Service (USFWS) California least tern (CLT) Memorandum of Understanding (MOU) with an estimated maximum of 84 days of pile removal activities during this period. Dredging activities, including transportation of dredged material to nearshore or ocean disposal sites, are not anticipated to generate noise levels capable of causing takes of marine mammals, and are proposed to occur as necessary at any time during the 196-day period outside of CLT nesting season and over the course of the one-year IHA period.

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

1.2 Proposed Action

NBPL is located on the peninsula of Point Loma near the mouth and along the northern edge of San Diego Bay. NBPL provides berthing and support services to Navy submarines and other fleet assets. The entirety of NBPL is restricted from general public access, although the adjacent waters of San Diego Bay are heavily used by the public as well as the Navy. The Proposed Action involves removal of approximately 409 partial piles (predominantly 16-inch concrete), performance of associated dredging of the Fuel Pier Inboard area to approximately -6.7 meters (m; -22 feet [ft]) mean lower low water (MLLW), and the potential beneficial reuse of the dredged sediments. Section 1.3 describes the proposed activities to be conducted during this IHA period in detail. The proposed activities with the potential to affect marine mammals within the waterways adjacent to NBPL that could result in harassment under the MMPA are pile removal by clipping,

cutting with an underwater chainsaw or diamond wire saw, or use of a vibratory hammer to loosen and pull piles. Because dredging noise generation occurs in the subsurface (i.e., where the bucket contacts sediment and below), noise generated by these activities are anticipated to be below injury and harassment thresholds and are not considered further in this application. Additionally, transport via barge of dredged sediment would generate underwater noise similar to existing vessel traffic in the Bay and would not result in any takes of marine mammals. Whereas this section provides an overview of the entire project, Section 2 provides more specific details on activities proposed to occur during the period of this IHA.

The recently constructed NBPL Defense Fuel Support Point, “Fuel Pier,” is critical to the mission of the Navy and is the only active Navy fueling facility in southern California. The Fuel Pier serves as a fuel depot for loading and unloading tankers, Navy underway replenishment vessels that refuel ships at sea (“oilers”) fueling Navy, Department of Homeland Security, Department of Defense, and foreign Navy vessels, as well as transferring fuel to the local replenishment vessels and other small craft operating in San Diego Bay.

The Proposed Action is needed to provide adequate ship berthing capability, including water depth, to support modern Navy ships and ultimately, Fleet readiness as part of the Navy’s overall mission to maintain, train, and equip combat-ready Naval forces. Unless the Navy dredges the currently too-shallow inboard area of the Fuel Pier, NBPL will not be able to properly support fueling operations for the widest variety of vessels.

No new ship homeporting actions are specifically planned as a part of the Proposed Action. Ongoing fuel loading at the NBPL Fuel Pier was previously analyzed in the NBPL Fuel Pier Replacement and Dredging Environmental Assessment (EA; Navy 2013a). Therefore, fuel loading operations associated with the Proposed Action are not addressed in this IHA which is limited to in-water pile removal activities.

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Path: Q:\3151_AquaticResources\SanDiegoMaintenanceDredging\MXD\ReportFigures\2020\NBPL_InnerBerths_FuelPier\SAP\Fig1-2a_ProjectLocation.mxd, aaron.johnson 2/18/2020

1 inch = 300 feet

0 150 300 Feet

Notes:
MLWW = Mean Lower Low Water
OD = Over Dredge

Berthing and Transit Area

Dredge to -22 MLLW Plus OD Allowance

Bathymetric Contour

FIGURE 1-1

Project Location
Navy Base Point Loma Fuel Pier
Inboard Pile Removal and Dredging
San Diego Bay, CA

1.3 Description of Activities

Figure 1-1 presents an overview of the new fuel pier and inboard dredging area. The Navy would remove piles associated with the old Fuel Pier footprint and dredge the Fuel Pier inboard area over a period of approximately 84 days within the 196-day period outside of CLT nesting season over the course of the one-year IHA period generally in the following manner:

- Following an initial hazardous materials survey and any necessary abatement, workers would remove approximately 5 piles per day. This pile removal rate is extrapolated from actual rates achieved during the previous Fuel Pier Replacement Project. At this rate, in-water pile removal activities are anticipated to require 84 working days. The existing, previously cut or clipped piles within the dredge footprint include 33.0 centimeter (cm; 13-inch) polycarbonate piles and 35.6-cm (14-inch) and 40.6-cm (16-inch) square concrete piles.
- Workers would conduct maintenance dredging of the Fuel Pier Inboard area to a design depth of -6.7 m (-22 ft) below MLLW and expected to include 8,671 cubic meters (11,341 cubic yards) of dredged material for beneficial reuse, in-water disposal, or upland disposal dependent on the quality of dredged sediments.

In the case of pile clipping, workers would place a hydraulic clipper over each pile and lower it to the mudline. Diver assistance may or may not be required during this specific pile removal activity. An underwater chainsaw operated by a diver may also be used to remove piles. A diamond wire saw rig may be used to cut piles with workers lowering the saw rig around a pile and then using a lever bar to push/pull the saw through the pile. Additionally, a vibratory hammer may be placed around a pile to loosen the pile from surrounding sediment and then workers would pull the pile vertically. It is assumed that the contractor will use one of the above described methods depending on which method proves to be most efficient method to remove the pile. Once the piles are cut or clipped, a crane would remove the pile and set it onto a barge for transport to a concrete processing yard (at NBPL or offsite). Throughout the pile removal effort, workers in support boats would gather any floating debris for recycling or disposal, as appropriate.

Following, or coincident with, removal of the remaining, previously cut piles, the Navy would dredge the Fuel Pier Inboard Area to depth of -6.7 m (-22 ft) MLLW. The total volume to be dredged would be 8,671 cubic meters (11,341 cubic yards) and dredging operations would occur during and after the 84 days required to complete pile removal and within the one-year IHA period. Dredged sediments would be disposed of via beneficial reuse or ocean disposal at the LA-5 Ocean Dredged Material Disposal Site.

1.3.1 In-Water Pile Removal

Previous demolition and pile removal activities at the NBPL Fuel Pier removed the previous structure and timber and concrete piles and concrete-filled steel caissons within the previous structure's footprint. Prior demolition and pile-removal activities along with construction of the current Fuel Pier were detailed in a series of IHA applications (Navy 2013b, 2014, 2015, 2016, and 2017a) and assessed in the Navy's NBPL Fuel Pier Replacement Environmental Assessment (2013a). Where piles were unable to be removed under previous actions, they were clipped at or above the mudline. In order to provide adequate depth to support current and future Navy vessels within the Fuel Pier Inboard Area, remaining partial piles within the Inboard Area must be fully removed or cut and/or clipped to the proposed final depth during dredging activities. Based on data collected from removal of the old Fuel Pier, an estimated inventory of piles by size and type to be removed are listed in Table 1-1.

Table 1-1 NBPL Fuel Pier Piles to be Removed During this IHA Period

Pile Type	Estimated Number
Fender Piles	
13-inch polycarbonate	12
14-inch concrete	56
Structural Piles	
16-inch concrete	341
Project Total Piles Removed	**409**

It is anticipated that differing removal equipment and methods would be employed to remove pilings based on individual pile type and size. A 24-inch pile clipper would be employed to clip both polycarbonate and concrete piles. Up to two 24-inch pile clippers may be used simultaneously to independently clip two separate piles at a time within the activity area. An underwater chainsaw may also be used to cut concrete piles where the pile clipper cannot be employed. A diamond wire saw would be employed for removal activities in the event that the above methods are unsuccessful. Finally, a vibratory hammer may be used to loosen relatively intact piles to free piles from surrounding sediment and then piles would be removed by vertical pulling.

Section 2 provides more specific detail on the number of piles to be removed and the methods to be used during the period of this IHA. Once extracted, the piles will be loaded onto a support barge where there will be transported to the quay wall for offloading. Once on shore, the debris will be crushed onsite or hauled to a concrete recycling facility; 100% of the concrete would be recycled. Beyond a quayside staging area, the contractor may stage some equipment and material on barges along the existing Fuel Pier. During pile removal, floating stick bar booms will be deployed around the active work area to provide a complete barrier to floating debris. Any floating debris will be gathered in work boats and will be disposed of or recycled as appropriate.

1.4 Best Management Practices, Mitigation, and Minimization Measures

Section 11 describes the general Best Management Practices (BMPs), mitigation, and minimization measures that may be implemented for all in-water activities. BMPs are routinely used by the Navy 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.

2 DATES, DURATION, AND LOCATION OF ACTIVITIES

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

2.1 Dates and Duration of Activities

For this analysis, it is assumed that the removal of all 409 piles (predominantly 16-inch square concrete piles) inside the dredge footprint, would be removed over approximately 84 days within the one-year IHA period. Based on previous pile removal activities at the project site, most recently in 2017-2018, different pile types and sizes would be removed over 3 days for polycarbonate piles and 81 days for concrete piles Table 2-1.

Table 2-1 Pile Type and Pile Removal Method and Duration

Pile Type	Removal Method	Number of Piles[1]	Piles Removed / Day[2]	Estimated Days[3]
Fender				
13-inch polycarbonate	Pile clipper	12	5	3
14-inch concrete	Pile clipper Two pile clippers Underwater chainsaw Diamond wire saw Vibratory hammer	56	5	12
Structural				
16-inch concrete	Pile clipper Two pile clippers Underwater chainsaw Diamond wire saw Vibratory hammer	341	5	69
Total		409		84

Notes:
1 Pile counts are extrapolated from previous Fuel Pier plans and per Navy email (McConchie 2020)
2 Rate of pile removal extrapolated from average values reported in previous Fuel Pier Replacement monitoring reports (IHA-5) for the previous Fuel Pier replacement project
3 Total Estimated Days is conservative and rounded up to next whole number

2.2 Project Area Description

San Diego Bay is a narrow, crescent-shaped natural embayment oriented northwest-southeast with an approximate length of 24 kilometers (km; 15 miles) and a total area of roughly 4,450 hectares (ha; 11,000 acres) (Port of San Diego [POSD] 2007). The width of the bay ranges from 0.3 km to 5.8 km (0.2 to 3.6 miles), and depths range from -23 m (-74 ft) below MLLW near the tip of Ballast Point to less than -1.2 m (-4 ft) below MLLW at the southern end (Merkel & Associates, Inc. 2009). About half of the bay is less than 4.6 m (15 ft) deep and most of it is less than 15 m (50 ft) deep (Merkel & Associates, Inc. 2009).

2.2.1 Bathymetric Setting

The northern and central portions of San Diego Bay have been shaped by historical dredging and filling to support large ship navigation and shoreline development; only the southernmost portion of the bay retains its natural shallow bathymetry (Merkel & Associates Inc. 2009). The bathymetry and bedform of the bay are defined by a main navigation channel that steps up to shallower dredged depths toward the

sides and south end of the bay (Merkel & Associates, Inc. 2009). The U.S. Army Corps of Engineers (USACE) dredges the main navigation channel in San Diego Bay to maintain a depth of -14.3 m (-47 ft) below MLLW and is responsible for providing safe transit for private, commercial, and military vessels within the Bay (NOAA 2010). Outside of the navigation channel, the Bay floor consists of platforms at depths that vary slightly (Merkel & Associates, Inc. 2009). Within the North Bay, typical depths range from -11.0 m to -11.6 m (-36 to -38 ft) below MLLW to support large ship turning and anchorage (Merkel & Associates, Inc. 2009).

Water depth in the Fuel Pier Inboard dredge area ranges from -3.0 to -6.1 m (-10 to -20 ft) below MLLW oriented along the prior alignment of the South Segment of the former Fuel Pier. Southeast of the former Fuel Pier alignment to the existing current Fuel Pier, water depth increases to -13.7 m (-45 ft) below MLLW which was previously maintained at this depth to accommodate fueling operations on what was formerly the bayside of the old Fuel Pier. Landside of the prior alignment of the South Segment of the old Fuel Pier, water depths increase from -3.0 m (-10 ft) to -7.6 m (-25 ft) below MLLW.

2.2.2 Circulation, Tides, Temperature, and Salinity

Circulation within San Diego Bay is affected by its crescent shape and narrow bay mouth, tides, and seasonal salinity and temperature variations (POSD 2007). San Diego Bay can be divided into four regions based on circulation characteristics:

- The North Bay – Marine Region extends from the bay mouth to the area offshore downtown San Diego. Tidal action has the greatest influence on circulation in this area, where bay water is exchanged with sea water over a period of two to three days (POSD 2007).
- The North-Central Bay – Thermal Region runs from the North Bay to Glorietta Bay (south of Coronado Island). In the Thermal Region, currents are mainly driven by surface heating. Incoming tides bring cold ocean water from deeper areas, which is then replaced with warm bay surface water when the tide recedes. These tidal processes lead to strong vertical mixing (POSD 2007).
- The South-Central Seasonally Hypersaline Region (i.e., with higher salt content than seawater) occurs between Glorietta Bay and Sweetwater Marsh. Here, variations in salinity due to warm-weather evaporation at the surface separate the water into upper and lower zones driven by density differences (POSD 2007).
- The South Bay Estuarine Region, located south of Sweetwater Marsh, receives occasional freshwater inflows from the Otay and Sweetwater Rivers. Residence time of bay water in the estuarine region may be greater than one month (POSD 2007). Common salinity values for the bay range from 33.3 to 35.5 practical salinity units for the bay mouth and the south bay, respectively (Chadwick et al. 1999).

San Diego Bay has mixed diurnal/semi-diurnal tides, with the semi-diurnal component being dominant (Largier 1995). The interaction between these two types of tides is such that the higher high tide occurs before the lower low tide, creating the strongest currents on the large ebb tide (Largier 1995). The tidal range (difference between MLLW and mean highest high water) is approximately 1.7 m (5.5 ft) (Largier 1995). In general, tidal currents are strongest near the bay mouth, with maximum velocities of 0.5 to 1.0 m per second (1.6 to 3.3 feet per second) (Largier 1995). Tidal current direction generally follows the center of the channel (Chadwick et al. 1999). Residence time for water in San Diego Bay increases from approximately 5 to 20 days in mid-bay to over 40 days in the South Bay (Chadwick et al. 1999). During an average tidal cycle, approximately 13 percent of the water in the San Diego Bay mixes with ocean water and then moves back into the bay (POSD 2007). The complete exchange of all the water in the San Diego Bay can take between 10 and 100 days, depending on the amplitude of the tidal cycle (POSD 2007). Tidal

flushing and mixing are important in maintaining water quality within San Diego Bay. The tidally induced currents regulate salinity, moderate water temperature, and disperse pollutants (POSD 2007). Water temperature in San Diego Bay ranges from 15.1 to 26.1 degrees Celsius (°C; 59.1 to 78.9 degrees Fahrenheit [°F]). This range can be attributed to thermoclines exhibited in deeper industrial/port waters, which are typical of this geographic region (Amec Foster Wheeler Environment & Infrastructure, Inc. 2016).

Temperature and density gradients, both with depth and along a longitudinal cross-section of the bay, drive tidal exchange of bay and ocean water beginning in the spring and continuing into fall. The seasonal thermal cycle has an amplitude of about 8 to 9 °C (14 to 16 °F). Maximum water temperatures occur in July and August, and minimums in January and February. In the winter, thermal gradients are absent, with cooler air temperatures and higher winds causing the bay to be nearly isothermal. During 1993 surveys, the warmest temperature was 29.3 °C (84.7 °F) recorded in the south bay, and the coolest temperature, 15.1 °C (59.2 °F), recorded just north of the Coronado Bridge in January (Lapota et al. 1993). The average surface temperature is estimated to be 19.0 °C (66.1 °F; National Data Buoy Center [NDBC] 2020). Maximum vertical temperature gradients of about 0.5 °C/m (0.3 °F/ft) occur during the summer. Typical longitudinal temperature range is about 7 to 10 °C (45 to 50 °F) (about 0.3 to 0.5 °C/km) over the length of the bay during the summer (Smith 1972). Temperature inversions also occur diurnally due to night cooling.

Salinities of the project area resemble those of the nearby open ocean, i.e. 32.8 to 33 parts per thousand (Tierra Data, Inc. 2012a).

2.2.3 Water Quality

Water quality is commonly assessed by measuring dissolved nutrients, dissolved oxygen, pH, turbidity, chlorophyll *a* (a measure of the amount of phytoplankton present in San Diego Bay), and coliform bacteria (Chadwick et al. 1999). Measured values for dissolved nutrients in the bay such as phosphate and silicates range from 0.9 to 4 parts per million (ppm) for silicon and 0.02 to 0.3 ppm phosphorus in the winter, to 0.3 to 1.3 ppm for silicates and 0.2 ppm phosphorus in the summer (Chadwick et al. 1999). This variation is the result of inflow of these nutrients with winter runoff, and uptake by phytoplankton growth in the summer (Chadwick et al. 1999). Dissolved oxygen levels range from approximately 4 milliliters per liter (mL/L) during the summer to 8 mL/L during the winter (Chadwick et al. 1999). These oxygen levels are typically at or near atmospheric equilibrium levels. The pH of seawater in San Diego Bay is relatively uniform, ranging from approximately 7.9 to 8.1 throughout the bay and the year (Chadwick et al. 1999).

Surface water chemistry is analyzed by the Regional Harbor Monitoring Program using primary and secondary indicators, including total and dissolved levels of copper (primary), and total and dissolved zinc and nickel (secondary). Copper concentrations in San Diego Bay show improvement in comparison with a historical baseline, and average copper concentrations do not exceed the California Toxics Rule (CTR) threshold of 5.8 micrograms per liter (µg/L) total and 4.8 µg/L dissolved. Less than 20 percent of measurements throughout the bay still exceed the CTR threshold. Both total and dissolved zinc and nickel concentrations are well below CTR threshold values used for the Regional Harbor Monitoring Program. All other dissolved and total metals have concentrations below their respective acute and chronic CTR thresholds (Amec Foster Wheeler Environment & Infrastructure, Inc. 2016). Polycyclic aromatic hydrocarbon concentrations are also below their respective CTR threshold values (Amec Foster Wheeler Environment & Infrastructure, Inc. 2016).

Turbidity is a measure of water clarity or murkiness and can be caused by suspended sediments transported in runoff or increased algal/bacterial growth (Tierra Data, Inc. 2010). Turbidity can also be created by natural and manmade resuspension of bottom sediments. Increased turbidity reduces the amount of light available for plant growth underwater, so it can affect the ability of San Diego Bay to support living organisms (Tierra Data, Inc. 2010). Turbidity in San Diego Bay varies, depending on the tides, seasons, and location within the bay (Tierra Data, Inc. 2010).

Chlorophyll *a* ranges from 0.2 to 25 µg/L (Chadwick et al. 1999). The highest values were measured in the South Bay in winter, when runoff carries high levels of nutrients into the South Bay. In summer, chlorophyll *a* levels return to background levels of 1 to 2 µg/L. These chlorophyll *a* levels are generally much higher than those found in the adjacent open ocean. Before 1964, when untreated sewage was still being discharged into the San Diego Bay, bacterial counts (fecal coliform) were as high as 82 milliliters in the South Bay (Chadwick et al. 1999). Since these discharges ended, bacterial counts typically remain below 10 milliliters except during some winter storms. These levels are below federal limits for water contact, implying that the San Diego Bay is generally safe for recreational use (Chadwick et al. 1999).

Current sources of pollution to San Diego Bay include underground dewatering, industries on the bay and upstream, marinas and anchorages, U.S. Naval activities, materials used for underwater hull cleaning and vessel antifouling paints, and urban runoff (Chadwick et al. 1999). Additional pollution sources include creosote-treated wood pier pilings, which are a source of polycyclic aromatic hydrocarbons, stormwater runoff from land used for industrial, commercial, and transportation purposes, bilge water discharge, and oil spills (Chadwick et al. 1999). Changes in Navy procedures since the mid-1990s have included replacing approximately half of the pier pilings with plastic, concrete, or untreated wood, and implementing the Bilge Oily Waste Treatment System for treatment of construction and repair wastewater.

Overall, the levels of contamination in the water and sediment in San Diego Bay appear to be lower now than in previous decades, including levels of some metals and polycyclic aromatic hydrocarbons (POSD 2007). However, copper concentrations remain routinely higher than federal and state limits for dissolved copper (POSD 2007).

2.2.4 Substrates and Habitats

Marine mammal occurrence in San Diego Bay is predominantly in the northern portion of San Diego Bay. Local and seasonal concentrations of marine mammals in San Diego reflect the opportunistic attraction of marine mammals in general to areas of high prey (fish) abundance; the proximity of haul-outs, resting sites, and feeding sites for pinnipeds; and, for cetaceans, the prevalence of marine conditions and access to and from the open ocean.

Sediments in San Diego Bay are relatively sandy (NAVFAC SW and POSD 2013) as tidal currents tend to keep the finer silt and clay fractions in suspension, except in harbors and elsewhere in the lee of structures where water movement is diminished. Much of the shoreline consists of riprap and manmade structures as can be seen in aerial views. The predominant habitats of the project area are shallow subtidal (-0.7 to -4 m [-2.2 to -12 ft] below MLLW), moderately deep (-3.7 to -6.0 m [-12 to -20 ft] below MLLW), and deep (>-6 m [-20 ft] below MLLW) subtidal and artificial hard substrates. Remaining partial piles may provide substrates for the growth of algae and invertebrates off the bottom and support more abundant fish populations than occur in the adjacent deep water habitat. Eelgrass is not present within the immediate project area and the most recent monitoring efforts do not report any eelgrass present within the Project area. However, eelgrass beds have been reported in proximity Fuel Pier's north side approximately 120 m (394 ft) to the north of the pile removal and dredge area (Merkel & Associates, Inc. 2018).

2.2.5 Vessel Traffic and Ambient Underwater Soundscape

As illustrated by Table 2-2 below, San Diego Bay is heavily used by commercial, recreational, and military vessels, with an average of 82,413 vessel movements (in or out of the bay) per year. This equates to about 225 vessel transits per day, a majority of which are presumed to occur during daylight hours. The number of transits does not include recreational boaters that use San Diego Bay, estimated to number 200,000 (San Diego Harbor Safety Committee 2009).

Refer to Section 6 for background on acoustics and definitions of metrics. Acoustic monitoring of ship noise in Glacier Bay, Alaska (Kipple and Gabriele 2007), found that root mean square (RMS) sound source levels from a variety of vessel types and sizes was typically within the range of 157-180 decibels (dB) referenced to 1 microPascal (re 1 µPa) at 1 m. Ship noise was characterized by a broad frequency range (roughly 0.1 to 35 kilohertz [kHz]), with peak noise at higher frequency for smaller vessels. Similar broad-spectrum (10 Hz to >1 kHz) noise has been reported for a variety of categories of ships (National Research Council [NRC] 2003). Within southern California, in the Santa Barbara Channel, large cargo ships at transit speeds range from 177 to 188 dB re 1 µPa (McKenna 2011). Ship noise in San Diego Bay thus has the potential to obscure underwater sound that would otherwise emanate from the project site to locations farther up the bay or offshore through the mouth.

The Navy has made extensive measurements of ambient underwater sound in the project area of San Diego Bay (NAVFAC SW 2020). Based on the most recent data provided in the Compendium of Underwater and Airborne Sound Data from Pile Driving and Demolition Activities in San Diego Bay (San Diego Noise Compendium; NAVFAC SW 2020), the median ambient underwater sound pressure level in areas of the bay subject to project construction noise averages approximately 129.6 dB re 1 µPa. Noise from non-impulsive sources becomes indistinguishable from other background noise as it diminishes to near ambient levels 2,000 to 3,000 meters from the project site. Distances to the threshold for acoustic disturbance from non-impulsive sources are based on the distances at which the project sound source declines to ambient.

Table 2-2 Port of San Diego Average Annual Vessel Traffic

VESSEL TYPE	VESSEL MOVEMENTS (Total Calls by Vessel Type)[1]		
	Subtotal by Vessel Type		*Total*
	Cargo	*Others*	
Total Annual Movements for All Vessel Types			**80,691**
Deep Draft Commercial Vessels (Cargo plus Cruise)[1]			
Cargo Ships (largest vessel: 1,000’ length,106’ beam, 41’draft)	**197**		**197**
Barge	5		
Bulk	5		
Container Ships	52		
General Cargo	90		
Roll On/Roll Off	45		
Cruise Ships (largest vessel: 1,000’ length, 106' beam, 34’ draft)		100	100
Excursion Ships (largest vessel: 222’ length, 57’ beam, 6’ draft)		68,000	68,000
Commercial Sportfishing (average vessel size: 123’ length, 32’ berth, 13’ draft)		10,094	10,094
Military (largest vessel: 1,115’ length, 252’ beam (flight deck), 39’ draft)		2,300	2,300

Notes*:*

[1] Tug traffic was not included in the above statistics since inner harbor tug movements alone exceed 7,000 for a typical year.

Source: San Diego Harbor Safety Committee (2009)
San Diego Harbor Safety Committee (2020)

3 MARINE MAMMAL SPECIES AND NUMBERS

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

The most frequently observed marine mammal in San Diego Bay is the California sea lion (*Zalophus californianus*), which often rests on buoys and other structures and occurs throughout the North to North-Central Bay. Other species include bottlenose dolphin (*Tursiops truncatus*), which is regularly seen in the North Bay; harbor seal (*Phoca vitulina*), which frequently enters the North Bay; and common dolphins (both short-beaked [*Delphinus delphis*] and long-beaked [*Delphinus capensis*]), which are rare visitors in the North Bay. Additional species considered under this IHA application include northern elephant seal (*Mirounga angustirostris*) and Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) based on associations with the waters of Southern California or historic records associated with San Diego Bay (NAVFAC SW and POSD 2013). Selection of species for review is based on previous IHA applications and subsequent marine mammal monitoring efforts associated with the demolition of the former NBPL Fuel Pier and construction of the current Fuel Pier over the course of five years (NAVFAC SW 2014, 2015, 2016, 2017a-b, 2018a-b). NOAA Fisheries Stock Assessment Reports (Carretta et al. 2015, 2017, and 2019) are considered in determining the estimated baseline and minimum populations of each designated stock of marine mammals that have the potential to occur within the activity area (i.e., the northern portion of San Diego Bay). The area of effect for the current proposed Project was intensively monitored during the previous IHA periods (NAVFAC SW 2014, 2015, 2016, 2017a-b, 2018a-b), with the greatest numbers occurring during the second IHA period, likely resulting from shifts in ocean and bay temperatures due to the 2015 El Nino event beginning in first IHA period (NAVFAC SW 2014, 2015). Observed numbers of marine mammals during these previous monitoring periods were used to establish local population estimates that would potentially be impacted by removal of remaining fuel pier piles and subsequent dredging. Of the five previous monitoring periods, the third, fourth, and fifth IHA period species observations are likely indicative of typical species at the Fuel Pier site (NAVFAC SW 2016, 2017a-b, 2018 a-b). Of those three IHA periods, the fourth IHA period (NAVFAC SW 2017b, 2018a) had the highest number of activity days and the highest average number of animals observed of the three most common marine mammal species (California sea lions, harbor seal, and bottlenose dolphins). For species not observed during the fourth IHA period (i.e., common dolphin and Pacific white-sided dolphin), observations from the second IHA period are used (NAVFAC SW 2015).

The Project action area for marine mammals is determined by the limits of potential effects, which in this case are defined by acoustic zones of influence (ZOIs) (see Section 6.7).

3.1 Species Descriptions and Abundances

3.1.1 California Sea Lion

3.1.1.1 Species Description

The California sea lion is now considered to be a full species, separated from the Galapagos sea lion (*Z. wollebae*ki) 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 (NOAA Fisheries 2020b).

3.1.1.2 Population Abundance

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).

3.1.2 Harbor Seal

3.1.2.1 Species Description

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 U.S. Like all true seals, harbor seals have short forelimbs and lack external ear flaps as present in otariids such as the California sea lion. Harbor seals inhabit coastal and estuarine waters and shoreline areas from Baja California to western Alaska. Harbor seals weigh up to 129 kg (285 pounds) and measure up to 1.8 m (6 ft) in length with males slightly larger than females (NOAA Fisheries 2020c).

3.1.2.2 Population Abundance

Based on post-breeding counts of individuals at known haul-outs, corrected for the proportion of the population that is out at sea, the population estimate for the California stock of harbor seal is 30,968 and the minimum population size is estimated as 27,348 (Carretta et al. 2019). The population size has increased since the 1980s and fluctuated during the past decade, with the highest counts in 2004 but lower counts in 2009 and 2012 (Carretta et al. 2016).

3.1.1 Bottlenose Dolphin

3.1.1.1 Species Description

The California coastal stock of bottlenose dolphin is distinct from the offshore population and is resident in the immediate (within 1 km of shore) coastal waters, occurring primarily between Point Conception, California, and San Quintin, Mexico. Bottlenose dolphins have a robust body and a short, thick beak. They range in length from 1.8 to 3.8 m (6 to 12.5 ft) and weigh from 135 to 635 kg (300 to 1,400 pounds); males are slightly larger than females. They are commonly found in groups of 2 to 15 individuals and in larger pods offshore. Coastal animals feed on benthic fish and invertebrates (NOAA Fisheries 2020e).

3.1.1.2 Population Abundance

Based on photographic mark-recapture surveys conducted along the San Diego coast from 2009 to 2011 (Weller et al. 2016), two separate population size estimates were generated from open and closed mark-recapture models. The best open model generated an estimate of 515 (95% confidence interval [CI] = 470– 564, coefficient of variation [CV]= 0.05) animals, while the best closed model produced an estimate

of 453 (95% CI = 411– 524, CV=0.06) animals. These estimates are for marked animals only and do not include an estimated ~ 40% of animals that are not individually recognizable (Weller et al. 2016). The estimated fraction of unmarked animals is highly uncertain because it is unknown how often unmarked animals are resighted. The new estimates are the largest obtained for this stock, dating back to the 1980s. For comparison with previous estimates of this stock, the closed population estimate of 453 (CV=0.06) animals is used as the best estimate of abundance (Carretta et al. 2017, 2019). In the aforementioned surveys of San Diego Bay, numbers of bottlenose dolphins were highly variable (from 0 to 40).

3.1.2 Short-Beaked and Long-Beaked Common Dolphins

3.1.2.1 Species Description

The California/Oregon/Washington stock of short-beaked common dolphin and the California stock of long-beaked common dolphin both occur in coastal southern California waters. While the long-beaked common dolphin is a nearshore species, the short-beaked common dolphin is widely distributed between the coast and at least 300 nm offshore (Navy 2017b). The short-beaked and long-beaked species were only recently separated and are difficult to distinguish at sea. All common dolphins are slender, with a relatively long beak sharply demarcated from the melon, a high, moderately falcate dorsal fin, and a unique crisscross color pattern. Adult long-beaked common dolphins range from 1.8 to 2.6 m (6 to 8.5 ft) long and weights ranging from 45.3 to 226.8 kg (160 to 500 pounds), whereas the short- beaked species average approximately 1.8 m (6 feet) in length and average 77.1 kg (170 pounds) in weight (NOAA Fisheries 2020f, 2020g).

3.1.2.2 Population Abundance

The distribution and abundance of common dolphins in coastal California waters varies considerably with oceanographic conditions; therefore, a multi-year average abundance estimate is appropriate (Carretta et al. 2017). The most recent estimate of short-beaked common dolphin abundance is 969,861 animals (Carretta et al. 2019). This estimate includes new correction factors for animals missed during the surveys. Similarly, the abundance estimate for long-beaked common dolphins in California, Oregon and Washington waters is 101,305 (Carretta et al. 2019).

3.1.3 Pacific White-Sided Dolphin

3.1.3.1 Species Description

The Pacific white-sided dolphin is a North Pacific endemic and one of the most abundant pelagic species of dolphins found in the cold-temperate waters of this region. These dolphins are boldly marked, with a dark gray or black dorsal surface and light gray sides, with light gray “suspender stripes” originating near the melon and angling toward the blowhole across each side into the light gray flank patch. The beak is dark with a narrow stripe extending to the bicolored dorsal fin. The beak is dark, with a narrow stripe extending to the bicolored flipper. The dorsal fin has a darker leading edge with light gray covering two-thirds of the posterior portion. Adults range from 1.7 to 2.4 m (5.5 to 8 ft) in length and weigh 136.1 to 181.4 kg (300 to 400 pounds), with males slightly larger than females (NOAA Fisheries 2020h).

3.1.3.2 Population Abundance

As summarized by Carretta et al. (2017), the most recent estimate of abundance for Pacific white- sided dolphins of California, Oregon, and Washington waters is 26,814 animals with an estimated minimum population size of 21,195 animals.

3.1.1 Northern Elephant Seal

3.1.1.1 Species Description

The largest of the "true seals", this highly sexually dimorphic seal is found only in the eastern North Pacific. Males are 8-10 times as large as females, reaching lengths of over 4.0 m (13 ft) and weights of 1,996 kg (4,400 pounds) (NOAA Fisheries 2020d). Both sexes are relatively large and have a large head. Their distinctive profile makes them unlikely to be misidentified with other species that their range overlaps with. Only young individuals could be mistaken for a sea lion or fur seal at sea if viewed quickly or from a distance (Navy 2017b).

3.1.1.2 Population Abundance

Based on elephant seals at U.S. rookeries in 2010, Lowry et al. (2014) reported that 40,684 pups were born. They then applied a multiplier of 4.4 to estimate approximately 179,000 elephant seals. This multiplier is derived from life tables based on published elephant seal fecundity and survival rates, and reflects a population with approximately 23% pups. The population is estimated to have grown at 3.8% annually since 1988 (Lowry et al. 2014). The minimum estimated population size is 81,368 (Carretta et al. 2019).

3.2 Spatial Distribution

Density assumes that marine mammals are uniformly distributed within a given area, although this is rarely the case. Marine mammals are usually clumped in areas of greater importance, for example, areas of high productivity, lower predation, safe calving, foraging, etc. The site-specific surveys of northern San Diego Bay, along with years of monitoring efforts at the NBPL Fuel Pier during the previous pier replacement project, provide high resolution of the distribution of marine mammals within the affected area.

3.3 Submergence

Cetaceans spend their entire lives in the water and spend most of their time (greater than [>] 90% for most species) entirely submerged below the surface. When at the surface, cetacean bodies are almost entirely below the water's surface, with the blowhole exposed to allow breathing. This makes cetaceans difficult to locate visually and also exposes them to underwater noise, both natural and anthropogenic, essentially 100% of the time because their ears are nearly always below the water's surface.

Seals and sea lions (pinnipeds) spend significant amounts of time out of the water during breeding, molting, and "hauling out" (resting out of the water on land or structures) periods. Sea lions in San Diego Bay are most commonly observed out of water, especially on bait barges, navigation aids, and other structures. When not actively diving, pinnipeds at the surface often orient their bodies vertically in the water column and often hold their heads above the water surface. Consequently, pinnipeds would not be exposed to underwater sounds to the same extent as cetaceans occurring the same location.

The Navy assumes that both cetaceans and pinnipeds that occur in the vicinity will be submerged and at the same water depth as the sound source, and will thereby experience the maximum received sound pressure levels (SPLs) predicted to occur at a given distance from the acoustic source on the basis of acoustic modeling. However, pinnipeds are also conservatively assumed to be out of the water for sufficient periods to be exposed to whatever airborne noise is generated by construction activities as well.

4 AFFECTED SPECIES STATUS AND DISTRIBUTION

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

4.1 California Sea Lion, U.S. Stock

4.1.1 Status and Management

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.

4.1.2 Distribution

More than 95% of the U.S. Stock breeds and gives birth to pups on San Miguel, San Nicolas, and Santa Barbara islands. Some movement has been documented between the U.S. Stock and Western Baja California, Mexico Stock, but rookeries in the U.S. are widely separated from the major rookeries of western Baja California. Smaller numbers of pups are born on San Clemente Island, the Farallon Islands, and Año Nuevo Island (Lowry et al. 1991). The California sea lion is by far the most commonly sighted pinniped species at sea or on land in the vicinity of San Diego Bay. In California waters, California sea lions represented 97 percent (381 of 393) of identified pinniped sightings at sea during the 1998–1999 NOAA Fisheries surveys (Carretta et al. 2000). They were sighted during all seasons and in all areas with survey coverage from nearshore to offshore areas (Carretta et al. 2000). California sea lions while potentially present at-sea, are most commonly seen hauled-out on piers and buoys within and leading into San Diego Bay, (Merkel & Associates, Inc. 2008). In a study of California sea lion reaction to human activity, Holcomb et al. (2009) showed that in general California sea lions are rather resilient to human disturbance.

The distribution and habitat use of California sea lions varies with the sex of the animals and their reproductive phase. Adult males haul-out on land to defend territories and breed from mid-to-late May until late July. Individual males remain on territories for 27 to 45 days without going to sea to feed. During August and September, after the mating season, the adult males migrate northward to feeding areas as far away as Washington (Puget Sound) and British Columbia (Lowry et al. 1991). They remain there until spring (March through May), when they migrate back to the breeding colonies. Thus, adult males are present in offshore areas only briefly as they move to and from rookeries. Distribution of immature California sea lions is less well known, but some make northward migrations that are shorter in length than the migrations of adult males (Huber 1991). However, most immature California sea lions are presumed to remain near the rookeries for most of the year. Adult females remain near the rookeries throughout the year. Most births occur from mid-June to mid-July (peak in late June).

Survey data from 1975 to 1978 were analyzed to describe the seasonal shifts in the offshore distribution of California sea lions near the Channel Islands (Bonnell and Ford 1987). The seasonal changes in the center of distribution were attributed to changes in the distribution of the prey species. If California sea

lion distribution is determined primarily by prey abundance as influenced by variations in local, seasonal, and interannual oceanographic variation, these same areas might not be the center of California sea lion distribution every year. Melin et al. (2008) showed that foraging female California sea lions showed significant variability in individual foraging behavior and foraged further offshore and at deeper depths during El Niño years as compared to non-El Niño years.

There are limited published at-sea density estimates for pinnipeds within southern California. At-sea densities likely decrease during warm-water months because females spend more time ashore to give birth and attend their pups. Radio-tagged female California sea lions at San Miguel Island spent approximately 70% of their time at sea during the nonbreeding season (cold-water months) and pups spent an average of 67% of their time ashore during their mother's absence (Melin and DeLong 2000). Different age classes of California sea lions are found in the San Diego region throughout the year (Lowry et al. 1991). Although adult male California sea lions feed in areas north of San Diego, animals of all other ages and sexes spend most, but not all, of their time feeding at sea during winter. During warm-water months, a high proportion of the adult males and females are hauled-out at terrestrial sites during much of the period.

The geographic distribution of California sea lions includes a breeding range from Baja California to southern California. During the summer, California sea lions breed on islands from the Gulf of California to the Channel Islands and seldom travel more than about 50 km (31 miles) from the islands (Bonnell et al. 1983). The primary rookeries are located on the California Channel Islands of San Miguel, San Nicolas, Santa Barbara, and San Clemente (Le Boeuf and Bonnell 1980; Bonnell and Dailey 1993). Their distribution shifts to the northwest in fall and to the southeast during winter and spring, probably in response to changes in prey availability (Bonnell and Ford 1987). In the nonbreeding season, adult and subadult males, and juvenile males and females (McHuron et al. 2018) migrate northward along the coast to central and northern California, Oregon, Washington, and Vancouver Island in British Columbia, and return south in the spring.

4.1.3 Site-Specific Occurrence

In San Diego Bay, in general, California sea lions regularly occur on rocks, buoys and other structures, and especially on bait barges, although numbers vary greatly. The closest potential haul-out locations to the Fuel Pier are two sets of Navy-owned docks that are 140 m (459 ft) to the southwest and 180 m (591 ft) to the north of the project area respectively. However, these docks are in constant use for Navy operations and training activities and California sea lions may haul-out here but are unlikely to remain very long due to the high levels of activity. California sea lions also haul-out at the Everingham Brothers Bait Barges that are 400 to 500 m (1,312 to 1,640 ft) southeast of the project area. Beyond these man-made structures, there are no known natural haul-out locations in the vicinity of the project area. As discussed in Chapter 3, California sea lion occurrence in the area surrounding the Project site is expected.

The fourth IHA period of the previous Fuel Pier Replacement Project recorded 2,263 individuals over 152 days of monitoring activity (NAVFAC SW 2017b, 2018a). This equates to an average of 14.9 California sea lions observed per day. Rounding to the nearest whole number leads to 15 individuals per day expected to be in the vicinity of the Fuel Pier. As a result, the Navy believes that the monitoring data from the fourth IHA period for the Fuel Pier Replacement Project represent the best available science on numbers of California sea lions that are likely to occur.

4.1.4 Behavior and Ecology

Sexual maturity occurs at around 4 to 5 years of age for California sea lions, and the pupping and mating season begins in May and continues through July (Heath 2002). California sea lions are gregarious during the breeding season and social on land during other times. California sea lions' food consists of squid, octopus, and a variety of fishes. While no studies have occurred of their diet in the bay, studies of food sources have been done in other California coastal areas (Antonelis et al. 1990; Lowry et al. 1990; Melin et al. 1993; Hanni and Long 1995; Henry et al. 1995). Fish species found in the bay that California sea lions most likely feed on include spiny dogfish, jack mackerel, Pacific herring, Pacific sardine, and northern anchovy. They also eat octopus and leopard shark (NAVFAC SW and POSD 2013).

California sea lions show a high tolerance for human activity (Holcomb et al. 2009), modify their foraging in response to spatial and temporal variations in the availability of different prey species (Lowry et al. 1991), and make opportunistic use of almost any available structures as haulouts (NAVFAC SW and POSD 2013).

California sea lions seek a variety of structures, such as rocks, piers, and buoys and low-profile docks for hauling out. These behaviors can be destructive to structures due to the weight of the animal and fouling. If California sea lions find an easy food source at tourist spots or fishing piers, their presence can become a nuisance at certain areas in the bay as they have at marinas in Monterey and San Francisco Bay (Leet et al. 1992). Marina operators and commercial and sport fishermen tend to consider them a major nuisance, leading to some human-caused mortality.

4.1.5 Acoustics

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 (NOAA Fisheries 2018).

4.2 Harbor Seal, California Stock

4.2.1 Status and Management

Harbor seals are protected under the MMPA and are not listed as threatened or endangered under the ESA. NOAA Fisheries has defined five distinct stocks on the U.S. west coast including California, Oregon/Washington Coast, Washington Northern Inland Waters, Southern Puget Sound, and Hood Canal. The Project site is located within the boundaries of the California Stock. The U.S. stock as a whole is not considered strategic or depleted under the MMPA (Carretta et al. 2019).

4.2.2 Distribution

Harbor seals are considered abundant throughout most of their range from Baja California to the eastern Alueutian Islands. An unknown number of harbor seals also occur along the west coast of Baja California, at least as far south as Isla Asuncion, which is about 161 km (100 miles0 south of Punta Eugenia. Peak numbers of harbor seals haul-out on land during late May to early June, which coincides with the peak of

their molt. They favor sandy, cobble, and gravel beaches (Stewart and Yochem 1994), with multiple haul-outs identified along the California mainland and Channel Islands (Carretta et al. 2016).

There are limited at-sea density estimates for pinnipeds within southern California. Harbor seals do not make extensive pelagic migrations but do travel 300 to 500 km (186 to 311 miles) on occasion to find food or suitable breeding areas (Carretta et al. 2016). Based on likely foraging strategies, Grigg et al. (2009) reported seasonal shifts in harbor seal movements based on prey availability. When at sea, they remain in the vicinity of haul-out sites and forage close to shore in shallow waters. In relationship to the entire California stock, harbor seals do not have a significant mainland California distribution south of Point Mugu due to beach urbanization and potential disturbance impacts.

4.2.3 Site-Specific Occurrence

Harbor seals are relatively uncommon within San Diego Bay. Similar to California sea lions, harbor seals haul-out on rocks, buoys and other structures. As stated above in Section 4.1.3, the nearest haul-outs are active Navy docks with a pair of bait barges further from the project area. Sightings occurred during Navy-sponsored transect surveys of northern San Diego Bay through March 2012, but were limited to individuals outside of the ZOI, on the south side of Ballast Point (Tierra Data, Inc. 2012b). The fourth IHA period of the previous Fuel Pier Replacement Project recorded 88 individuals over 152 days of monitoring activity (NAVFAC SW 2017b, 2018a). This equates to an average of 0.6 harbor seals observed per day and, rounded to the nearest whole number, to 1.0 individual per day expected to be in the vicinity of the Fuel Pier. Because the fourth year IHA period of the previous Fuel Pier Replacement Project produced what is considered a typical number of species observations, it represents the best available and conservative estimate for numbers of harbor seals that are likely to occur.

4.2.4 Behavior and Ecology

Harbor seals prefer sheltered coastal waters and feed on schooling benthic and epibenthic fish species in shallow water (Bonnell and Dailey 1993). While not studied in the bay, specific prey species have been studied in other California waters (Stewart and Yochem 1985, 1994; Oxman 1993; Henry et al. 1995). Of particular note to San Diego Bay are these potential prey species: specklefin midshipman, plainfin midshipman, jack mackerel, shiner surfperch, yellowfin goby, and English sole. Harbor seals also eat octopus, two species of which are found in the bay (NAVFAC SW and POSD 2013). Although their ecological niche in the bay has not been studied, this pinniped is not likely to play a significant role because of their low numbers (NAVFAC SW and POSD 2013). Harbor seals mate at sea and females give birth during the spring and summer although the “pupping season” varies by latitude.

4.2.5 Acoustics

In air, harbor seal males produce a variety of low-frequency (<4 kHz) vocalizations, including snorts, grunts, and growls. Male harbor seals produce communication sounds in the frequency range of 100 to 1,000 Hz (Richardson et al. 1995). Pups make individually unique calls for mother recognition that contain multiple harmonics with main energy below 0.34 kHz (Bigg 1981; Thomson and Richardson 1995). Harbor seals hear nearly as well in air as underwater and had lower thresholds than California sea lions (Kastak and Schusterman 1998). Kastak and Schusterman (1998) reported airborne low frequency (100 Hz) sound detection thresholds at 65.4 dB re 20 µPa for harbor seals. In air, they hear frequencies from 0.25 kHz – 30 kHz and are most sensitive from 6 to 16 kHz (Richardson et al. 1995; Terhune and Turnbull 1995; Wolski et al. 2003).

Adult males also produce underwater sounds during the breeding season that typically range from 0.025 to 4 kHz (duration range: 0.1 second to multiple seconds; Hanggi and Schusterman 1994). Hanggi and

Schusterman (1994) found that there is individual variation in the dominant frequency range of sound between different males, and Van Parijs et al. (2003) reported oceanic, regional, population, and site-specific variation that could be vocal dialects. In water, they hear frequencies from 1 to 75 kHz (Southall et al. 2007) and can detect sound levels as weak as 60 to 85 dB re 1 µPa within that band. They are most sensitive at frequencies below 50 kHz; above 60 kHz sensitivity rapidly decreases.

4.3 Bottlenose Dolphin, California Coastal Stock

4.3.1 Status and Management

Bottlenose dolphins are protected under the MMPA and are not listed as threatened or endangered under the ESA. NOAA Fisheries has defined two distinct stocks on the U.S. west coast including California Coastal and California/Oregon/Washington Off-Shore. The Project site is located within the boundaries of the California Coastal Stock. The U.S. stock is not considered strategic or depleted under the MMPA (Carretta et al. 2019).

4.3.2 Distribution

The bottlenose dolphin California Coastal stock occurs at least from Point Conception south into Mexican waters, at least as far south as San Quintin, Mexico. In southern California, animals are found within 500 m (152.4 ft) of the shoreline 99 percent of the time and within 250 m (76.2 ft) 90 percent of the time (Hanson and Defran 1993). Occasionally, during warm-water incursions such as during the 1982–1983 El Niño events, their range extends as far north as Monterey Bay (Wells et al. 1990). Bottlenose dolphins in the Southern California Bight – the coastal waters between Point Conception and just south of the Mexican border - appear to be highly mobile within a narrow coastal zone (Defran et al. 1999), and exhibit little seasonal site fidelity within the Southern California Bight (Defran and Weller 1999) and along the California coast; over 80 percent of the dolphins identified in Santa Barbara, Monterey, and Ensenada have also been identified off San Diego (Navy 2010).

As seen in the Navy's marine mammal surveys of San Diego Bay (Merkel and Associates 2008, Tierra Data, Inc. 2012b, NAVFAC SW 2014), bottlenose dolphins have occurred sporadically and in highly variable numbers and locations.

4.3.3 Site-Specific Occurrence

The fourth IHA period of the previous Fuel Pier Replacement Project recorded 67 individuals over 152 days of monitoring activity (NAVFAC SW 2017b, 2018a). This equates to an average of 0.4 bottlenose dolphin observed per day. Rounding to the nearest whole number leads to 1.0 individuals per day expected to be in the vicinity of the Fuel Pier. Because the fourth year IHA period of the previous Fuel Pier Replacement Project produced what is considered a typical number of species observations, it represents the best available and conservative estimate for numbers of harbor seals that are likely to occur.

4.3.4 Behavior and Ecology

The coastal stock utilizes a limited number of fish prey species with up to 74 percent being various species of surfperch or croakers, a group of non-migratory year-round coastal inhabitants (Defran et al. 1999, Allen et al. 2006). For southern California, common croaker prey species include spotfin croaker, yellowfin croaker, and California corbina, while common surfperch species include barred surfperch and walleye surfperch (Allen et al. 2006). The corbina and barred surfperch are the most common surf zone fish where bottlenose dolphins have been observed foraging (Allen et al. 2006). Defran et al. (1999) postulated that the coastal stock of bottlenose dolphins showed significant movement within their home range (Central California to Mexico) in search of preferred but patchy concentrations of nearshore prey (i.e., croakers

and surfperch). Bearzi et al (2009), in an analysis of bottlenose dolphins in the vicinity of Santa Monica, also concluded that low individual re-sighting rates indicates a large bottlenose dolphin distribution influenced by prey distribution. After finding concentrations of prey, animals may then forage within a more limited spatial extent to take advantage of this local accumulation until such time that prey abundance is reduced; the dolphins then shift location once again to be over larger distances (Defran et al.1999, Bearzi et al. 2009). Specific prey items of bottlenose dolphins along the California coast were studied by Defran et al. (1986). San Diego Bay bottlenose dolphins forage on species such as jack mackerel, Cortez grunt, striped mullet, and black croaker, white sea bass, white croaker, spotted croaker, yellowfin croaker, California corbina, queenfish, Pacific mackerel, Pacific bonito, and sierra (NAVFAC SW and POSD 2013).

4.3.5 Acoustics

Sounds emitted by bottlenose dolphins have been classified into two broad categories: pulsed sounds (including clicks and burst-pulses) and narrow-band continuous sounds (whistles), which usually are frequency modulated. Whistles range in frequency from 0.8 to 24 kHz but can also go much higher. Clicks and whistles have a dominant frequency range of 110 to 130 kHz and a source level of 218 to 228 dB re 1 µPa at 1 m (peak to peak levels; Au 1993) and 3.5 to 14.5 kHz with a source level of 125 to 173 dB re 1 µPa at 1 m, respectively (Ketten 1998). The bottlenose dolphin has a functional high-frequency hearing limit of 160 kHz (Au 1993) and can hear sounds at frequencies as low as 40 to 125 Hz (Turl 1993). Inner ear anatomy of this species has been described (Ketten 1992). Electrophysiological experiments suggest that the bottlenose dolphin brain has a dual analysis system: one specialized for ultrasonic clicks and the other for lower- frequency sounds, such as whistles (Ridgway 2000). The audiogram of the bottlenose dolphin shows that the lowest thresholds occurred near 50 kHz at a level around 45 dB re 1 µPa (Nachtigall et al. 2000, Finneran and Houser 2006, 2007). Below the maximum sensitivity, thresholds increased continuously up to a level of 137 dB re 1 µPa at 75 Hz. Above 50 kHz, thresholds increased slowly up to a level of 55 dB re 1 µPa at 100 kHz, then increased rapidly above this to about 135 dB re 1 µPa at 150 kHz. Scientists have reported a range of best sensitivity between 25 and 70 kHz, with peaks in sensitivity occurring at 25 and 50 kHz at levels of 47 and 46 dB re 1 µPa (Nachtigall et al. 2000).

Temporary threshold shifts (TTS) in hearing have been experimentally induced and behavioral responses observed in captive bottlenose dolphins (Ridgway et al. 1997, Schlundt et al. 2000, 2006, Nachtigall et al. 2003, 2004, Finneran et al. 2002, 2005, 2007). Ridgway et al. (1997) observed changes in behavior at the following minimum levels for 1 second tones: 186 dB re 1 µPa at 3 kHz, 181 dB re 1 µPa at 20 kHz, and 178 dB re 1 µPa at 75 kHz. TTS levels were 194 to 201 dB re 1 µPa at 3 kHz, 193 to 196 dB re 1 µPa at 20 kHz, and 192 to 194 dB re 1 µPa at 75 kHz.

Schlundt et al. (2000) exposed bottlenose dolphins to intense tones (0.4, 3, 10, 20, and 75 kHz); the animals demonstrated altered behavior at source levels of 178 to 193 dB re 1 µPa, with TTS after exposures between 192 and 201 dB re 1 µPa at 1 m (though one dolphin exhibited TTS after exposure at 182 dB re 1 µPa). Nachtigall et al. (2003) determined threshold for a 7.5 kHz pure tone stimulus. No shifts were observed at 165 or 171 dB re 1 µPa, but when the sound level reached 179 dB re 1 µPa, the animal showed the first sign of TTS. Recovery apparently occurred rapidly, with full recovery apparently within 45 minutes following sound exposure. In another experiment, TTS occurred after 30 minutes of exposure to 160 dB re 1 µPa at 4 to 11 kHz. TTS occurred at test frequencies of 8 to 16 kHz but was negligible or absent at higher frequencies (Nachtigall et al. 2004).

4.4 Short-Beaked Common Dolphin, California/Oregon/Washington Stock and Long-Beaked Common Dolphin, California Stock

4.4.1 Status and Management

Both species of common dolphin are protected under the MMPA and are not listed as threatened or endangered under the ESA. Neither of the two stocks of common dolphins is considered strategic or depleted under the MMPA (Carretta et al. 2019).

4.4.2 Distribution

Short-beaked common dolphins are the most abundant cetacean off California and are widely distributed between the coast and at least 300 nautical miles (nmi) offshore. In contrast, long-beaked common dolphins generally occur within 50 nmi of shore. Both species of common dolphin appear to shift their distributions seasonally and annually in response to oceanographic conditions and prey availability (Carretta et al. 2016). The long-beaked species apparently prefers shallower, warmer water than the short-beaked common dolphin (Perrin 2009). Both tend to be more abundant in coastal waters during warm-water months (Bearzi 2005).

4.4.3 Site-Specific Occurrence

Common dolphins are present in the coastal waters outside of San Diego Bay, but infrequently enter the bay (NAVFAC SW and POSD 2013). However, several sightings of common dolphins in the Project area during the previous fuel pier demolition and construction project in 2014 prompted their inclusion in the second year IHA application for that project. More sightings occurred during the second IHA period for the previous Fuel Pier Replacement Project (NAVFAC SW 2015). Given the lack of observations during the fourth IHA period, the Navy believes the monitoring data from the second IHA period for the previous Fuel Pier Replacement Project represent the best available science on numbers of short- or long-beaked common dolphins that are likely to occur. The second IHA period of the previous Fuel Pier Replacement Project recorded 850 individuals over 100 days of monitoring activity (NAVFAC SW 2015). This equates to an average of 8.5 common dolphins observed per day. Rounding to the nearest whole number leads to 9.0 individuals per day expected to be in the vicinity of the Fuel Pier. Since the two species could not be distinguished in the field, the same estimate of individuals is used as a combined estimate for both species.

4.4.4 Behavior and Ecology

Common dolphins are often found in large herds of hundreds or even thousands. They are extremely active, fast moving, and engage in spectacular aerial behavior. They are noted for riding bow and stern waves of boats, often changing course to bow ride the pressure waves of fast-moving vessels and even large whales. Common dolphins can be frequently seen in association with other marine mammal species. They feed on squid and small, schooling fish, sometimes working together to herd fish into tight balls, and occasionally taking advantage of fishing activities to feed on fish escaping from nets or discarded by fishermen (American Cetacean Society 2004).

Common dolphins are an intermittent transient visitor to San Diego Bay and are most commonly observed during the late spring and early summer when bait fish (anchovies and sardines) arrive in increasing numbers. Common dolphins have primarily been observed in the north and north central Bay in pods of 6 to less than 100 animals. The animals typically move rather quickly through the area in tight alignment and occasionally observed riding the bow wave of large ships.

4.4.5 Acoustics

While no empirical data on hearing ability exists for common dolphins, functional hearing for both the short- and long- beaked common dolphin is estimated to occur between approximately 150 Hz and 160 kHz, placing them among the group of cetaceans that can hear mid-frequency sounds (Southall et al. 2007).

Recorded *Delphinus* sp. vocalizations (which are similar among species within this genus) include whistles, chirps, barks, and clicks; clicks and whistles have dominant frequency ranges of 23 to 67 kHz and 0.5 to 18 kHz, respectively (Ketten 1998). Maximum source levels of approximately 170 dB re 1 µPa at frequencies of 25 and 35 kHz were reported for common dolphins sounds off of southern California (Fish and Turl 1976). Best sensitivity was observed at 60 to 70 kHz, with responses evoked up to 152 kHz. At this maximum frequency, the stimulus sound level required to evoke a response was 127 dB re 1 µPa received level. Sensitivity decreased more quickly at the higher frequencies than the lower ones, with the resulting U-shaped audiogram for this species similar to that of other dolphins (Finneran et al. 2009).

4.5 Pacific White-Sided Dolphin, California/Oregon/Washington, Northern and Southern Stocks

4.5.1 Status and Management

The stock structure of Pacific white-sided dolphins is dynamic and poorly understood. While the northern and southern stocks are differentiated on the basis of distribution, genetics, and morphological characters, the two forms mix off of Southern California (Carretta et al. 2017). Neither of the two stocks of Pacific white-sided dolphins is considered strategic or depleted under the MMPA.

4.5.2 Distribution

As summarized by Carretta et al. (2017), Pacific white-sided dolphins are endemic to temperate waters of the North Pacific Ocean and are common both on the high seas and along the continental margins. Off the U.S. west coast, Pacific white-sided dolphins occur primarily in shelf and slope waters. Sighting patterns from aerial and shipboard surveys conducted in California, Oregon and Washington suggest seasonal north-south movements, with animals found primarily off California during the colder water months and shifting northward into Oregon and Washington as water temperatures increase in late spring and summer (Carretta et al. 2017).

4.5.3 Site-Specific Occurrence

Given the lack of observations during the fourth IHA period, the Navy believes the monitoring data from the second IHA period for the previous Fuel Pier Replacement Project represent the best available science on numbers of Pacific white-sided dolphins that are likely to occur (NAVFAC SW 2015). The second IHA period of the previous Fuel Pier Replacement Project recorded 27 individuals over 100 days of monitoring activity. This equates to an average of 0.3 Pacific white-sided dolphins observed per day. Rounding to the nearest whole number leads to to 1.0 individuals per day expected to be in the vicinity of the Fuel Pier.

4.5.4 Behavior and Ecology

Pacific white-sided dolphins are highly social and commonly occur in groups of less than a hundred but can form herds containing several thousands of individuals. They often associate with Risso's dolphins and short-beaked common dolphins, and occasionally feed in association with California sea lions and mixed-species aggregations of seabirds. Cohesiveness of dolphin groups differences according to behavior:

dispersed subgroups while milling, socializing, and feeding, and more tightly grouped while traveling and resting. Pacific white-sided dolphins are highly acrobatic and exhibit a variety of leap types.

These dolphins feed opportunistically on a variety of prey, such as squid and small schooling fish (capelin, sardines, and herring) (NOAA Fisheries 2020f). Pacific white-sided dolphins can live more than 40 years with males reaching sexual maturity around 10 years and females around 8 to 11 years of age.

4.5.5 Acoustics

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.

4.6 Northern Elephant Seal, California Stock

4.6.1 Status and Management

The California breeding stock of northern elephant seal is not considered strategic or depleted under the MMPA. Populations of northern elephant seals in the U.S. and Mexico have recovered after being reduced to near extinction by hunting, undergoing a severe population bottleneck and loss of genetic diversity with the population reduced to only an estimated 10-30 individuals. There are two distinct populations of northern elephant seals: (1) a breeding population in Baja California, Mexico, and (2) a breeding population on U.S. islands off California. Northern elephant seals in the San Diego region could be from either population (Carretta et al. 2016).

4.6.2 Distribution

Northern elephant seals breed and give birth in California (U.S.) and Baja California (Mexico), primarily on off-shore islands. Spatial segregation in foraging areas between males and females is evident from satellite tag data. (Carretta et al. 2016; Lowry et al. 2014).

4.6.3 Site-Specific Occurrence

Northern elephant seals occur in the southern California Bight, and have the potential to occur in San Diego Bay (NAVFAC SW and POSD 2013), but the only recent documentation of occurrence near the project area was of a single distressed juvenile observed hauled out on the beach south and inshore of the Fuel Pier during the second year of the previous Fuel Pier IHA period (NAVFAC SW 2015). In light of the lack of observed Northern elephant seals in the immediate project area, a conservative estimate of two Northern elephant seals are assumed to have the potential to occur in the vicinity of the Fuel Pier during pile removal activities.

4.6.4 Behavior and Ecology

Northern elephant seals are found in coastal areas and deeper waters of the California Current Large Marine Ecosystem (Carretta et al. 2016; Jefferson et al. 2014). The foraging range of northern elephant seals extends thousands of kilometers offshore from the breeding range into the central North Pacific Transition Zone; however, their range is not considered to be continuous across the Pacific (Simmons et al. 2010). Adult males and females segregate while foraging and migrating (Simmons et al. 2010, Stewart and DeLong 1995). Adult females mostly range west to about 173° W, between the latitudes of 40° N and 45° N, whereas adult males range farther north into the Gulf of Alaska and along the Aleutian Islands to between 47° N and 58° N (Le Boeuf et al. 2000, Stewart and DeLong 1995).

4.6.5 Acoustics

Burgess et al. (1998) detected possible vocalizations in the form of click trains that resembled those used by males for communication in air. The audiogram of the northern elephant seal indicates that this species is well-adapted for underwater hearing; sensitivity is best between 3.2 and 45 kHz, with greatest sensitivity at 6.4 kHz and an upper frequency cutoff of approximately 55 kHz (Kastak and Schusterman 1999).

5 HARASSMENT AUTHORIZATION REQUESTED

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

Under Section 101 (a)(5)(D) of the MMPA, the Navy requests an IHA for the take of a small numbers of marine mammals, by Level B behavioral harassment only, incidental to the additional removal of partial former Fuel Pier piles. The Navy requests an IHA for proposed activities that will be conducted during a one-year period beginning January 1, 2022 and ending December 31, 2022. The Navy previously submitted IHA applications for the five years required to accomplish the previous fuel pier removal and replacement project (Navy 2013a, 2014, 2015, 2016, and 2017a), all of which were approved by NOAA Fisheries.

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 ZOIs generated from pile removal activities and implementation of marine mammal monitoring and a 20-m (66-ft) buffered shutdown zone.

5.1 Method of Incidental Taking

This authorization request considers noise from pile removal including via pile clipping, underwater chainsaw, diamond wire saw, and/or a vibratory hammer. These activities were deemed as the only activities that have the potential to disturb or displace marine mammals or produce a temporary shift in their hearing ability (TTS) resulting in Level B harassment, as defined above.

Based on an analysis of the available data associated with pile removal, there is small potential for marine mammals to experience permanent threshold shift (PTS) during pile removal resulting in Level A take. However, Level A zones will be fully monitored to avoid take. To further eliminate the likelihood of Level A takes, a buffered shutdown zone out to 20 m (66 ft) would be implemented to halt activities that could potentially injure a marine mammal that is near in-water Project-related activities. All pile-removal activities will either be delayed from starting or halted if any marine mammals approach the buffered shutdown zone (20 m [66 ft]) which would include all distances calculated for the Level A zone. No Level A take is anticipated with implementation of this buffered shutdown zone.

In-water pile-removal activities include a range of potential methodologies and sound sources (e.g., pile clippers, underwater chainsaw, diamond wire saw, vibratory hammer). To provide a realistic worst-case scenario, the Navy has estimated takes by assuming pile removal sound generating activities listed in Table 2-1 will occur on separate days. The total number of in-water workdays is estimated as 84. This analysis predicts 2,275 exposures for all species (see Section 6 for estimates of exposures by species) that could be classified as Level B harassment under the MMPA. The Navy's mitigation procedures, presented in Section 11, include monitoring of mitigation zones during pile removal activities. The Navy believes that these mitigation measures will be effective in avoiding marine mammal exposures to sound levels that would constitute Level A harassment.

6 NUMBERS AND SPECIES EXPOSED

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

6.1 Introduction

The NOAA Fisheries application for an IHA requires applicants to determine the number of marine mammals that are expected to be incidentally harassed by an action and the nature of the harassment (Level A or B). Section 5 defines MMPA Level A and Level B and Section 6 presents how these definitions were relied on to develop the quantitative acoustic analysis methodologies used to assess the potential for the 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 Level B harassment only through construction activities involving in-water pile removal. Other activities, including dredging, are not expected to result in take as defined under the MMPA. Project-related activities are not anticipated to generate airborne noise beyond operation of combustion engines.

In-water pile removal would temporarily increase the local underwater noise environment in the vicinity of the Project. However, all in-water pile removal activities would occur underwater preventing generation and transmission of airborne noise that could potentially result in disturbance to marine mammals that spend significant time above the surface (i.e., pinnipeds).

Research suggests that increased noise may impact marine mammals in several ways and that these impacts depend on many factors. Noise impacts are discussed in more detail in Section 7. Assessing whether a sound may disturb or injure a marine mammal involves understanding the characteristics of the acoustic source and the potential effects that sound may have on the physiology and behavior of that marine mammal. Sound is important for marine mammal communication, navigation, and foraging (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.

Based on the BMPs identified in Sections 11 and 13, non-impulsive sound sources associated with pile removal would not result in Level A exposure of marine mammals as defined under the MMPA. However, the noise-related impacts discussed in this application may result in Level B harassment. The methods for estimating the number and types of exposures are summarized below.

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

- Estimating the area of impact where noise levels exceed acoustic thresholds for marine mammals (Sections 6.7)
- Evaluating the potential presence of marine mammals based on historical occurrence or by site-specific survey as outlined in (Section 6.9)
- Estimating potential harassment exposures by multiplying the estimated daily site-specific abundance of marine mammals by their probable exposure duration during pile removal activities (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 Hertz (Hz). The amplitude (loudness) of a sound is its pressure, whereas its intensity is proportional to power and is pressure squared. The standard international unit of measurement for pressure is the Pascal, which is a force of 1 Newton exerted over an area of 1 square meter; sound pressures are measured in microPascals (μPa).

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

The method commonly used to quantify airborne sounds consists of evaluating all frequencies of a sound according to a weighted filter that mimics human sensitivity to amplitude as a function of frequency. This is called A-weighting and the decibel level measured is called the A-weighted sound level (dBA). Methods of frequency weighting that reflect the hearing of marine mammals have been proposed (Southall et al. 2007, Finneran and Jenkins 2012) and are being used in new analyses of 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 overpressure, or underpressure, observed during each pulse or sound event and is presented in dB re 1 μPa. The RMS level is the square root of the mean of the squared pressure (= intensity) level as measured over a specified 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 Acoustical Terms

Term	*Definition*
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for water is 1 microPascal (µPa) and for air is 20 µPa (approximate threshold of human audibility).
Sound Pressure Level, SPL	Sound pressure is the force per unit area, usually expressed in microPascals where 1 Pascal equals 1 Newton exerted over an area of 1 square meter. The SPL is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressure exerted by the sound to a reference sound pressure. SPL is the quantity that is directly measured by a sound level meter.
Frequency, Hz	Frequency is expressed in terms of oscillations, or cycles, per second or hertz (Hz). Typical human hearing ranges from 20 Hz to 20 kilohertz (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 decibel (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 µPa^2 sec	Sound exposure level is a measure of energy. Specifically, it is the dB level of the time integral of the squared-instantaneous sound pressure, normalized to a 1-sec period. It can be an extremely useful metric for assessing cumulative exposure because it enables sounds of differing duration, to be compared in terms of total energy.
Waveforms, µPa over time	A graphical plot illustrating the time history of positive and negative sound pressure of individual pile strikes shown as a plot of µPa over time (i.e., seconds).
Frequency Spectrum, dB over frequency range	The amplitude of sound at various frequencies, usually shown as a graphical plot of the mean square pressure per unit frequency (µPa^2/Hz) over a frequency range (e.g., 10 Hz to 10 kHz in this application).
A-Weighting Sound Level, dBA	The SPL in decibels as measured on a sound level meter using the A- or C-weighting filter network. The A-weighting filter de-emphasizes the low and high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective human reactions to noise.
Ambient Noise Level	The background sound level, which is a composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location. In the case of the Project area, the ambient underwater noise level is 129.6 dB re 1 µPa (NAVFAC SW 2020).

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*
Dredging	1–500	161–186 dB RMS re: 1 µPa at 1 meter	Richardson et al. 1995; DEFRA 2003, Reine et al. 2014
Small vessels	860–8,000	141–175 dB RMS re: 1 µPa at 1 meter	Galli et al. 2003, Matzner & Jones 2011 Sebastianutto et al. 2011
Large ship	20–1,000	157–188 dB re: 1 μPa^2sec SEL at 1 meter	McKenna 2011; Kipple and Gabriele 2007
Tug docking gravel barge	200–1,000	149 dB at 100 meters	Blackwell and Greene 2002

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

6.3.1 Ambient Noise

Ambient noise 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 in San Diego Bay is highly variable over time, largely because of anthropogenic sources that include vessel engines and cranes, generators, and other types of mechanized equipment on piers and wharves or the adjacent shoreline (Urick 1983).

As discussed in the five IHA applications for the previous NBPL Fuel Pier demolition and replacement project (Navy 2013b, 2014, 2015, 2016, and 2017a), underwater noise levels in the Project area are commonly 126 to 137 dB re 1µPa, with an overall average of approximately 129.6 dB re 1µPa, and higher maximum RMS and SPL_{PEAK} readings (in excess from 150 dB re 1µPa) due to passing ships in the Navigation Channel (NAVFAC SW 2020). 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 In-Water Pile Removal Noise

The sounds produced by in-water construction activities fall into two sound types: impulsive and non-impulsive (defined below). Impact pile driving produces impulsive sounds, while the equipment used to extract piles 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). Because the Project would not include pile-driving, the Project is not anticipated to generate any impulsive sounds.

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, the 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 TTS) harassment (NOAA Fisheries 2018 and 2020a). NOAA Fisheries has developed acoustic threshold levels for determining the onset of PTS in marine mammals in response to underwater impulsive and non-impulsive sound sources (Table 6-3). 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, such as from pile clipping (NOAA Fisheries 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 (Navy 2010).

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

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

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

Notes:

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

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

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

[4] Cumulative sound exposure level over 24 hours.

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

***Abbreviations*:**

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

6.5 Limitations of Existing Noise Criteria

The application of the 120 dB RMS re 1 µPa behavioral threshold can sometimes be problematic because this threshold level can be either at or below the ambient noise level of certain locations. The 120 dB RMS re 1 µPa threshold level for non-impulsive noise originated from research conducted by Malme et al. (1984, 1986) for California gray whale response to continuous industrial sounds, such as drilling operations.

To date, there is no research or data supporting a response by pinnipeds or odontocetes to non-impulsive sounds, such as from vibratory pile driving, as low as the 120 dB re 1µPa threshold. Southall et al. (2007) reviewed studies conducted to document the behavioral responses of harbor seals and northern elephant seals to non-impulsive sounds under various conditions. They concluded that those limited studies suggest that exposures between 90 dB and 140 dB RMS re 1 µPa generally do not appear to induce strong behavioral responses. W hile the Level B threshold criteria for non-impulsive noise is 120 re 1 µPa, noise from non-impulsive sources associated with the Project is assumed to become indistinguishable from background noise as it diminishes to 129.6 dB re 1 µPa with distance from the source (NAVFAC SW 2020). This value is used as a local baseline ambient noise value for all noise sources to be employed during pile removal activities.

6.6 Auditory Masking

Natural and artificial sounds can disrupt behavior through auditory masking or interference with a marine mammal's ability to detect and interpret other relevant sounds, such as communication and echolocation signals (Wartzok et al, 2004). Masking occurs when both the signal and masking sound have similar frequencies and either overlap or occur very close to each other in time. A signal is very likely to be masked if the noise is within a certain "critical bandwidth" around the signal's frequency and its energy level is similar or higher (Holt 2008). 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). Miksis-Olds & Tyack (2009) showed that manatees modified vocalizations differently during increased noise, depending on whether or not a calf was present.

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.

6.7 Modeling Potential Noise Impacts from Pile Removal

In this IHA application, the Navy has used NOAA Fisheries Technical Guidance and User Spreadsheet (NOAA Fisheries 2018 and 2020a), and acoustic data recorded during previous in-water work demolishing the old Fuel Pier at NBPL to identify the Level A (injury) and Level B (behavior) ZOIs that would result from pile removal and installation.

Table 6-4 Noise Model Used to Calculate Level A and B ZOI by Pile Removal Method and Pile Type

<table>
<tr><th>Removal Method</th><th>Pile Type</th></tr>
<tr><td colspan="2">Level A ZOIs: NOAA Fisheries Technical Guidance (2018) and User Spreadsheet (2020a)
Level B ZOIs: Real-time data collected during the previous Fuel Pier Replacement Project (NAVFAC SW 2020) and City of Seattle Pier 62 Project (Greenbusch Group 2018)</td></tr>
<tr><td>Pile clipper</td><td>13-inch polycarbonate fender piles
14-inch and 16-inch concrete piles</td></tr>
<tr><td>Two pile clippers[1]</td><td rowspan="4">14- and 16-inch concrete piles</td></tr>
<tr><td>Underwater chainsaw</td></tr>
<tr><td>Diamond wire saw[2]</td></tr>
<tr><td>Vibratory hammer[3]</td></tr>
</table>

Notes:

[1] Two pile clippers to be used to simultaneously clip up to two concrete piles

[2] Diamond wire saw, as reported in the San Diego Noise Compendium for removal of 66-inch and 84-inch caissons which have similar observed noise profiles (NAVFAC SW 2020)

[3] Vibratory hammer for removal of timber piles, as reported in Greenbusch Group (2018)

6.7.1 Underwater Sound Propagation

Pile removal activities would generate underwater noise that potentially could result in disturbance to marine mammals swimming by the Project Area. Maximum distances to Level A thresholds for cumulative sound exposure were calculated using the current NOAA Fisheries Technical Guidance and User Spreadsheet (NOAA Fisheries 2018 and 2020a). Observed noise levels during pile removal projects in San Diego Bay, including at the Project site during the previous Fuel Pier Replacement Project, have been compiled and provide real-world examples of sound loss between source and far field points specifically at the current Project site (NAVFAC SW 2020). The compiled San Diego Noise Compendium data include observed distances at which a given noise source attenuated to ambient sound level of San Diego Bay.

6.7.2 Underwater Noise from Pile Removal

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 6-5 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 pile clippers, underwater chainsaw, diamond wire saw, and vibratory hammer as shown in Table 6-5. Data from the most similar activities reported in the San Diego Noise Compendium (NAVFAC SW 2020) have been used as proxies for the proposed activities at the NBPL Fuel Pier. For these purposes, the mean maximum RMS SPL is the most conservative criterion; peak SPLs and SELs for these types of sources would only exceed Level A thresholds less than 1 m (3.3 ft) from the source.

Table 6-5 Observed Mean Maximum Sound Levels and Durations for Removal Activities Likely to Occur at Project Site

Removal Method	*Pile Size and Type*	*RMS SPL (dB re 1 µPa) Observed Mean Maximum (at 10 m)*	*Estimated Duration per Pile (mm:ss)[1]*
Pile clipper	13-inch polycarbonate piles	154	5:00
Pile clipper	14- and 16-inch concrete piles[2]	147	5:00
Two pile clippers[3]	14- and 16-inch concrete piles	150	5:00
Underwater chainsaw[4]	14- and 16-inch concrete piles	150	10:00
Diamond wire saw[5]	14- and 16-inch concrete piles	162	20:00
Vibratory hammer[6]	14- and 16-inch concrete piles	152	10:00

Notes:

[1] Estimated pile clip/cut durations are conservative estimates that are greater than durations observed in the San Diego Noise Compendium (NAVFAC SW 2020)

[2] Observed 16-inch pile clipping/cutting data are used here for all 14- and 16-inch pile removal activities as 14-inch data are not reported in the San Diego Noise Compendium (NAVFAC SW 2020)

[3] For instances of two same noise sources (i.e., two identical pile clippers) active simultaneously, additive models call for an adjustment of +3 dB where a single clipper (147 dB RMS re 1µPa) increases to 150 dB RMS re 1µPa where two clippers are used simultaneously (Kinsler et al 2000)

[4] Appendix B.2 of the San Diego Noise Compendium (NAVFAC SW 2020) records underwater chainsaw source value as 147 dB RMS observed at 17 m (56 ft) which is calculated to 150 dB RMS at 10 m (33 ft) in this application to maintain consistency with other source levels.

[5] Diamond wire saw reported sound levels based on 66-inch and 84-inch caissons and value reflected here is likely larger than would occur through use of smaller wire saw (for which no data are available) for 16-inch concrete piles (NAVFAC SW 2020)

[6] Vibratory hammer pile removal sound reported based on vibratory pile removal value for timber piles as identified in Greenbusch Group (2018)

Abbreviations:

dB re 1 µPa = decibels referenced to a pressure of 1 microPascal,
m = meters, mm:ss = minutes:seconds

Source: NAVFAC SW 2020; Greenbusch Group 2018

For the analyses that follow, the previously observed source levels and durations identified in Table 6-5 and assuming removal of 5 piles per day were utilized. Distances to Level A (onset PTS) thresholds, based on cumulative SEL using the previously observed Mean Maximum RMS Source Level, have been calculated as shown in Appendix A using the NOAA Fisheries Technical Guidance and User Spreadsheets (NOAA Fisheries 2018 and 2020a) and identified in Table 6-6.

Table 6-6 Projected Distances to Underwater Level A Thresholds by Marine Mammal Hearing Group

Pile Removal Activity	*Projected Distances to Level A Thresholds (m [ft])*		
	MF	*PW*	*OW*
13-inch polycarbonate piles with pile clipper 154 dB RMS for 0.42 hour per day	0.0	0.0	0.0
14- and 16-inch concrete piles with pile clipper 147 dB RMS for 0.42 hour per day	0.0	0.0	0.0
14- and 16-inch concrete piles with two pile clippers 150 dB RMS for 0.42 hour per day	0.0	0.0	0.0
14- and 16-inch concrete piles with underwater chainsaw 150 dB RMS for 0.83 hour per day	0.0	0.1 (0.33)	0.1 (0.33)
14- and 16-inch concrete piles with diamond wire saw 162 dB RMS for 1.7 hours per day	0.0	0.3 (1.0)	0.0
14- and 16-inch concrete piles with vibratory hammer 152 dB RMS for 0.83 hour per day	0.1 (0.33)	0.9 (3.0)	0.1 (0.33)

Abbreviations:

RMS = root mean square, dB re 1 µPa = decibels referenced to a pressure of 1 microPascal
m = meters, ft = feet
MF = mid-frequency cetaceans, PW = phocid pinnipeds, OW = otariid pinnipeds

For this project, the distance to the Level B threshold was determined using either practical spreading loss, or an assessment of real-time data for the same pile removal techniques and piles from NAVFAC SW (2020). However, the Level B monitoring zones were determined by the more conservative of the two distances (indicated by bold text in Table 6-7), with noise likely dissipating to ambient somewhere in-between these two distances. For the analysis of the real-time data, we evaluated the data provided in NAVFAC SW (2020), with the Level B zone identified by the distance at which the sound from the Project source reached the established ambient noise level in north San Diego Bay (129.6 dB re 1 µPa; NAVFAC SW [2020]). While this exceeds the regulatory threshold of 120 dB as specified in Table 6-3 (NOAA Fisheries 2018), it is a more realistic representation of the acoustic environment in San Diego Bay. For instance, with the 16-inch concrete piles clipped using a 24-inch pile clipper, NAVFAC SW (2020) shows that project-related noise levels dropped to below ambient levels first at 141 m (463 ft) and then again at 215 m (705 ft); However, two values at 309 m (1,014 ft) were both greater than and less than ambient levels. This variability indicated that noise levels at far-field locations may have been influenced by factors that were not project-related (i.e. vessel traffic in the main navigation channel). If we evaluate the same pile removal methodology using the source level from Table 6-5, the practical spreading loss model predicts that concrete pile clipping noise would drop to ambient levels at 145 m (476 ft) for a single clipper, and 229 m (751 ft) for two clippers being used simultaneously. The drop and then increase in noise levels at far-field distances follows the same trend for most of the real-time data for the pile removal methodologies in NAVFAC SW (2020), which showed increased noise levels at between 300 and 400 m (984 and 1,312 ft) from the Project area. It should be noted that at this distance from the Project area, there is increased boat traffic as large and small boats approach the Everingham Brothers Bait Barges to the southeast of the Project site. For the use of pile clipper(s), because the real-time data showed variability of noise data between 215 and 309 m (705 and 1,014 ft), and based on the assumption that the

higher value was not project-related, we chose a monitoring distance of 250 m (820 ft) for both the single and dual pile clippers. The information above provides an example of how real-world acoustic data was evaluated to assess potential distances to the Level B ZOIs based on real-time data.

The expected radial distances to Level B behavioral disturbance thresholds and corresponding areas within the ZOIs are summarized in Table 6-7. Figures 6-1 through 6-6 depict the extent of the ZOIs associated with noise propagation specific to each of the pile removal methods. The Physical Interaction Shutdown Zone (10 m [33 ft]) from the source are not shown because the shutdown procedure (activated when a marine mammal would approach to within the larger 20 m [66 ft] buffered shutdown zone) would prevent any exposures.

Table 6-7 Distances to Underwater Level B Thresholds and ZOI Areas within the Thresholds from Pile Removal

Pile Removal Activity	*Source Value (dB RMS @ 10 m)*	*Duration (hrs/day)*	*Projected Distance to and Area of Level B Thresholds[1]*			
			Practical Spreading Loss		*Real-time Data*	
			Distance (m [ft])	*Area (km²[sq. miles])*	*Distance (m [ft])*	*Area (km²[sq. miles])*
13-inch polycarbonate piles with pile clipper	154	0.42	**423 (1,378)**	0.37 (0.14)	350 (1,148)	0.27 (0.10)
14- and 16-inch concrete piles with pile clipper	147	0.42	145 (456)	0.07 (0.03	**250 (820)**	**0.16 (0.06)**
14- and 16-inch concrete piles with two pile clippers[2]	150	0.42	229 (751)	0.19 (0.07)	**250 (820)**	**0.22 (0.08)**
14- and 16-inch concrete piles with underwater chainsaw	150	0.83	**229 (751)**	**0.14 (0.05)**	45 (148)	0.01 (<0.01)
14- and 16-inch concrete piles with diamond wire saw	156	1.7	**575 (1,886)**	**0.63 (0.24)**	350 (1,148)	0.27 (0.10)
14- and 16-inch concrete piles with vibratory hammer[3]	152	0.83	**311 (1,020)**	**0.22 (0.09)**	-	-

Notes:

[1] Distances to Level A and B thresholds were calculated using acoustic data compiled for NBPL in the 2020 San Diego Noise Compendium (NAVFAC SW 2020) except for use of vibratory hammer which is sourced from City of Seattle Pier 62 Project (Greenbusch Group 2018). The Level B ZOIs for pile removal are based on the distance for noise to decay to ambient levels (129.6 dB re 1µPa). Bold distances represent monitoring zones used for Level B harassment.

[2] For concrete pile removal via multiple clippers, the maximum radial distance is the same as that for use of a single pile clipper but the total ZOI area is greater due to potential offset between individual clippers.

[3] Because real-time data for use of vibratory hammer are not presented in the San Diego Noise Compendium (NAVFAC SW 2020), only calculated spreading loss distances are presented here.

***Abbreviations*:**

dB re 1 µPa = decibels referenced to a pressure of 1 microPascal,
km² = square kilometers, m = meters, ft = feet
RMS = root mean square, ZOI = Zone of Influence (area encompassed within acoustic threshold boundary).

Source

Potential PSO Location

Proposed Dredge Footprint

Projected Distance to Level B Thresholds (154 dB RMS)

20m Buffered Shutdown Zone

423m - Practical Spreading Loss (0.37 sq. km / 0.14 sq. mi)

350m - Real Time Data (0.27 sq. km / 0.10 sq. mi)

1 inch = 300 feet

0 300 Feet

FIGURE 6-1

Level B ZOI for 13-inch Polycarbonate Pile Removal via Pile Clipper
Navy Base Point Loma
Maintenance Dredging
Fuel Pier Inboard Area

Path: \\sdg1-fs1\gis\3151_AquaticResources\SanDiegoMaintenanceDredging\MXD\ReportFigures\2020\NBPL_InnerBerths_FuelPier\IHA\Fig6_1_PolySmallClippers.mxd, aaron.johnson, 5/14/2021

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

Source

Potential PSO Location

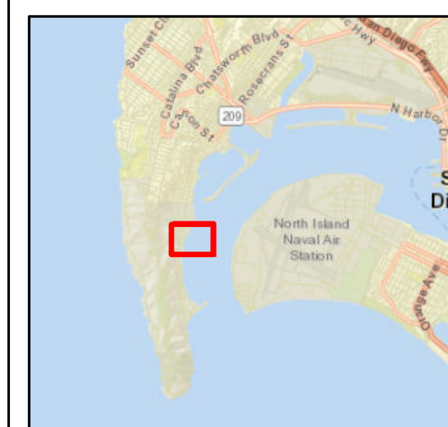
Proposed Dredge Footprint

Projected Distance to Level B Thresholds (147 dB RMS)

20m Buffered Shutdown Zone

145m - Practical Spreading Loss (0.07 sq. km / 0.03 sq. mi)

250m - Real Time Data (0.16 sq. km / 0.06 sq. mi)



1 inch = 250 feet

0 250 Feet

FIGURE 6-2

Level B ZOI for 14- and 16-inch Concrete Pile Removal via Single Pile Clipper
Navy Base Point Loma
Maintenance Dredging
Fuel Pier Inboard Area

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

Path: \\sdg1-fs1\gis\3151_AquaticResources\SanDiegoMaintenanceDredging\MXD\ReportFigures\2020\NBPL_InnerBerths_FuelPier\IHA\Fig6_2_ConcreteSmallClipper.mxd, aaron.johnson, 5/14/2021

FIGURE 6-3

Level B ZOI for Multiple
Concrete Pile Removal via
Two Simultaneous Pile Clippers
Navy Base Point Loma
Maintenance Dredging
Fuel Pier Inboard Area

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

Path: \\sdg1-fs1\gis\3151_AquaticResources\SanDiegoMaintenanceDredging\MXD\ReportFigures\2020\NBPL_InnerBerths_FuelPier\IHA\Fig6_3_Concrete_2SmallClippers.mxd, aaron.johnson, 5/18/2021

FIGURE 6-4

Level B ZOI for 14- and 16-inch Concrete Pile Removal via Hydraulic Chainsaw
Navy Base Point Loma
Maintenance Dredging
Fuel Pier Inboard Area

Path: \\sdg1-fs1\gis\3151_AquaticResources\SanDiegoMaintenanceDredging\MXD\ReportFigures\2020\NBPL_InnerBerths_FuelPier\IHA\Fig6_4_Concrete_Chainsaw.mxd, aaron.johnson, 5/18/2021

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

Source

Potential PSO Location

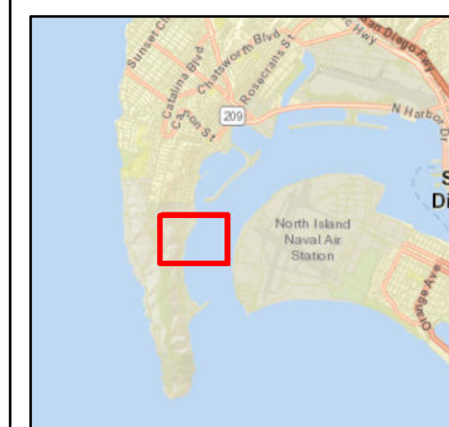
Proposed Dredge Footprint

Projected Distance to Level B Thresholds (156 dB RMS)

20m Buffered Shutdown Zone

575m - Practical Spreading Loss (0.63 sq. km / 0.24 sq. mi)

350m - Real Time Data (0.27 sq. km / 0.10 sq. mi)



1 inch = 400 feet

0 400 Feet

FIGURE 6-5

Level B ZOI for 14- and 16-inch Concrete Pile Removal via Wire Saw
Navy Base Point Loma
Maintenance Dredging
Fuel Pier Inboard Area

Path: \\sdg1-fs1\gis\3151_AquaticResources\SanDiegoMaintenanceDredging\MXD\ReportFigures\2020\NBPL_InnerBerths_FuelPier\IHA\Fig6_5_Concrete_WireSaw.mxd, aaron.johnson, 5/18/2021

Source

Potential PSO Location

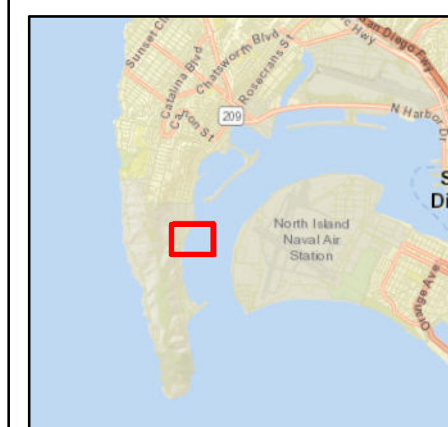
Proposed Dredge Footprint

Projected Distance to Level B Thresholds (152 dB RMS)*

20m Buffered Shutdown Zone

311m - Practical Spreading Loss (0.22 sq. km / 0.09 sq. mi)

*Note: Practical Spreading Loss only, no local real-time data available



1 inch = 250 feet

0 250 Feet

FIGURE 6-6

Level B ZOI for 14- and 16-inch Concrete Pile Removal via Vibratory Extraction
Navy Base Point Loma
Maintenance Dredging
Fuel Pier Inboard Area

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

Path: \\sdg1-fs1\gis\3151_AquaticResources\SanDiegoMaintenanceDredging\MXD\ReportFigures\2020\NBPL_InnerBerths_FuelPier\IHA\Fig6_6_Concrete_VibratoryExtraction.mxd, aaron.johnson, 5/18/2021

6.8 Basis for Estimating Take by Harassment

The U.S. Navy is seeking authorization for the potential taking, by Level B harassment only, of California sea lions, harbor seals, northern elephant seals, bottlenose dolphins, common dolphins, and Pacific white-sided dolphins in northern San Diego Bay resulting from activities associated removal of piles remaining from previous demolition and replacement of the NBPL Fuel Pier. Marine mammals are present to varying degrees in San Diego Bay year-round, with California sea lions being the most common. 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.

Level A (PTS onset) takes, as well as risks of physical injury, would not occur for all analyzed species due to the small threshold distances and implementation of the 20-m (66-ft) buffered shutdown zone.

Potential Level B takes would occur throughout pile removal activities if marine mammals are present within the ZOIs (Table 6-7, Figures 6-1 through 6-6). Marine mammals observed in the area would likely be swimming and/or foraging. As such, potential takes by disturbance will have a negligible short-term effect on individual marine mammals and would not result in population-level impacts.

Beyond the size of the ZOIs associated with pile removal activities, estimated takes are based on the expected daily number of individuals of a species, based on previously observed total species counts divided by days of activity observed during marine mammal monitoring efforts during the previous five IHA periods at the Fuel Pier. A majority of the estimated daily number of individuals species used in this analysis are based on the fourth year IHA monitoring report from the previous Fuel Pier Replacement Project (NAVFAC SW 2017b). This monitoring period had the highest number of activity days and the highest average number of animals observed per day for the three most common species and likely represents the species presence and numbers in San Diego Bay. The second year IHA monitoring report from the previous Fuel Pier Replacement Project is used for species that were not observed during the fourth IHA period (NAVFAC SW 2015). Given those conditions, marine mammal observations for these time periods provide the most conservative estimate of species abundance for the general Project area.

6.8.1 California Sea Lion

California sea lions are present in northern San Diego Bay year-round and are by far the most numerous marine mammal in the bay as reported during previous IHA monitoring periods at the Fuel Pier (NAVFAC SW 2014, 2015, 2016, 2017a-b, 2018a-b). The local population comprises adult females and sub-adult males and females, with adult males being uncommon (Merkel and Associates, Inc. 2008; Navy 2010; TDI 2012b; NAVFAC SW 2014).

Based on the observations presented in NAVFAC SW (2017b, 2018a), an average of 14.9 California sea lions per day (rounded to 15 per day) were observed during the fourth IHA period of the previous Fuel Pier Replacement Project. This expected daily individual count was used to calculate the Level B take for California sea lions over the 84 days of pile removal activities under the project.

Potential takes would likely involve sea lions that are loafing on or in the vicinity of structures or moving through the area in route to foraging areas or structures where they haul out. California sea lions that are taken could exhibit behavioral changes such as increased swimming speeds, increased surfacing time, or decreased foraging. Most likely, California sea lions may move away from the sound source and be

temporarily displaced from the areas of pile removal. As was observed during monitoring for previous IHAs (NAVFAC SW 2014, 2015, 2016, 2017a-b, 2018a-b), with or without the bait barges, sea lions are expected to remain concentrated in the northern part of the bay, be hauled out or swimming in the general vicinity of the Project site. Minimal reactions were observed from animals that were observed swimming or resting on structures within the Level B ZOIs (NAVFAC SW 2014, 2015, 2016). As such, potential takes by disturbance will have a negligible short-term effect on individual California sea lions and would not result in population-level impacts.

6.8.2 Harbor Seal

Based on the observations presented in NAVFAC SW (2017b, 2018a), an average of 0.6 harbor seals per day (rounded to 1 per day) were observed during the previous Fuel Pier Replacement Project. This expected daily individual count was used to calculate the Level B take for harbor seals.

Potential takes would likely involve harbor seals that are on the shoreline or structures at the identified location, or swimming in the vicinity. The most likely movements of harbor seals would be to and from foraging areas in the kelp beds south of Ballast Point. Harbor seals that are taken could exhibit behavioral changes such as entering the water in response to airborne noise, increased swimming speeds, increased surfacing time, or decreased foraging. Most likely, harbor seals may move away from the sound source and be temporarily displaced from the areas of pile removal. With the absence of any major rookeries and only a few isolated haul-out areas near or adjacent to the Project site, potential takes by disturbance will have a negligible short-term effect on individual harbor seals and would not result in population-level impacts.

6.8.3 Bottlenose Dolphin

Bottlenose dolphins can occur at any time of year in northern San Diego Bay. Based on the observations presented in NAVFAC SW (2017b, 2018a), an average of 0.4 bottlenose dolphins per day (rounded to the 1 per day) were observed during the previous Fuel Pier Replacement Project. This expected daily individual count was used to calculate the Level B take for bottlenose dolphin.

Potential takes could occur if bottlenose dolphins move through the area on foraging trips when pile removal would occur. Bottlenose dolphins that are taken could exhibit behavioral changes such as increased swimming speeds, increased surfacing time, or decreased foraging. Most likely, bottlenose dolphins may move away from the sound source and be temporarily displaced from the areas of pile removal. There are no indications that bottlenose dolphins use or regularly occur in the area near the Fuel Pier. Hence any exposure to Project-generated sound is likely to be transient and at relatively large distances. Therefore, potential takes by disturbance will have a negligible short-term effect on individual bottlenose dolphins and would not result in population- level impacts.

6.8.1 Common Dolphin (Short-Beaked and Long-Beaked)

Common dolphins are generally abundant in the outer coastal waters, and although they have been uncommon in San Diego Bay (NAVFAC SW and POSD 2013). Based on the observations presented in NAVFAC SW (2015), an average of 8.5 common dolphins per day (rounded to 9 per day) were observed during the previous Fuel Pier Replacement Project. This expected daily individual count was used to calculate the Level B take for common dolphins.

It is expected that common dolphins would move rapidly through the Project area as seen during the first two IHA periods. Therefore, potential takes by disturbance will have a negligible short-term effect on individual common dolphins, and would not result in population-level impacts.

6.8.2 Pacific White-Sided Dolphin

Pacific white-sided dolphins are more commonly seen offshore, but were documented in the Project area. Based on the observations presented in NAVFAC SW (2015), an average of 0.3 Pacific white-sided dolphins per day (rounded to 1 per day) were observed during the previous Fuel Pier Replacement Project. This expected daily individual count was used to calculate the Level B take for Pacific white-sided dolphin.

Potential takes could occur if Pacific white-sided dolphins move through the area on foraging trips when pile removal would occur. Pacific white-sided dolphins that are taken could exhibit behavioral changes such as increased swimming speeds, increased surfacing time, or decreased foraging. Most likely, they may move away from the sound source and be temporarily displaced from the areas of pile removal. There are no indications that Pacific white-sided dolphins use or regularly occur in San Diego Bay. Hence any exposure to Project-generated sound is likely to be transient and at relatively large distances. Therefore, potential takes by disturbance will have a negligible short-term effect on individual Pacific white-sided dolphins and would not result in population-level impacts.

6.8.3 Northern Elephant Seal

A single individual northern elephant seal was observed during the second IHA period (2015) for the previous Fuel Pier Replacement Project (NAVFAC SW 2015). However, with increasing numbers (Carretta et al. 2016), their presence in the greater San Diego waters is considered as a reasonable possibility. With so few individuals observed inside of San Diego Bay, an expected daily individual count of two northern elephant seal was used to calculate the Level B take for northern elephant seals. Given the limited observation records of this species in San Diego Bay, a five individual buffer is requested in addition to the expected two individuals.

Potential takes would likely involve single individuals that are on the shoreline or structures at the identified location, or swimming in the vicinity, most likely near the mouth of the bay. Elephant seals that are taken could exhibit behavioral changes such as entering the water in response to airborne noise, increased swimming speeds, increased surfacing time, or decreased foraging. Most likely, elephant seals may move away from the sound source. With the absence of any rookery or regularly used foraging or haul-out sites, potential takes by disturbance will have a negligible short-term effect on individual harbor seals and would not result in population-level impacts.

6.8.1 Species Not Included

Previous IHA's had requested Level B Take for Risso's dolphins and gray whales; However, given that Risso's dolphins have not been observed to enter San Diego Bay, and individual gray whales rarely occur in San Diego Bay, Level B harassment takes of these species are not expected. Furthermore, the relatively small Level B monitoring zones, and the proposed measures for visual detection measures summarized in Sections 11 and 13, and in the Project-specific monitoring plan, for non-IHA marine mammals would negate take of these species.

6.9 Description of Take Calculation and Exposure Estimates

Pile removal activities may take place concurrently, where multiple piles are extracted during the day. The following assumptions were used to calculate potential exposures to piles removal activity noise for each species:

- Each animal can be "taken" via Level B harassment once every 24 hours.

- Differing methods of pile removal (i.e., underwater chainsaw and pile clipper) will not occur coincidentally while up to two pile clippers may be used simultaneously.
- Pile removal is estimated to require 84 days of in-water work within the 196-day period outside CLT nesting season over the course of the one-year IHA period.
- The number of individual takes by species is expected daily count based on previous observations multiplied by the number of days of pile removal activities (84 days) described in Section 2 (Table 2-1) and is summarized in Table 6-8.

Table 6-8 Summary of Expected Daily Species Presence in Project Area and Requested Level B Takes

Species	*Expected Average Individuals Per Day*	*Requested Level B Take*
California sea lion[1]	15	1,260
Harbor seal[1]	1	84
Bottlenose dolphin[1]	1	84
Common dolphin (Long- and Short-beaked)[2]	9	756
Pacific white-sided dolphin[2]	1	84
Northern elephant seal	-	7[3]
	Total	**2,275**

Notes:

[1] Average daily counts based on observations during Year 4 Fuel Pier Replacement Project Monitoring (NAVFAC SW 2016b).

[2] Average daily counts based on observations during Year 2 Fuel Pier Replacement Project Monitoring (NAVFAC SW 2015).

[3] Expected potential of two northern elephant seals over the duration of project activity with a +5 buffer for Level B take.

7 IMPACTS TO MARINE MAMMAL SPECIES OR STOCKS

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

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

7.1.1 Potential Effects Resulting from Underwater Noise

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

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

7.1.1.1 Physiological Responses

Because the ears are the 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 the ossicles, damage the cochlea, cause hemorrhage, and leak cerebrospinal fluid into the middle ear (Ketten et al. 2004). Sub-lethal impacts also include hearing loss, which is caused by exposure to perceptible sounds. Moderate injury implies partial hearing loss. Permanent hearing loss (also called 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 impacts are almost entirely acoustically mediated. Based on the mitigation measures outlined in Chapter 11 and the conservative modeling assumptions discussed in Chapter 6, marine mammals may be present. Therefore, marine mammals that are present during construction may experience auditory effects but 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 haul-out time, possibly to avoid in-water disturbance.

Controlled experiments with captive marine mammals showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway et al. 1997, Finneran et al. 2003) 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, 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 re 1µPa 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 haul-out site or feeding areas. One of these harbor seals was even seen to swim to within 150 m (492 ft) of the pile-driving barge during pile driving. Several California sea lions, however, were observed at distances of 500 to 1,000 m (1,640 to 3,280 ft) swimming rapidly and porpoising away from pile-driving activities. Both harbor seals and California sea lions continued feeding on dense schools of herring that occasionally occurred during pile driving (Caltrans 2001). Observations at other construction sites, including the previous NBPL Fuel Pier demolition and replacement project indicated that California sea lions typically did not respond behaviorally to pile driving (NAVFAC SW 2014, 2015, 2016, 2017a-b, 2018a-b, Navy 2016). The reasons for these differences are not known and probably reflect the context of construction activities and the previous experiences of the animals.

Observations of marine mammals on Naval Base Kitsap at Bangor 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 porpoise were more likely to change direction while traveling during construction (HDR, 2012). Pinnipeds were more likely to dive and sink when closer to pile-driving activity, and a greater variety of other behaviors were observed with increasing distance from pile driving.

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

Marine mammals encountering in-water demolition operations over the Project's construction time frame 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 pile removal noise are expected to vary. Some individuals may occupy the Project area during pile removal 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 ZOIs is only a small portion of foraging habitat utilized in San Diego Bay 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 the response. Since pile removal activities will only occur during daylight hours, marine mammals swimming, foraging, or resting in the Project area at night will not be affected. Effects of pile removal 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 pile removal operations at NBPL Fuel Pier 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. The sound generated from all planned pile removal activities is non-pulsed (e.g., continuous) which is not known to cause injury to marine mammals. Mitigation is likely to avoid most potential adverse underwater impacts to marine mammals from pile removal 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.

8 IMPACT ON SUBSISTENCE USE

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

Potential impacts resulting from the Proposed Action will be limited to individuals of marine mammals located in NBPL Fuel Pier ZOI that have no subsistence requirements. Therefore, no impacts on the availability of species or stocks for subsistence use are considered.

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

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

The proposed activities at the NBPL Fuel Pier are expected to have little if any effects on the distribution of marine mammals within the Project area. Only small numbers of marine mammals are expected to be present during pile removal activities and there are no haul-out structures within the Project area available to seals or sea lions. 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 removal effects on likely marine mammals prey (i.e., fish) and minor impacts to the immediate substrate during the removal of piles.

9.1 Pile Removal Effects on Potential Prey (Fish)

The current IHA application addresses non-impulsive impulsive sounds associated with the machinery used to extract piles that were previously partially removed during the demolition of the old NBPL Fuel Pier. 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 file, although several are based on studies in support of large, multiyear bridge construction projects (Scholik and Yan 2001 and 2002, Govoni et al. 2003, Hawkins 2005, Hastings 1990 and 2007, Popper et al. 2006, Popper and Hastings 2009). The most likely impact to fish from pile removal activities at the Project area would be temporary behavioral avoidance of the immediate area. The duration of fish avoidance of this area after pile removal 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. 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 2015). 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 demolition and construction 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:

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

Based on the intensity and attenuation of construction noise defined above (estimated using simple transmission loss equation with propagation factor 15), the distance to which underwater noise will no longer result in injury or disturbance of fish is depicted in Table 9-1.

Table 9-1 SELcum Values (10-meter source distance) for Pile Removal and Fish Thresholds

Pile/Activity Type and Duration (seconds/day; s/ day)	*RMS SPL (dB re 1 µPa) (10 meter)*	*SEL_{cum} (10 meter)*	*Injury Threshold for Fish > 102 grams (234 dB SEL_{cum})*	*Injury Threshold for Fish <102 grams (191 dB SEL_{cum})*	*Behavior 150 dB RMS (dB re 1 µPa)*
13-inch polycarbonate pile removal with clipper (1,512 s/ day)	154	186	<1 m	<5 m	Yes (up to 22 m)
14- and 16-inch concrete square pile removal using pile clipper (1,512 s/ day)	147	179	<1 m	<2 m	<10 m
14- and 16-inch concrete pile(s) removal using two pile clippers (1,512 s/ day)	150	182	<1 m	<3 m	Yes (up to 10 m)
14- and 16-inch concrete pile removal using underwater chainsaw (2,988 s/ day)	150	185	<1 m	<5 m	Yes (up to 10 m)
14- and 16-inch concrete pile removal using diamond wire saw[1] (6,120 s/ day)	162	200	<1 m	Yes (up to 40 m)	Yes (up to 65 m)
14- and 16-inch concrete pile removal using vibratory hammer (2,998 s/ day)	152	187	<1 m	<5 m	Yes (up to 16 m)

Notes:

[1] Diamond wire saw reported sound levels based on 66-inch and 84-inch caissons and value reflected here is likely larger than would occur through use of smaller wire saw (for which no data are available) for 16-inch concrete piles

Abbreviations:

dB re 1 µPa = decibels referenced to a pressure of 1 microPascal,
s/ day = second per day, m = meters, < = less than, > = greater than
RMS = root mean square, SEL = Sound Exposure Level, cum = cumulative

None of the planned pile removal activities would exceed either of the injury thresholds for fish within 10 m (33 ft) of the source except use of the diamond wire saw which would have the potential to exceed the 191 dB SEL threshold for fish < 102 grams out to approximately 40 m (131 ft) from the source. Further, it is anticipated that preparation activities for pile clipping or cutting (i.e., positioning the clipper or wire saw) and upon initial startup of the either saw would cause fish to move away from the affected area outside areas where injuries may occur. Therefore, relatively small portions of the Project area would be affected for relatively short periods of time, the potential for effects on fish to occur would be temporary and limited to the duration of sound-generating activities.

9.2 Pile Removal Effects on Potential Foraging Habitat

The area likely impacted by the NBPL Fuel Pier pile removal project is relatively small compared to the total available habitat in San Diego Bay. As a result, the removal of pilings, substrate disturbance, and high levels of activity at the Project site would be inconsequential in terms of long-term effects on marine mammal foraging.

Turbidity is expected to increase in the short-term during pile removal. The size and shape of the turbidity plume from pile removal are difficult to quantify because of variability in naturally occurring conditions, such as wind and currents. Consequently, it is difficult to predict the specific areas that may be influenced by the plume. Pile removal activities are likely to increase turbidity in the immediate vicinity, for example when high-pressure water jetting is used. Turbidity monitoring during jetting to remove caissons for the previous Fuel Pier Replacement Project revealed relatively minor if any changes, with only localized decreases in water clarity that dissipated within three to five minutes (but up to 10) from the start of jetting (NAVFAC SW 2018a). Therefore, if water jetting is utilized during pile removal at the Project site, it would likely have similar effects to water jetting during previous caisson removal activities with the resulting effects being relatively minor, local to the pile being worked on, and having only temporary negative effects on water quality lasting until sediment resettles.

Eelgrass beds have been reported in proximity Fuel Pier's north side approximately 120 m (394 ft) to the north of the pile removal and dredge area (Merkel & Associates, Inc. 2018). Therefore, pile removal activities are part of the proposed Project would neither directly impact the nearest eelgrass beds through physical disruption of habitat nor indirectly via decreased water quality due to increased turbidity as these impacts, as discussed above, would be localized to the Project site and temporary in nature.

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 removal of pilings, substrate disturbance, and high levels of activity at the Project site would be inconsequential in terms of effects on marine mammal foraging. Therefore, pile removal is not likely to have a permanent, adverse effect on marine mammal foraging habitat in the Project Area.

10 IMPACTS TO MARINE MAMMAL FROM LOSS OR MODIFICATION OF HABITAT

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

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

11 MEANS OF EFFECTING THE LEAST PRACTICABLE ADVERSE IMPACTS – MITIGATION MEASURES

The availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, their habitat, and on their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance.

The exposures outlined in Section 6 represent the maximum expected number of marine mammals that could be exposed to acoustic sources reaching Level B harassment levels. The Navy 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 Pile-Removal Activities

11.1.1 Proposed Measures

1. Level A and Level B Harassment ZOIs During Pile Removal
    a. During all pile removal activities, regardless of predicted SPLs, a buffered shutdown zone of 20 m (66 ft) will be monitored (10 m [33 ft] Physical Interaction Shutdown Zone and additional 10 m [33 ft] buffer). 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 construction equipment during in-water activities. If an animal enters the buffered shutdown zone, pile removal would be stopped until the individual(s) has left the zone of its own volition, or not been sighted for 15 minutes.
    b. The Level A/B harassment ZOIs will be monitored throughout the time required to remove a pile. If a marine mammal is observed entering the Level B ZOI, an exposure would be recorded and behaviors documented. Work would continue without cessation, unless the animal approaches or enters the buffered shutdown zone, at which point pile extraction shall be halted.
2. Visual Monitoring
    a. Pile Removal: Monitoring will be conducted for a 20 m (66 ft) buffered shutdown zone and within the Level B ZOI before, during, and after pile removal activities. The Level B ZOI may be adjusted, subject to NOAA Fisheries concurrence. Monitoring will take place from 30 minutes prior to initiation through 30 minutes post-completion of removal activities.
    b. Monitoring will be conducted by qualified protected species observers (PSOs). 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., the pile removal barge, on shore at the Fuel Pier, or any other suitable location) to monitor for marine mammals and implement shutdown/delay procedures, when applicable, by notifying the equipment operator of a need for a shutdown of pile removal. Up to two PSOs will be deployed on the pile removal barge or on the Fuel Pier with a clear view of the buffered shutdown zone and ZOIs based on the visibility of the monitoring zone specific to each activity and visibility of that zone on a given day as needed..

c. Prior to the start of pile removal activity, the buffered shutdown zone will be monitored for 30 minutes to ensure that they are clear of marine mammals. Pile removal will only commence once observers have declared the buffered shutdown zone clear of marine mammals; Animals will be allowed to remain in the Level B ZOI and their behavior will be monitored and documented.

d. If a marine mammal approaches/enters the buffered shutdown zone during the course of pile removal operations, pile removal will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the buffered shutdown zone, or 15 minutes have passed without a re-detection of the animal(s) from the last observation time.

e. If a marine mammal species not covered in this IHA enters the Level B harassment zone, all pile removal activities shall be halted until the animal(s) has been observed to have left the Level B ZOI, or has not been observed for at least one hour. NOAA Fisheries will be notified immediately with the species, and precautions made during the encounter. Pile installation or extraction will be allowed to proceed if the above measures are fulfilled for non-IHA species.

f. In the unlikely event that environmental conditions, such as heavy fog, prevent the visual detection of marine mammals within the buffered shutdown zone, in-water pile removal activities will either be delayed or stopped until the environmental conditions allow the PSO to monitor the full buffered shutdown zone.

g. If the take of a marine mammal species approaches the take limits specified in the IHA, NOAA Fisheries will be notified, and appropriate steps will be discussed.

5. Daylight Construction – In-water pile removal work will occur only during daylight hours that allow for sighting of marine protected species within all Project area and defined monitoring zones. While the ambient lighting conditions will dictate the ability to see marine mammals, generally in the Project area, daylight hours will be considered as from 45 minutes after sunrise 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) the sediments of the Project site 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. Additionally, the use of bubble curtains was evaluated during the previous NBPL Fuel Pier project (completed in 2018) and were eliminated from consideration for that project and, by extension, this project given the dynamic tidal cycle in San Diego Bay.

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 the Navy expects that visual mitigation will be highly effective. Visual detection conditions in San Diego Bay are generally excellent. By its orientation, the bay is sheltered from large swells and infrequently experiences strong winds; winds are less than 17 knots 98% of the time between November and April (San Diego Bay Harbor Safety Committee 2009). Fog is anticipated on 10-20% of the days, typically in late night and early morning hours (San Diego Bay Harbor Safety Committee 2009) and could occasionally limit visibility for marine mammal monitoring. 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, and the buffered shutdown zone covers relatively small and accessible areas of the bay. As such, proposed mitigation measures are likely to be very effective.

12 MINIMIZATION OF ADVERSE EFFECTS ON SUBSISTENCE USE

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

(i) A statement that the applicant has notified and provided the affected subsistence community with a draft plan of cooperation;

(ii) A schedule for meeting with the affected subsistence communities to discuss proposed activities and to resolve potential conflicts regarding any aspects of either the operation or the plan of cooperation;

(iii) A description of what measures the applicant has taken an/or will take to ensure that proposed activities will not interfere with subsistence whaling or sealing; and

(iv) What plans the applicant has to continue to meet with the affected communities, both prior to and while conducting activity, to resolve conflicts and to notify the communities of any changes in the operation.

There is no subsistence use of marine mammal species or stocks in the Project area.

13 MONITORING AND REPORTING MEASURES

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

13.1 Monitoring Plan

The following monitoring measures would be implemented along with the mitigation measures (Section 11) in order to reduce impacts to marine mammals to the lowest extent practicable during the period of this IHA. A marine mammal monitoring plan will be developed further and submitted to NOAA Fisheries for approval well in advance of the start of construction during the IHA period.

13.1.1 Visual Marine Mammal Observations

The Navy will collect sightings data and behavioral responses to pile removal activities for marine mammal species observed in the region of activity during the period of construction. All observers will be trained in marine mammal identification and behaviors.

13.1.2 Methods of Monitoring

The Navy will monitor the 20 m (66 ft) buffered shutdown zone and Level B ZOIs before, during, and after pile removal activities. Based on NOAA Fisheries requirements, the Marine Mammal Monitoring Plan would include the following procedures:

- Trained PSOs will be placed at the best vantage point(s) practicable (e.g., the pile removal barge, on shore at the Fuel Pier, or any other suitable location) to monitor for marine mammals and implement shutdown/delay procedures, when applicable, by notifying the equipment operator of a need for a shutdown of pile removal. Up to two PSOs will be deployed on the pile removal barge or on the Fuel Pier with a clear view of the buffered shutdown zone and Level B ZOIs.
- Up to two PSOs, as necessary, will be deployed at locations (i.e., from land, the pile removal barge, or on the Fuel Pier) with a clear view of the buffered shutdown zone and ZOIs. The actual monitoring location(s) will be based on providing the greatest visibility of the monitoring zone specific to each activity.
- During all observation periods, observers will use binoculars and the naked eye to search continuously for marine mammals within the visual range of the PSOs.
- Monitoring distances will be measured with range finders.
- Distances to animals will be based on the best estimate of the PSO, relative to known distances to objects in the vicinity of the PSO.
- Bearing to animals will be determined using a compass.
- In-water activities will be curtailed under conditions of fog or poor visibility that might obscure the presence of a marine mammal within the buffered shutdown zone.

- Pre-Activity Monitoring:
  - Visual surveys will occur for at least 30 minutes prior to the start of in-water activities.
  - If a marine mammal is present within the 20-m (66-ft) buffered shutdown zone, in-water activities will be delayed until either the animal has voluntarily left and been visually confirmed beyond the buffered shutdown zone, or 15 minutes as elapsed since the last observation time without a re-detection of the animal.
  - The buffered shutdown zone may only be declared clear, and pile removal started, when the entire buffered shutdown zone is visible (i.e., when not obscured by poor light, rain, fog, etc.). If the buffered shutdown zone is obscured by fog or poor lighting conditions, activity at the location will not be initiated until the buffered shutdown zone is visible.
  - If marine mammals are present within the Level B Behavioral Harassment Monitoring Zone, in-water activities will not need to be delayed.
- During Activity Monitoring:
  - If a marine protected species approaches, or appears to be approaching, the 20-m (66-ft) buffered shutdown zone, the PSO who first observed the animal will alert the PSO closest to the pile being removed ("Command" PSO), who will notify the work crew of the animal's current status; in-water activities will be allowed to continue while the animal remains outside the buffered shutdown zone.
  - If the marine protected species enters the 20-m (66-ft) buffered shutdown zone, a shutdown will be called by the "Command" PSO. As the animal enters the buffered shutdown zone, all pile removal operations will be stopped and the animal(s) will be 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 buffered shutdown zone and has been visually confirmed beyond the buffered shutdown zone, or 15 minutes have passed without re-detection of the animal (i.e., the zone is deemed clear of marine protected species). The "Command" PSO 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 Navy 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 ZOI. The monitoring coordinator or lead PSO shall notify the Navy point of contact, who will then contact NOAA Fisheries immediately. For non-IHA species, pile removal will be allowed to proceed if the animal(s) is observed to leave the Level B ZOI, 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 NOAA Fisheries reporting requirements.
  - If a marine mammal is observed entering the Level B monitoring zones, the pile segment being worked on will be completed without cessation, unless the animal enters or approaches the buffered shutdown zone. Regardless of location within the Level B monitoring zone, an initial behavior and the location of the animal(s) will be logged. Behaviors will be continually 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.
  - Previous monitoring efforts during the Fuel Pier Replacement Project used a method to calculate "extrapolated" accounts for instances where visual obstructions prevented PSOs from observing the full monitoring zone. This methodology is based on three factors: 1) the amount of area not observed during individual pile removal activities, 2) an estimate of species density as described in Section 6 based on previous Fuel Pier Replacement Project monitoring and NMSDD, and 3) the amount of time of potential exposure during individual pile removal activities as described in Section 2. This method will be implemented for this project as well and will provide a conservative estimate of unobserved "takes."
- Post-Activity Monitoring:
  - Monitoring of all zones will continue for 30 minutes following completion of pile removal. 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.
- Concurrent Action
  - There is a possibility that an overlap of in-water pile removal activities could occur. If separate pile removal activities were to occur simultaneously, then two "Command" PSO positions would be in place. These positions would act independently and would have the ability to shutdown proximate pile removal activities if a marine protected species entered the buffered shutdown zone under their observation. Sightings of marine protected species at one location that are moving towards the other location will be communicated among the PSOs, to increase the awareness of an incoming potential sighting.

13.1.3 Data Collection

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

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

To the extent practicable, the Navy 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 report will be submitted to NOAA Fisheries within 90 calendar days of the completion of acoustic measurements and marine mammal monitoring. The results will be summarized in textual, graphical, and tabular formats and include summary metrics, as applicable. A final report will be prepared and submitted to the NOAA Fisheries within 30 days following receipt of comments on the draft report from the NOAA Fisheries.

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

14 RESEARCH

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

The U.S. Navy is one of the world's leading organizations in assessing the effects of human activities on the marine environment including marine mammals. From 2004 through 2013, the Navy has funded over $240M specifically for marine mammal research. Navy scientists work cooperatively with other government researchers and scientists, universities, industry, and non-governmental conservation organizations in collecting, evaluating, and modeling information on marine resources. They also develop approaches to ensure that these resources are minimally impacted by existing and future Navy operations. It is imperative that the Navy's research and development (R&D) efforts related to marine mammals are conducted in an open, transparent manner with validated study needs and requirements. The goal of the Navy's R&D program is to enable collection and publication of scientifically valid research as well as development of techniques and tools for Navy, academic, and commercial use. Historically, R&D programs are funded and developed by the Navy's Chief of Naval Operations Energy and Environmental Readiness and Office of Naval Research (ONR), Code 322 Marine Mammals and Biological Oceanography Program. Primary focus of these programs since the 1990s is on understanding the effects of sound on marine mammals, including physiological, behavioral and ecological effects.

ONR's current Marine Mammals and Biology Program thrusts include but are not limited to: (1) monitoring and detection research; (2) integrated ecosystem research including sensor and tag development; (3) effects of sound on marine life (such as hearing, behavioral response studies, physiology [diving and stress], and the Population Consequences of Acoustic Disturbance model; and (4) models and databases for environmental compliance.

To manage some of the Navy's marine mammal research programmatic elements, OPNAV N45 developed in 2011 a new Living Marine Resources (LMR) Research and Development Program (http://www.lmr.navy.mil/). The goal of the LMR Research and Development Program is to identify and fill knowledge gaps and to demonstrate, validate, and integrate new processes and technologies to minimize potential effects to marine mammals and other marine resources. Key elements of the LMR program include:

- Providing science-based information to support Navy environmental effects assessments for research, development, acquisition, testing, and evaluation as well as Fleet at-sea training, exercises, maintenance, and support activities.
- Improving knowledge of the status and trends of marine species of concern and the ecosystems of which they are a part.
- Developing the scientific basis for the criteria and thresholds to measure the effects of Navy-generated sound.
- Improving understanding of underwater sound and sound field characterization unique to assessing the biological consequences resulting from underwater sound (as opposed to tactical applications of underwater sound or propagation loss modeling for military communications or tactical applications).

- Developing technologies and methods to monitor and, where possible, mitigate biologically significant consequences to living marine resources resulting from naval activities, emphasizing those consequences that are most likely to be biologically significant.

Other National Department of Defense Funded Initiative - Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP) are the Department of Defense's environmental research programs, harnessing the latest science and technology to improve environmental performance, reduce costs, and enhance and sustain mission capabilities. The Programs respond to environmental technology requirements that are common to all of the military Services, complementing the Services' research programs. SERDP and ESTCP promote partnerships and collaboration among academia, industry, the military Services, and other Federal agencies. They are independent programs managed from a joint office to coordinate the full spectrum of efforts, from basic and applied research to field demonstration and validation.

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Appendix A

NBPL FUEL PIER PILE REMOVAL PTS CALCULATIONS – NOAA Fisheries

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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	NBPL - Fule Pier Pile Removal Project
PROJECT/SOURCE INFORMATION	San Diego Compendium of Underwater Sound - 13-inch polycarbonate pile removal
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	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})	154
Duration of Sound Production (hours) within 24-h period	0.42
Duration of Sound Production (seconds)	1512
10 Log (duration of sound production)	31.80
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**	**0.2**	**0.1**	**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	NBPL Fuel Pier Pile Removal Project
PROJECT/SOURCE INFORMATION	San Diego Bay Noise Compendium - 16-inch concrete pile removal
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	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 modificatic

STEP 3: SOURCE-SPECIFIC INFORMATION

Source Level (L_{rms})	147
Duration of Sound Production (hours) within 24-h period	0.42
Duration of Sound Production (seconds)	1512
10 Log (duration of sound production)	31.80
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)	**0.0**	**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	NBPL Fuel Pier Pile Removal Project
PROJECT/SOURCE INFORMATION	San Diego Bay Noise Compendium - 16-inch concrete pile clipping with +3dB adjustment for two pile clippers simultaneous
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	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 modificatic

STEP 3: SOURCE-SPECIFIC INFORMATION

Source Level (L_{rms})	150
Duration of Sound Production (hours) within 24-h period	0.42
Duration of Sound Production (seconds)	1512
10 Log (duration of sound production)	31.80
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.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	NBPL - Fule Pier Pile Removal Project
PROJECT/SOURCE INFORMATION	San Diego Compendium of Underwater Sound - Underwater Chainsaw
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 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)	2
Duration of Sound Production within 24-h period (seconds)	600
10 Log (duration of sound production)	27.78
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)	**2.4**	**0.2**	**3.6**	**1.5**	**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: 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	NBPL Fuel Pier Pile Removal Project
PROJECT/SOURCE INFORMATION	San Diego Bay Noise Compendium - Wire Saw from Caisson Cutting
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	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})	156
Duration of Sound Production (hours) within 24-h period	1.7
Duration of Sound Production (seconds)	6120
10 Log (duration of sound production)	37.87
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)	**0.5**	**0.0**	**0.7**	**0.3**	**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.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	NBPL - Fuel Pier Pile Removal Project
PROJECT/SOURCE INFORMATION	Greenbush Group 2018

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	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)	152
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)	**1.5**	**0.1**	**2.2**	**0.9**	**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.

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