ACOUSTIC AND MARINE SPECIES MONITORING PLAN FOR THE NAVY'S IHA #4 FUEL PIER REPLACEMENT PROJECT AT NAVAL BASE POINT LOMA

Submitted to:

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

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For:
Naval Base Point Loma

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

µPa	micropascal
APE	American Piledriving Equipment
dB	decibel(s)
EA	Environmental Assessment
ESA	Endangered Species Act
ft	feet
GPS	Global Positioning System
Hz	hertz
IHA	Incidental Harassment Authorization
in	inch/inches
IPP	Indicator Pile Program
kHz	kilohertz
LD	Larson Davis
LZ_{eq}	z-weighted sound levels
m	meters
MMO	Marine Mammal Observer
NAVFAC SW	Naval Facilities Engineering Command, Southwest
NBPL	Naval Base Point Loma
NEPA	National Environmental Policy Act
NIST	National Institute of Standards and Technology
NMFS	National Marine Fisheries Service
PC	Precast piles
re 1 µPa	referenced to one micropascal
rms	root mean square
SEL	sound exposure level
SLM	Sound Level Meter
SOP	Standard Operating Procedures
SPL	sound pressure level
UW	University of Washington
VM	Variable Moment
ZOI	zone of influence

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1 INTRODUCTION

1.1 Purpose of the Monitoring Plan

The purpose of this Monitoring Plan is to provide protocols for acoustic and marine species monitoring implemented during pile driving and demolition activities associated with Incidental Harassment Authorization (IHA) #4, including the 2016/2017 pile driving and in-water construction activities associated with Phase IV of the Navy's Fuel Pier Replacement Project (Project) at Naval Base Point Loma (NBPL), California (Figure 1-1). The Navy worked closely with the National Marine Fisheries Service (NMFS) during the previous IHA phases to develop specific acoustic and marine mammal methodologies for the Project. Due in part to the on-going El Niño conditions and the sightings of unique marine mammals for this region, the Navy had to implement "real-time" monitoring changes which where memorialized in the Standard Operating Procedures (SOP) and previous years IHAs for this Project. This monitoring plan has been designed to incorporate all of the lessons learned from previous year's monitoring effort while avoiding conflicts with the many military and non-military activities that occur continually in San Diego Bay. Monitoring locations will avoid the federal navigation channel and other primary routes of vessel transit.

The components associated with the activities identified in the IHA #4 Application have been adjusted to account for modifications to acoustic data collection equipment and observation of marine mammal species identified during the first two IHAs, as well as changes to scheduled construction milestones. This year's monitoring plan will incorporate all of the modifications and lesson's learned from the previous three years of acoustic and marine mammal monitoring, and apply them to this year's monitoring effort to achieve the following objectives:

1. Collect acoustic data on the installation of the rectangular 24-inch (in) by 30-in (24×30) concrete fender piles at the new Fuel Pier, and 16-in concrete guide piles at Naval Mine and Anti-Submarine Warfare Command (NMAWC), where the Navy's marine mammals have been temporarily relocated. This data will be used to validate sound pressure levels (SPL) at the Level A/B zones of influence (ZOIs) recorded during previous IHAs.
2. Collect acoustic data for the diamond saw cutting of caissons associated with the old Fuel Pier. This data will be used to validate sound pressure levels (SPL) recorded during previous IHAs.
3. Collect acoustic data for the removal of 30-in steel piles from the temporary dolphin. The construction contractor has proposed to either vibe the piles out or torch cut at the mudline. This data will be used to validate sound pressure levels (SPL) recorded during previous IHAs
4. Monitor for the presence and behavior of marine mammals and other protected species during in-water construction activities to minimize impacts to marine species and effectively document marine species occurring within ZOI boundaries

5. As required in the previous IHA, the Navy collected ambient data three separate times in the vicinity of the project site at different times of year. Although the data shows that the mean ambient noise is 128 dB rms (NAVFAC SW 2015), the Navy will continue to use to use the 120 dB regulatory threshold. No ambient underwater data will be collected during IHA #4.

Marine mammal and other protected species monitoring will be conducted before, during, and after pile driving and extraction activities within the appropriate ZOIs for potential injury and behavioral disturbance thresholds. The proposed monitoring will enumerate the occurrence of species in proximity to the project site and document the number of marine mammal species exposed to underwater and airborne sound levels that would constitute "takes" under the Marine Mammal Protection Act (MMPA). Endangered Species Act (ESA) listed species (e.g., California least terns and green sea turtles) will also be monitored, as appropriate. As statistically robust results from acoustic monitoring become available, marine species monitoring protocols based on modeled ZOIs will be adjusted accordingly.

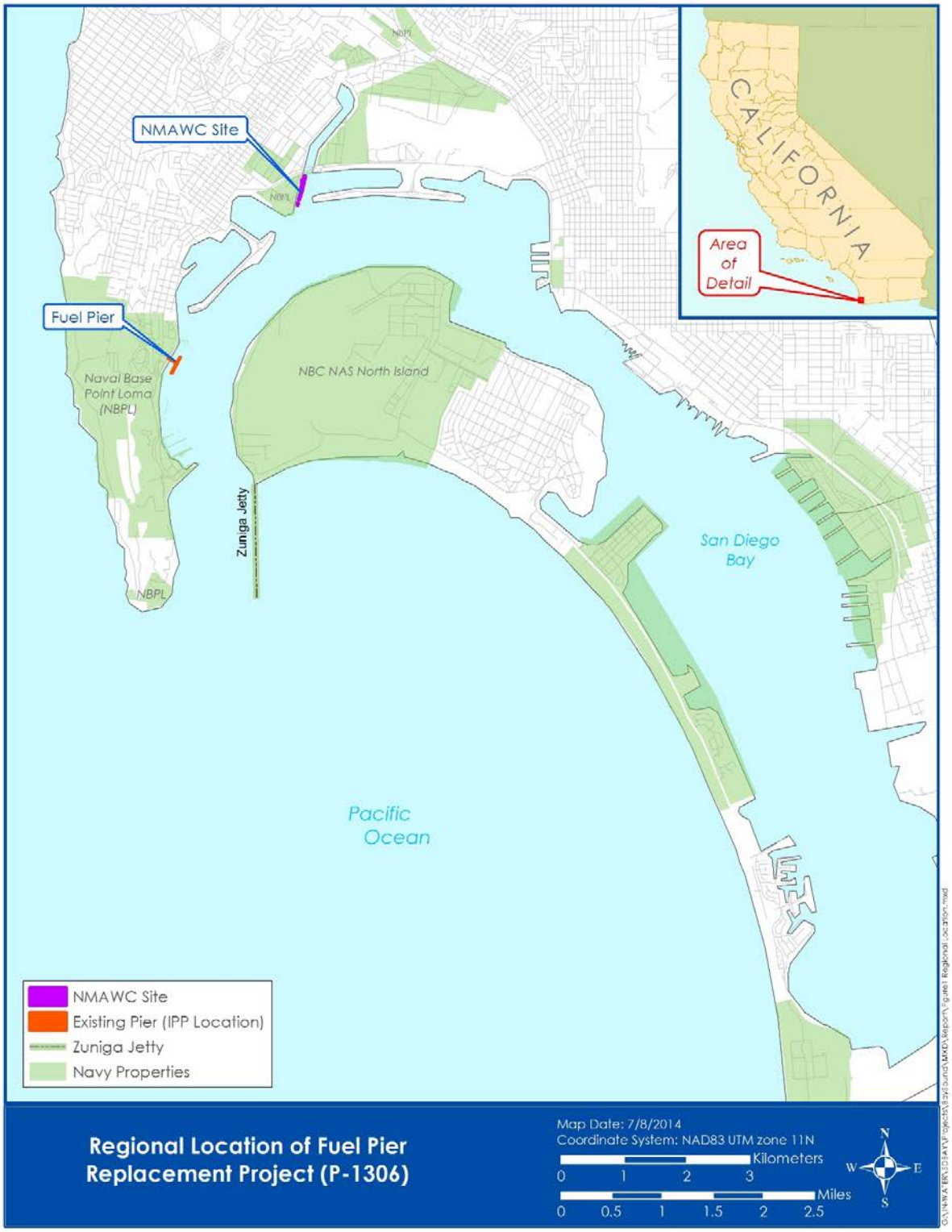

Figure 1-1. Regional Location – Fuel Pier Replacement Project, Naval Base Point Loma.

1.2 Scope and Timing

The scope of the Monitoring Plan includes pile driving and pile extraction activities for IHA #4 (8 October 2016 through 7 October 2017) at the Navy's Fuel Pier Replacement Project. The scope of monitoring encompasses acoustics and marine species monitoring developed to comply with environmental monitoring mutually agreed upon as a result of the Navy's National Environmental Policy Act (NEPA) Environmental Assessment (EA) (Navy 2013a), or as a condition of approval by other regulatory agencies.

This Monitoring Plan will be managed by Naval Facilities Engineering Command Southwest (NAVFAC SW) Southwest using the same contractors that have performed monitoring for all of the previous IHAs. NAVFAC SW will also utilize the support of the Space and Naval Warfare Systems Center Pacific and the University of Washington for acoustic support.

2 FUEL PIER REPLACEMENT PROJECT

2.1 Project Description

Refer to the EA (Navy 2013a) and IHA Applications (Navy 2012, 2013b, 2014, 2015) for a full description of the Fuel Pier Replacement Project.

2.2 Project Area

The project area is in northern San Diego Bay and radiates outwards from the existing fuel pier (P-180) on NBPL (see Figure 1-1). These areas will be monitored both acoustically and for the presence/absence of marine species (marine mammals, green sea turtles, and California least terns).

2.3 Construction and Demolition-related Activities

Table 2-1 presents an amended summary of the in-water demolition and construction activities during the time frame covered by IHA #4. Due to design and logistical constraints encountered during the 2015/2016 production year covered by IHA #3 (Navy 2015), both the installation and removal of piles and caissons are expected to occur under IHA #4. Table 2-1 provides the anticipated number of piles to be driven and removed during the 2016/2017 production pile driving year based on the submitted pile driving plan provided by the construction contractor and approved by the Navy. Descriptions of pile installation, removal and demolition activities are provided in the IHA Applications (Navy 2012, 2013b, 2014, 2015).

2.4 Activities Monitored During this IHA Period

2.4.1 Pile Driving

During IHA #4 (October 8, 2016 to October 7, 2017), two locations will require monitoring for pile driving, demolition, and extraction activities: 1) The new Fuel Pier; and 2) at NMAWC. During IHA #1, enclosures associated with the Navy Marine Mammal Program were moved from areas adjacent to the existing Fuel Pier to NMAWC to eliminate the potential for exposure of the Navy's marine mammals to potentially harmful noise as part of the new Fuel Pier construction (see Figure 1-1).

Pile driving at the new Fuel Pier will include the installation of 30-in steel plumb and batter piles and concrete, and composite fender piles ranging in size from 16-in square to rectangular 24-in by 30-in at the new Fuel Pier. A second monitoring location will be located at NMAWC, which is to the northeast of the new Fuel Pier. The Navy estimates that the contractor will drive approximately one steel batter pile per day during the limited steel pile driving production phase of construction. Each steel pile is assumed to require up to two hours of driving with substantial time needed for adjustment and alignment of the hammer, and a pile template used to guide the piles. The installation of steel batter piles will require extensive use of the vibratory hammer to initially set the piles, with impact pile driving utilized to complete the installation to

Table 2-1. Activity Summary, Pile Driving and Demolition.

Activity/Method	Location and Timing	Estimated # of Days	Pile Type	# Piles Installed	# Piles Removed
Concrete Fender Piles, Impact Pile Driving	Adjacent to the new pier, Oct '16	22	24×30 concrete piles	65	
Concrete Fender Piles, Impact Pile Driving	South dolphin, Mar-Apr '17	6	24×30 concrete piles	16	
Poly Fender Pile, Impact Pile Driving	Corner of shore-ward side of new pier, Nov-Oct '16	1	16-in dia concrete filled fiberglass pile	1	
South Mooring Dolphins (2), Impact and Vibratory Pile Driving	NBPL south of existing fuel pier, Dec '16	24	30-in dia steel pipe	24	
Navy Mammal Relocation to SSC	NMAWC and SSC, Sep-Oct '17	10	16-in PC concrete guide piles	21	
Totals		**63**		**127**	
Piles cut off at mudline with pile cutter	NBPL old pier north and south segment-new pier footprint, Dec '16-Apr '17	40	12-in PC concrete fender		239
Piles cut off at mudline with pile cutter	NBPL old pier north and south segment-new pier footprint, Dec '16-Apr '17	6	24-in square concrete fender		24
Piles cut off at mudline with pile cutter	NBPL old pier north and south segment, Dec '16-Apr '17	20	18-in square concrete fender		123
Piles dry pulled with barge-mounted crane or cut off at mudline.	NBPL old pier include south end of existing pier and existing trestle, Dec '16-Apr '17	15	13-in dia poly filled with concrete		60
Cut off at mudline with diamond belt saw	NBPL old pier end of existing pier, Jan-Apr '17	34	84-in concrete-filled steel caisson		21
Cut off at mudline with diamond belt saw	NBPL old pier include south end of existing pier and existing trestle, Jan-April '17	35	66-in concrete-filled steel caisson		30
Piles vibrated out or cut off at mudline[1]	Temp dolphin south of old pier, Nov '16	6	30-in steel		12
Navy Mammal Relocation to SSC	NMAWC and SSC, Sept-Oct '17	8	16-in round PC concrete		40
Totals		**164**			**549**
Estimated Total In-Water Construction Days - 227					

Notes: dia = diameter; # = number; PC=Precast.

[1]The 30-in piles will be either vibratory extracted or cut at the mudline by divers using a torch.

the required depth. All other piles of will be jetted or stabbed and driven with an impact hammer. Soft start[1] procedures will be employed for all impact pile sizes.

Pile driving of steel, poly and concrete piles, and extraction of steel, poly, concrete and caissons will utilize a range of equipment, depending on several different factors (e.g., pile size or substrate). The equipment used includes:

- The 30-in steel pipe piles would be initially driven using an American Pile Driving Equipment, Inc. (APE) Variable Moment 250 VM Vibratory Hammer Extractor powered by a model 765 hydraulic power source creating a maximum driving force of 2,389 kilonewtons (269 tons). Impact pile driving would use one of two different single action diesel impact hammers (model D62-22), with maximum energies of 153,770 foot-pounds (ft-lbs) and minimum energy of 78,956 ft-lbs. The hammer utilized for approximately 90% of the impact pile driving would be fitted with a hydraulic tripping cylinder with four adjustable power settings that could be reset while driving. The backup D62-22 DELMAG impact hammer would be fitted with a manual trip and could be used when issues arose with the primary impact hammer.
- The 24×30 piles would be driven using an APE single action diesel impact hammer (model D80-42), with maximum energies of 198,450 ft-lbs and minimum energy of 127,008 ft-lbs. the hammer would be fitted with a manual power level modulator and shut off trip.
- The single 16-in poly-concrete pile and the 16-inh guide piles at NMAWC would be driven using an APE single action diesel impact hammer (model D25-32), with maximum energies of 58,245 ft-lbs and minimum energy of 29,484 ft-lbs. The hammer would be fitted with a manual power level modulator and shut off trip.
- Caissons would be cut with a diamond belt saw capable of cutting caissons with diameters of up to 84 in.
- Concrete piles at NMAWC and the steel 30" pipe piles along with the single 16" poly pile at the Fuel Pier will potentially be removed using one of several different methods: 1) Jet/extract with vibratory hammer (see specs above), 2) Cut with Prime® Concrete Pile Cutter Model 24, 3) Custom built diamond wire saw, or 4) Plasma Torch Cutter

[1] Soft-start procedures, in which impact driver energy levels are gradually increased, are believed to allow time for fish and wildlife to move away from the pile driving site before the highest noise levels are produced. For the Fuel Pier Replacement Project, there is a deviation from those methods typically requested by the NMFS which utilize one-minute period between hammer blows for soft-start. Results from the Test Pile Program and EHW-1 project in Puget Sound indicated a one-minute wait period may be too long between hammer blows; Longer breaks between the sounds may be interpreted by the animals as a transient sound and may not serve the intended purpose of providing an indication that louder sounds are about to begin. The Navy consulted with NMFS regarding using a shorter waiting period (i.e. 30 seconds) and NMFS found that the Navy's reasoning was valid and accepted the requested modification. For the Fuel Pier Replacement Project, the soft starts for vibratory hammers require initial starts of 15 seconds at reduced energy followed by a 30-second waiting period. This measure is repeated two additional times. The soft starts for impact hammers require one dry fire followed by a 30-second waiting period. This procedure is repeated two additional times.

The variation in power for the pile driving equipment is not expected to substantively influence the SPLs produced during pile installation/removal activities (WSDOT 2007, 2010, 2012). Other factors such as pile materials and size, subsurface conditions, and propagation parameters at the project site would likely override any influence from the machinery.

Pile driving activities are scheduled to begin with the continuation of the 24×30 concrete fender piles adjacent to the new Fuel Pier, followed by the installation of the one remaining 16-in pile, then the 30-in and 24×30 piles for the southern mooring dolphin, and finally the 16-in guide piles associated with the Navy's Marine Mammal Program. However, scheduling may change and any of the construction activities may occur concurrently, or separately. Marine species monitoring will be conducted during all pile driving activities. No acoustic monitoring for the 30-in steel piles or the one remaining 16-in poly-concrete pile will occur.

2.4.2 Pile Removal and Demolition

Pile removal during the 2016/2017 production year will involve the removal of 549 piles or caissons via pile cutting; diamond belt saw, jet and vibratory and plasma torch (see Table 2-1). The Navy estimates that the contractor will conduct removal activities over 164 days at various rates depending on the types of piles removed and efficiency of the removal process. The concrete pile cutter uses a hydraulic ram to pinch and cut the concrete and rebar. Pile cutting does not exceed regulatory thresholds as a pulse source and will not require monitoring. In-situ recording of the first 3 piles cut will be collected and analyzed to validate the sound source as impulse. If the cutting event is determined to be continuous (i.e. vibratory) and not impulse, the cutting activity will be monitored using the same protocol as the caisson cutting. Typical jetting and vibratory extraction occur at the same time and therefor the acoustics generates by the jetting are essentially enveloped by the vibratory acoustics and are monitored as one sound source. In the rare occasion that jetting occurs outside of a vibratory action, in-situ acoustic recording of the jetting activity will be collected and analyzed to determine source levels. If monitoring is required, stand-alone jetting activity will be monitored using the same protocol as the caisson cutting Each concrete filled steel caisson is assumed to require up to six hours of sawing with substantial time needed for divers to setup and align a diamond saw cutter to perform up to two cuts per caisson. The removal of fender and poly piles will utilize a hydraulic pile cutter to cut the piles at the mud line. The removal of the steel pipe piles associated with the temporary mooring dolphin will be removed by using the vibratory hammer or torch cut by divers at the mud line.

2.4.3 Monitoring Equipment Used During Pile Driving, Removal, and Demolition-Related Activities

The following equipment will be required to conduct acoustic measurements and marine species monitoring:

- Survey boats (with elevated observation points) will include: a fixed marine radio for the Captain to monitor channel 16 and other marine channels independent of observers

communicating on a dedicated channel, depth finder, measuring tape, navigational plotting equipment, and both fixed and hand-held Global Positioning System (GPS) Units. Vessels will comply with all Coast Guard regulations and be able to pass a Coast Guard safety inspection;

- Airborne Sound Level Meters (SLMs) and hydrophones (Table 2-2);
- Hearing protection for all personnel and boat operators near the source;
- Portable marine radios for the observers to communicate with the monitoring coordinator, construction contractor, and other observers;
- Cellular phones (one per boat/observing location), and the contact information for the other observers, and monitoring coordinator;
- Flags (one green, one red per boat/observing location) as back-up for radio communication;
- Nautical charts;
- Daily tide tables for the project area within San Diego Bay;
- Watch or Chronometer;
- Binoculars with built-in compass (quality of 7x50 or better);
- Laser rangefinder;
- Monitoring plan, IHA permit, and/or other relevant permit requirement specifications in sealed clear plastic cover;
- Tablets with marine species and acoustic databases for data collection;
- Notebook with pre-standardized monitoring Marine Mammal Observation Record forms on non-bleeding paper (e.g., Rite-in-the Rain);
- Marine mammal identification guides on waterproof paper;
- Clipboard; and
- Pen / Pencil.

Sound data acquisition during pile driving will utilize a combination of equipment used during previous monitoring efforts (Table 2-2). The Hydro DB real-time Underwater Sound Level Meter (USLM) will be deployed as the primary acoustic monitoring device. DSG-ST Ocean (Loggerhead®) acoustic data loggers may be used for hydroacoustic measurements, but data will not be analyzed, unless specifically needed to validate the USLM measurements. The acoustic monitoring equipment will be deployed by Marine Mammal Observers (MMOs) or Acoustic Technicians (ATs) at the appropriate locations prior to construction activities.

Table 2-2. Acoustic Monitoring Equipment.

Item	Make	Model
DSG-ST acoustic data logger	Loggerhead	DSG-ST

Hydro DB Real Time SLM	UW (custom)	USLM
Hydrophone (Hydro DB SLM)	HTI	96-min
Sound Level Meter	Larson Davis	LD 831
Microphone	PCB	377B02
Preamplifier for Microphone	PCB	PRM 831
Pistonphone, HI Pressure	ETMC Technologies	42AC

Acoustic technicians will provide real-time monitoring of in-water activities to determine rms SPL values. The USLM will be used to document rms SPLs at both near field and far-field locations for both impact and vibratory pile driving events, as well as during demolition activities. Recordings from USLM and Loggerheads will be compared for consistency, if needed. All monitoring systems will deploy hydrophones at mid-depth at each station. The Larson Davis (LD) 831 Class 1 integrated SLM will be used to record and observe airborne SPLs. The LD 831 is equipped with data logging firmware capable of recording a variety of metrics including LZF_{max} (rms value), and LZ_{eq} (1sec, Sound Exposure Level [SEL] value) for each recorded event. LD 831 SLMs with detachable LD microphones will be placed on tripods to collect airborne sound levels at source (15 m [50 ft]) to validate previously reported source SPLs to maintain established airborne marine mammal ZOIs. The Hydro DB USLM will be used to validate the SPL thresholds at the initiation of pile production.

All hydrophones, microphones, and recording systems will be checked prior to deployment each day to ensure proper operation. All sensors, signal conditioning equipment, and sampling equipment will be calibrated at the start of the monitoring period to National Institute of Standards and Technology (NIST) standards.

2.4.4 Previous Data Collection and MMPA Thresholds

Based on acoustic data collected during previous IHAs, the distances to the Level A/B regulatory thresholds are presented in Table 2-3. The data collected provided source levels to calculate these distances. These distances represent the area likely to be ensonified by sounds as a result of the project and are the basis for all monitoring efforts associated with this project.

Table 2-3. Measured or Calculated Distances to Level A (Injury) and Level B (Disturbance) Thresholds for Sound at the new Fuel Pier and NMAWC.

Activity	Measured/Calculated Distances to Thresholds (meters [feet])					
	Underwater				Airborne[1]	
	Level A		Level B		Level B	
	190 dB	180 dB	160 dB	120 dB[2]	100 dB	90 dB
New Fuel Pier Construction and Demolition						
Impact driving (30-in steel piles)[3]	75 (246)	350 (1,148)	2,000 (6,562)	N/A	80 (262)	233 (764)
Vibratory driving (30-in steel piles)[3]	10[4] (33)	10[4] (33)	N/A	3,000 (9,483)		
Impact driving (16-in poly-concrete piles)[5]	20 (66)	50 (164)	270 (886)	N/A	42 (138)	149 (489)
Impact driving (24×30 piles)[5]			470 (1,542)	N/A		
Diamond saw (66-in and 84-in caissons)[5,6]	N/A			631 (2,070)	N/A	
NMAWC Construction and Demolition						
Impact driving (16-in concrete piles)[5]	10[4] (33)	10[4] (33)	126 (413)	N/A	105 (345)	728 (2,389)
Vibratory pile extraction (16-in concrete piles)[5]	N/A			631 (2,070)		

Notes: [1] Airborne data not available for the diamond saw, but it is not expected to exceed regulatory thresholds.

[2] Mean ambient sound levels in San Diego Bay are approximately 128 dB rms (NAVFAC SW 2015)

[3] Data for 30-in piles is based on a limited number of piles from the Year #2 IHA. The distances presented here are based on pile driving with 36-in steel piles, which is considered as conservative. Source levels of 178 dB rms for vibratory pile driving, and 204 dB rms for impact pile driving were used to generate the distances to the regulatory thresholds.

[4] Measured values are less than 10 m (33 ft). For measured distances of less than 10 m (33 ft), the regulatory requirement is a minimum monitoring distance of 10 m (33 ft).

[5] Based on source levels of 192 dB rms (24×30 concrete fender piles), 194 dB rms (16-in poly-concrete piles), 176.6 dB rms (16-in concrete pile driving), and 155 dB rms (diamond saw and 16-in vibratory concrete pile extraction).

[6] Airborne noise levels did not exceed regulatory thresholds during previous IHAs.

3 MARINE MAMMAL MONITORING

3.1 Objectives

The objective of marine species monitoring is to monitor for the presence of marine mammals and other protected species in San Diego Bay relative to the injury (Level A) and behavioral (Level B) disturbance zones. In doing so, the intent is to minimize and document the potential impacts of the project on those species, while still allowing the project to achieve the projected construction milestones.

3.2 Methods

The marine species monitoring component of this monitoring plan was developed by the Navy, taking into consideration the logistical, environmental, and security requirements for working in the project area. During the production pile driving and removal activities for IHA #4, distances to regulatory thresholds are based on the acoustic data identified in previous Yearly Monitoring Reports (NAVFAC SW 2014, 2015; see Table 2-3). The ZOI boundaries determined during these phases of construction were used to determine monitoring locations for the remainder of the Fuel Pier demolition and construction. Monitoring for green sea turtles and California least terns will also occur to address the ESA-listed species most-likely to occur in the project area. The methods described below were specifically designed to address these issues.

Buffers were added to the pinniped and cetacean Level A ZOIs to reduce the potential for a Level A "take" (Table 3-1). These buffered Level A ZOIs are called "shutdown zones" for the purposes of this monitoring plan. Marine mammal monitoring will also occur for additional areas beyond the area for the Level A thresholds where sound pressure levels may cause behavioral harassment of marine mammal species. If, during the course of acoustic data collection, the data shows that source levels are higher than expected, the distances to the regulatory thresholds will be adjusted as need based on any new data. For all in-water construction and demolition activities, a minimum in-water protective shutdown zone 10 m (33 ft) is proposed.

Table 3-1. Monitored Distances to Level A (Injury) and Level B (Disturbance) Thresholds for Sound at the new Fuel Pier and NMAWC

Activity	Monitored Distances to Thresholds (meters [feet])					
	Underwater				Airborne	
	Level A[1] (Shutdown)		Level B		Level B	
	190 dB	180 dB	160 dB	120 dB	100 dB	90 dB
New Fuel Pier Construction and Demolition						
Impact driving (30-in steel piles)	150 (492)	450 (1,476)	2,000 (6,562)	N/A	80 (262)	233 (764)
Vibratory driving (30-in steel piles)	10 (33)	10 (33)	N/A	3,000 (9,483)		
Impact driving (16-in poly-concrete piles)	40 (131)	100 (328)	270 (886)	N/A		
Impact driving (24×30 piles)			470 (1,542)	N/A		
Diamond saw (66-in and 84-in caissons)	10 (33)	10 (33)	N/A	631 (2,070)	N/A[2]	
NMAWC Construction and Demolition						
Impact driving (16-in concrete piles)	10 (33)	10 (33)	126 (413)	N/A	105 (345)	728 (2,389)
Vibratory pile extraction (16-in concrete piles)	10 (33)	10 (33)	N/A	631 (2,070)		

Notes: [1] Includes buffers of varying distances

[2] Airborne noise levels did not exceed regulatory thresholds during previous IHAs. No airborne monitoring will take place for diamond saw cutting of caissons.

All MMOs will record all visible marine mammal sightings. Confirmed "takes" on a per pile basis will be registered once the sightings data has been overlaid with the isopleths identified in Table 3-1, or based on refined acoustic data, if amendments to the ZOIs are needed. Acousticians may be recording SPLs in real-time, but, to avoid biasing the observations, will not communicate that information directly to MMOs. These acoustic monitoring platforms may move closer to, or farther from, the source depending on whether received SPLs are less than or greater than the regulatory threshold values.

Based on information provided in the IHA #3 monitoring report, an MMO in San Diego Bay can identify animals to the species level at up to 500 m (1,640 ft). The distances to the regulator thresholds presented in Table 3-1 show that the only ZOIs that would fall outside of the 500 m (1,640 ft) observable area are the Level B ZOIS for the 30-in impact and vibratory pile driving

Level B ZOIs (2,000m [6,562 ft], and 3,000 m [9,483 ft]), and for the diamond saw and vibratory pile extraction at NMAWC (631 m [2,070 ft]).

In the event that a non-IHA marine mammal species is observed by a MMO during pile driving and removal activities, the location and directional movement of the animal (or group) with respect to the applicable Level B ZOI will be determined, and all construction will be stopped immediately if the animal (or group) is likely to enter the ZOI. If a boat is available, MMOs will follow the animal (or group) at a distance of at least 100 m (328 ft) until the animal (or group) has left the Level B ZOI. Pile driving will commence if the animal (or group) has not been seen inside the Level B ZOI for at least one hour of observation. If the animal (or group) is re-sighted, pile driving will be stopped and a boat-based MMO (if available) will follow the animal until it has left the Level B ZOI.

During installation of any size piles, or during any activity, all MMOs can initiate shutdown procedures by calling the monitoring coordinator ("Command") located close to the construction activities, who will then stop construction by notifying the construction crew via either verbal or visual communication procedures.

3.2.1 Marine Mammal Observer Qualifications

Monitoring will be conducted by qualified observers with the following minimum qualifications:

- Visual acuity in both eyes (correction is permissible) sufficient for discernment of moving targets at the water's surface, with the ability to estimate target size and distance; use of binoculars may be necessary to correctly identify the target;
- A minimum of a Bachelor's degree in biological science, wildlife management, mammalogy, or related field;
- Prior training and experience conducting at-sea marine mammal monitoring and/or surveys, including the identification of marine mammal behavior;
- Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations; and
- Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.

3.2.2 Marine Species Data Collection

The data collected during all pile installation or removal activities will not change regardless of the type and size of the pile being installed or removed. NMFS requires that at a minimum, the following information be collected by MMOs:

- Date and time that pile driving or removal begins or ends;
- Construction activities occurring during each observation period;
- Weather parameters identified in the acoustic monitoring (e.g., wind speed and direction, air temperature);
- Tide state and water currents;

- Visibility;
- Species, numbers, and if possible sex and age class of marine mammals;
- Marine mammal behavior patterns observed, including bearing and direction of travel, and if possible, the correlation to SPLs;
- Distance from pile driving activities to marine mammals and distance from the marine mammal to the observation point;
- Locations of all MMOs;
- Other human activity in the area.

The required fields will be incorporated into paper-based and electronic forms that will be used by the MMOs. To the extent practicable, the MMOs will also record behavioral observations that may make it possible to determine if the same or different individuals are being "taken" as a result of project activities over the course of a day.

Marine mammal monitoring may take place at the same locations at which acoustic data collection is occurring. Marine species monitors will identify and document any occurrences of marine mammals, green sea turtles, or California least terns. During pile installation, the MMOs will be positioned as close as possible to the boundaries of the applicable buffered Level A ZOIs (see Table 3-1) and an additional observer may be added to monitor the larger ZOIs between the injury and disturbance isopleths, if needed. For portions of certain construction activities, acoustic technicians will be placed at varying distances to verify the Level A (190 dB rms and 180 dB rms) or Level B (160 dB rms and 120 dB rms) isopleths.

A dedicated monitoring coordinator will be on-site during all construction days. The monitoring coordinator will oversee the environmental monitoring staff, including all acousticians and MMOs and will serve as the liaison between the environmental monitoring staff and the construction contractor to assist in the distribution of information.

The Navy will monitor the Level A and Level B ZOIs before, during, and after all pile driving and removal activities. Based on acoustic data collected during previous IHAs, monitoring zones were established that allow MMOs to observer the ensonified areas to the greatest extent possible. Table 2-3 and Table 3-1 identify the distances to the regulatory thresholds and the monitored zones relative to these thresholds.

Because the areas associated with certain Level B ZOIs are beyond the visible range of MMOs (500 m [1,640 ft]) an estimation of the number of animals and "take" will be calculated for these areas. For the 30-in piles, MMOs will be stationed at the southern end of the ZOI, as well as directly on the new Fuel Pier and will be able to watch a majority of the Level B ZOI in these areas. However, the area directly east of the new Fuel Pier, and to the north are the areas that will require the estimation of the number of animals and Level B "take" in non-visible areas. For the diamond saw, most of the Level B ZOI will be obscured by the new Fuel Pier directly to the east of the new Fuel Pier. At NMAWC, an MMO will be stationed to the south of the pile driving activity in either a boat or on a land-based position, which would increase the observable area due

to less overlap of monitoring areas. In all cases, all observable areas during construction/demolition will be taken into account when calculating the non-visible areas.

Regardless of the distances to the regulatory thresholds, and based on NMFS requirements, marine mammal monitoring will include the following procedures:

- The MMOs will be located at the best vantage point(s) during in-water construction activities that allows them to see the entirety of the shutdown zones and as much of the disturbance zone as possible. The MMOs will primarily concentrate on monitoring the shutdown zones; however, monitoring of the disturbance zone will continue provided that it will not interfere with the effectiveness at sighting marine mammals in the shutdown zone. Depending on the pile location, the MMOs may be stationed on piers or docks near in-water construction activities and/or in small vessels. The number of marine mammal observers will vary depending on the size and complexity of the shutdown and disturbance zones, as determined by the size and type of pile (i.e., concrete or steel) being installed or removed, or the activity type (i.e., pile installation/extraction or demolition activities).
- All in-water construction activities will be conducted from 45 minutes after sunrise to 45 minutes before sunset. If lighting conditions do not allow MMOs to observe the Level A/B ZOIs effectively, construction times may be amended.
- Monitoring will be conducted before, during, and after pile driving/removal activities. Pile driving activities include the time to remove a single pile or series of piles, as long as the time elapsed between uses of the pile driving equipment is no more than 30 minutes.
    - During all observation periods, the MMOs will use binoculars and/or the naked eye to search continuously for marine mammals.
    - Prior to the start of pile driving and/or removal activities, the shutdown and disturbance zones will be monitored for 15 minutes to ensure that driving will only commence once observers have declared the shutdown zone clear of marine mammals; animals will be allowed to remain in the shutdown zone (i.e., must leave of their own volition) and their behavior will be monitored and documented. The shutdown zone may only be declared clear, and pile driving started, when the entire shutdown zone is visible (i.e., when not obscured by a poor light, rain, fog, etc.). If the shutdown zones are obscured by fog or poor lighting conditions, pile driving at the location will not be initiated until that zone is visible. Should such conditions arise while pile driving is underway, the activity would be halted.
    - Monitoring will take place for 30 minutes after completion of pile driving activities.
    - Observers shall record all incidences of marine mammal occurrence and behavioral observations using an approved paper-based or electronic data form.
        - Marine mammal observations shall include the following information:
            - Observer's location;
            - Location of the pile being driven;
            - Species, number of individuals (if more than one), sex, age class (if possible), distance to animal, bearing and direction of travel;

- If acoustic monitoring is being conducted for that pile, a received SPL may be estimated, or the received level may be estimated on the basis of past or subsequent acoustic monitoring; and
- Photographs will be taken of non-IHA species, if possible.

▪ Behavioral observations may include:
- Changing durations of surfacing and diving, number of blows (cetaceans) per surfacing, moving direction and/or speed;
- Reduced/increased vocal activities of pinnipeds;
- Changing/cessation of certain behavioral activities (e.g., socializing or feeding);
- Visible startle response or aggressive behavior (e.g., tail/fluke slapping or jaw clapping);
- Avoidance of areas where sound sources are located;
- Flight responses (e.g., pinnipeds flushing into water from haul outs); and
- Increased haul out time and/or changes in vocalizations (pinnipeds)

▪ The following additional information should be collected on the data form:
- Date and time that pile driving begins or ends;
- Construction activities occurring during each observation period;
- Weather parameters (e.g., percent cover, visibility);
- Water conditions (e.g., sea state, tide state); and
- Other human activity in the area

- If a marine mammal approaches or enters the shutdown zone during the course of construction or demolition operations, activities will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone, or 15 minutes has elapsed without a re-detection of the animal.
- For all in-water construction and demolition activities, a minimum in-water protective shutdown zone of 10 m (32.8 ft) will be monitored.
- During non-pile driving, in-water heavy machinery work with the potential to affect marine mammals shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe work conditions if marine mammals come within 10 m (33 ft).
- All MMOs will be in radio communication with each other so that the MMOs will know when to anticipate incoming marine mammal species and when they are tracking the same animals observed elsewhere (i.e., a resighting)
- Marine species monitors may be co-located with the acoustic monitors.
- Monitoring would be primarily dedicated to observing the shutdown zone; however, MMOs would record all marine mammal sightings beyond these distances provided it did not interfere with their effectiveness at carrying out the shutdown procedures.

3.2.2.1 New Fuel Pier Construction and Demolition MMO monitoring locations

Depending on the pile size and/or activity, from one to five MMOs will be used during demolition, pile driving, or pile extraction activities (Figure 3-1). For the 30-in piles only, a person will be solely responsible for the collection of pile driving start and stop times, but will act as a secondary

MMO to aid in identifying animals in the vicinity of the pile being driven. Table 3-1 shows the monitored airborne and underwater Level A/B ZOIs for all pile sizes and activity types (including buffers identified in Table 3-1) based on representative pile locations. The details below provide specific details on monitoring efforts associated with each pile size and type of activity:

3.2.2.1.1 30-in Steel Pipe Pile (Impact and Vibratory Pile Driving, Vibratory Pile Extraction)

- Six personnel (Five MMOs and one "Command" position) will be in place during pile driving activities (Figure 3-1).
  - Three of the five MMOs will be positioned in various pier-based locations around the new Fuel Pier to monitor the Level A/B ZOIs.
    - Two MMOs will be stationed at the north and south ends of the second deck of the new Fuel Pier.
    - One MMO will be stationed on a second story balcony of a building on the existing Fuel Pier. This building is scheduled to be demolished as part of the project. When this occurs, a suitable secondary location within similar visibility will be used as an observation location.
  - One MMO will be positioned in a boat at, or near, the two floating docks associated with the Everingham Brothers Bait Barge Company (EBBCO), and will focus on the furthest extent of the cetacean shutdown ZOI (450 m [1,476 ft]).
  - One MMO will be positioned on a second-story balcony of a Navy building on Ballast Point at the entrance to San Diego Bay. The MMO will focus on the furthest extent of the Level B ZOIs, and will monitor for marine mammals as they enter or exit San Diego Bay.
  - The "Command" position will remain on the construction barge for the duration of monitoring efforts, and will log pile driving start and stop times. This position will act as a secondary MMO during monitoring efforts, but will not log marine species observations as part of their normal duties. They will use either verbal or visual communication procedures to stop active construction if an animal enters the shutdown zones for pinnipeds (150 m [492 ft]) or cetaceans (450 m [1,476 ft]).

3.2.2.1.2 24×30 Concrete Fender Pile (Impact Pile Driving)

- Three personnel (two MMOs and one "Command" position) will be in place during pile driving activities (Figure 3-1).
  - Two MMOs will be stationed the second deck of the new Fuel Pier. Their exact location will be determined by the pile location, but will generally be at the north and south ends of new Fuel Pier
  - The "Command" position will remain in close proximity to the pile being driven, and will log pile driving start and stop times as well as act as an MMO. They will use either verbal or visual communication procedures to stop active construction if an animal enters the shutdown zones for pinnipeds (40 m [131 ft]) or cetaceans (100 m [328ft]).

3.2.2.1.3 16-in Poly-Concrete Pile (Impact Pile Driving)

- Two MMOs (one MMO and one "Command" position) will be in place during pile driving activities (Figure 3-1).

- One MMO will monitor the Level A/B ZOIs and will be positioned on the upper deck of new Fuel Pier.
- The "Command" position will remain in close proximity to the pile being driven, and will log pile driving start and stop times as well as act as an MMO. They will use either verbal or visual communication procedures to stop active construction if an animal enters the shutdown zones for pinnipeds (40 m [131 ft]) or cetaceans (100 m [328ft]).

3.2.2.1.4 66-in and 84-in Caisson (Diamond Saw Cutting)

- One MMO will be in place during caisson cutting activities (Figure 3-1).
  - The MMO will collect species observations, but will also collect start and stop times of construction activities (i.e., during pre-construction surveys, construction, and post-construction surveys).
  - If pile driving occurs at the same time as diamond saw cutting, the MMO will only monitor the buffered ZOI for physical interaction with construction equipment (10 m [33 ft]). They will relay any observations outside of this to a MMO who is part of the pile driving monitoring crew.
  - If diamond saw cutting is occurring without any other construction activity, the MMO will monitor all areas within visual range of the action.

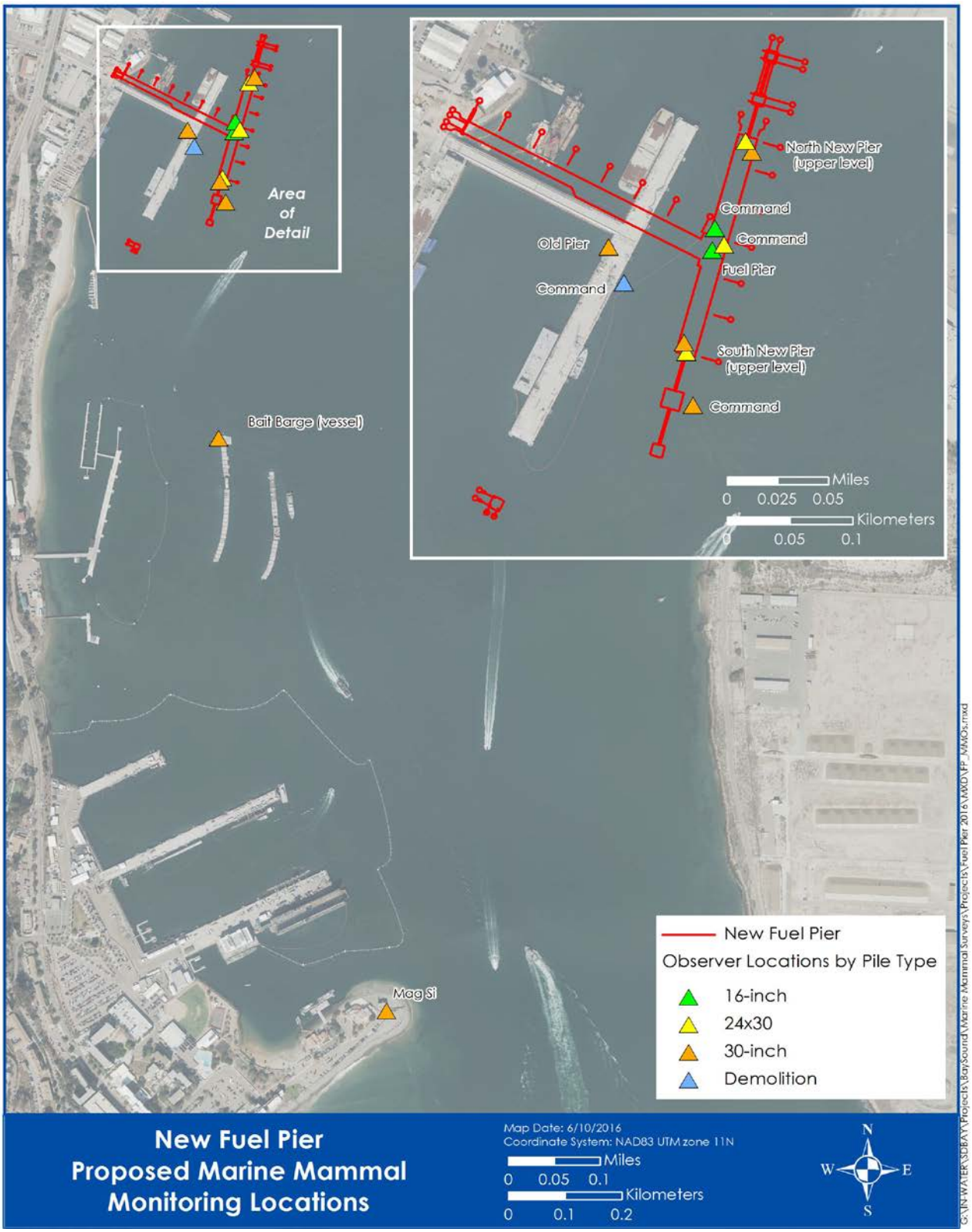

Figure 3-1. Example of the Monitoring Locations for Pile Driving and Demolition at the New Fuel Pier.

3.2.2.2 Navy Marine Mammal Program (NMAWC)

Regardless of activity type, at least two MMOs will be used during any construction or pile extraction activity (Figure 3-2). However, depending on the pile location, a boat may be used in lieu of a land-based MMO.

3.2.2.2.1 16-in pile installation (Impact Pile Driving), and pile extraction

- Two MMOs (one MMO and one "Command") will be in place during pile driving activities (Figure 3-2).
  - One MMO will monitor the Level A/B ZOIs and will be positioned at a land- or water-based position, depending on the location of the pile being driven or extracted.
  - The "Command" position will remain in close proximity to the pile being driven, and will log pile driving start and stop times as well as act as an MMO. They will use either verbal or visual communication procedures to stop active construction if an animal enters the shutdown zones for pinnipeds or cetaceans (10 m [33 ft]).

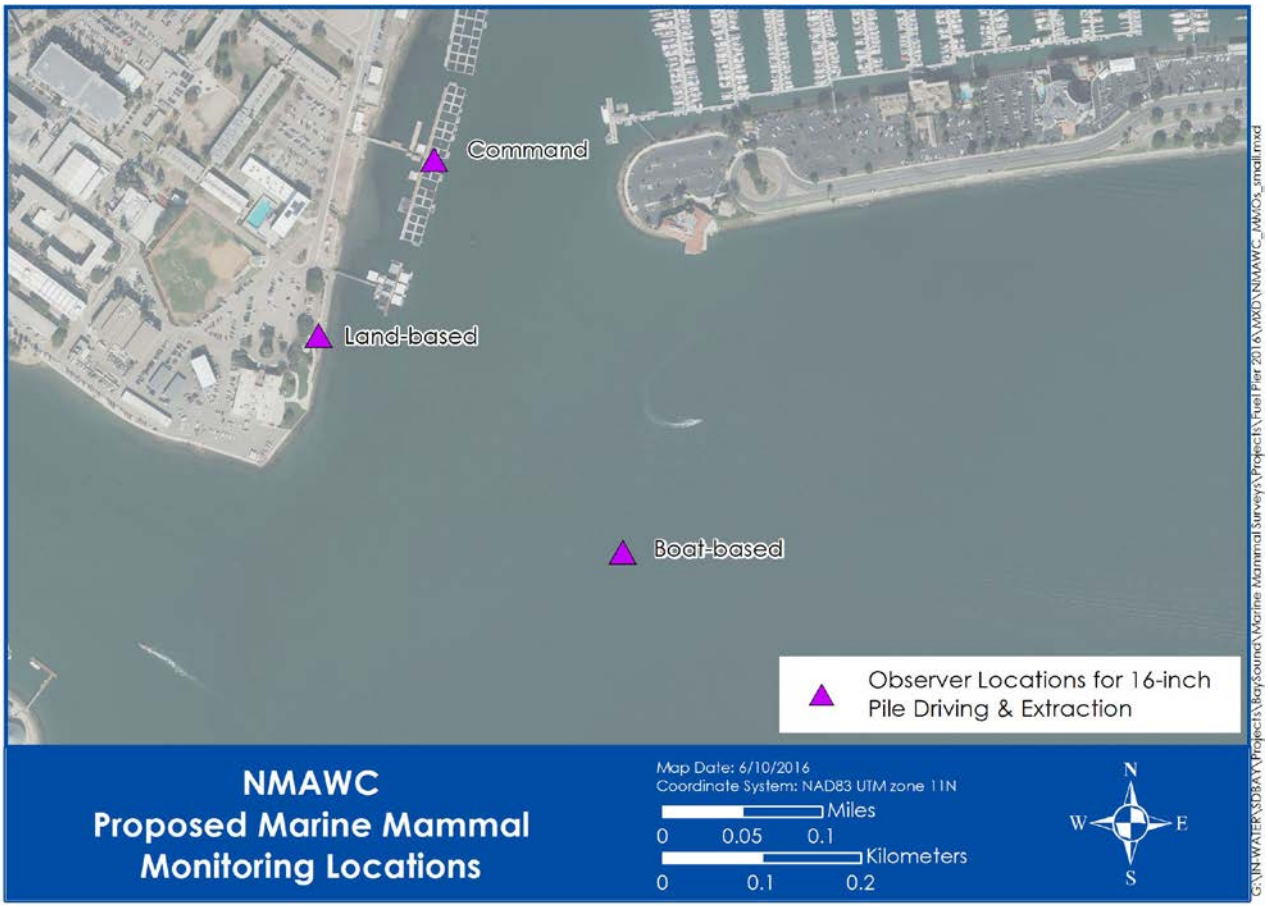

Figure 3-2. Example of the Monitoring Locations for Pile Driving and Extraction at NMAWC.

3.2.2.3 Concurrent Actions

There is a possibility of an overlap of construction and/or demolition activities could occur at the new Fuel Pier. If this were to occur, monitoring locations and the number of monitors would be adjusted to account for any overlap of monitored ZOIs (see Table 3-1). If both demolition (e.g., diamond saw cutting with a single MMO/"Command") and pile driving (e.g., 30-in pile driving with five MMOs, and one "Command" position) occur at the same time at the new Fuel Pier, then two "Command" positions would be in place and both would have the ability to shutdown construction. Based on acoustic measurements of all project in-water construction activities and an understanding of sound propagation from those sources, the overall ZOI's for the Project area would not change. Because diamond saw cutting is likely to last for the duration of pile driving and beyond, when pile driving is stopped the single MMO /"Command" would remain on site for the duration of diamond saw use, and observations would be attributed to the demolition action.

4 ACOUSTIC MONITORING

4.1 Objectives

The primary purpose of acoustic monitoring during IHA #4 is to record and validate underwater SPLs at multiple locations for pile driving and demolition activities. Monitoring of underwater sound will allow us to verify previously measured SPL thresholds for marine mammals and wildlife species. These zones are defined by thresholds established by NMFS. Each zone encompasses the area within the underwater or airborne isopleths. The Navy has committed to a shutdown of pile driving when any marine mammal or green sea turtle is present within the defined Level A ZOIs. See definitions below:

a. Level A (injury) Zones:
   i. Underwater

      The underwater Level A zone includes the area within the 180 dB rms[2] isopleth for cetaceans; and within the 190 dB rms isopleth for pinnipeds and green sea turtles.

   ii. Airborne

      There is no airborne injury threshold for marine mammals; only a behavioral disturbance threshold discussed below.

b. Level B (behavioral disturbance) Zones:
   i. Underwater

      The behavioral disturbance zone includes the area within the 160 dB rms isopleth for marine mammals during impact pile driving, and the 120 dB rms isopleth for marine mammals during vibratory pile driving; the latter may be adjusted upward based on ambient sound levels that exceed the threshold, subject to concurrence from NMFS.

   ii. Airborne

      The distance to marine mammal disturbance thresholds will be measured. These are currently 90 dB re 20µPa (unweighted) for harbor seals and 100 dB re 20µPa (unweighted) for all other pinnipeds. Shutdowns are not required within the airborne zones.

4.2 Methods

The acoustic component of this monitoring plan was developed by the Navy, taking into consideration the logistical, environmental, and security requirements for working in the project area. During

[2] For impact pile driving, rms is calculated over the period of the pulse that contains 90% of the acoustical energy (typically the time interval between 5 percent and 95 percent). For vibratory pile driving, rms refers to the SPL of the signal averaged over 10 seconds of continuous operation.

activities associated with IHA #4, acoustic monitoring will occur to verify distances to regulatory thresholds determined from previously collected data points. For activities such as pile driving of 30-in steel pipe piles, the Navy will use previously recorded source data and previously validated ZOI distances from source and will position MMOs based on those ZOIs (see Table 2-3). For other activities, such as fender pile driving and demolition, the Navy will continue to collect *in situ* acoustic data to validate source and ZOI's. Source levels for both fender pile sizes were initially expected to be below 180 dB rms at the source; however, data collected during the IHA #3 showed that source levels were greater than 190 dB rms, and that data collected in far-field locations was similar to the modeled Level B ZOIs presented in the IHA #3 Application. The methods described below were specifically designed to address these issues. All acoustic monitoring stations will be located per NMFS (2012).

Empirical acoustic monitoring data will be used to validate source and transmission loss values for concrete fender piles and caissons as determined from measurements collected during the 2015/2016 production pile driving year. Underwater acoustic monitoring will use the USLM acoustic data logger as the primary data collection device, use the Loggerhead DSG-ST as a secondary data collection device, implement an intermittent calibration protocol. Dr. Peter Dahl of the University of Washington will be consulted on any acoustic issues, if needed.

4.2.1 Acoustic Data Collection

When acoustic data is collected, one to three hydroacoustic stations and two to three airborne monitoring station will be located at various distances away from the in-water construction activities (Figure 4-1).

Impact pile driving is treated as an impulsive sound source because it provides definitive peaks in SPL over a given time frame. The Hydro DB USLM will provide the capability to observe real-time estimates of peak, rms, and SEL SPLs for each individual pile driving event. The real-time display of rms SPLs observed from the Hydro DB system will be used in the field to validate expected SPLs, determine Level A/B threshold distances, and refine monitoring locations. For vibratory pile driving, which is treated as a continuous sound source, source levels measured during the IPP and 2014/2015 production pile driving documented that peak SPLs never exceeded 180 dB rms. For vibratory removal activities the Hydro DB system will be set to record and analyze vibratory SPLs. The results will be evaluated to validate expected SPLs, determine Level B threshold distance, and refine monitoring locations. Collected acoustic data are considered as "sufficient" when the unique obtained values are demonstrated to be consistent over multiple piles. Sufficient data provides substantiation that collected values fit within the modeled values for any specific pile across the total number of piles that are recorded for that type.

Airborne sound source measurements will be taken at 15 m (50 ft) from the source and at far-field positions to validate airborne ZOIs for pile driving of 30-in piles at the new Fuel Pier, and for the 16-in pile driving at NMAWC. For the purposes of this monitoring year, the pinniped airborne harassment threshold of 100 dB re 20 µPa rms (unweighted) for sea lions will be 80 m (262 ft) and the 90 dB re 20 µPa rms (unweighted) for harbor seals will be 233 m (764 ft) at the new Fuel Pier.

These monitoring distances were established based on airborne SPLs from impact pile driving of 36-in steel pipe piles as reported in the 2014/2015 monitoring report (NAVFAC SW 2015). Data from IHA #1 indicates that the 100 dB re 20 µPa rms threshold is at 105 m (345 ft) and the 90 dB dB re 20 µPa rms threshold is at 728 m (2,389 ft). These distances will be verified throughout pile driving at both the new Fuel Pier and at NMAWC.

4.2.1.1 Acoustic Monitoring Locations

During 2016/2017 production pile driving, monitoring locations will be conservatively based on acoustic data analyzed for the greatest SPLs documented during previous year's production pile driving. For all acoustic monitoring, locations are based on the best professional judgment of the acoustic technicians in order to utilize the best positions to obtain the necessary data. The measured Level A/B (injury/behavioral) thresholds presented in Table 2-3 are based on data collected from previous production pile driving years. For the 30-in piles at the southern mooring dolphins, the distances in Table 2-3 are considered as conservative in that they are based on 36-in piles that were driven during IHA #2. At the new Fuel Pier, a hydrophone will be deployed at multiple locations for the 24×30 concrete fender piles, during caisson cutting, during 30-in pile removal for the temporary mooring dolphin, and for the 16-in concrete guide piles at NMAWC. Details of the acoustic data collection are provided below.

4.2.1.2 New Fuel Pier Construction and Demolition

4.2.1.2.1 16-in poly-concrete pile on the New Pier, and 30-in steel piles at the Southern Mooring Dolphins

- No underwater acoustic data will be collected during the pile driving for the single 16-in poly concrete fender pile and the 30-in steel pipe pile installation at the new Fuel Pier. Acoustic data collected during the IHA #3 for the 16-in poly pile will be used to generate distances to the Level A/B thresholds for this pile. Acoustic data collected during the IPP and 2014/2015 Production Pile Driving for 36-in steel pipe piles will be used to conservatively implement distances to Level A/B thresholds for the 30-in piles (see Table 3-1 for monitored distances);
- One airborne sound monitoring station will be located at 15 m (50 ft) from the source for the 30-in piles. A second airborne data collection point will be positioned at varying distances from the source. No airborne data will be collected for the 16-in pile.

4.2.1.2.2 24×30 Concrete Fender Pile (Impact Pile Driving)

- The Navy will conduct acoustic monitoring for concrete fender piles to further validate the Level A/B ZOIs;
- The USLM will be used to collect real-time data for pile driving to validate and adjust ZOIs, as needed;
- No acoustic data will be collected at the Level B ZOI. Data collected during IHA #3 was deemed as sufficient to validate the modeled Level B ZOIs impact pile driving;

- Airborne data from IHA #3 was deemed sufficient and no airborne data will be recorded for the 24×30 fender piles; and
- Placement of the hydrophones will be adjusted to minimize obstructions from construction materials or equipment.

4.2.1.2.3 66-in and 84-in Caisson (Diamond Saw Cutting)

- At the start of caisson-cutting, the Navy will conduct acoustic monitoring of 84-in caissons with a diamond belt saw to further validate the Level B ZOI (120 dB rms);
- The USLM will be used to collect real-time data for pile driving to validate and adjust ZOIs, as needed;
- Airborne sound levels did not reach regulatory thresholds for diamond saw cutting during IHA #2. As a result, no airborne data will be recorded for the diamond saw cutting during IHA #4; and
- Placement of the hydrophones will be adjusted to minimize obstructions from construction materials or equipment.

4.2.1.2.4 30-in Steel Piles, Temporary Mooring Dolphin (Vibratory Pile Removal, Torch Cutting)

- The Navy will conduct acoustic monitoring for the removal of steel piles to further validate the Level B ZOI (120 dB rms);
- The USLM will be used to collect real-time data for pile driving to validate and adjust ZOIs, as needed;
- One airborne sound monitoring station will be located at 15 m (50 ft) from the source. A second airborne data collection point will be positioned at varying distances from the source.
- Placement of the hydrophones will be adjusted to minimize obstructions from construction materials or equipment.

4.2.1.3 Navy Marine Mammal Program (NMAWC)

4.2.1.3.1 16-in pile (Impact Pile Driving)

- The Navy will conduct acoustic monitoring for concrete guide piles to further validate the Level A/B ZOIs;
- The USLM will be used to validate acoustic data collected during the IHA #1;
- Initial monitored ZOIs will preliminarily be based on data provided in the IHA #1 monitoring report (NAVFAC SW 2014), but will be adjusted based on new acoustic data; Based on data collected during IHA #1 (2013/2014) the maximum source levels for pile extraction were 155 dB rms. This data has been deemed as sufficient to calculate the Level B ZOI for pile extraction (see Table 2-3), and no further acoustic data will be collected;
- One airborne sound monitoring station will be located at 15 m (50 ft) from the source. A second airborne data collection point will be positioned at varying distances from the source; and
- Placement of the hydrophones will be adjusted to minimize obstructions from construction materials or equipment.

Vessel-based platforms will be utilized opportunistically to allow for acoustic measurements to be collected at multiple locations based on the type and location of in-water construction activities. The exact locations will vary depending on whether impact or vibratory driving or removal is occurring. The number, locations, and methods of deployment will vary based on the targeted isopleths, measured results, and local knowledge of suitable locations that avoid conflict with Naval or civilian activities.

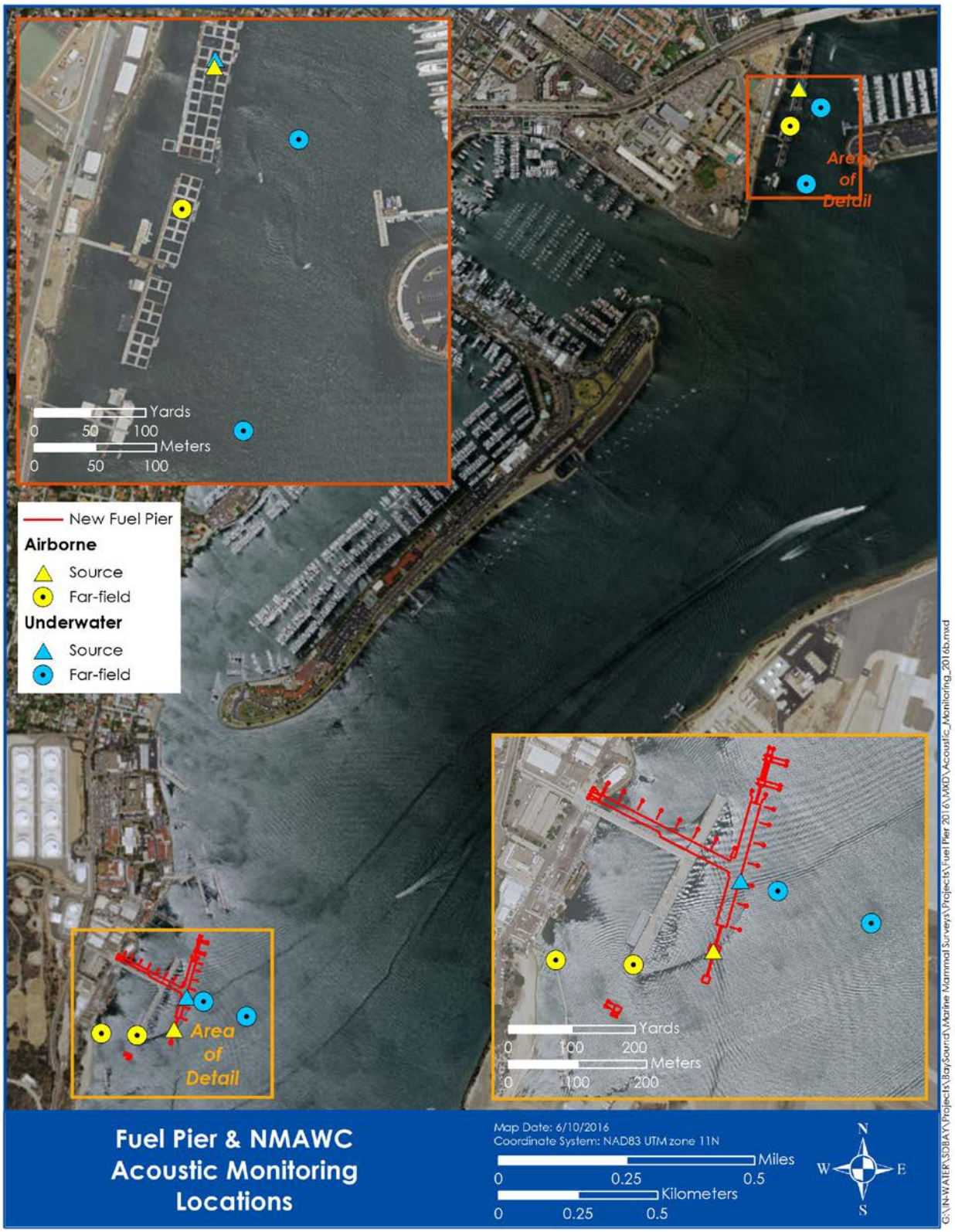

Figure 4-1. Acoustic Monitoring Locations (New Fuel Pier and NMAWC).

Hydrophone positions will be adjusted relative to the pile driving location to accommodate the projected distances to regulatory thresholds. Additional systems will be deployed from anchored vessels at various locations along the predicted outer limits of the injury and behavioral ZOIs for pile installation or caisson demolition.

Vessels will serve as marine species monitoring platforms for monitoring of pile driving of steel pipe piles and during fender pile driving and removal activities, when pier-based observation isn't sufficient to obtain an effective vantage point. In the event that acoustic monitoring is completed for a specific event, vessels will remain on-site for the duration of the marine mammal monitoring effort.

For acoustic recording sessions, reporting of sound pressure levels and required reporting metrics will be based on post-processed data at the appropriate frequency range. Use of the Hydro DB USLM and LD 831 SLM will be used to display an approximate real time output of the sound pressure levels received by the hydrophone or microphone and validate Level A/B threshold distances.

During all vessel-based recordings, the vessel will be anchored and the engine off. Recording will be made for the duration of each individual pile. GPS positions will be logged for each recording position.

In summary, acoustic monitoring includes the following components:

- Each hydrophone (underwater) and microphone (airborne) will be calibrated at the start of the monitoring time frame and all applicable systems will be checked at the beginning of each day of monitoring activity;
- Environmental data would be collected including but not limited to: wind speed and direction, air temperature, humidity, surface water temperature, water depth, wave height, weather conditions and other factors that could contribute to influencing the airborne and underwater sound levels (e.g., aircraft, boats, etc.); and
- The monitoring coordinator will supply the acoustics specialist with the substrate composition, hammer model and size, hammer energy settings and any changes to those settings during the piles being monitored, depth of the pile being driven, and blows per foot for the piles monitored.

Hydroacoustic specific:

- For underwater recordings, SLM systems will follow methods in accordance with NMFS most recent guidance (NMFS 2012) for the collection of source levels;
- For each monitored location, a hydrophone will be deployed at mid-depth in order to evaluate site specific attenuation and propagation characteristics;
- Hydroacoustic monitoring will occur near the predicted ZOIs for Level A/B harassment ZOIs sufficient to document ZOI distances. Hydroacoustic monitoring will be conducted

for the 24×30 concrete fender piles, as well as for removal activities using diamond saw cutting of 84-in caissons adjacent to the new fuel pier, and the temporary mooring dolphin to the south of the old pier. The resulting data set will be analyzed to examine and confirm sound pressure levels and rates of transmission loss for each separate in water construction activity that was not sufficiently validated during previous IHA periods. With NMFS' concurrence, these metrics will, if needed, be used to recalculate the limits of Level A and Level B isopleths, and to make corresponding adjustments in marine mammal monitoring of these zones;

- Hydrophones will be located to best assess the Level A/B ZOIs using a static line deployed from a pier or stationary (temporarily moored) or drifting vessel. Locations of acoustic recordings will be collected via GPS. A depth sounder and/or weighted tape measure will be used to determine the depth of the water at the hydrophone deployment site. The hydrophone will be attached to a weighted nylon cord to maintain a constant depth;
- The SPLs will be monitored in real time by observing the 90% dB rms variable on the Hydro DB USLM during each pile driving event, if source SPLs are greater than 180 dB rms for a specific construction activity. Acoustic data recordings will be post-processed to determine maximum rms SPLs. Sound levels will be measured in Pascals which are easily converted to dB; and
- Ambient underwater conditions will be not be measured as part of this phase of the new Fuel Pier construction. Data from the previous three data collection cycles (IHA #1 [2013/2014]. IHA #2 [2014/2015], and IHA #3 [2015/2016]), is sufficient to show that ambient conditions in San Diego Bay exceed the 120 dB rms regulatory threshold.

Airborne specific:

- For airborne recordings, to the extent that logistics and security allow, reference recordings will be collected at approximately 15 m (50 ft) from the source via a sound meter with integrated microphone. Other distances may also be utilized to obtain better data if the signal cannot be clearly isolated due to other sound sources (i.e., barges or generators); and
- Airborne levels would be recorded as unweighted in dB and the distance to marine mammal behavioral disturbance thresholds would be calculated.

5 ACTIVITIES ASSOCIATED WITH EACH SUBSEQUENT IHA

The Navy will apply for subsequent IHAs, as necessary, to cover in-water construction and demolition activities scheduled for each production year (October 8 to October 7). Construction-related activities, including production pile driving, for this IHA will start in October 2016. Activities to be monitored under subsequent IHAs will include any remaining demolition or production pile driving that was not completed under the current IHA. Each subsequent IHA Application will update the estimated numbers and types of piles to be installed/extracted based on the final pier design and progress made during the previous IHA period(s). Components associated with the Fuel Pier demolition/construction will be evaluated and included as part of each subsequent IHA application.

6 INTERAGENCY NOTIFICATION

The Navy anticipates that the monitoring zones may be modified as a result of acoustic data obtained during the monitoring period, and to reflect other conditions related to construction activities and marine mammal species occurrence. In the event that the Navy needs to immediately modify terms of this monitoring plan (e.g., if source levels and measured isopleths differ substantially from modeled results), a NMFS representative will be promptly contacted for discussion of the requested modification.

In addition, if the Navy finds an injured, sick, or dead marine mammal, the Navy will notify NMFS as quickly as possible. The MMO who initially sighted the animal will notify the Navy project biologist who will inform the NBPL stranding coordinator of the injured, sick, or dead marine mammal. The NBPL stranding coordinator will then notify the NMFS west coast stranding coordinator of these sightings and a decision will be made on whether to collect the animal. If the marine mammal's condition is determined to be a direct result of the project, additional notification would be made to NMFS headquarters (Ben Laws, 301-427-8425). The Navy will provide NMFS with a data sheet detailing the species or description of the animal(s), the condition of the animal (including carcass condition if the animal is dead), location, the date and time of first discovery, observed behaviors (if alive), and photo or video (if available).

Care should be taken in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death, if that occurs. In preservation of biological materials from a dead animal, the finder (i.e. the MMO) has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed.

7 REPORTING

A draft report would be submitted to NMFS within 45 calendar days of the completion of acoustic measurements and marine mammal monitoring. The results would be summarized in graphical form and include summary statistics and time histories of sound values for each pile. A final report would be prepared and submitted to the NMFS within 30 days following receipt of comments on the draft report from the NMFS. At a minimum, the report shall include:

- General data:
  - Date and time of activities.
  - Water conditions (e.g., sea-state, tidal state).
  - Weather conditions (e.g., percent cover, visibility).
- Specific pile data for acoustically monitored piles:
  - Description of the activities being conducted.
    - Size and type of piles.
    - The machinery used for installation or removal.
  - The power settings of the machinery used for installation or removal
- Specific acoustic monitoring information:
  - A description of the monitoring equipment.
  - The distance between hydrophone(s) and pile.
  - The depth of the hydrophone(s).
  - The physical characteristics of the bottom substrate where the piles were driven or extracted (if possible).
  - Acoustic data (per Section 3 above) for each monitored pile and activity.
- Pre-activity observational survey-specific data:
  - Dates and time survey is initiated and terminated.
  - Description of any observable marine mammal behavior during monitoring.
  - If possible, the correlation to underwater sound levels occurring at the time of the observable behavior.
  - Actions performed to minimize impacts to marine mammals.
- During-activity observational survey-specific data:
  - Description of any observable marine mammal behavior during monitoring.
  - If possible, the correlation to underwater or airborne sound levels occurring at the time of this observable behavior.
  - Actions performed to minimize impacts to marine mammals.

  - Times when pile extraction is stopped due to presence of marine mammals within the shutdown zones and time when pile driving resumes.
- Post-activity observational survey-specific data:
  - Results, which include the detections of marine mammals, species and numbers observed, sighting rates and distances, behavioral reactions within and outside of safety zones.
- A refined take estimate based on the number of marine mammals observed during the course of construction.

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