Request for Incidental Harassment Authorization for Offshore Patrol Cutter Homeporting at United States Coast Guard Base Los Angeles/Long Beach, California

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Table of Contents

Tables

Appendices

Executive Summary

United States Coast Guard Base Los Angeles/Long Beach (LA/LB) is located on 27 acres of government-owned land on the southern tip of Terminal Island within the Los Angeles Harbor. The Base runs along the western half of Reservation Point at the mouth of Los Angeles Main Channel, which provides principal access to the Port of Los Angeles. The proposed action includes construction of facilities to homeport two Offshore Patrol Cutters (OPC) at Base LA/LB including a new Maintenance and Weapons Division (MWD) facility, warehouse modifications, building 16 modifications, waterfront improvements, and associated site/utility work. The proposed action waterfront improvements includes a new 30-foot wide, approximately 265-feet long concrete pile supported wharf extension. The wharf extension will include fendering, mooring fixtures, power mounds, water and sanitary sewer shore ties that will provide utility connections for both bow north, and bow south OPC mooring.

In support of the proposed work, the United States Coast Guard is requesting Level B Take from the National Oceanic and Atmospheric Administration National Marine Fisheries Service for five species that may be present in the project vicinity. These species include the California sea lion, Pacific harbor seal, bottlenose dolphin, short-beaked common dolphin, and gray whale.

Section 1 Description of Activities

1.1 Introduction

United States Coast Guard (USCG) Base Los Angeles/Long Beach (LA/LB) is located on 27 acres of government-owned land on the southern tip of Terminal Island within the Los Angeles Harbor. The Base runs along the western half of Reservation Point at the mouth of Los Angeles Main Channel which provides principal access to the Port of Los Angeles (Figure 1). Base LA/LB is accessed from the mainland via Interstates 110 (Harbour Freeway), 710 (Long Beach Freeway), and the Terminal Island Freeway. Base LA/LB provides several personnel support services on-site like warehouse and maintenance facilities and administration buildings. Government housing is not available on Base. Base LA/LB is currently the homeport for a buoy tender, seven small boats, and four Fast Response Cutters (FRC). Base LA/LB has three piers along its western boundary (listed from north to south) (Figure 2):

1. Industrial wharf that berths the CGC GEORGE COBB buoy tender and supports the Aids to Navigation (ANT) mission.
2. Medium Endurance Cutters (WMEC) Pier that forms the western boundary of the small boat basin.
3. High Endurance Cutters (WHEC) Pier that is connected to and extends south from the WMEC Pier forming the WMEC/WHEC Pier. The WMEC/WHEC Pier is 1,255 feet long by 30 feet wide.

Figure 1: USCG Base LA/LB Location and Vicinity Map

The WMEC Pier was built in the 1950s and is approximately 227 feet long by 30 feet wide and supported by concrete piles with timber fender piles, wales, and chocks. The WHEC Pier was built in 1986 and is approximately 1,028 feet long by 30 feet wide and supported by concrete piles with foam-filled fenders with timber-bearing panels supported on steel H-piles. The water depths at the moorings are 34 feet at the WMEC Pier and 36 feet to 39 feet at the WHEC Pier. Recent bathymetry from 2013 indicates the channel depth adjacent to the WMEC/WHEC Pier is approximately 57 feet (USCG 2016). Base LA/LB was previously the homeport of two 378-foot WHECs —the CGC CHASE and CGC HAMILTON — including a total of 346 personnel. These two vessels were relocated to Naval Base San Diego in 1999. Since that time, Base LA/LB's WHEC Pier has been primarily used by visiting long-range cutters and has not functioned as a permanent homeport for any long-range cutters (USCG, 2016).

Five tenant commands have boats on trailers (or just trailers) stored at Base LA/LB: Port Security Unit (PSU) 311, maritime safety and security (MSST) 91103, Station LA/LB, and CGC GEORGE COBB. The PSU and MSST stores its boats/trailers on the concrete apron in front of their boat/engineering buildings (Buildings 50 and 51, respectively). The ANT stores its boats/trailers under a metal roof attached to Building 18. Station LA/LB stores its two boats/trailers near the boat haul-out finger pier. CGC GEORGE COBB stores its boats/trailers just south of Building 12 in the buoy yard. There is no excess capacity for boat/trailer storage at any of these locations. Tenants can remove small boats from the water using either the boat haul-out pier located just south of the Industrial Wharf or the 6-ton jib crane in the small boat basin.

1.2 Proposed Action

The proposed action includes construction of facilities to homeport two OPC at Base LA/LB including a new Maintenance and Weapons Division (MWD) facility, warehouse modifications, building 16 modifications, waterfront improvements, and associated site/utility work. The proposed action waterfront improvements includes a new 30-foot wide, approximately 265-feet long concrete pile supported wharf extension. The wharf extension will include fendering, mooring fixtures, power mounds, water and sanitary sewer shore ties that will provide utility connections for both bow north, and bow south OPC mooring. The proposed action includes removal of existing, and replacement with new, potable water, fire water, and sewer pipelines/systems from the respective shore side points of connection to the existing pier, and extending to the new OPC pier and berths. The waterfront improvements include repair of the bank erosion area and placement of rock slope protection near the new electrical substation. Erosion repair is expected to be limited to placement of rock slope protection consisting of mixed rock sizes between less than ¼-ton up to 2-ton, to be placed carefully to ensure rocks are interlocked. The shore side proposed action includes the OPC MWD Support Facility comprised of approximately 10,550 SF new construction adjacent to and south of the FRC Maintenance Assistance Team (MAT) building, and approximately 1,050 SF of new storage space adjacent to and east of the existing FRC MAT building. It is intended that the OPC MWD Facility will support two OPCs. Crew and support personnel parking requirements for the OPCs will be accommodated by existing Base parking spaces, and will be augmented by refurbished and new parking spaces as shown on the plans. A minimum of 41 new parking spaces will be constructed, with an additional 105 parking spaces to be refurbished, for a total of 146 spaces to support two OPC's. The proposed site for the new MWD Facility building shall be located immediately adjacent to and south of the FRC MAT building. The landside work includes removal and relocation of two ceremonial cannons. A general layout of the facility plan is provided in Figure 2. Final materials, configuration, and construction methodology will be determined by a yet to be selected design builder. The design builder will be directed to obey all NMFS restrictions and requirements.

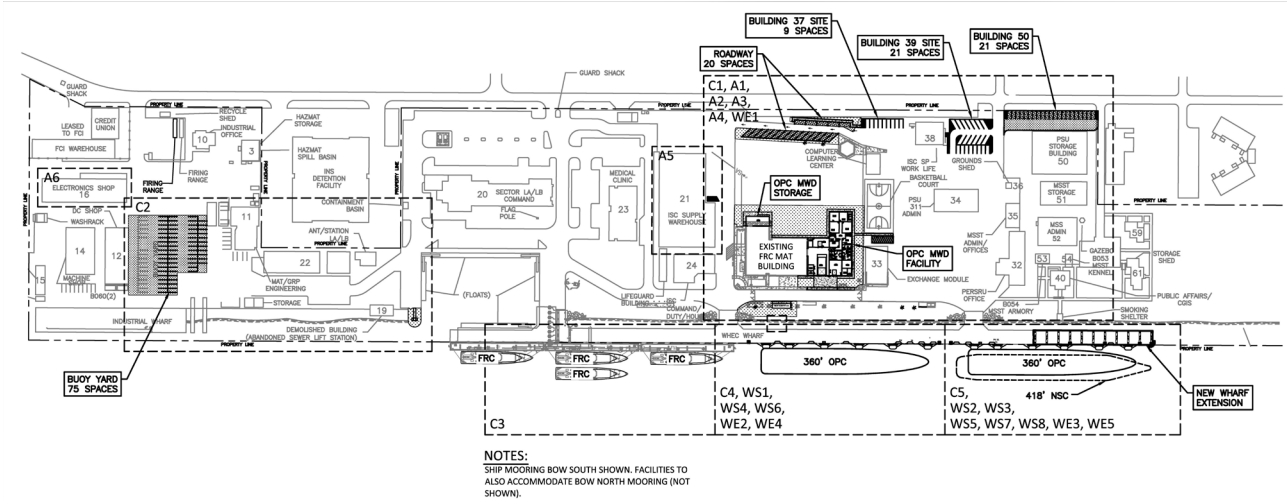

Figure 2: Base LA/LB OPC Homeport Proposed Layout

Section 2 Dates, Duration, and Location of Activity

The proposed pile driving is anticipated to occur during two in water work windows, the first between February 1st, 2021 and April 14th, 2021, and the second between September 1st, 2021, and January 31st, 2022. It is requested that the IHA be issued by December 1st, to ensure adequate lead time to pile driving activities. Dimension of pile to be used will be determined by the design build contractor. The estimated pile size will be between a minimum size of 16-inch square or octagonal pile and maximum size of 30-inch round pile. Piles will be pre-cast pre-stressed concrete. There would be a maximum of 102 piles utilized for this phase of work. The final number of piles necessary would be determined by the design builder. It is estimated that a maximum of six vertical piles can be installed each working day, which would require up to 17 production days of pile driving activities for support of the new wharf extension. Once the new wharf deck is complete there will be follow-up pile driving work for the fender stations. There would be a maximum of 126 piles (inclusive of fender piles and corner protection piles) installed during this phase of work, as the worst case scenario for pile driving. An estimated six fender piles can be installed each day which equate to 18 production days to install the concrete fender piling and three additional days to install the smaller corner protection piling. Final piling sizes are to be determined by the design builder, not to exceed 30-inch round pile size as evaluated. A maximum of 38 full production pile driving days are anticipated. Pile driving would occur at the USCG Base LA/LB OPC Homeport Project wharf extension area, as located in Figure 2. The exact timeframe of pile installation and pile size to be utilized will be confirmed after the award of the Design/Build contract. Methods of construction will also be determined by the design builder. Pile driving is expected to occur in two work windows due to restrictions related to the California least tern, further described in Section 10. The design build contractor will determine the order of construction within the approved timing windows.

Section 3 Affected Species Status and Distribution

3.1 Introduction

There are five marine mammal species that may occur or move through the waters near or within the project area. These include the California sea lion, pacific harbor seal, bottlenose dolphin, short-beaked common dolphin, and gray whale. Gray whales may be rare in the project area and vicinity. These marine mammals are managed under the jurisdiction of the National Marine Fisheries Service (NMFS), a division of the National Oceanic and Atmospheric Administration (NOAA). Table 3-1 describes the stock numbers, likelihood of occurrence, and season of occurrence for these species in the project vicinity.

Table 3-1 Stock Assessment of Marine Mammals Present in the Los Angeles/Long Beach Harbor

Species	Stock Name	Stock Abundance	Relative Occurrence in Long Beach and Los Angeles Harbors	Season(s) of Occurrence
California sea lion *Zalophus californianus*	U.S. Stock	257,606	Common	Year round
Pacific harbor seal *Phoca vitulina*	California Stock	30,968	Common	Year round
Bottlenose dolphin *Tursips truncatus*	California Coastal Stock	453	Occasional	Year round
Short-beaked Common Dolphin *Delphinus delphis*	California/Oregon /Washington Stock	969,861	Occasional	Year round
Gray Whale *Eschrichtius robustus*	Eastern North Pacific Stock	26,960	Rare	Year round

Source: NOAA 2015, 2017a, 2017b, 2019a, 2019e

3.2 California Sea Lion

The California sea lion (*Zalophus californianus*) is a part of the Otariidae family, differentiated from other pinniped families by the presence of external ear flaps. California sea lions are sexually dimorphic. Males typically approach lengths up to eight feet and may weigh up to 800 pounds, while females are typically around six feet in length and range from 200 to 240 pounds. The average lifespan is 20 to 30 years, with sexual maturity being reached between four and five years. Pups are dark brown at birth, becoming blonde to tan in color as they approach maturity. Adult males tend to have darker coloration than juveniles and females. California sea lions are social animals that participate in group hunting and may cooperate with other species, such as dolphins, when hunting large schools of fish. They have been observed in groups of several hundred individuals or more. While they are social on land and water, males will aggressively defend their territory during breeding season and females will fight with other females to defend their pups. Their diet consists of aquatic prey found in upwelling areas, including squid, anchovies, mackerel, rockfish, and sardines. They are opportunistic feeders that may take fish from commercial fishing gear, sport fishing lines, and fish passage facilities at dams and rivers. While California sea lions can stay at sea for up to two weeks at a time, they often use haul-outs: out of water locations where they can rest, socialize, breed, and molt. Haul-out locations can include sandy beaches, rocky coves, marina docks, jetties, and buoys (NOAA 2019b).

California sea lions in the U.S. are not listed as threatened or endangered under the Endangered Species Act (ESA) or as depleted under the Marine Mammal Protection Act (MMPA). California sea lion stock is estimated

to be at approximately 40% over its maximum net productivity level. It is therefore considered to be within its range of optimum sustainable population level (NOAA 2019b).

California sea lions were the most commonly observed marine mammal during biological surveys of the Los Angeles Harbor and Long Beach vicinity during the 2008 and 2013 to 2014 monitoring periods. Individuals were observed hauled-out and resting on buoys, docks, riprap shorelines, as well as docked cargo ships. They were frequently documented to be foraging near bait barges and fish markets, as well as in the wakes of fishing boats entering the Port Complex (MBC 2016).

3.3 Pacific Harbor Seal

The Pacific harbor seal (*Phoca vitulina* var. *richardsi*) is a true seal, and is one of three subspecies of harbor seal. Five subspecies were recognized until recent genetic analysis failed to substantially differentiate between populations. True seals have no external ear flaps and are also known as crawling seals due to their flopping locomotion on land necessitated by their short flippers. Males and females are similar in size, with males being slightly larger. They reach six feet in length and can approach 300 pounds. Harbor seals may forage off shore, but are typically found in coastal waters. The Pacific harbor seal tends towards solitary activity while in the water, but will come ashore in groups at haul-outs. Haul-outs, generally consisting of rocks, reefs, or beach area, are used for rest, thermoregulation, social interaction, birthing and nursing pups, and predator avoidance. Typical prey species include fish, shellfish, and crustaceans, which are foraged for during shallow and deep dive hunting excursions. Mating occurs at sea, with pups being birthed during the spring and summer seasons. Pups are ready to swim and dive within minutes of birth. The nursing period lasts for four to six weeks (NOAA 2019f). Pacific Harbor seals are found along the West Coast of North America from California, north to the Bering Sea. They are a non-migratory species that ranges within 15 to 31 miles from home, but have been known to travel up to 249 miles from tagging locations.

The Pacific harbor seal is not listed as threatened or endangered under the ESA and is not designated as depleted under the MMPA in the California area. Human influenced mortalities fall below the calculated potential biological removal level (PBR), and they are therefore not considered to be a strategic stock under the MMPA (NOAA 2015).

In the Los Angeles and Long Beach Harbors, Pacific harbor seals were much less common than California sea lions, accounting for approximately 26 percent of marine mammal observations. Harbor seals were more commonly observed in the outer harbor areas, resting or foraging along riprap shorelines, particularly in the vicinity of the outer harbor breakwaters (SAIC 2010, MBC 2016).

3.4 Bottlenose Dolphin

The bottlenose dolphin (*Tursiops truncates*) is a member of the Delphinidae family, which encompasses species commonly recognized as dolphins. Bottlenose dolphins are named for their short, thick snout (rostrum). They are gray in color, ranging from almost white to almost black. Their bellies tend towards lighter colors, with the dorsal side being darker in color. Individuals living in nearshore coastal waters tend to be smaller and lighter in color than those that live offshore. Bottlenose dolphins range in length, from six to 13 feet, and can weigh between 300 and 1,400 pounds. Sexual maturity is reached between five to 13 years for females and between nine and 14 years in males. Females are pregnant for approximately 12 months. Once a calf is born, it is nursed for up to 20 months, and may stay with its mother from three to six years. Calves maintain a “baby position” while swimming, with the mother surfacing first, followed closely by the calf (NOAA 2019c). Bottlenose dolphin’s life expectancy exceeds 40 years, with females outliving males at 60 or more years in age. California bottlenose dolphins typically are found within 0.6 miles of shore (NOAA 2016). Bottlenose dolphins feed on a variety of

prey, including fish, squid, and crustaceans. They forage for food either individually or cooperatively. Cooperative feeding may involve herding fish into a group, whereupon they take turns to charge through the group and feed. Another technique involves trapping schools of fish against sand bars and seawalls.

The California coastal stock of bottlenose dolphin is not listed as threatened or endangered under the ESA and is not listed as depleted under the MMPA. They are not listed as a strategic stock under the MMPA due to a human influenced mortality rate that falls below the PBR (NOAA 2017a).

Bottlenose Dolphin individuals accounted for approximately two percent of all marine mammal observations during the most recent biological baseline survey of the Los Angeles and Long Beach harbors. The majority of observations involved individuals foraging in the outer harbor area (SAIC 2010, MBC 2016).

3.5 Short-beaked Common Dolphin

Like the bottlenose dolphin, the short-beaked common dolphin (*Delphinus delphis*) is a member of the Delphinidae family, which encompasses species commonly recognized as dolphins. They are the most abundant cetacean off the California coast, and are found up to approximately 350 miles from the coastline (NOAA 2017). Short-beaked common dolphins are closely related to and similar in form to long-beaked common dolphins. Although they were once thought to be a single species, they differ slightly in size, appearance, and habitat preferences. The short-beaked common dolphin is less than six feet long, weighing approximately 170 pounds, with males being slightly larger than females. They have a rounded forehead (melon), a moderately long snout (rostrum), and a relatively long, triangular mid-back dorsal fin (NOAA 2019g). They have a distinctive hourglass color pattern, defined by a gray cape extending from the back of the head to below the dorsal fin, where a "V" is visible on either side of the body. A narrow dark stripe extends from the lower jaw to the flipper. The colors of juveniles are somewhat muted, becoming more apparent in adulthood. Males reach sexual maturity as early as five years of age and as late as 12 years. Calving takes place off the California coast during the winter, after a 10 to one month gestation period. Calves start to wean after approximately one year, and will remain dependent for another year or more. Short-beaked common dolphins can dive to depths of approximately 1,000 feet, but are typically active for feeding to approximately 100 feet. They typically feed on schooling fish and cephalopods migrating towards the surface at night. They will generally live to around 35 years in age.

Short-beaked common dolphins are not listed as threatened or endangered under the ESA, and are not listed as depleted under the MMPA. They are not listed as a strategic stock under the MMPA due to a human influenced mortality rate that falls below the PBR (NOAA 2017b).

Short-beaked common dolphins are not frequently observed in the Los Angeles and Long Beach harbor area, but are occasionally present. Observations during biological surveys in 2013 through 2014 included one observation of a pod of 40 individuals in the Los Angeles Main Channel. No other observations of short-beaked common dolphins were made during this survey period (MBC 2016).

3.6 Gray Whale

Gray whales (*Eschrichtius robustus*) are large baleen whales comprising the only species in the Eschrichtiidae family. They range from 42 to 49 feet in length, and can weigh as much as 90,000 pounds. Females are slightly larger than males. They are the most frequently seen whale off the California coastline. They are recognizable by their lack of a dorsal fin and mottled gray color. They possess a dorsal hump with a series of six to 12 bumps known as knuckles. Adults carry a heavy load of barnacles, adding to the mottled coloring. Their tail flukes are close to 10 feet wide, with S-shaped trailing edges and a deep median notch. Gray whales are sexually mature between six and 12 years of age. Females will carry a single calf for 12 to 13 months. A newborn calf is

approximately 14 to 16 feet long, and weights around 2,000 pounds. The average lifespan of Gray whales is unknown. One individual was estimated to be 75 to 80 years old at the time of death. Gray whales will travel either alone or in small groups, but may congregate in larger numbers at feeding and breeding grounds. They are bottom feeders that consume benthic and epibenthic invertebrates, such as amphipods. Feeding is accomplished by rolling on their sides while swimming along the bottom, filtering prey out of the bottom sediments through 130 to 180 course baleen plates on each side of their upper jaws. Feeding areas can be identified by long trails left in the bottom sediment knows as “feeding pits” (NOAA 2019f). Gray whales are primarily found in the shallow coastal waters of the North Pacific Ocean. They migrate from summer feeding grounds in the northern Bering and Chukchi seas and the norther Pacific coast, to winter breeding and calving areas off the coast of Baja California, Mexico.

The eastern north Pacific group of gray whales was removed from the ESA as a threatened or endangered species after 1994. The eastern north Pacific group has human influenced mortality rate falling below the PBR, and is therefore not listed as a strategic stock under the MMPA. They do not currently have a formal status under the MMPA (NOAA 2019a)

Gray whales are periodically, but not regularly sighted within the Los Angeles and Long Beach harbor area. No Gray whales were sighted during the 2013 to 2014 survey or the 2008 year survey. One small gray whale, and later a dead gray whale was observed inside the harbor areas during the 2000 year survey (MEC 2002, SAIC 2010, MBC 2016). Elevated gray whale strandings have occurred along the west coast of North America from Mexico through Alaska since January 1, 2019. This has been declared an Unusual Mortality Event (UME) and is ongoing (NOAA, 2020). No strandings have been documented in the harbor during this period. Whale carcasses have been spotted in the wider vicinity.

Section 4 Type of Incidental Taking Authorization Requested

4.1 Take Authorization Request

The USCG requests authorization from the NMFS, under Section 101 (a)(5)(D) of the MMPA, for incidental take by Level B harassment (as defined by Title 50 Code of Federal Regulations, Part 216.3) of small numbers of marine mammals, specifically California sea lions, Pacific harbor seals, bottlenose dolphin, short-beaked common dolphin, and Gray whales during the installation of a wharf extension at USCG Base Los Angeles/Long Beach. With implementation of the measures summarized in Section 10: Mitigation Measures, no Level A harassment is anticipated. The USCG does request authorization for Level A take of a small number of Pacific harbor seals, as they may unexpectedly surface inside of Level A zones. The USCG requests an Incidental Harassment Authorization (IHA) for the incidental take of marine mammals as described in this application. The USCG may request an annual renewal of the IHA if the project is not completed within the authorized year. The USCG is not requesting a multi-year Letter of Authorization (LOA) at this time, as the activities described in this request are not expected to rise to the level of injury or death, which would require an LOA.

A detailed description of the acoustic exposure assessment methodology used to quantify potential exposures to marine mammals resulting from underwater and airborne noise generated during pile driving can be found in Section 5: Take Estimates of Marine Mammals. The methodology used generates conservative take estimates because all animals are assumed to be exposed 100 percent of the time. Temporary behavioral responses are expected to occur as a result of the Base LA/LB OPC Homeport project; however, the extent of the response would depend on the species, received level of sound, and distance from the work area.

4.2 Method of Take

The Base LA/LB OPC Homeport project has the potential to result in Level B incidental take of marine mammals due to underwater and airborne noise disturbance during the driving of new piles to extend the existing wharf at Base LA/LB. This evaluation assumes underwater noise will encompass all take, as any marine mammals that surface in the area would have been exposed to the underwater noise. No marine mammal haul out in the project area would be only exposed to airborne noise. Airborne take is therefore not separated out so as to avoid doubling the take estimate due to overlap. Level A harassment is not anticipated with mitigation measures described in Section 10: Mitigation Measures; However, level A take is requested for a small number of Pacific harbor seal.

Section 5 Take Estimates for Marine Mammals

5.1 Fundamentals of Sound

Sound levels often are often expressed in decibels (dB). A decibel is commonly used to describe the magnitude of a sound pressure, and is a logarithmic measure of the sound strength. All sound levels in this document are in decibels referenced to a sound pressure of 1 micropascal (dB re: 1 µPa), which is used for underwater noise.

The reference pressure in water is different than the reference pressure in air, and therefore decibels in water and in air cannot be directly compared to each other. Sound levels in air are rarely as high as sound levels measured in water.

Most sounds, including the sound of a pile driving strike, are composed of many different frequencies. Not all marine mammal species have equal hearing capabilities, in terms of the absolute hearing sensitivity and the frequency band of hearing

In-water construction activities under the proposed project would include impact pile driving, which produces impulsive sounds. Impulsive sounds are typically transient, brief (less than 1 second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay. They can occur in repetition or as a single event. Examples of impulsive sound sources include explosives, gunshots, seismic airguns, and impact pile drivers.

The metrics to describe underwater sound include its peak sound pressure level, sound exposure level, and root mean square. These metrics can be defined as:

Peak Sound Pressure Level (Peak SPL or L_{PEAK}): Peak SPL is the instantaneous maximum sound pressure within a single pile strike. Peak SPL is a metric to measure underwater sound from impulse sources such as underwater pile driving.

Sound Exposure Level (SEL): The SEL is a measure of sound level that takes into account the duration of the signal. For a pile strike, the SEL characterizes the total sound energy during a single strike normalized to one second. The SEL is the constant sound level in one second, which has the same amount of acoustic energy as the original time-varying sound (i.e., the total energy of an event). For a single pile strike, the SEL is typically 25 dB less than the Peak SPL.

Cumulative Sound Exposure Level (SEL_{cum}): The installation of a pile or multiple piles throughout a day can involve hundred or even thousands of pile strikes. The Cumulative SEL represents the total sound energy associated with a series of pile strike events, such as the total pile strikes throughout the day. Cumulative SEL can be estimated from the single-strike SEL and the total number of strikes during the day.

Root Mean Square Sound Pressure Level (RMS): The RMS can represent the average sound energy of a single strike. The RMS is the square root of the energy divided by the impulse duration.

A pile strike can be characterized by its Peak SPL, RMS, and SEL. For a single pile strike, the Peak SPL will be the highest value and the SEL will be the lowest. Peak levels are generally 10 to 20 dB higher than RMS levels.

5.2 Applicable Noise Criteria

The NMFS has issued acoustic thresholds for five marine mammal functional hearing groups (as updated in 2016 and revised in 2018). The NMFS guidance includes noise thresholds for Level A Harassment that are based on injury to an animal's hearing, or onset of permanent threshold shift (PTS). For impact pile driving, the NMFS has developed the dual thresholds of Peak SEL and SEL_{cum}. There is also a SEL_{cum} injury threshold associated with vibratory pile driving. Means and methods of construction are to be determined by the selected design build contractor. The contractor will be directed to utilize vibratory pile drivers, as a less injurious pile driving method before utilizing impact pile driving where possible.

The threshold expressed in the SEL_{cum} metric accounts for the level and duration of exposure, both of which are factors that contribute to the potential for a noise source to induce hearing loss. The threshold for pile driving is the total duration sound exposure within a 24-hour accumulation period (or less than 24 hours, if the period over which the activity occurs is less than 24 hours). This method assumes the receiver (animal) remains at the distance at which they would exactly meet the threshold over 24 hours at that distance. (NMFS 2018b).

The NMFS also has issued noise thresholds for Level B Behavior Harassment levels that are still applicable. The Level B thresholds are based on disturbance to marine mammals by disruption of behavioral patterns, and their metric criteria is expressed in RMS. Thresholds based on the RMS metric do not consider the duration of exposure.

Both the Level A and Level B noise thresholds are different for impact pile driving and for vibratory pile driving. The Level A and Level B noise thresholds are summarized in Table 5-1 below.

Table 5-1: Marine Mammal Injury and Disturbance Thresholds

Functional Hearing Group	Underwater Noise Thresholds				
	Impulsive Sound Impact Pile Driving			Non-Impulsive Sound Vibratory Pile Driving	
	Auditory Injury Level A Threshold (PTS)		Behavioral Disturbance Level B Threshold	Auditory Injury Level A Threshold (PTS)	Behavioral Disturbance Level B Threshold
	dB Peak	dB SEL_{cum}	dB RMS	dB SEL_{cum}	dB RMS
Low-Frequency Cetaceans	219	183	160	199	120
Mid-Frequency Cetaceans	230	185	160	198	120
High-Frequency Cetaceans	202	155	160	173	120
Phocid Pinnipeds (seals)	218	185	160	201	120
Otariid Pinnipeds (sea lions)	232	203	160	219	120

Notes:
Low-frequency Cetaceans = baleen whales (includes humpback, Northern minke, Sei, gray, blue)
Mid-frequency Cetaceans = dolphins, toothed whales, beaked whales, bottle nose whales (includes sperm whale, killer whale, bottlenose dolphin, Pacific White-sided dolphin)
High-frequency Cetaceans = true porpoises, river dolphins, cephalorhynchid. (Dall's Porpoise)
Phocid Pinnipeds = true seals (harbor seal, Northern elephant sea, ribbon seal)
Otariid Pinnipeds = sea lions, fur seals (California and Stellars sea lion, northern fur seal)

5.3 Estimation of Pile Driving Sound

The source of underwater sound produced during construction of the proposed project will be impact pile driving. Pile extraction and other underwater demolition activities are not anticipated. A final design build contractor has not been selected at this time. A solicitation for a design-build team will occur prior to project pile driving. The design-build team will determine final project design parameters within a set of proscribed limitations. The final number and type of piles have not been confirmed at this time. Because the pile types have not been determined, this noise analysis has evaluated two potential pile driving types: 16-inch by 16-inch square or octagonal concrete and 30-inch round concrete piles. The final type and size of piles will be determined during final design of the proposed project. The maximum number of piles to be driven is estimated to be up to six per day. The number of piles driven per day could vary for different project elements and is subject to change based on work conditions at the time. Similarly, the substrate below the wharf extension is not known at this time. The substrate type may be stiff clay, dense silty sand, or hard clay. Geotechnical boring to determine ground type will be completed prior to final design and pile driving by the design build contractor. A worst case scenario has been evaluated to provide the maximum number of strikes versus ground type. A variety of pile driving machine models have been evaluated, and the maximum number of strikes dependent on pile driving machine has likewise been estimated. Data utilized for estimation of pile driving strikes is provided in the project geotechnical report (TCG 2019). Pile driving was calculated by the geotechnical report utilizing the Modified Gates Equation. Under the worst case scenario for maximum noise generation, a 16-inch by 16-inch pile would need to be driven 34 feet into hard clay at 400 kips which would take an estimated 46 blows per foot (bpf) utilizing a Delmag d25-32. A 30-inch round pile would need to be driven 38 feet into dense silty sand at 400 kips, which would take an estimated 46 bpf utilizing the same equipment. The required kip cannot be generated by this equipment for driving a 30-inch pile into hard clay. The required depths are determined by the necessary downward load and uplift in relation to substrate and pile type. Utilization of larger piles would require fewer piles to be placed. Once the wharf extension has been completed, fender piles would be driven at a later date. The precise location, composition, size, and design of these piles would also be determined by the design build team. Under a worst case scenario for noise generation, a 30-inch round pile would be utilized. This number has therefore been used for calculations. Addition of these piles has been included in all take estimates. Section 2 provides further discussion of pile driving quantities.

Table 5-2 provides the types and sizes of piles, number of piles per day, and number of strikes per pile for the most intensive scenario. The number of piles driven each day and the number of pile strikes are conservative estimates of the number of impact piles under the proposed project. Actual project impacted is anticipated to be lower than this amount.

Table 5-2: Summary of Potential Pile Driving Activity

Pile Type and Size	Pile Driving Method (Impact or Vibratory)	Maximum Number of Piles	Number of Days of Pile Driving	Maximum Number of Piles per Day	Estimated Number of Strikes per Pile
16-inch Concrete	Impact	102	17	6	1,564
30-inch Concrete	Impact	54	9	6	1,748
Concrete Fender/Corner*	Impact	126	21	6	Maximum 1,748

*Size to be determined by the design builder. A maximum of 30-inch size is assumed for the purposes of strike calculation. This size has been selected as a worst case scenario and is expected to be smaller in dimension.

The timing of pile strikes will be limited by several restrictions to avoid and minimize noise impacts (see Section 10 Mitigation). In-water pile driving will occur between September 1 and April 14, to avoid the nesting season of

the California least tern. Pile driving will occur only during daylight hours, when visual marine mammal monitoring can be conducted. Pile driving will only occur after sunrise and before sunset with enough light available to allow 30 minutes of monitoring before and after pile driving. This will allow the visual monitors time to complete their pre- and post-construction surveys.

5.3.1 Underwater Noise from Impact Pile Driving

Potential underwater noise effects on marine mammals have been evaluated by estimating the distances from the construction activity under the proposed project to the Level A and Level B Harassment noise thresholds. These distances to the noise thresholds are called isopleths. The isopleth distances can be used to estimate the area within which underwater noise levels are above the NMFS noise thresholds.

5.3.1.1. Underwater Noise Modeling

The NMFS has accepted the practical spreading loss model to estimate transmission loss of sound through water (NMFS 2012). The practical spreading loss model includes both spreading loss and attenuation loss of sound levels with distance. Spreading loss represents a regular weakening of sound as it spreads from the source, while attenuation loss includes the effects of absorption and scattering.

To estimate distances associated with the PTS onset thresholds for Level A Harassment, the NMFS has provided the User Spreadsheet Tool (2018c). The User Spreadsheet Tool is an Excel spreadsheet that is based on the practical spreading loss model. The NMFS User Spreadsheet Tool consists of twelve color-coded worksheets or tabs. Spreadsheet Tab E.1, Impact Pile Driving, is the custom tab for impact pile driving with input values specific for impact pile driving activities.

For impulsive sounds such as impact pile driving, the User Spreadsheet Tool evaluates both Peak SPL and SEL_{cum} thresholds. When evaluating impulsive sources that have dual metric thresholds (i.e., SEL_{cum} and Peak), users should rely upon whichever metric yields the largest isopleth for a particular marine mammal hearing group (NMFS 2018b).

To evaluate the Level B Harassment behavioral thresholds, a manual version of the practical spreading loss model has been used. In the absence of data on site-specific attenuation rates, an attenuation rate of 4.5 dB per doubling of distance should be used for all projects (Caltrans 2015, WSDOT 2019). The basic practical spreading loss model for a 4.5 dB per doubling of distance is provided in the equation below.

$$TL = F * Log(D_1/D_2)$$

TL = Transmission Loss, which is the amount of sound reduction between two distances. As applied here, TL is a negative number.
D_1 = distance where the sound level is known or measured, such as the reference distance of 10 meters for impact pile driving
D_2 = distance where the sound level is to be estimated, such as the isopleth distance to the noise threshold
F = Attenuation Factor (F=15 for attenuation of 4.5 dB per doubling of distance)

To calculate the distance at which the threshold noise levels will be reached, solve for D_2 in the equation below

$$D_2 = D_1 * 10^{(TL/15)}$$

5.3.1.2. Modeling Assumptions

Underwater sounds from impact pile driving can be estimated from the type of pile driver (impact or vibratory), type of pile (concrete, steel, or wood), size of pile, number of pile strikes per day, and sound propagation over distance. The proposed project anticipates either 16-inch or 30-inch concrete piles, to be driven by an impact hammer (Table 5-2). Underwater sound levels have been estimated for both 16-inch and 30-inch concrete piles.

Pile Driving Sound Levels

Underwater sound from pile driving varies depending on the different types and diameters of piles, types of hammers, and different types of substrates. Because underwater sound monitoring has not been conducted at the project site, the estimation of underwater sound levels has been based on acoustic data from pile driving measured at similar projects in California and other coastal waters (Caltrans 2015).

The type and size of pile, and the method of pile driving can affect the underwater sound generated during pile driving events. A vibratory hammer produces sound energy that is spread out over time and is generally 10 to 20 dB lower than impact pile driving. Sound pressures associated with concrete piles are lower than comparably sized steel piles. Other factors affecting underwater sound include water depth, tidal conditions or currents, sound attenuation systems such as bubble curtains, and geotechnical conditions (Caltrans 2015).

The first step is to determine the peak, RMS, and SEL levels for a single strike of both 16-inch and 30-inch concrete piles. Because site-specific data are not available, reference sound levels are based on measured sound levels of similar piles at a specific distance. Reference sound levels from pile driving are reported at positions close to the pile, usually at a fixed distance of 10 meters (33 feet) from the pile.

Reference sound levels for similar types and sizes of piles are available from underwater sound monitoring data conducted at other projects in California and other coastal waters. Caltrans provides a detailed summary of underwater sound levels for various types of piles and conditions in its Compendium of Pile Driving Sound Data in Appendix I of its Technical Guidance (Caltrans 2015).

The reference sound levels for the 16-inch concrete piles have been estimated from the sound measurements of 18-inch concrete piles, from Table I.2-1 in the Compendium document (Caltrans 2015). Based on these measured sound levels, the reference sound levels have been assumed to be 185 dB Peak, 166 dB RMS, and 155 dB SEL for a single-strike of a 16-inch concrete pile under the proposed project.

The reference sound levels for the 30-inch concrete piles have been estimated from the sound measurements of 30-inch Type 2 concrete piles at the Choctawhatchee Bridge in Florida, from Table I.2-3 in the Compendium document (Caltrans 2015). The reference sound levels have been assumed to be 200 dB Peak, 176 dB RMS, and 166 dB SEL for a single-strike of a 30-inch concrete pile under the proposed project.

Bubble Curtain

The proposed project will include an air bubble curtain to reduce underwater noise from impact pile driving. Bubble curtains infuse the area surrounding the pile with air bubbles, creating a bubble screen that inhibits the propagation of underwater sound from the pile.

Results on the effectiveness of bubble curtains in reducing sound pressure waves are varied. A Caltrans review of the effectiveness of bubble curtains found that the data generally indicate that an air bubble curtain used on a steel or concrete pile with a maximum cross-section dimension of 24 inches or less will provide

approximately 5 dB of sound reduction (Caltrans 2015). For a mid-sized steel pile (with a dimension greater than 24 but less than 48 inches), the Caltrans data indicate that an air bubble curtain will provide about 10 dB of sound reduction. For larger piles (with a dimension of greater than 48 inches) about 20 dB of sound reduction is indicated.

For concrete piles, the noise attenuation from bubble curtains has been variable. For 16-inch-square concrete piles at the Concord Naval Weapons Station, an unconfined air bubble curtain system attenuated sound pressures by approximately 5 to 8 dB when the tide was slack and currents were light and by 0 to 4 dB when tidal currents were present. For 24-inch octagonal concrete piles for Amports Pier 95 where tidal currents could be quite strong at times, a confined bubble curtain reduced sound pressures by 15 to 20 dB in shallow water and by 10 to 15 dB in deeper water. For 24-inch octagonal concrete piles at Berth 32 in Oakland, the air bubble curtain system reduced peak pressures by 5 to 10 dB and RMS levels by about 5 dB.

Proper design and implementation of the air bubble curtain are key factors in the effectiveness of this strategy. Because of the uncertainties associated with degree of attenuation that would be provided by an air bubble curtain, it is recommended that attenuation assumed for any attenuation device be limited to 5 dB (Caltrans 2015). For the proposed project, the proposed bubble curtain is assumed to reduce the reference sound levels for pile driving sound by 5 dB, which is a conservative assumption recommended by Caltrans (Caltrans 2015).

Number of Impact Pile Strikes

The NMFS Level A thresholds account for the level and duration of exposure, and are based on the total duration sound exposure within a 24-hour accumulation period. The 24-hour cumulative sound level is calculated from the reference sound level of a single strike and the total number of pile strikes in a day. The total pile strikes are calculated from the number of strikes per pile and the number of piles per day, which are presented in Table 5-2.

In comparison, the NMFS Level B behavioral harassment thresholds are based on the RMS metric, which does not consider the duration of exposure and the number of pile strikes.

Sound Propagation

Underwater sound propagation for most pile driving projects in shallow water can involve the direct transmission from the source to the receiver, reflections from the surface and the bottom, and the potential for sound energy that is re-radiated from the ground to reach the receiver. Underwater sound propagation can be evaluated from site-specific sound measurements, or from conservative assumptions when activity-specific information is unavailable.

Because site-specific data on sound propagation is not available for the proposed project site, sound propagation has been estimated from the NMFS default values. NMFS typically recommends the default propagation value of practical spreading (15 log R) for projects occurring in shallow, coastal areas (e.g., pile driving). Sound is assumed to diminish at a rate of 4.5 per doubling of distance from the pile, and is considered a conservative approach.

Marine Mammal Auditory Weighing Functions

Auditory weighting functions take into account what is known about marine mammal hearing sensitivity and susceptibility to noise-induced hearing loss, and can be applied to a sound-level measurement to account for frequency-dependent hearing. The NMFS User Spreadsheet Tool incorporates marine mammal auditory

weighting functions. For impact pile driving, the default Weighing Factor Adjustment (WFA) is 2 kHz (NMFS 2018b).

Modeling Input Summary

Table 5-3 presents the modeling input data for estimating the underwater sound levels under the proposed project. The exact size of piles and number of pile strikes are not yet known early in the design process, so the input data in Table 5-3 are worst-case estimates to provide a conservative approach.

Table 5-3: Data Used to Estimate Underwater Sound from Pile Driving

	16-inch Concrete Impact Pile Driving Sheet E.1	30-inch Concrete Impact Pile Driving Sheet E.1	Source
Weighing Factor Adjustment (WFA)	2	2	NMFS default
Source Peak Level(1)	180	195	Caltrans 2015
Source RMS(1)	161	171	Caltrans 2015
Source SEL(1)	150	161	Caltrans 2015
Number of strikes per pile	1,564	1,748	
Number of piles per day	6	6	
Propagation (xLogR)	15	15	NMFS default
Distance of single strike SEL measurement (meters)	10	10	Caltrans 2015
Notes: 1) A 5-dB reduction was assumed for impact driving with the use of bubble curtains (Caltrans 2015)			

5.3.1.3. Estimation of Pile Driving Noise

Table 5-4 provides the estimated distances (isopleths) to the Level A and Level B noise thresholds under the proposed project. Appendix A provides copies of the NMFS User Spreadsheet Tools. Figures 3 and 4 provide an aerial reference for the distances outlined in Table 5-4.

Table 5-4: Estimated Distances of Level A and B Noise Thresholds

		Level A Noise Thresholds - Impact Pile Driving						
Pile Type		**Low-Frequency Cetaceans**	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**	**Level B 160 dB Impact Piles**	**Level B 120 dB Vibratory Piles**
	SEL_{cum} Threshold	183	185	155	185	203	--	--
	RMS Threshold	--	--	--	--	--	160	120
16-Inch Concrete	**Isopleth to threshold (meters)**	28.0	1.0	33.4	15.0	1.1	11.7	N/A
30-Inch Concrete	**Isopleth to threshold (meters)**	163.4	5.8	194.6	87.4	6.4	54.1	N/A
Notes: 1) A 5-dB reduction was assumed for impact driving with the use of bubble curtains (Caltrans 2015)								

Underwater noise from impact pile driving under the proposed project is estimated to exceed both the Level A (injury) and Level B (behavioral) noise thresholds. The proposed project will include an air bubble curtain during construction to reduce underwater noise from impact pile driving, which has reduced the distances over which Level A and Level B harassment would occur. Mitigation measures to reduce underwater noise impacts are identified in Section 10: Mitigation Measures.

Figure 3: Distances to Level A Noise Thresholds.

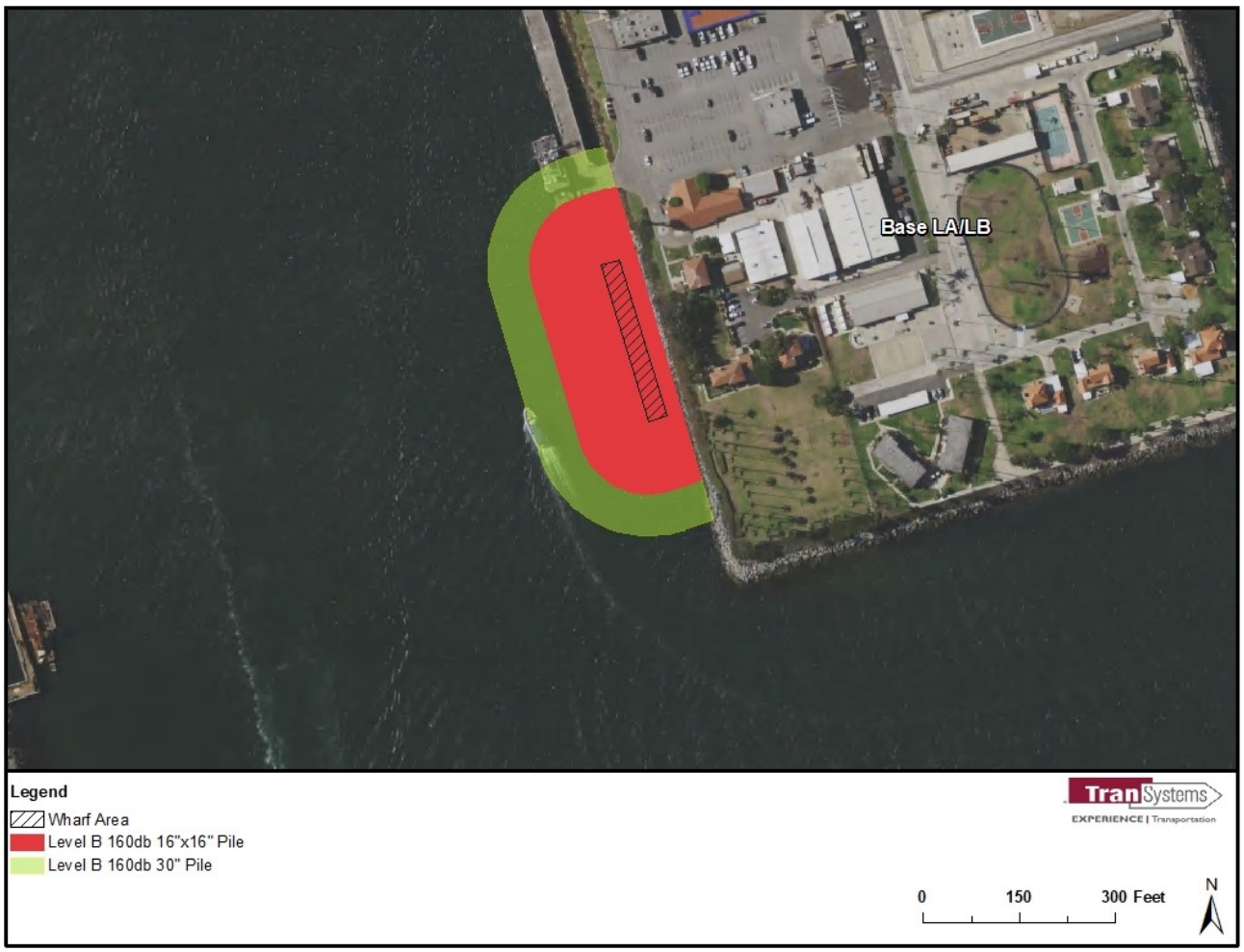

Figure 4: Distance to Level B Noise Thresholds

5.3.2 Airborne Noise

Pile driving will generate airborne noise that may result in behavioral disturbance to pinnipeds that are hauled-out or otherwise surfaced. Similar to underwater noise, the practical spreading model is used to estimate the extent of sound levels that may result in Level B harassment of marine mammals. Distance to NMFS thresholds was calculated with a 20 $\log_{10}$ attenuation rate, to evaluate the spherical spreading loss of airborne construction noise.

Measurements taken during the Naval Base Kitsap at Bangor Test Pile Program Final Marine Mammal Monitoring Report (HDR 2012) were utilized for estimation of airborne noise due to vibratory and impact driving. The greatest unweighted maximum noise level (L_{max}) measurement was 102 dB, with the average L_{max} being 97 dB at 50 feet (15 meters). Impact driving noise was at the greatest L_{max} at 112 dB, with the average L_{max} at 103 dB at 50 feet (15 meters). For the Naval Base Kitsap study, test piles ranged in size from 24 to 48 inches.

Table 5-5 provides L_{max} distance levels for conservatively estimating the distance to NMFS harassment thresholds. No pinniped haul-outs are located in the potential zone of airborne noise impact, as this area covers the active shipping channel. Individuals that may surface in the area would have passed within the underwater zone of impact. Airborne noise is not considered further so as to not double count potential take that may occur due to underwater noise.

Table 5-5 Extent of Sound Pressure Levels for Airborne Noise

Activity	Distance		Area	
	100 dB	90 dB	100 dB	90 dB
Vibratory Extraction and Driving	20 meters	60 meters	0.001 km^2	0.011 km^2
Impact Driving	60 meters	190 meters	0.011 km^2	0.113 km^2

Note: dB = decibel

5.4 Description and Estimation of Take

The USCG is seeking authorization for exposure of marine mammals to Level B harassment that may result from pile driving activities associated with the LA/LB OPC Homeport wharf extension. Take is expected to be limited to behavioral effects on individuals, with no effect on species populations. Any effect on an individual of a marine mammal species is anticipated to be limited to short-term disturbance of normal behavior, or temporary displacement of animals from the zone of responsiveness. There are limited estimates of marine mammal density for the Los Angeles and Long Beach harbors. Biological surveys of the harbors were completed across 2013 and 2014 to provide a biological baseline (MBC 2016).

Marine mammal monitoring will ensure that no cetaceans or pinnipeds are present in the relevant Level A harassment zones during pile driving.

Population estimates for take are based on biological baseline surveys performed for the Los Angeles and Long Beach harbors in 2000, 2008, and 2013-2014 (MEC 2002, SAIC 2010, MBC 2016). The highest population observation in the survey zones surrounding the Base LA/LB for each species was assumed to be the maximum number of individuals that would be affected on any given day. This is a conservative approach that seeks to overestimate Level B take, as the Base LA/LB wharf is not in an area that appears to be highly travelled or frequented by marine mammals.

5.4.1 California Sea Lion Take

Biological baseline studies for the Los Angeles and Long Beach provided counts for California Sea Lions (MEC 2002, SAIC 2010, MBC 2016). Surveys in 2000 and 2008 collected incidental observations primarily during birding surveys, but also during the course of other surveys for water quality, benthic invertebrate sampling, and other surveys. Observations were collected through binoculars from a boat. The 2013-2014 survey included specific species counts targeting marine mammals. There is no specific noted mass haul-out point near Base LA/LB. The 2013-2014 report provides the total observed individuals as 587. This represents observations, not population totals.

The exposure calculation for Level B Take of California sea lions is limited to underwater noise exposure. The 2008 report provides the highest number of observed individuals in the project vicinity on a single day as 65, higher than the next closest tally at 48. The project vicinity includes zones 4, 20, and 34 in the 2008 report, encompassing the harbor areas adjacent to the base on all sides. It is assumed that the maximum exposure on any given day is 65 individuals to Level B harassment. However, it is expected that only smaller groups of up to 10 individuals would be expected to traverse the area. Given a maximum pile driving period of 38 days, there is an estimated take of 380 individuals through Level B harassment. This is a highly conservative estimate of potential individuals in the project take area, with actual take due to harassment likely to be lower.

5.4.2 Pacific Harbor Seal Take

Pacific harbor seals are less abundant in the Los Angeles and Long Beach Harbors, according to the biological baseline surveys conducted in 2002, 2010, and 2013-2014 (MEC 2002, SAIC 2010, MBC 2016). Harbor seals were most commonly observed resting or foraging along the riprap shorelines, particularly near the breakwaters of the outer harbor. Activities at the Base LA/LB location should not affect any animals located near the outer harbor. The 2013-2014 observed 223 individuals over the survey season. This represents observations, not population totals.

The exposure calculation for Level B Take of Pacific harbor seals is limited to underwater noise exposure. A shut down zone include the Level B Take area for the Pacific harbor seal. The highest observation on any given day in the zones surrounding the Base LA/LB area is one. This is likely due to the species apparent avoidance of the inner harbor areas, potentially due to high levels of ship traffic. Although few individuals have been reported in the area, there are many in the larger area. Pacific harbor seals may unexpectedly appear inside the Level A impact area, and so Level A take of one individual per every other day is requested for this species. This would equate to maximum conservative estimate of 19 individuals.

5.4.3 Bottlenose Dolphin Take

Bottlenose dolphins sporadically enter the inner Los Angeles and Long Beach harbor areas, according to observations collected during the biological baseline surveys conducted in 2002, 2010, and 2013-2014 (MEC 2002, SAIC 2010, MBC 2016). Pods and individuals have been observed in small numbers foraging in the outer harbor. Activities at the Base LA/LB location should not affect any animals located near the outer harbor. The 2013-2014 survey observed 18 individuals over the specified timeframe. This represents observations, not population totals.

The exposure calculation for Level B Take of Bottlenose dolphins is limited to underwater noise exposure. The highest observation on any given day in the zones surrounding the Base LA/LB area is 12 (SAIC 2010). It is therefore assumed that the maximum exposure on any given day is 12 individuals to Level B harassment. However, It is expected that this species will travel in small groups of two or three. Given a maximum pile driving period of 38 days, this would equate a take of 114 individuals through Level B harassment. This is a highly conservative estimate of potential individuals in the project take area, with actual take due to harassment likely to be lower.

5.4.4 Short-beaked Common Dolphin Take

Short-beaked common dolphin are infrequently observed inside the Los Angeles and Long Beach Harbor areas, according to observations collected during the biological baseline surveys conducted in 2002, 2010, and 2013-2014 (MEC 2002, SAIC 2010, MBC 2016). They are occasionally observed in the outer harbor area. Activities at the Base LA/LB location should not affect any animals located near the outer harbor. The 2013-2014 survey observed 40 individuals over the specified timeframe. This represents observations, not population totals. It is notable that all 40 individuals were observed once in a single pod, which does not establish a population trend.

The exposure calculation for Level B Take of short-beaked common dolphins is limited to underwater noise exposure. As there are limited observations of this species in the vicinity of the wider Los Angeles and Long Beach Harbors, the 40 individual observation is highly unlikely to be present in the project area on a daily basis. It is therefore assumed that the maximum exposure on any given day is 40 individuals to Level B harassment. Given a maximum pile driving period of 38 days, this would equate a take of 1520 individuals through Level B harassment. However, the likelihood of species present across every day is very low. Given the rarity of pod

sightings in this area, a conservative estimate of one group per week is being utilized. This would provide a take of 200 individuals to through Level B harassment.

5.4.5 Gray Whale Take

Gray whales are extremely rare in the area. Observations of individuals are reported sporadically in the Los Angeles and Long Beach Harbors, and are not known to occur every year (MEC 2002, SAIC 2010, MBC 2016). Gray whales have been observed in the outer harbor area. There is no regularly predictable presence of gray whales for estimation of Level B Harassment.

It is anticipated that marine mammal observers, as outlined in Section 10 Mitigation Measures, would be able to sight and stop pile driving activities, so that pile driving does not occur while any gray whales may be within the exclusion zone. Level A Take for up to two gray whales is requested, in the unlikely event that they enter the project harassment area before a shutdown can be initiated.

5.4.6 Summary

Pile driving associated with the Base LA/LB OPC Homeport project would occur over two construction seasons. Based on the above discussion, the USCG is requesting Level B and Level A take for the five marine mammal species that may occur in the project vicinity. Take estimates have been conservatively estimated to ensure any impacts to individuals are accounted for. No adverse population level impacts are expected due to this project activity, and impacts to individuals are expected to be negligible and short-term. Table 5-6 provides a summary of potential species take.

Table 5-6 Summary of Potential Take for All Species

Species	Pile Driving Impacts		
	Level B Underwater	Level A	Total Estimated
California sea lion	380	0	380
Pacific harbor seal	0	19	19
Bottlenose dolphin	114	0	114
Short-beaked Common Dolphin	200	0	200
Gray Whale	0	2	2

Section 6 Affected Status and Distribution of Species Potentially Affected

6.1 Effects of Underwater Noise on Marine Mammals

The effect of pile driving on marine mammals can be either physiological or behavioral, due to masking of natural sounds, disturbance of normal behavior, impairment of hearing on a temporary or permanent basis, or non-auditory damage to other organs (Richardson et al. 1995). The following criteria are suggested by Richardson et al. (1995) for evaluating the different zones of effects:

- Zone of hearing loss, discomfort or injury: Direct effects resulting in discomfort or tissue damage to auditory or other systems, including a temporary threshold shift, a temporary loss in hearing, a permanent threshold shift and loss in hearing at specific frequencies, or deafness.
- Zone of masking: Additive noise may increase difficulty with the detection of other sounds, including communication calls, sounds of prey, and other environmental sounds. This zone of effect occurs at 160 dB for impact noise and 120 dB for continuous noise.
- Zone of responsiveness: Marine mammals may change their behavior. Temporary behavioral effects may not indicate long lasting consequence for exposed individuals, typically considered Level B harassment. Temporary behavioral effects may be evidence that an animal has heard a noise, and may not indicate a lasting consequence due to noise exposure (Southall et al. 2007. This zone of effect occurs at 160 dB for impact noise and 120 dB for continuous noise.
- Zone of audibility: Marine mammals may hear the noise. Marine mammals as a group have a functional hearing range of 10 hertz (Hz) to 180 kilohertz (kHz), with the best thresholds near 40 dB (Southall et al. 2007). No thresholds apply to the zone due to difficulty in determining the audibility of a particular noise for a particular species. This zone does not fall within a noise range of take as defined by NMFS. The zone of audibility may be masked by background noise, causing further limitation. Background noise is produced by natural and anthropogenic sources.

6.2 Expected Responses to Pile Driving

Marine mammal response to pile driving is dependent on the difference between background noise and construction noise. The Port of Los Angeles area has a high volume of boat traffic and a large presence of people in the vicinity, leading to a higher level of background noise than other less trafficked and populated areas containing marine mammal habitat (NOAA 2016). Harbor seals and California Sea Lions have been shown to become quickly habituated to fishery deterrent methods, and may similarly be habituated to the port background and construction related noise (Jefferson 1996).

Pile driving activities may result in temporary, short-term changes in typical behavior, as well as avoidance of the area of activity. Marine mammals may show signs that they are startled by the noise, and may respond by swimming away from the noise source, avoiding the area. Other potential behavioral changes may include increase swimming speed, increased surfacing time, and decreased foraging in the activity area. Pinnipeds may increase haul-out times in avoidance of the in-water disturbance. Due to the relatively short term nature of the activity and restriction of pile driving to day time hours, it is unlikely that pile driving would result in permanent displacement of marine mammals.

6.3 Effects of Airborne Noise on Marine Mammals

Pile driving and other nearby construction would expose marine mammals to airborne noise, which has the potential to cause harassment should they be nearby the Base LA/LB wharf extension activities. Should California sea lions or Pacific harbor seals be hauled-out in the project vicinity, they may be exposed to Level B

noise thresholds. Noise levels are not expected to exceed Level A thresholds. Behavioral responses are likely to be similar to those discussed in connection to underwater noise. In general, airborne noise is likely to cause pinnipeds to change their normal behavior, such as causing them to move away from the source of noise. Similar to underwater noise, due to the relatively short term nature of the activity and restriction of pile driving to day time hours, it is unlikely that pile driving would result in permanent displacement of marine mammals. There would be no population level impacts that would affect the long-term fitness of these marine mammals.

6.4 Effects of Human Disturbance on Marine Mammals

The Los Angeles Harbor area is a high traffic port and Base LA/LB sees regular usage, including foot traffic during operations. The California sea lions and Pacific harbor seals that may use the area as a haul-out location are not expected to experience behavioral responses to human presence. There is not expected to be any particular disturbance to marine mammals due to human disturbance at the project location due to acclimation of any marine mammals regularly in the area (Holcombe et. Al. 2009). This primarily applies to California sea lions that may haul-out in the vicinity.

Section 7 Anticipated Impacts on Subsistence Uses

There are no subsistence uses of marine mammals that occur in the Base LA/LB area, or the greater Port of Los Angeles area. There are therefore no impacts expected to the availability of the species stock as a result of the proposed Base LA/LB OPC Homeport project.

Section 8 Anticipated Impacts on Habitat

There are no permanent long-term effects on marine habitat proposed or anticipated to result from implementation of the Base LA/LB Homeporting project. The additional wharf footprint would cover approximately 0.2 acre. Installation of additional wharf length would be negligible in the context of the larger surroundings in its footprint. Pilings may serve as habitat for primary producers and other consumers, somewhat mitigation the loss of bottom habitat.

Short-term changes to the marine environment and marine mammal habitat may occur during construction. Construction activities may result in temporary loss of foraging habitat during the duration of pile driving activities. Sedimentation due to pile driving would lead to short-term reduction in water quality. Similar to disturbance of marine mammals due to pile driving noise, underwater noise may disturb fish that would otherwise be in the vicinity of the project area. As fish may disperse from the construction vicinity, this area could lose its temporary foraging value for marine mammals. It is likely that fish would relocate to other areas to avoid noise energy (Hastings and Popper 2005). Pinniped foraging habitat may temporarily decrease in value during the period when piles are driven using impact hammering. The duration of fish avoidance that follows stoppage of pile driving is unknown. The area of avoidance represents a small portion of the total area within the foraging range of marine mammals that may be present in the project area. Use of a bubble curtain would provide some mitigation of these effects.

Essential Fish Habitat (EFH), as designated under the Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act, is present in the Base LA/LB vicinity. The portion of the project area below mean higher high water is designated as EFH under two fishery management plans (FMPs): the Coastal Pelagic Species FMP and the Pacific Groundfish FMP. Table 1 presents a list of the species managed under these plans that were observed in the vicinity of the project area during 2008 biological surveys (SAIC, 2010). The waters of the LA/LB Harbor are also designated as a Habitat Area of Particular Concern under the Pacific Groundfish FMP. Habitat Areas of Particular Concern are areas in EFH where fisheries management has identified a need to conserve sensitive, rare habitats from activities such as fishing practices or developmental stress. The fish species listed in Table 1 use a variety of habitats for foraging, including benthic habitat (ecological region at the very bottom of the sea), open water, and intertidal areas. In particular, the rocky marine and kelp forest habitat in the project area may be used regularly by species managed under the Groundfish FMP. Also, several species in the Coastal Pelagic FMP are known to use LA/LB Harbor and would be expected to be present in the project area, as described in Table 8-1. Project activities will incorporate measures, as identified in the *Final Environmental Assessment for Offshore Patrol Cutter Homeporting at United States Coast Guard Base Los Angeles/Long Beach, California* (USCG 2016).

Table 8-1: EFH Managed Species Potentially Occurring in the Project Area

Common Name	Scientific Name
Coastal Pelagic Species FMP	
Jack mackerel	*Trachurus symmetricus*
Northern anchovy	*Engraulis mordax*
Pacific mackerel	*Scomber japonicas*
Pacific sardine	*Sardinops sagax*
Pacific Groundfish FMP	
Brown rockfish	*Sebastes auriculatus*
California scorpionfish	*Scorpaena guttata*
California skate	*Raja inornata*
English sole	*Parophrys vetulus*
Pacific sanddab	*Citharichthys sordidus*
Rockfishes	*Sebastes spp.*
Spiny dogfish shark	*Squalus acanthias*
Vermilion rockfish	*Sebastes miniatus*

Note: EFH = Essential Fish Habitat; FMP = Fishery Management Plan
Sources: PFMC 2014, PFMC 2011, SAIC 2010

Section 9 Anticipated Habitat Impacts on Marine Mammals and Likelihood of Restoration

The Proposed Base LA/LB OPC Homeport Project is not expected to result in any impact to marine mammal habitats that could cause significant or long-term consequences for individual marine mammals or their populations. Foraging and dispersal habitat for marine mammals will be temporarily modified by disturbance due to increased airborne noise from construction and underwater noise due to pile driving. As outlined in Section 8: Anticipated Impacts on Habitat, project activities are not expected to have significant long term impact on the ability of marine mammals to disperse or forage in undisturbed areas within their foraging range. The proposed project activity is not anticipated to have a long term adverse effect on marine mammals. No restoration of habitat due to project activities is anticipated to be necessary.

Section 10 Mitigation Measures

10.1 Description of Mitigation Measures

The proposed project will include noise abatement measures to reduce underwater noise from impact pile driving. The following mitigation measures are proposed in order to reduce the number of marine mammals potentially affected by the proposed project.

Avoidance and minimization measures to be incorporated into the project would include project timing, equipment used, pile type, and pile size that could avoid or minimize impacts on marine mammals and their habitat.

Pile Driving Restrictions

- Pile driving activities will occur between September 1 and April 14, to avoid the nesting season of the California least tern.
- Protected Species Observers (PSOs) will be present for all marine mammal observation requirements.
- No underwater driving will occur between the hours of 7 p.m. and 7 a.m.
- Pile driving will occur only during daylight hours when visual marine mammal monitoring can be conducted. If lighting conditions do not allow visual monitors to observe the shutdown zones effectively, then construction will not be allowed to start (or continue) until conditions improve. Marine mammal monitoring must take place from 30 minutes prior to initiation of pile driving activity through 30 minutes post-completion of pile driving activity. Pile driving may commence when observers have declared the shutdown zone clear of marine mammals. In the event of a delay or shutdown of activity resulting from marine mammals in the shutdown zone, their behavior must be monitored and documented until they leave of their own volition, at which point the activity may begin again.
- If a marine mammal is entering or is observed within an established shutdown zone, pile driving must be halted or delayed. Pile driving may not commence or resume until either the animal has left and been visually confirmed beyond the shutdown zone; 15 minutes have passed without subsequent detections of small cetaceans and pinnipeds; or 15 minutes have passed without subsequent detections of large cetaceans. NMFS may adjust the shutdown zones pending review and approval of an acoustic monitoring report.
- Should environmental conditions deteriorate such that the marine mammals within the entire shutdown zone would not be visible (e.g., fog, heavy rain), pile driving and removal must be delayed until the PSO is confident marine mammals within the shutdown zone could be detected.
- For in-water construction, heavy machinery activities other than pile driving (e.g., use of barge-mounted excavators, or dredging), if a marine mammal comes within 10 meters, construction must cease operations and reduce vessel speed to the minimum level required to maintain steerage and safe working conditions.
- Concrete piles will be used for construction of the proposed project. Driving concrete piles instead of steel piles will result in lower noise levels from individual pile strikes (Caltrans 2015).
- A bubble curtain is required during all impact driving, to be operated in a manner consistent with the following performance standards:
    - The bubble curtain must distribute air bubbles around 100 percent of the piling perimeter for the full depth of the water column.

    - The lowest bubble ring must be in contact with the mudline for the full circumference of the ring, and the weights attached to the bottom ring shall ensure 100 percent mudline contact. No parts of the ring or other objects shall prevent full mudline contact.
    - Air flow to the bubblers must be balanced around the circumference of the pile.
- If a species for which authorization has not been granted, or a species for which authorization has been granted but the authorized takes are met, is observed approaching or within the monitoring zone, pile driving and removal activates must shut down immediately using delay and shut0-down procedures. Activities must not resume until the animal has been confirmed to have left the area or the observation time period has elapsed.
- A "soft-start" technique will be used during pile driving to allow marine mammals to vacate the area before the pile driver reaches full power. The use of a soft-start procedure is believed to provide additional protection to marine mammals by providing a warning, and/or giving marine mammals a chance to leave the area prior to the hammer operating at full capacity. For impact driving, an initial set of three strikes will be made by the hammer at reduced energy, followed by a 1-minute waiting period, then two subsequent three-strike sets before initiating continuous driving.

10.2 Mitigation Effectiveness

With implementation of the mitigation measures described above, it is anticipated that marine mammals will be protected from Level A harassment and the potential effects associated with Level B harassment will be reduced. If mitigation is not conducted properly, the potential for effects increases. Visual observations and hydroacoustic monitoring will be implemented to ensure the effectiveness of planned mitigation measures. Monitors will be required to check in to ensure mitigation measures are working as intended. Visual monitors will monitor the shutdown zone for marine mammals and will stop work if marine mammals enter the shutdown zone. Monitors will also ensure the appropriate shutdown zone is in place for protection from Level A harassment. Should hydroacoustic monitoring indicate that mitigation measures are not working to reduce sound to appropriate levels, the monitors will work with the construction crew to adjust measures or they will expand the shutdown zone as needed to provide proper protection to marine mammals.

Section 11 Arctic Plan of Cooperation

The Arctic Plan of Cooperation is not applicable to the USCG Base LA/LB OPC Homeport project, as project activities would not occur in or near a traditional Arctic subsistence hunting area. No further discussion is included.

Section 12 Monitoring and Reporting Measures

The USCG is anticipating the usage of a Visual Marine Mammal Monitoring Plan and a Hydroacoustic Monitoring Plan, consistent with the *Final Environmental Assessment for Offshore Patrol Cutter Homeporting at United States Coast Guard Base Los Angeles/Long Beach, California* (USCG 2016). These plans will be implemented prior to and during pile driving activities. Both plans will provide guidelines for ensuring there is no Level A take, that Level B take is minimized to the extent practical, and that all activities are documented. A brief description of the anticipated plans is as follows.

Visual Marine Mammal Monitoring

A PSO will be available to conduct visual surveys before and during pile driving to inspect the work zone and adjacent waters for marine mammals. A visual marine mammal monitoring plan will be developed and implemented in consultation with, and with approval from, the NMFS. The visual monitoring plan would include the following provisions:

- Independent PSOs (i.e. not construction personnel) meeting NMFS requirements will be utilized.
- A shutdown zone of 10 meters will be established to ensure that no marine mammals are present in the area where impact pile driving noise might exceed NMFS thresholds. The exclusion zone will include all areas where the underwater noise levels are anticipated to equal or exceed the Level A (acoustic injury) noise thresholds for marine mammals.
- Marine mammal observers will monitor the exclusion zone for the presence of marine mammals. They will alert work crews to the presence of marine mammals in or near the exclusion zone, and advise when to begin or stop work to reduce the potential for acoustic harassment, consistent with NMFS requirements.
- The marine mammal monitoring will contain the following informational elements at a minimum:
    - Dates and times (begin and end) of all marine mammal monitoring.
    - Construction activities occurring during each daily observation period, including how many and what type of piles were driven or removed and by what method (i.e., impact or vibratory).
    - Weather parameters and water conditions during each monitoring period (e.g., wind speed, percent cover, visibility, sea state).
    - The number of marine mammals observed, by species, relative to the pile location and if pile driving or removal was occurring at time of sighting.
    - Age and sex class, if possible, of all marine mammals observed.
    - PSO locations during marine mammal monitoring.
    - Distances and bearings of each marine mammal observed to the pile being driven or removed for each sighting (if pile driving or removal was occurring at time of sighting).
    - Description of any marine mammal behavior patterns during observation, including direction of travel and estimated time spent within the Level A and Level B harassment zones while the source was active.
    - Number of individuals of each species (differentiated by month as appropriate) detected within the monitoring zone, and estimates of number of marine mammals taken, by species (a correction factor may be applied to total take numbers, as appropriate).
    - Detailed information about any implementation of any mitigation triggered (e.g., shutdowns and delays), a description of specific actions that ensued, and resulting behavior of the animal, if any.

  - Description of attempts to distinguish between the number of individual animals taken and the number of incidences of take, such as ability to track groups or individuals.
- All PSO datasheets and/or raw sighting data will be submitted with the report (in a separate file from the final marine mammal monitoring report referenced immediately above).

Hydroacoustic Monitoring

A hydroacoustic monitoring plan would be developed and implemented in consultation with, and with approval from, the NMFS. The monitoring plan will include the following provisions:

- Hydroacoustic monitoring and reporting will be conducted by a qualified technician using appropriate instrumentation.
- Sound measurements will be taken at a reference location and at additional locations by the design build contractor to determine actual underwater sound levels. Measurements will be taken at two depths: one in mid-water column and one near the bottom but at least 3 feet (1 meter) above the bottom.
- Monitoring reports that summarize the monitoring results, construction activities, and environmental conditions will be submitted to the NMFS, as noted in the monitoring plan associated with an Incidental Harassment Authorization (IHA) for this project.
- The hydroacoustic monitoring report will include, at a minimum the following items:
  - Hydrophone equipment and methods, including recording device, sampling rate, distance (meters) from the pile where recordings were made, and the depth of recording device(s).
  - The type of pile being driven, substrate type, method of driving during recordings, and whether a sound attenuation device is used.
  - Impact pile driving measurements will include pulse duration and mean, median and maximum sound levels. (dB re: 1µPa): cumulative sound exposure level (SELcum), peak sound pressure level (SPLpeak), , and single-strike sound exposure level (SELs-s).
  - Number of strikes (impact) or duration (vibratory) per pile measured, one-third octave band spectrum and power spectral density plot.

A final report will be submitted to the NMFS after completion of the proposed project, as noted in the monitoring plan associated with the IHA for this project.

Section 13 Means of Coordination

Construction and potential harassment activities will be evaluated relative to observed sound levels and marine mammal reaction by type of sound source. The effectiveness of mitigation measures will be discussed in eh monitoring report, and potential recommendations will be made to improve effectiveness if warranted. The monitoring report will provide information useful for evaluating potential effects or permitting of future projects. All data gathered during construction and operation will be made available to NMFS to encourage learning and coordinate research opportunities related to incidental taking of marine mammals.

Section 14 List of Preparers

Kelsey Kropp
- B.S. Biology: Evolution, Environment, and Conservation
- B.S. Zoology
- 13 years of experience

Tim Krause
- J.D. Environmental Law
- M.S. Environmental Engineering
- B.S. Environmental Science
- 35 years of experience

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Appendix A

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

VERSION 2.0: 2018

KEY

	User Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	USCG IHA for LA/LB Homeport: 16-inch concrete piles with bubble curtain
PROJECT/SOURCE INFORMATION	Geotechnical Report, Basis of Design, Caltrans Compendium of Pile Driving Sound Data. Attenuated source level (assumes 5-dB reduction by bubble curtain as per Caltrans recommendation).

Please include any assumptions

PROJECT CONTACT	Tim Krause, Transystems

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	NMFS default value for impact pile driving

¥ 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 75), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

*** BROADBAND Sources: Cannot use WFA higher than maximum applicable frequency (See GRAY tab for more information on WFA applicable frequencies)**

STEP 3: SOURCE-SPECIFIC INFORMATION

NOTE: Choose either E1-1 OR E.1-2 method to calculate isopleths (not required to fill in sage boxes for both)

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

SEL_{cum}

Source Level (RMS SPL)	
Number of piles per day	
Strike Duration$^{\Delta}$ (seconds)	
Number of strikes per pile	
Duration of Sound Production (seconds)	0
10 Log (duration of sound production)	#NUM!
Propagation (xLogR)	
Distance of source level measurement (meters)*	

$^{\Delta}$Window that makes up 90% of total cumulative energy (5%-95%) based on Madsen 2005

*Unless otherwise specified, source levels are referenced 1 m from the source.

PK

Source Level (PK SPL)	
Distance of source level measurement (meters)*	
Source level at 1 meter	#NUM!

*Unless otherwise specified, source levels are referenced 1 m from the source.

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

RESULTANT ISOPLETHS*

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

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS isopleth to threshold (meters)	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**
PK Threshold	219	230	202	218	232
PTS PK isopleth to threshold (meters)	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**

E.1-2: ALTERNATIVE METHOD TO CALCULATE PK AND SEL_{cum} (SINGLE STRIKE EQUIVALENT)

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**189.7**

SEL_{cum}

Source Level (Single Strike SEL)	150
Number of strikes per pile	1564
Number of piles per day	6
Propagation (xLogR)	15
Distance of single strike SEL measurement (meters)*	10

*Unless otherwise specified, source levels are referenced 1 m from the source.

PK

Source Level (PK SPL)	180
Distance of source level measurement (meters)*	10
Source level at 1 meter	195.0

*Unless otherwise specified, source levels are referenced 1 m from the source.

RESULTANT ISOPLETHS*

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

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS isopleth to threshold (meters)	**28.0**	**1.0**	**33.4**	**15.0**	**1.1**
PK Threshold	219	230	202	218	232
PTS PK isopleth to threshold (meters)	**NA**	**NA**	**NA**	**NA**	**NA**

WEIGHTING FUNCTION CALCULATIONS

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

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

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

VERSION 2.0: 2018

KEY

	User Provided Information
	NMFS Provided Information (Technical Guidance)
	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	USCG IHA for LA/LB Homeport: 30-inch concrete piles with bubble curtain
PROJECT/SOURCE INFORMATION	Geotechnical Report, Basis of Design, Caltrans Compendium of Pile Driving Sound Data. Attenuated source level (assumes 5-dB reduction by bubble curtain as per Caltrans recommendation).

Please include any assumptions

PROJECT CONTACT	Tim Krause, Transystems

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	NMFS default value for impact pile driving

¥ 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 75), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

*** BROADBAND Sources: Cannot use WFA higher than maximum applicable frequency (See GRAY tab for more information on WFA applicable frequencies)**

STEP 3: SOURCE-SPECIFIC INFORMATION

NOTE: Choose either E1-1 OR E.1-2 method to calculate isopleths (not required to fill in sage boxes for both)

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

SEL_{cum}

Source Level (RMS SPL)	
Number of piles per day	
Strike Duration$^{\Delta}$ (seconds)	
Number of strikes per pile	
Duration of Sound Production (seconds)	0
10 Log (duration of sound production)	#NUM!
Propagation (xLogR)	
Distance of source level measurement (meters)*	

$^{\Delta}$Window that makes up 90% of total cumulative energy (5%-95%) based on Madsen 2005

*Unless otherwise specified, source levels are referenced 1 m from the source.

PK

Source Level (PK SPL)	
Distance of source level measurement (meters)*	
Source level at 1 meter	#NUM!

*Unless otherwise specified, source levels are referenced 1 m from the source.

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

RESULTANT ISOPLETHS*

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

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS isopleth to threshold (meters)	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**
PK Threshold	219	230	202	218	232
PTS PK isopleth to threshold (meters)	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**

E.1-2: ALTERNATIVE METHOD TO CALCULATE PK AND SEL_{cum} (SINGLE STRIKE EQUIVALENT)

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**201.2**

SEL_{cum}

Source Level (Single Strike SEL)	161
Number of strikes per pile	1748
Number of piles per day	6
Propagation (xLogR)	15
Distance of single strike SEL measurement (meters)*	10

*Unless otherwise specified, source levels are referenced 1 m from the source.

PK

Source Level (PK SPL)	195
Distance of source level measurement (meters)*	10
Source level at 1 meter	210.0

*Unless otherwise specified, source levels are referenced 1 m from the source.

RESULTANT ISOPLETHS*

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

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS isopleth to threshold (meters)	**163.4**	**5.8**	**194.6**	**87.4**	**6.4**
PK Threshold	219	230	202	218	232
PTS PK isopleth to threshold (meters)	**NA**	**NA**	**3.4**	**NA**	**NA**

WEIGHTING FUNCTION CALCULATIONS

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

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

USCG IHA for LA/LB Homeport
9-22-20 Revision

Practical Spreading Loss Model
Level B Harassment Noise Thresholds

Pile Type and Size	Level B Impact Pile NOAA-NMFS Impact Criteria	Source RMS	Source RMS Distance (meters)	Calculation Distance (meters)[1] to Level B Threshold (Isopleths)	Distance (miles)
16-inch concrete - impact pile[2] no bubble curtain	160	166	10	25.1	0.016
16-inch concrete - impact pile with bubble curtain (-5 dB reduction)	160	161	10	11.7	0.007
30-inch concrete - impact pile[3] no bubble curtain	160	176	10	116.6	0.072
30-inch concrete - impact pile with bubble curtain (-5 dB reduction)	160	171	10	54.1	0.034

Notes:
1) Assumes an attenuation rate of 4.5 dB per doubling of distance (an attenuation factor of 15)
2) Source RMS of 166 dB from 18-inch concrete piles, Table I.2-1 of Caltrans Compendium of Pile Driving
3) Source RMS of 176 dB from 30-inch concrete piles in Table I.2-3 of Caltrans Compendium of Pile Driving.