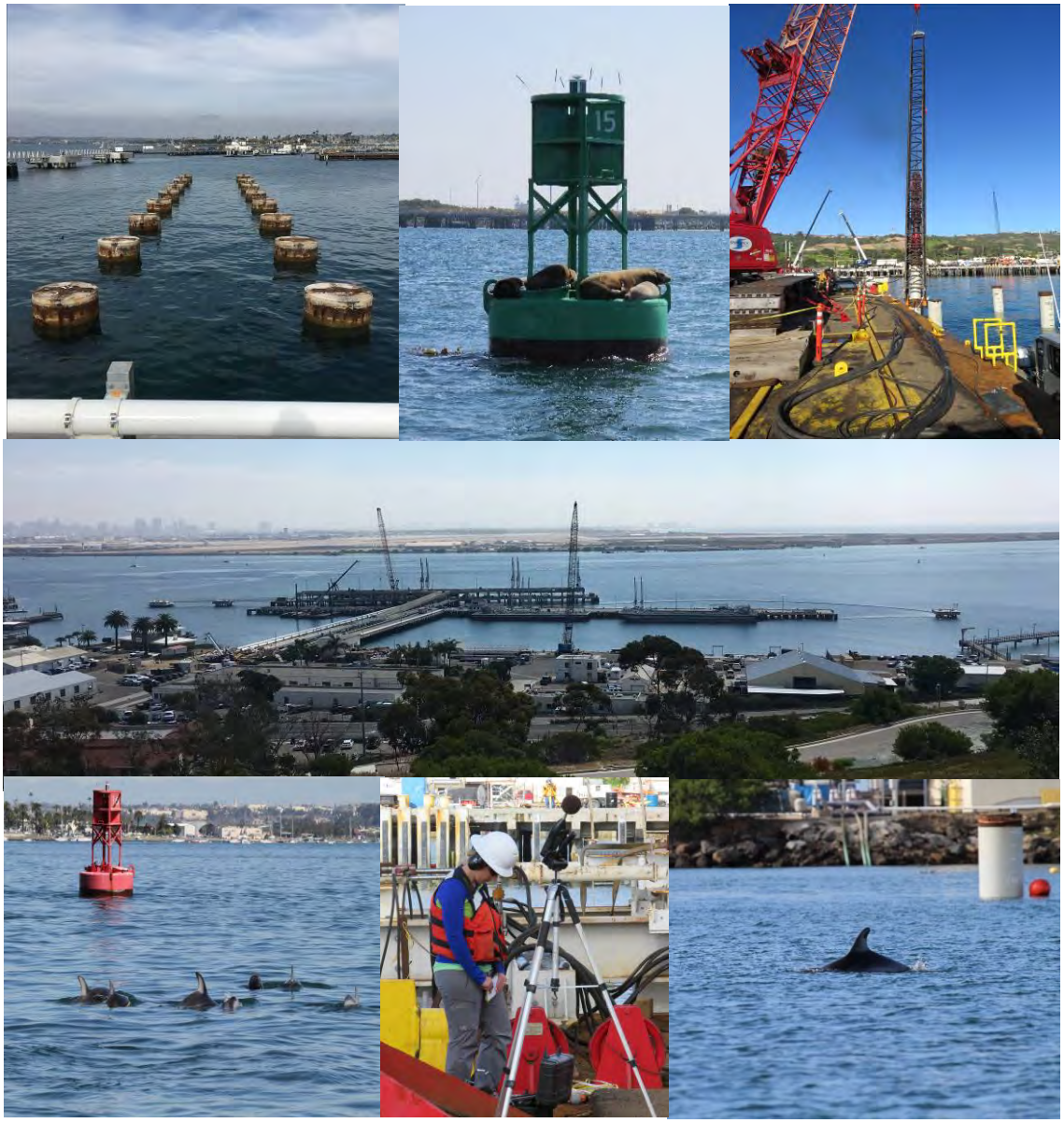
MONITORING REPORT for
FUEL PIER REPLACEMENT PROJECT (P-151)
NAVAL BASE POINT LOMA, SAN DIEGO, CA
8 October 2016 to 30 April 2017

Including MMPA IHA (Acoustics and Marine Mammals) and ESA (Green Sea Turtle, and California Least Tern) Requirements



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Prepared for:

Naval Facilities Engineering Command Southwest
Coastal Integrated Products Team
2730 McKean Street, Building 291
San Diego, California 92101
Point of Contact: Mr. Mitch Perdue, Senior Biologist

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Prepared by:

Tierra Data Inc.
10110 W. Lilac Road
Escondido, California 92026

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Acronyms and Abbreviations

%	percent
°	degrees
°C	degrees Celsius
°F	degrees Fahrenheit
µPa	microPascals
APE	American Piledriving Equipment, Inc.
AT	Acoustic Technician
BD	Boat Driver
BSS	Beaufort Sea State
DA	Database Administrator
DT	Database Technician
dB	decibel
DHS	Department of Homeland Security
DPS	Distinct Population Segment
EA	Environmental Assessment
EBBCO	Everingham Brothers Bait Company
ESA	Endangered Species Act
FS	Field Supervisor
ft	feet
ft-lbs	foot-pounds
HTI	High Tech, Inc
Hz	hertz
IHA	Incidental Harassment Authorization
IPP	Indicator Pile Program
kHz	kilohertz
km	kilometers
LD	Larson Davis
LZ_{eq}	Level Z weighted (unweighted), equivalent
LZF_{max}	Level Z weighted (unweighted), maximum fast
LZF_{peak}	Level Z weighted (unweighted), peak fast
m	meters
Mag Si	Magnetic Silencing facilities
MMO	Marine Mammal Observer
MMPA	Marine Mammal Protection Act
MOU	Memorandum of Understanding
mph	miles per hour
NAVFAC SW	Naval Facilities Command Southwest
Navy	U.S. Navy
NBPL	Naval Base Point Loma
NMAWC	Naval Mine and Anti-Submarine Warfare Center

Acronyms and Abbreviations (continued)

NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PM	Project Manager
Project	Fuel Pier Replacement Project
PSD	Pressure Spectral Density
psi	pounds per square inch
QA/QC	Quality Assurance/Quality Control
re 1 µPa	referenced to one microPascal
re 20 µPa	referenced to 20 microPascals
rms	Root Mean Square
SEL	Sound Exposure Level
SEL_{cum}	Cumulative SEL
SLM	Sound Level Meter
SPL	Sound Pressure Level
Tern	California least tern
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
USLM	Underwater Sound Level Meter
ZOI	Zone of Influence

1.0 Introduction

This report summarizes the monitoring efforts that the U.S. Navy (Navy) was required to undertake during the construction of the Fuel Pier Replacement Project (Project) at Naval Base Point Loma (NBPL) in San Diego, California (Figure 1-1). The monitoring was conducted in compliance with the Marine Mammal Protection Act (MMPA) Incidental Harassment Authorization (IHA), the Magnuson-Stevens Fisheries Management Council Act, and the Endangered Species Act (ESA).

The dates associated with IHA #4 for the Project included all available working days from 8 October 2016 to 7 October 2017; however, this report covers the period from 8 October 2016 to 30 April 2017. No in-water pile driving activities are authorized between 1 May 2017 to 15 September 2017 due to the California least tern (Tern; *Sternula antillarum browni*) breeding/nesting season. Demolition activities will continue during this timeframe; however, remaining pile driving will not resume until 16 September 2017. All Project-related monitoring conducted between 1 May and 7 October 2017 will be documented in an addendum to this report.

Pursuant to the National Environmental Policy Act, an Environmental Assessment (EA) was finalized and a Finding of No Significant Impact was issued for the Project dated June 2013 (Navy 2013). The Navy was also required to consult with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) regarding the potential impact to marine mammals, green sea turtles (*Chelonia midas*), and California least terns from in-water noise created by pile driving, and noise created by demolition activities. The EA and consultations with NMFS and USFWS provided avoidance, minimization, and monitoring measures, including defining the acoustic footprint generated from the construction activities, monitoring marine mammals before, during and after in-water construction, and limiting in-water activities to non-nesting periods.

1.1 Project Description

1.1.1 Project Location

The old fuel pier at NBPL is over 100 years old and is not consistent with current standards (including seismic and California State Lands Commission safety standards). The poor condition of the existing fuel pier was noted in the Navy Region Southwest, Port Operations Shore Infrastructure Plan, dated April 2009 (Navy 2010). The pier serves as a fuel depot for loading and unloading tankers, Navy replenishment vessels, Department of Homeland Security (DHS), Department of Defense, and foreign Navy vessels. In addition to the poor condition of the structure itself, the existing fuel pier has reached a maximum capacity for the deeper outer berth, resulting in vessels being turned away due to a lack of available docking and mooring space. It is anticipated that future classes of ships would generally be more multi-purpose, require more frequent fueling, and further increase the fuel capacity loading requirement for the new replacement fuel pier (Navy 2010). The fuel pier at the NBPL is critical to the mission of the Navy and is the largest active Navy fueling facility in southern California.

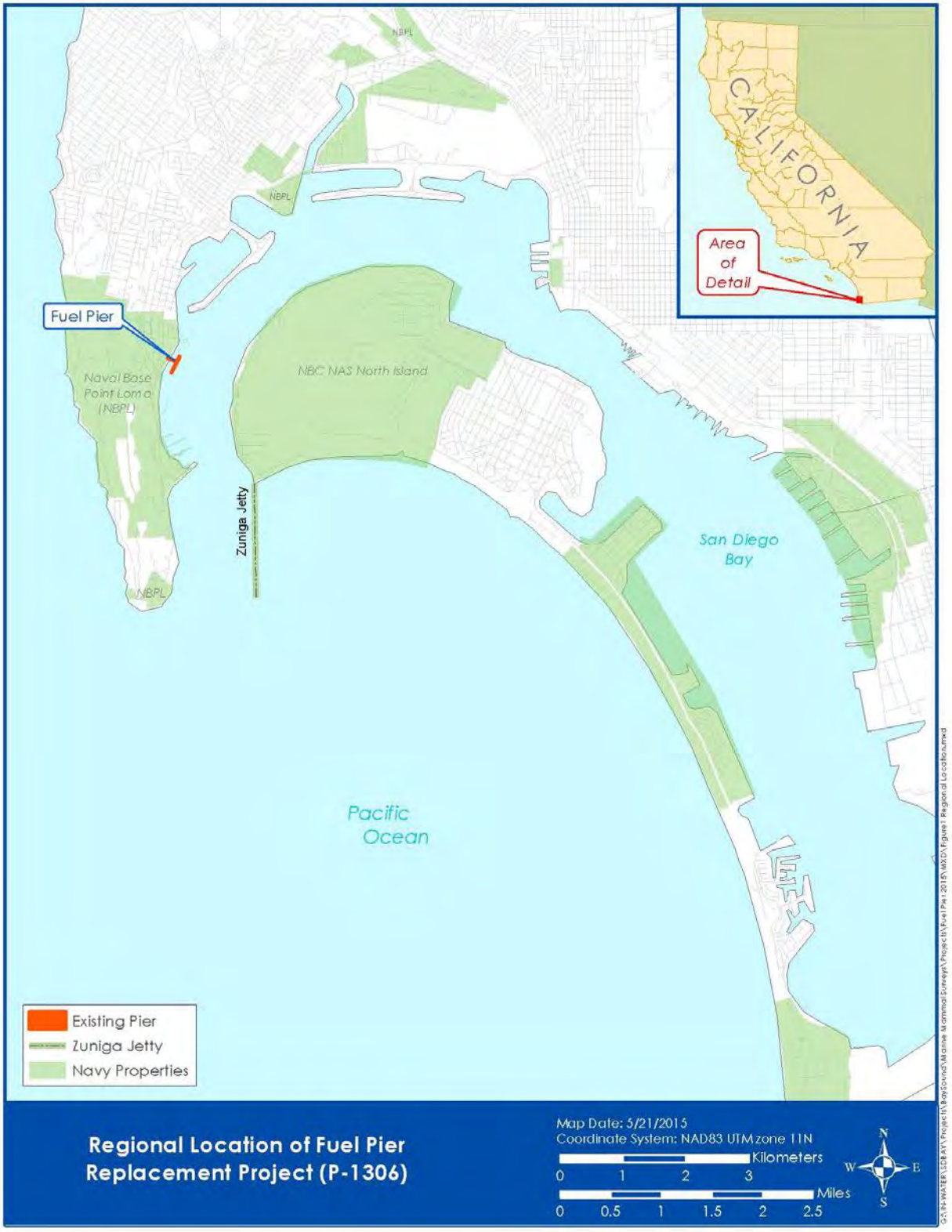

Figure 1-1. Regional Location of the Fuel Pier Replacement Project.

The purpose of the Project is to replace the aging and seismically deficient fuel pier with a new pier capable of fueling existing and future classes of naval vessels and would meet current California State Lands Commission Marine Oil Terminal Engineering and Maintenance Standards regulations. It would also meet projected Navy and Coast Guard ship fueling requirements and ensure that the Navy and DHS have adequate and safe ship fueling facilities now and in the future. Through improved safety features, fuel reception, and delivery capability, the Navy and DHS would be able to accomplish their missions of security and national defense (Navy 2013).

The Project is being phased in over a five-year timeline and has approximately one year remaining to completion. The first phase involved the temporary relocation of the Navy Marine Mammal Program enclosures close to the new fuel pier to the Naval Mine and Anti-Submarine Warfare Command (NMAWC) location, and the Indicator Pile Program (IPP) for the Project (Figure 1-2). The second phase of the Project included the completion of the pile driving for the IPP, and installation of steel structural piles for the new fuel pier decking. The third phase involved driving a portion of the new fuel pier fender pile system. The fourth phase (detailed in this report) included pile driving of fender piles and dolphin piles for the new fuel pier, including two IPP piles, as well as demolition of the old fuel pier. The final phase of construction will entail relocation, and driving, of concrete piles at the NMAWC docking facilities to their original configuration as well as bringing back the Navy's Marine Mammal Program enclosures to the docks and piers in the vicinity of the new fuel pier.

1.1.2 In-Water Construction and Demolition Activities Under IHA #4 (8 October 2016 to 30 April 2017)

1.1.2.1 Equipment

1.1.2.1.1 Production Pile Driving

The same crane/barge system was used throughout the pile driving efforts. This included a Manitowoc 888 hydraulic crawler crane with a 60.9-meter (m; 200-foot [ft)]) boom secured to a 54.9×15.2×3.7 m (180×50×12 ft) spud barge, and a 48.8×12.2 m (160×40 ft) flat deck material barge.

Pile driving equipment varied depending on the type of piles being driven. Three types of piles were driven during the timeframe discussed in this report, including: 30-inch steel piles, 24-inch by 30-inch (24×30) concrete piles, and a 16-inch poly-concrete pile. Four hammer systems (one vibratory and three impact hammers) were used. Vibratory and impact hammers were used to drive the 30-inch steel piles; different impact hammers were used to drive the 24×30 and 16-inch piles. All piles were driven one at a time, and only one hammer was lifted and utilized at any one time with the second hammer serving as a backup to the primary hammer.

Figure 1-2. Map of the Project Areas.

High pressure water jetting was used to "pre-drill" holes for the 24×30 piles through the hardened Bay Point Formation (approximately 20 to 40 m [66 to 132 ft] below the mudline).

- 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) was used to initially drive the 30-inch piles.
- An APE single action diesel impact hammer (model D62-22), with energies of between 78,956 foot-pounds (ft-lbs) and 153,770 ft-lbs was used to complete the driving of the 30-inch piles. The hammer utilized for most of the impact pile driving was fitted with a hydraulic tripping cylinder with four adjustable power settings that could be reset while driving. A backup D62-22 DELMAG impact hammer was fitted with a manual trip and was used when issues arose with the primary impact hammer.
- An APE single action diesel impact hammer (model D80-42), with energies of between 127,008 ft-lbs and 198,450 ft-lbs was used to drive the 24×30 piles. An APE single action diesel impact hammer (model D25-32), with energies of between 29,484 ft-lbs and 58,245 ft-lbs was used for the single 16-inch pile. These hammers were fitted with a manual power level modulator and shut off trip.
- For the 24×30 piles, three different water jetting techniques were used to break through the Bay Point Formation that impeded pile driving efforts. The 16- and 30-inch piles were driven through the formation without jetting. The different jetting techniques included: a pipe that used a single nozzle, a modified 24-inch square spud pile (a pile that is normally used to keep barges in place) with four nozzles welded to the tip, and 2-inch piping built into the middle of the 24×30 piles. All three techniques used high pressure water to form a hole through the Bay Point Formation so that the 24×30 piles could be driven more easily.

1.1.2.1.2 Demolition

Demolition of the in-water portions of the old fuel pier used several different types of equipment including a wire saw, pile clipper, and two types of sediment removal techniques. The equipment specifications are provided below:

- Caisson cutting utilized a Mactech DWS-102l 102-inch inline hydraulic feed diamond wire saw (Photo 1-1a) that was positioned using a Link-Belt RTC 8065 extendable boom crane. The saw was set up on one side of the caisson with constant pressure applied via the saw, or the pressure could be modulated via a manual lever on an associated barge. The caissons were then removed via a second crane and placed on a barge for removal from the site.
- Sediment removal occurred if the wire saw was unable to get close enough to the mudline to meet requirements to cut the caissons at the mudline. High pressure hoses, or an "airlift" system, were used to remove sediment, if necessary. Appendix A provides a full description of the techniques used and monitoring results for sediment removal activities.
- Pile clipping used a Prime® Concrete Pile Cutter (Model 24) with a hydraulically actuated blade that cut through the piles using approximately 3,000 pounds per square inch of pressure (Photo 1-1b). The clipper was placed over the pile using a Link-Belt RTC 8065 extendable boom crane. The piles were then removed via a second crane and placed on either a truck or a barge for removal from the site.

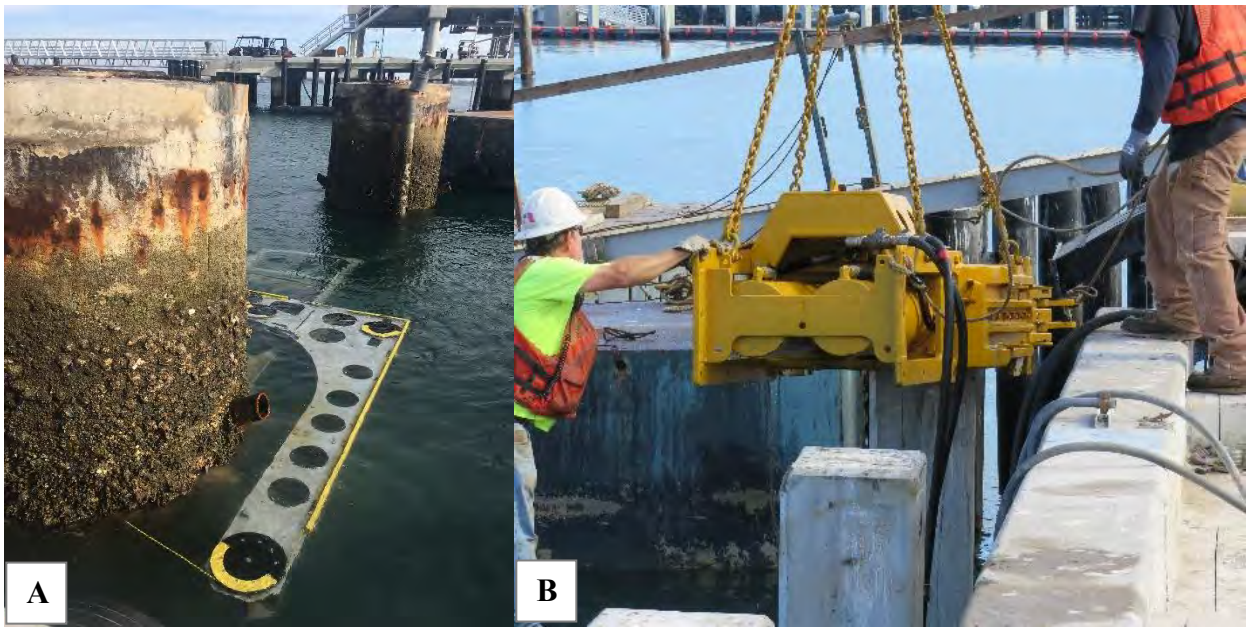

Photo 1-1. Wire Saw (a) and Pile Clipper (b) used During Demolition Activities of the Old Fuel Pier.

1.1.2.2 Construction and Demolition Activities

1.1.2.2.1 Production Pile Driving

Production pile driving during the 8 October 2016 to 30 April 2017 timeframe included multiple non-overlapping episodes of pile driving activities utilizing vibratory and impact hammers during the installation of 68 piles of multiple sizes and types over the course of 34 days. Structural piles were installed for two dolphins to the south of the new fuel pier, fender piles were installed on the east and west sides of the new fuel pier as well as on one of the dolphins (Photo 1-2), and a single 16-inch poly-concrete pile (concrete pile lined with a polycarbonate outer sheath) was driven on the west side of the pier. The combination of breasting and mooring dolphins to the south and the mooring dolphins to the north of the new fuel pier enable the overall size of the pier to be smaller while accommodating the mooring/securing of larger vessels during fueling operations. Fender piles were installed on the east and west sides of the new pier as well as on the breasting dolphin. (Photo 1-2).

In-water pile driving was conducted exclusively from a barge-based crane with controls for pile driving located on either the barge itself or on the new fuel pier, depending on the pile location. Over the course of those 34 days, from less than one to eight piles were driven per day.

Photo 1-2. Photo of the Breasting and Mooring Dolphin Piles Looking South Towards Point Loma.

Table 1-1 provides a summary of pile driving based on the individual pile type. The number and locations of installed piles included:

- One 16-inch diameter poly-concrete fender pile was driven along the western side of the new fuel pier. This pile was approximately 27 m (88 ft) long and was not considered to be a structural pile. The pile was driven using an impact hammer (model D25-32).
- Forty-three 24-inch by 30-inch (24×30) concrete fender piles were driven on the perimeter of the new fuel pier (27 piles) and on the east and west sides of the breasting dolphin (16 piles). These piles were 29 m (96 ft) long and were not considered to be structural piles. The piles were all driven using only an impact hammer (model D80-42). Prior to pile driving, high pressure water jetting was used to create guide holes for these piles.
- Twenty-four 30-inch diameter, 1/2-inch-thick, steel pipe piles were driven as part of the two dolphins to the south of the new fuel pier. These were structural piles; 2 were plumb (vertical) piles that were 41 m (135 ft) long, 6 were plumb piles that were 29 m (95 ft) long, and 16 were batter (angled) piles that were 39 m (127 ft) long. The two longer plumb piles were driven as part of the IPP and had sensors attached to them to assess load capabilities. The batter piles provide lateral stabilization when ships are moored for fueling operations. These piles were initially driven using the vibratory hammer followed by an impact hammer (model D62-22).

Table 1-1. Summary of Pile Driving.

Pile Size and Type	Pile Driving Date Ranges	Number of Piles	Days of Pile Driving
24×30 Concrete Fender (New Fuel Pier)	08 Oct 2016	3	1
16-inch poly-concrete	26 Oct to 27 Oct 2016	1	2
24×30 Concrete Fender (New Fuel Pier)	08 Dec to 15 Dec 2016	24	5
30-inch Steel (Plumb)	01 Feb to 22 Feb 2017	8	6
30-inch Steel (Batter)	28 Feb to 23 Mar 2017	16	14
24×30 Concrete Fender (Breasting Dolphin)	03 Apr to 14 Apr 2017	16	6
TOTAL		**68**	**34**

1.1.2.2.2 Demolition

Demolition during the 8 October 2016 to 30 April 2017 timeframe involved the removal of caissons from the north side of the old fuel pier, as well as removal of several different structural and fender pile sizes under, and adjacent to, the south and north sections of the old pier (Table 1-2). The trestle and northern section of the old fuel pier were built using caissons as the main structural support, with fender piles installed along the edges of the pier. This is in comparison to the southern portion of the old fuel pier which was built using only structural piles, with fender piles of varying sizes along the edges of the pier. Other demolition activities, including the removal of the pier deck, piping, and support beams of the old fuel pier, were not monitored because they did not involve in-water work. Demolition activities during 8 October 2016 and 30 April 2017 included:

- Eighteen 84-inch caissons were cut as part of the demolition of the north side of the pier. All caissons were cut using wire saw first at the middle of the caisson, then again at the mudline. A single caisson remains in place due to a misaligned cut during the mid-caisson cut. The cut for this caisson will be completed after 30 April 2017.
- A total of 278 piles were clipped during the period addressed in this report. The fender piles sizes and types included 14-, 18-, and 24-inch square fender piles, as well as 13-inch round polycarbonate and poly-concrete piles on both the eastern and western sides of the southern and northern portions of the old fuel pier. The structural piles were all 16-inch piles, arranged either as plumb or batter piles, under the southern portion of the old fuel pier.

Table 1-2. Summary of Demolition Activities.

Demolition Activity	Demolition Activity Date Ranges	Number of Piles/Caissons Removed	Days of Demolition
Pile Clipping[1] (Old Pier-North)	10 Oct to 14 Oct 2016	12	5
84-inch Caissons (Old Pier-North)	12 Dec 2016 to 07 Feb 2017	18[2]	27
Pile Clipping[1] (Old Pier-South)	15 Feb to 30 Apr 2017	278	37
TOTAL		**308**	**69**

Note: [1]Includes concrete piles (14-inch, 18-inch, 24-inch), and polycarbonate and poly-concrete piles (13-inch).
[2]One caisson was cut at mid-depth, but not removed. A second mid-depth cut will be required to remove the caisson, but this will occur after 30 April 2017.

1.2 Purpose of the Monitoring Program

The acoustic and marine species monitoring program was implemented, along with the avoidance and minimization measures for pile driving activities, to minimize impacts to marine species. Objectives and protocols for both were established by the Navy in the Acoustic and Marine Species Monitoring Plan for the Project as part of the IHA #4 application (Navy 2016) and submitted to NMFS for approval prior to the start of construction. The following sections outline the acoustic and marine species monitoring objectives.

1.2.1 Acoustic Monitoring of Construction Activities

1.2.1.1 Monitoring Plan Objectives

The Monitoring Plan included in the IHA #4 application (Navy 2016) provided an in-depth description of the various monitoring efforts, including protocols for the acquisition and processing of both underwater and airborne sounds during the proposed in-water construction activities. The objectives in the Monitoring Plan were broadly stated based on the proposed actions described in the EA (Navy 2013). The objectives were refined based on the methods for in-water construction proposed for the production pile driving phases and include the continued collection of *in situ* data to validate the Level A and Level B Zone of Influence (ZOI) based on the transmission loss model (Dahl et al. 2012) utilizing approved instrumentation.

1.2.1.2 Overview of the Acoustic Monitoring Program

Multiple acoustic data collection systems were utilized to accomplish the objectives of the Monitoring Plan submitted in the IHA #4 application (Navy 2016) and to record both underwater and airborne sound levels for the various in-water construction activities. Airborne and hydroacoustic sound data acquisition equipment used during the 2016/2017 Project production pile driving year used many of the same sound level meters (SLMs) and hydrophone/microphone configurations used during the previous years of the Project pile driving. For underwater noise monitoring, an emphasis was placed on data collection using the Hydro DB Underwater Sound Level Meter (USLM) instrument developed by the University of Washington Applied Physics Laboratory. The Hydro DB USLM provided the capability to document and record real time decibel (dB) root mean square (rms) SPLs for each separate sound-producing, in-water, construction activity at graduated distances from pile locations to verify

modeled SPLs for individual ZOIs. In addition to the USLM, a Loggerhead® DSG-ocean acoustic autonomous data logger was used to record source values (from 10 m [33 ft]) as a backup to the USLM system; however, all data from the USLM system was used, and the Loggerhead data was archived. All airborne sound measurements were collected using a Larson-Davis LD 831 SLM unit to verify the 100 dB and 90 dB isopleths. The various types of SLMs enabled implementation of adaptive data collection approaches for the various sizes, types and locations of both in-water and airborne construction activities, and allowed for internal consistency checks of measured rms SPLs.

Acoustic monitoring data collection efforts were relatively consistent among the various phases of pile driving or demolition activities. Acoustic monitoring equipment, means, and methods provided consistent results and served to effectively determine SPLs and applicable ZOIs while meeting the IHA's (NMFS 2016) reporting requirements and maintaining consistency with National Oceanic and Atmospheric Administration (NOAA) guidance. Additionally, the complexity of each individual site and pile locations warranted adjustments to monitoring locations and equipment settings.

1.2.1.2.1 Acoustic Terminology

This report uses specialized terminology related to underwater sound and technical aspects of the monitoring program. Terminology is described below:

- SPL: Sound pressure is the force per unit area, usually expressed in microPascals (µPa), where 1 Pascal equals 1 Newton exerted over an area of 1 square meter. The SPL is expressed in dB as 20 times the logarithm to the base 10 of the ratio between the pressure exerted by the sound to a referenced sound pressure. SPL is the quantity that is directly measured by a SLM.
- Underwater sound pressure: SPL in dB is referenced to one microPascal (re 1 µPa), unless otherwise stated.
- Airborne sound pressure: SPL in dB is referenced to 20 microPascals (re 20 µPa), unless otherwise stated.
- Frequency: Frequency is expressed in terms of oscillations, or cycles, per second. Cycles per second are commonly referred to as hertz (Hz). Typical human hearing ranges from 7 Hz to 20 kilohertz (kHz).
- Peak sound pressure: the instantaneous maximum of the absolute positive or negative pressure over the frequency range from 7 Hz to 20 kHz and is presented as dB re 1 µPa.
- Root Mean Square SPL: For impact pile driving, characterizes overall dB rms levels by integrating sound for each waveform across 90 percent (%) of the acoustic energy in each wave and averaging all waves in the pile-driving event. This value is referred to as the rms 90%. With this method, the time averaging per pulse varies.
- Sound Exposure Level (SEL): is a measure of energy. Specifically, it is the dB level of the time integral of the squared-instantaneous sound pressure, normalized to a 1-sec period. It can be an extremely useful metric for assessing cumulative exposure because it enables sounds of differing duration, to be compared in terms of total energy. The accumulated SEL (SEL_{cum}) is used to describe the SEL from multiple events (e.g., many pile strikes). This can be calculated directly as a logarithmic sum of the individual single-strike SELs for the pile strikes that were used to install the pile.

- Level Z weighted, equivalent (LZ_{eq}): LZ_{eq} is a value recorded by the SLM that represents SEL SPL over a specified time or interval. The LZ_{eq} is most typically referred to in 1-second intervals or over an entire event in this report.
- Level Z weighted, fast (LZF_{max}): LZF_{max} is a value recorded by the SLM that represents the maximum rms value recorded for any 125-millisecond time frame during each individual recording.
- Level Z weighted, fast (LZF_{peak}): LZF_{peak} is a value recorded by the SLM that represents the peak rms value recorded over a specified time or interval

1.2.2 Marine Species Monitoring

1.2.2.1 Monitoring Plan Objectives

The Monitoring Plan provided with the IHA #4 application (Navy 2016) provides an in-depth description of the various monitoring efforts for marine species, including timeframes, data acquisition requirements, and protocols for marine species monitoring. Objectives associated with marine species monitoring during the fuel pier construction and demolition include:

- Enumeration of the number and types of species identified relative to the Project time frame;
- Validate modeled ZOIs for pile driving activities and implement amended marine species monitoring stations, if required; and
- Minimization of the potential impacts of the Project on those species, while still allowing the project to achieve the projected construction milestones.

1.2.2.2 Overview of the Marine Mammal Monitoring

Marine mammals identified in the IHA #4 application and the Monitoring Plan (Navy 2016) with the potential to occur in San Diego Bay during the project timeframe included:

- Harbor seals (*Phoca vitulina*),
- California sea lions (*Zalophus californianus*),
- Bottlenose dolphins (*Tursiops truncatus*),
- Common dolphins (*Delphinus* sp.),
- Northern elephant seals (*Mirounga angustirostris*),
- Pacific white-sided dolphins (*Lagenorhynchus obliquidens*),
- Risso's dolphins (*Grampus griseus*), and
- Gray whales (*Eschrichtius robustus*).

Because the two common dolphin species (long-beaked [*D. capensis*] and short-beaked [*D. delphis*]) are easily misidentified in the field, and the species have overlapping habitat preferences, all references to “common dolphins” assume that any sighting could be of either species. Other federally protected marine species anticipated to occur during this project included the green sea turtle and Terns.

1.2.2.2.1 Production Pile Driving

During pile driving efforts, marine mammal monitoring was conducted before, during, and after pile driving activities within the modeled ZOIs for potential Level A (physical injury) and Level B (behavioral disturbance) harassment thresholds (Table 1-3). The marine mammal monitoring

evaluated sightings relative to the type and number of species exposed to underwater and airborne sound levels that would constitute "takes" under the MMPA (see the applications for IHA #4 [Navy 2016] for a definition of "take" under the MMPA). Marine Mammal Observers (MMOs) documented the presence of any marine mammal species in the project area and recorded potential disruptions to behavioral patterns that might constitute Level B harassment. The MMOs also identified marine species that might enter the Level A harassment ZOI during new fuel pier construction. The number and locations of MMOs changed relative to the pile size/type and the corresponding Level A/B ZOIs, with the larger of the monitoring efforts for the 30-inch piles due to a larger Level B ZOI.

Table 1-3. Injury and Disturbance Thresholds for Underwater and Airborne Sounds.

Marine Mammal Group	Airborne Criteria[3, 4] (re: 20 µPa)	Underwater Criteria (re: 1 µPa)			
		Vibratory Pile Driving[1]		Impact Pile Driving[2]	
		Level A (Injury)	Level B (Behavioral)	Level A (Injury)	Level B (Behavioral)
Cetaceans	N/A	180 dB rms	120 dB rms	180 dB rms	160 dB rms
Harbors Seals	90 dB rms	190 dB rms	120 dB rms	190 dB rms	160 dB rms
All Other Pinnipeds	100 dB rms				

Notes: [1] Non-pulsed/continuous sounds
[2] Pulsed sounds
[3]Sound level at which pinniped haul out disturbance has been documented. Not an official threshold, but used as a guideline; [4] dB rms is unweighted

For the installation of the concrete piles (16-inch and 24×30) via impact pile driving, the Level B ZOIs were visually surveyed at all times based on the smaller distances to the 160 dB regulatory threshold (259 m [849 ft] and 500 m [1,640 ft], respectively). Any "take" identified during pile driving for piles of these sizes is considered as actual "take," as opposed to extrapolated "take" for larger Level B ZOIs. During 30-inch and 24×30 pile driving, the Level B ZOI extended beyond the visual range of MMOs in certain parts of San Diego Bay (estimated to be up to 700 m [2,297 ft] for all MMOs near/on the new fuel pier, and 1,500 m [4,921 ft] for the position stationed at the Magnetic Silencing facilities (Mag Si) due to the elevated position on the new fuel pier, and the use of "Big Eye" binoculars at the Mag Si position). As a result, a portion of Level B "take" associated with the 30-inch piles is actual "take," and a portion is extrapolated "take" based on the area outside of the visual range for vibratory and impact pile driving multiplied by the densities of individual species in northern San Diego Bay, and then adjusted for the amount of time for impact and vibratory pile driving. Densities were taken from data provided in the IHA #4 application (Navy 2016). Further detail on actual and extrapolated "take" is provided in Section 0.

1.2.2.2.2 Demolition and Jetting Activities

Under IHA #4, pre-construction and post-construction surveys were not required as part of the permit mitigation measures for demolition activities. Thus, visual monitoring efforts focused on the times when demolition activities (i.e., caisson cutting and pile clipping) and jetting were active, and no pre-construction or post-construction surveys took place. However, monitoring occurred between demolition/jetting activities due to the generally short duration between the activities.

1.2.2.3 Other Species Monitored

As part of consultations with the USFWS, under the ESA, monitoring of marine species also included the observation, documentation, and reporting of occurrences of the green sea turtle (*Chelonia mydas*) and Terns within the project area. Monitoring was conducted by the MMOs in conjunction with monitoring of marine mammal species. Monitoring was conducted before, during, and after in-water construction activities following standard protocols and observational descriptors defined in IHA #3, and consistent with the methods implemented during the Indicator Pile Program and previous IHAs for this project. Updates on Tern arrival and nesting progress to nearby Navy installations was provided by the Navy contractor technical representative and integrated into daily briefings of MMOs. In addition, the monitoring program was designed to document the foraging success of Terns in the project area during the beginning of the Tern breeding season.

1.2.2.3.1 California Least Tern

The Tern is a small migratory bird with long, narrow wings and a broad, forked tail. The species is listed as endangered under the Federal ESA, as well as the California state ESA. The species establishes nesting colonies on sandy soils with little vegetation along the coast of California, including San Diego Bay. Nesting sites are located at Naval Air Station North Island and Naval Base Coronado, as well as other locations at Lindberg Field, San Diego Bay National Wildlife Refuge (D Street Fill/Sweetwater Marsh Unit, South San Diego Bay Unit), and Chula Vista Wildlife Reserve (Frost 2016). The Tern forages both in the bay and offshore, where they plunge-dive for small fish (e.g., anchovies and silversides; Atwood and Minsky 1983; Frost 2016). The Navy and Port of San Diego have been monitoring Tern nesting and foraging locations in the bay for over 40 years.

The Navy has entered into a Memorandum of Understanding (MOU) with USFWS that summarizes commitments to Tern conservation and enhancement in San Diego Bay. In accordance with the MOU, in-water construction activities in designated foraging zones during 1 April to 15 September require prior consultation with the USFWS. The Navy conducted an informal consultation with the USFWS under Section 7 of the ESA for the Project, obtaining concurrence to allow in-water construction until 30 April of each year during the project. In January 2017, a request was made to the USFWS to continue demolition work (caisson cutting and pile clipping) after 30 April 2017. During an informal follow-up consultation between the Navy and USFWS, the request was granted, and demolition work will be allowed to continue during the Tern breeding/nesting season.

1.2.2.3.2 Green Sea Turtle

The green sea turtle is a medium sized turtle characterized by a smooth, keelless, and light to dark brown shell with dark mottling. The species is globally distributed in subtropical and tropical waters. While there have been sightings along the entire U.S. West Coast, the species more typically occurs south of San Diego, California. The breeding population in Mexico was listed as endangered in July 1978; however, in April 2016 the range-wide and breeding population listings of the green sea turtle were removed, and replaced with listings (endangered or threatened) of distinct population segments (DPS; NMFS and USFWS 2016).

The East Pacific DPS, ranging from 40º North to 40º South and encompassing much of the coast of California, is listed as threatened under the ESA. Green sea turtles migrate north and south from Mexico breeding sites to feeding grounds, primarily coastal bays and lagoons (Benson and Dutton 2012). Green sea turtles forage in San Diego Bay, primarily in eelgrass beds, with mobile and sessile invertebrates and eelgrass their major dietary components (Lemons et al. 2011). The occurrence and growth rates of green sea turtles in the bay have been strongly associated with the warm water discharge from a power plant that operated in the southern part of the bay between the 1960s and 2010 (Eguchi et al. 2010, 2012; Benson and Dutton 2012; MacDonald et al. 2012). Since decommissioning of the power plant in 2010, green sea turtles no longer aggregate in the discharge channel, but a small group of 30 to 60 sea turtles still primarily reside in the southern portion of the bay (Madrak et al. 2016; NOAA Southwest Fisheries Center 2014; San Diego Unified Port District 2016).

2.0 Methods

2.1 Overview of the Monitoring Program Methods

To fulfill the requirements of all applicable regulatory documents, data were collected on the presence of marine species as well as in-water and airborne sound during both construction and demolition activities. While the MMOs focused on marine mammals, they were also responsible for identifying protected species other than marine mammals (namely the Tern and green sea turtles). Marine species and acoustic monitoring occurred between 8 October 2016 and 30 April 2017, with the monitoring effort focused in northern San Diego Bay (see Figure 1-1 for the Project location). Monitoring locations were based on distances of both measured and modeled marine mammal behavioral and injury ZOIs, which were primarily determined using the acoustic data collected during previous years.

2.2 Project Staffing

Staff included the project manager (PM), field supervisor (FS), database administrator (DA), database technicians (DTs), MMOs, acoustic technicians (ATs), and boat drivers (BDs) (Table 2-1). Marine species observers were experienced in marine species identification, and had extensive knowledge of the biology and behavior of locally occurring marine species. Furthermore, prior to beginning their observation, all MMOs received training on the marine species likely to be present in San Diego Bay and on the specifics of the ZOIs, and the project activities likely to occur. Prior to construction and demolition activities, ATs were trained on how to use the acoustic data logging equipment as well as how to run analyses on the data collected. While personnel may have had several roles throughout the project timeframe, personnel only performed one task at a time on any given day.

2.2.1 Roles and Responsibilities

Project Manager. The PM was responsible for technical, quality assurance/quality control, and financial oversight of the monitoring project.

On-site Field Supervisor. The on-site FS role was to act as a liaison between the construction crew/managers and the project team with regards to safety, staff scheduling, and any issues that might impact monitoring efforts. The on-site FS also served as the lead MMO for any IHA compliance issues.

Command. The Command position was responsible for relaying information to the primary MMOs on the status of construction as well as signaling (and/or announcing) the need to halt construction in the even that an animal entered the “shutdown” ZOI. The position was always co-located with the construction crew. During pile driving (or co-occurring pile driving and demolition), the “Command” position also acted as a secondary observer, relaying sightings of monitored marine species to MMOs, who logged the observations on their tablets or hardcopy data sheets; however, if in relaying the position of the animal to the primary MMO, the primary MMO did not observe the individual, then the “Command” would log the sighting for the animal. Because only a single MMO was required for demolition activities (i.e., caisson and pile removal), the Command position not only tracked activity start and stop times and halted construction if an animal entered the 10 m (33 ft)

shutdown ZOI, but also recorded monitored marine species observations within their visible range. By tracking marine species near demolition activities, they were alert to their approaches in advance of an animal potentially entering the shutdown ZOI.

Marine Mammal Observers. All MMOs were experienced in marine species identification and behavior of locally-occurring species. Their primary responsibility was to identify marine species and log observations of individuals or groups of marine species. Their primary focus was on the marine mammals that occurred near construction activities, but they were also responsible for identifying Terns and green sea turtles in the project area. The MMOs were also responsible for monitoring for sediment plumes during jetting operations.

Table 2-1. Project Staff.

Company/Organization	Name	Role(s)[1]
Tierra Data, Inc.	Karen Green	PM, CC
	Todd McConchie	FS, MMO, CMND, BD, AT, DA, CC
	Mark Cotter	MMO, DT, AT, BD, CMND
	Amanda Bird	MMO
	Tamara Bryant	MMO
	Shannon Coates	MMO, CMND, BD, AT, DT
	Andrew Fredell	MMO, CMND, BD
	Brian Galvez	MMO, CMND, BD, AT, DT
	Vanessa James	MMO
	Joseph Kean	MMO
	Jim Kellogg	MMO, BD, AT, CC, DT
	Rachel Mayoras	MMO
	Sharon Valenta	MMO
	Robyn Walker	MMO
	Jenna Walls	MMO
Rincon Consultants, Inc.	Derek Lerma	Consultant
Heilprin Environmental Services, Inc	Danny Heilprin	MMO, BD, CC
Marine Taxonomic Services	Kees Schipper	MMO, BD, CC
	Antonette Gutierrez	MMO, BD
	Grace Teller	MMO

Notes: [1]PM=Project Manager; MMO=Marine Mammal Observer; CMND=Command; FS=Field Supervisor; AT=Acoustic Technician; BD=Boat Driver; DA=Database Administrator; DT=Database Technician, CC=Company Contact.

Boat Drivers. The BDs' responsibility was to convey MMOs or ATs to their designated monitoring station(s). If the station was a boat-based station, once the BD had deployed the anchor, they acted as an MMO.

Acoustic Technicians. The ATs were responsible for set up, calibration, the deployment of acoustic data collection systems, and documenting readings from field units. Acoustic data were collected from the Fuel Pier, pile driving barge, and near-/far-field boat locations depending on the construction or demolition activity. During acoustic data collection, the ATs did not act as MMOs or BDs.

Database Technician. The DTs were responsible for updating daily sightings and acoustic data to a master database that housed all of the data for the entire project. They performed a Quality Assurance/Quality Control (QA/QC) of the daily data before it was uploaded to the master database as well as updated a daily log of activities.

Database Administrator. The DA performed additional QA/QC of all of the data in the master database, as well as addressed any technical issues with the database and/or data collection equipment.

2.3 Acoustic Monitoring Program Methods

The following sections describe equipment and methods used in monitoring sound in the environment. Hydroacoustic and airborne data collection methods were based on the most current NOAA guidance at the time the Monitoring Plan was developed and included with the IHA #4 application (Navy 2016).

2.3.1 Acoustic Measurements

2.3.1.1 Acoustic Monitoring Equipment

Two separate types of hydroacoustic measurement systems were utilized to collect underwater acoustic data during construction and demolition activities. To comply with the requirement to observe Sound Pressure Levels (SPLs) in real-time during in-water construction activities, the Hydro DB USLM was primarily used to collect recordings at various locations. The Hydro DB USLM used a High Tech, Inc. (HTI) 96-min hydrophone, with 180 dB re: 1V/µPa sensitivity. The second hydroacoustic measurement system utilized Loggerhead® DSG-ocean acoustic recorders to collect data at source only. The Loggerhead device was outfitted with an HTI 96-min hydrophone and was deployed at mid-depth when used. The Loggerhead source data were collected as a backup in case data collected by the USLM were corrupted; however, the Loggerhead data were not needed and were archived.

Table 2-2. Sound Monitoring Equipment.

Item	Make	Model
DSG-Ocean acoustic data logger	Loggerhead	DSG-Ocean
Hydrophone (Loggerhead® DSG-Ocean)	HTI	96-min
Hydro DB USLM	Hydro DB	Custom
Hydrophone (Hydro DB USLM)	HTI	96-min
Sound Level Meter	Larson Davis (LD)	831
Microphone (LD SLM)	PCB	377B02
Preamplifier for microphone (LD SLM)	PCB	PRM 831
Pistonphone, Hi Pressure	ETMC Technologies	42AC

For airborne sound recordings, Larson Davis (LD) LD 831 SLM units fitted with a preamplifier (PCB PRM 831) and microphone (PCB 377BO2) were used to collect sound level recordings at source and far-field locations. Airborne sound LD 831 SLM units were affixed to tripods adjusted to a 1.5-m (5-ft) height and placed at various distances from construction activities. LD 831 SLM units recorded continuously in 1 second time-histories at 16 kHz, providing several acoustic metrics real-time and archived over the recorded observation period.

2.3.2 Instrument Calibration

Individual HTI hydrophones and PCB microphones were calibrated daily before use, and calibration tones were recorded for at least 60 seconds to establish relative received voltage sensitivity relationships needed for post-processing. Calibrations were made using an ETMC 42AC pistonphone equipped with a custom coupler designed for a 96-min hydrophone and PCB microphone (see Table 2-2). The piston phone generates a consistent 100-Pascal signal and calibrations were made at 163.9 dB re 1 µPa at 250 Hertz for each hydrophone and 134.0 dB re 20 µPa at 250 Hz for PCB microphones.

2.3.3 Acoustic Data Collection and Management

2.3.3.1 In-Water Acoustic Data Collection

Underwater SPLs were recorded within approximately 10 m (33 ft) of construction or demolition (e.g., source measurements) as well as at various distances away (far-field measurements). In all cases the measurements were recorded at a depth equal to half of the water depth. Hydroacoustic measurement systems recorded underwater sound levels from piers, barges, or vessels.

During the 8 October 2016 to 30 April 2017 monitoring period, hydroacoustic measurements were recorded to obtain underwater SPLs during demolition of 24-inch square concrete reactionary piles (pile clipping) and 84-inch concrete-filled caissons (pile cutting), as well as the installation of concrete non-structural 24×30-inch fender piles (pile jetting only). Acoustic monitoring was not conducted during impact driving of the 24×30-inch piles since recent representative data already had been collected near the end of the IHA #3 monitoring period, September and October 2016 (NAVFAC SW 2016b).

The hydroacoustic measurements during pile clipping, cutting, and jetting were recorded utilizing the “vibratory” settings on the Hydro DB ULSM. Measurements were recorded at source for each of these activities. Far-field measurements were recorded during pile cutting and jetting; far-field measurements were not recorded during clipping of the 24-inch square piles because of the short duration of the pile clipping activities (e.g., 1 to 2 minutes per pile) for the 24-inch piles. Far-field acoustic measurements during pile jetting were obtained using a vessel-based drift methodology in which the closest feasible distance to source was chosen and then the boat was allowed to drift with the tidal current away from the pile until near ambient SPLs were obtained. All other far-field measurements were either from a boat at anchor, or from piers or barges near the project area. In all cases, the measurements were recorded at a depth equal to half of the water depth. During all vessel-based sound recordings, the vessels engine and depth sounder were turned off. Positions were logged for each individual sound recording file and location.

2.3.3.2 Airborne Acoustic Data Collection

Airborne sound recordings were collected at source (15 m [49 ft]) as well as at various distances away (from 200 to 250 m [565 to 820 ft]) during the pile driving of 30-inch steel piles. The airborne measurement system was positioned with a direct line of sight to the pile and mounted approximately 1.5 m (5 ft) above the barge or pier structures (Figure 2-2). Airborne sound measurements were recorded for the entire duration for both vibratory and impact pile driving activities to determine airborne ZOIs. For IHA #4, the Level B airborne ZOIs were updated based on the 30-inch steel data since it was the largest pile driven during the 2016/2017 production year. For the previous IHA monitoring reports, the airborne ZOIs were based on the 36-inch steel piles because they were the largest piles driven in each IHA year.

2.3.3.3 Acoustic Data Management

Acoustic information was documented on hardcopy forms and then transferred to a Microsoft Access database. Information collected at the time of the recording included: date, AT initials, general morning/afternoon weather information (wind, waves, and air temperature), pile number, hydrophone location, hydrophone depth, water depth, start/end time of activity, and type of activity. These data were added to a master database that housed all acoustic and marine species data for the entire project. Data records were subject to QA/QC during data entry and printed copies for each day were archived with the original field data forms. All raw acoustic files from the USLM were saved as *.BIN and *.TXT files and all raw files from the Loggerhead were saved as *.DSG.

2.3.4 Acoustic Data Analysis

Acoustic data collected during IHA #4 were post-processed to obtain the following sound metrics and to determine appropriate transmission loss models

For in-water data collection of demolition (e.g., pile clipping and caisson cutting) and installation activities (pile jetting), the mean and maximum SPL, expressed in dB re 1 µPa, were calculated and reported. The SPLs at far-field distances (Figure 2-1) during caisson cutting and pile jetting activities became difficult to distinguish from ambient noise during real-time data collection and a reliable *in situ* distance to the Level B ZOI could not be determined. As a result, source levels recorded at 10 m (33 ft; Figure 2-1) were used to estimate the far-field distances to the Level B ZOI using the Practical Spreading Loss model. The Practical Spreading Loss model was also used in place of *in situ* data for pile clipping activities. The practical spreading loss model is the recommended method by NMFS (NOAA 2012) for estimating transmission loss near shore, because it uses conservative thresholds of received SPLs that may cause behavioral disturbance and injury to cetaceans and pinnipeds. The general formula for transmission loss is:

$$TL = B * \log_{10}(R) + C * R, \text{ where}$$

B = logarithmic (predominantly spreading) loss
C = linear (scattering and absorption) loss
R = ratio of receiver distance to source reference distance (usually 1m or 10m)

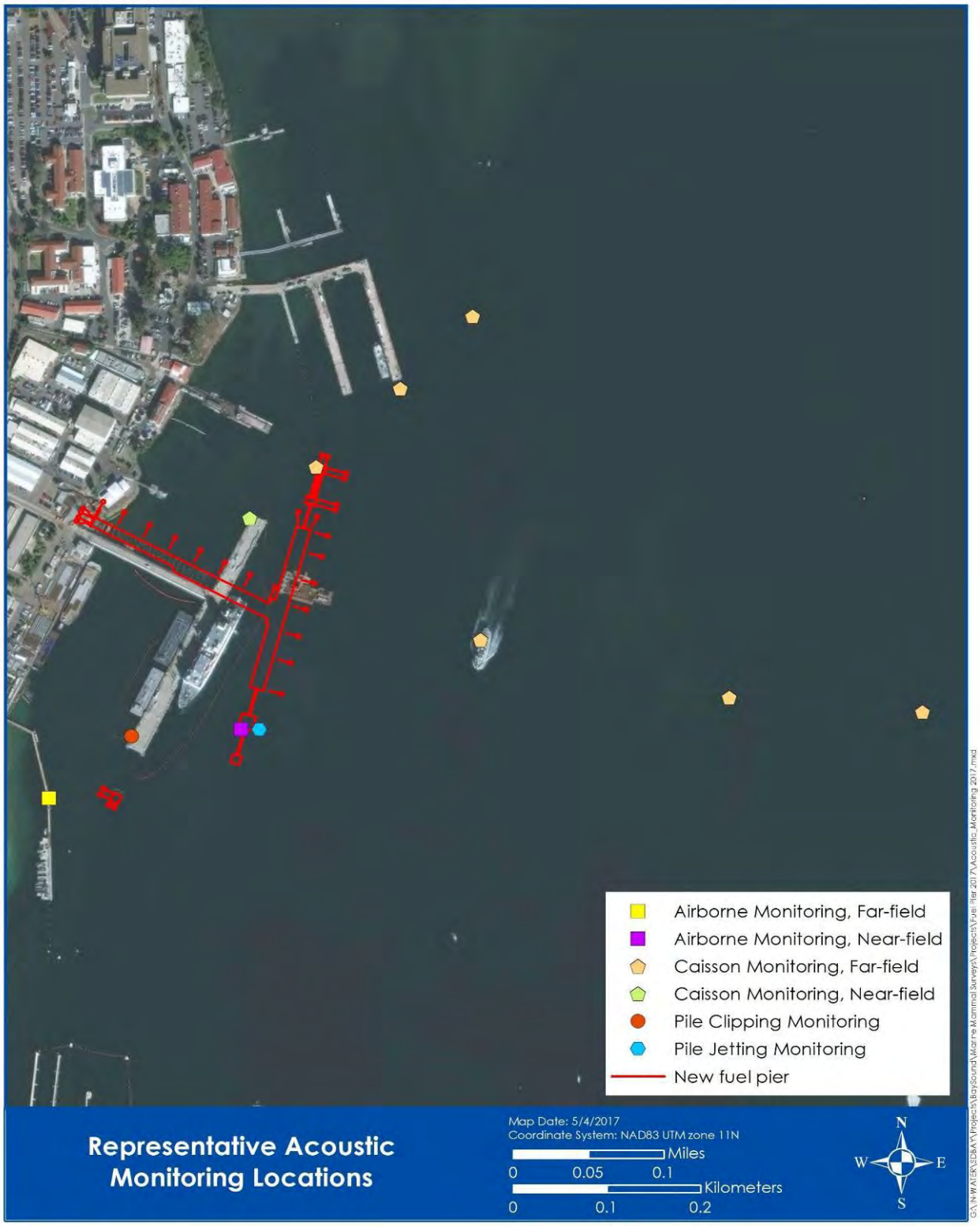

Figure 2-1. Representative Acoustic Data Collections Locations for Caisson Cutting, Pile Clipping (All Sizes), 24×30 Pile Jetting, and Pile Driving (Airborne for 30-inch steel piles).

In the transmission loss formula, the C term is strongly dependent on frequency, temperature, and depth, but is conservatively assumed to equal zero for pile driving. The B term has a value of 10 for cylindrical spreading and 20 for spherical spreading. A practical spreading value of 15 is often used in shallow water conditions where spreading may start out spherically but then ends up cylindrically in the sound in constrained by the surface and the bottom. Because of the depths and bathymetry inside northern San Diego Bay, the practical spreading loss model was used to calculate distances to the ambient noise levels in San Diego Bay (129.6 dB rms; NAVFAC SW 2015).

For airborne data collection of vibratory and impact pile driving activities, the mean and maximum values for LZ_{eq}, $LZF_{max,}$ and LZF_{peak} were calculated and reported. Using the mean of the LZF_{max} value recorded at 15 m (49 ft), and far-field locations (Figure 2-1), the sound level transmission loss was calculated to determine the distances to the 90 dB and 100 dB noise contours. The LZF_{max} is the highest rms sound level collected over a 125-millisecond interval.

2.4 Marine Species Monitoring Program Methods

2.4.1 Observer Training

Prior to the start of all pile driving activity, the FS conducted a briefing for construction supervisors and crews, Navy staff, and the marine mammal and acoustic monitoring teams. New personnel were also briefed when they joined the construction project. All MMOs received consistent training relative to marine mammals covered under the IHA, as well as Tern, and Pacific green sea turtle identification and mitigation measures. Each observer was informed of project construction details and their roles and responsibilities as an observer, including regulatory requirements (i.e., MMPA/ESA) and professional behavior. All observers were trained to be consistent, diligent, and free of distractions for the entirety of the monitoring period. Additionally, observers were instructed on proper methods for locating marine species, sighting cues for the various species anticipated to occur in the project area, and how to estimate distances between their MMO location and observed species.

2.4.2 Marine Species Visual Monitoring Protocols

MMOs were placed at the best vantage point to effectively monitor for marine species using the naked eye or binoculars, with a specific focus on marine mammals. Based on the location of the pile being driven, MMOs would adjust their locations to provide the best visibility around the pile or barge. Furthermore, because the Level A and Level B ZOIs changed relative to the construction or demolition activity, the number of MMOs and their positions were adjusted accordingly. In-water pile operations ceased when sighting conditions (e.g., ambient light, fog, rain, and high waves) did not allow for effective monitoring of the shutdown zone and surrounding waters.

All marine mammal observations were recorded, regardless of their position relative to the Level A/B ZOIs. Recorded data included MMO latitude and longitude, MMO initials; sky cover; Beaufort Sea State (BSS); visibility; time of sighting (to the second); species; number of individuals in the water or hauled out; distance and bearing to the individual(s); animal sex and age (when possible); animal direction of travel; whether the individual was a re-sight from a different MMO; behavior at the time of the sighting (primary behavior), if there was a behavior as a result of a stimulus that may, or may not, have been related to the project (secondary behavior), and the time

of that behavior; haulout location; construction activity; notes specific to the sighting; other human activity in the area; and whether a photograph or video footage was taken during the sighting.

All data were collected utilizing either an electronic (on a tablet, Appendix B) or hardcopy datasheets. All data were downloaded (from tablets) or manually entered to the master Microsoft Access database that housed all the sightings for all MMOs for the entirety of the project. Based on the MMO latitude and longitude, and the distance and bearing to the sighted individual(s), the location of each sighting was auto-calculated in the Microsoft Access database. QA/QC checks were made at the end of each monitoring day to ensure all data fields were complete and locations of sightings were reasonably located relative to the project area.

Because the Command position kept a detailed log of construction start and stop times, that data were cross-referenced against the observations times from the MMOs, and the activity data from the Command database was added to each MMOs observations. In this way, the activity data from the Project-personnel who was closest to the construction activity was cross-referenced against all MMO observation times, and each observation was directly associated with an activity and pile number for later analysis of "take."

Once the animal observations were cross-referenced against an activity, those observations that were during active construction or demolition, were plotted on a map and checked against the Level A/B ZOIs. If the animal location was outside of the ZOIs, then it was not deemed a "take," even if it had occurred during pile driving. If the animal was located inside of the ZOI, and during active construction or demolition, then it was deemed as a "take." Also, if the animal was located inside the ZOIs, but not during active construction or demolition, then it was not deemed as a "take." This analysis process provided a quick evaluation relative to activity data and "take" on a weekly basis.

2.4.2.1 Monitoring Zones

The monitoring of ZOIs, and the implementation of other mitigation measures, were designed to minimize impacts of underwater sound from in-water construction activities on marine mammals. The analysis of modeled acoustic data presented in the final EA (Navy 2013) was used to initially model the distances to the Level A and Level B ZOIs for the pile driving during IHA #1 and was verified during *in situ* data collection during monitoring. Acoustic data collected during each subsequent IHA year was then used as a means of generating the Level A/B ZOIs for IHA #4. During IHA #4 (Table 2-3), acoustic data was also gathered via *in situ* measurements at source and far-field locations to further validate the shutdown and Level B ZOIs during pile driving and demolition activities.

The Project did not have any Level A "take" allowed as part of the IHA #4; therefore, a buffer distance was added to the initial estimated Level A ZOIs for pile driving to reduce the likelihood of a Level A "take" (Table 2-4). In adding buffers, the project provided a conservative approach to monitoring that allowed the project to operate with minimal potential for injury to monitored species.

Table 2-3. Initial Estimated Distances to Injury and Disturbance Thresholds for Construction and Demolition.

Activity	Measured/Calculated Distances to Thresholds (meters [feet])					
	Underwater				Airborne	
	Level A		Level B		Level B	
	190 dB	180 dB	160 dB	120 dB[1]	100 dB	90 dB
Construction						
Impact driving (30-in steel piles)[2]	75 (246)	350 (1,148)	2,000 (6,562)	N/A	80 (262)	233 (764)
Vibratory driving (30-in steel piles)[2]	10[3] (33)	10[3] (33)	N/A	3,000 (9,483)		
Impact driving (16-in poly-concrete piles)[4]	20 (66)	50 (164)	270 (886)	N/A	42 (138)	149 (489)
Impact driving (24×30 piles)[4]			500 (1,640)			
Pile jetting (Multiple systems)[5,6]	10[3] (33)		N/A	N/A	N/A	
Demolition						
Diamond saw (66-in and 84-in caissons)[4,5]	10[3] (33)		N/A	631 (2,070)	N/A	
Pile clipping (13-, 14-, 18-, 24-inch)[5,6]	10[3] (33)		N/A	N/A	N/A	

Notes: [1] Mean ambient sound levels in San Diego Bay are between 128 and 130 dB rms (NAVFAC SW 2015). The 3,000 m (9,483 ft) represents the point at which pile driving noise blends with ambient noise in San Diego Bay;

[2] Data for 30-in piles were based on a limited number of piles from the Year #2 IHA. These initial distances were based on pile driving with 36-in steel piles, which was 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;

[3] Measured source values were less than all Level A thresholds; therefore, the regulatory requirement was a minimum monitoring distance of 10 m (33 ft);

[4] Based on underwater 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);

[5] Airborne noise levels did not exceed regulatory thresholds during previous IHAs; [6] Pile jetting and pile clipping did not require monitoring of a Level B ZOI, and a 10 m (33 ft) ZOI was observed for physical interaction with jetting or clipping equipment.

Table 2-4. Monitored Distances to Injury and Disturbance Thresholds for Construction and Demolition.

Activity	Measured/Calculated Distances to Thresholds (meters [feet])					
	Underwater				Airborne	
	Level A[1]		Level B		Level B[2]	
	190 dB	180 dB	160 dB	120 dB[1]	100 dB	90 dB
Construction						
Impact driving (30-in steel piles)	150 (492)	450 (1,476)	2,000 (6,562)	N/A	51 (167)	188 (617)
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)			500 (1,640)			
Pile jetting (Multiple systems)	10 (33)		N/A	1,165 (3,822)	N/A	
Demolition						
Diamond saw (66-in and 84-in caissons)	10 (33)		N/A	631 (2,070)	N/A	
Pile clipping (13-, 14-, 18, 24-inch)	10 (33)		N/A	2,511 (8,238)	N/A	

Notes: [1] The Level A distance for impact pile driving represents the buffered shutdown zone. Measured source values for vibratory pile driving, pile jetting, pile clipping, and caisson cutting were less than all Level A thresholds; therefore, the Level A distance of 10 m (33 ft) represents the physical interaction shutdown zone.

[2]Based on airborne data collected for 30-inch steel piles.

Definitions of the ZOIs associated with construction/demolition activities are defined below:

- **Level A Buffered "Shutdown" Zone.** To reduce the likelihood of a Level A "take," buffers were added to the anticipated Level A ZOIs (Table 2-3). Buffer distances were determined from estimated swim speeds of the various species authorized for "take" in the IHA, and the approximate time that shutdown of pile driving could be implemented by the monitoring staff and construction contractors. A literature review of swim speeds for California sea lions and coastal bottlenose dolphins found that swim speeds ranged from 2.7 to 10 m/second (6 to 22 miles per hour [mph]), with the maximum swim speeds of both species generally falling between 3 and 15 m/second (13 and 33 mph; Godfrey 1985; Lockyer and Morris 1987; Fish 1997; Fish et al. 2002; Rohr et al. 2002; Noren et al. 2006). Swim speeds of 5 m/second (11 mph) for pinnipeds and 10 m/second (22 mph) for cetaceans were used to establish a buffer for the Level A ZOI. Shutdown of impact pile driving was tested multiple times during previous years and was determined to be between 8 to 10 seconds from the time the MMO observed the animal, called Command, and the hammer was completely stopped. Buffer distances were determined by multiplying the applicable swim speeds for pinnipeds and

cetaceans by the maximum time required to shut down. A degree of rounding was applied to make buffers recognizable distances and to consider the tendency of pinnipeds to utilize the existing pier structure to approach without detection. If an animal approached, or entered, these buffered ZOIs, construction was halted regardless of whether they were observed inside the actual Level A ZOIs (Table 2-3, Figure 2-2, Figure 2-3, and Figure 2-4). If an animal were to be first observed inside any of the actual Level A ZOIs (see Table 2-3), the "Command" position would prepare a separate write-up describing the observations before, if applicable, during, and after the event.

- **Physical Interaction "Shutdown" Zone.** During caisson cutting, pile clipping and pile jetting, source levels did not exceed the Level A thresholds for cetaceans or pinnipeds. However, to comply with the Year #4 IHA, a 10 m (33 ft) "shutdown" ZOI was used to eliminate an animal physically interacting with pieces of equipment used as part of this project.
- **Level B Zone.** The Level B ZOIs included all areas where the underwater sound was anticipated to equal, or exceed, the Level B (behavioral impacts) harassment thresholds for marine mammals. The Level B ZOI varied depending on the pile size and type with a range of 270 m (886 ft) to 3,000 m (9,483 ft). These ZOIs were determined based on a combination or *in situ* data collection, calculations (practical spreading loss), or modeling (Dahl et al. 2012) using the unique environmental and bathymetric characteristics of San Diego Bay. Regardless of the extent of the Level B ZOI, all MMOs used either their naked eye or binoculars to observe the full extent of the ZOI, if possible. The MMO at the Mag Si position also used "big eye" binoculars to increase their ability to see marine mammals entering San Diego Bay from the south. If the fullest extent of the Level B ZOI was not completely monitored, density data, the area that was not completely observed, and the amount of time of the active construction or demolition were used to infer the presence of marine mammals inside of the Level B ZOI. These data were then used to extrapolate Level B "take" based on actual pile driving time.
- **Airborne Zone.** The airborne ZOIs included all areas where pinnipeds might be exposed to noise at specific thresholds while hauled out of the water. The ZOIs were determined based on spherical spreading loss and were modeled to be from 42 to 233 m (138 to 764 ft; see Table 2-3 above and Figure 2-2 below), depending on the pile size and type.

All sightings were plotted and evaluated weekly relative to "take" on a per pile basis. Animals that entered the buffered "shutdown" zone, and the actual Level A ZOI, were evaluated on a case-by-case basis at the time of the event, with write-ups of the interactions with the project submitted to the Navy within 12 hours of the incident. Furthermore, if acoustic data were being collected at the time of the animal entering the Level A ZOIs, source levels were evaluated to determine the actual distance to the Level A threshold.

If animals occurred within the either the Level A or Level B zones associated with the pile, then they were considered as finalized "take" and are reported as such in this document. If an animal was observed during pile driving, but was in an area that was acoustically shaded (i.e., south of Ballast Point), then it was not considered as a "take" regardless of active construction or demolition.

Throughout the course of the project, some modifications to initial monitoring protocols were implemented to properly document and track individual animals and better address the potential for "take" in the project area. Modifications included adding or deleting fields to the data collection sheets, or adjusting shutdown ZOIs based on newly acquired acoustic data. Detailed descriptions of the modifications, and when they occurred, are provided in Appendix D.

To minimize the probability of multiple MMOs counting a single animal (and thereby potentially overestimating "take"), sightings were tracked on a continuous basis by an observer at one monitoring location and then "handed off" to an observer on a second location, if the animal(s) moved in the direction of the second MMO. Along with a checkbox indicating that a sighting was a resight, the MMOs kept detailed sighting data and, whenever possible, indicated in their field notes which station handed off the sighting. This allowed the DA to track individual animals over time as they were passed from one MMO to another.

If an MMO observed an injured, sick, or dead marine mammal, the MMO who initially sighted the animal notified the Navy project biologist who informed the NBPL stranding coordinator. The NBPL stranding coordinator then notified the NMFS west coast stranding coordinator and a decision was made on whether to collect the animal. If the marine mammal's condition was determined to be a direct result of the project, additional notification would have been made to NMFS headquarters (Ben Laws, 301-427-8425), including data sheets 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). Appendix E provides a sample of the hardcopy Level A impact worksheet.

MMOs were also responsible for documenting observations of green sea turtles and Terns. Sighting information for green sea turtles and Terns included all data that was collected for marine mammals (e.g., distance, bearing, and number of individuals); however, a specific focus of the Terns was whether they were foraging during pile driving. Due to the focus of the MMOs on marine mammals in the area, successful tern foraging was only noted if a bird was seen with a fish in its beak, but the number of times that an animal successfully, versus unsuccessfully, foraged was not tracked.

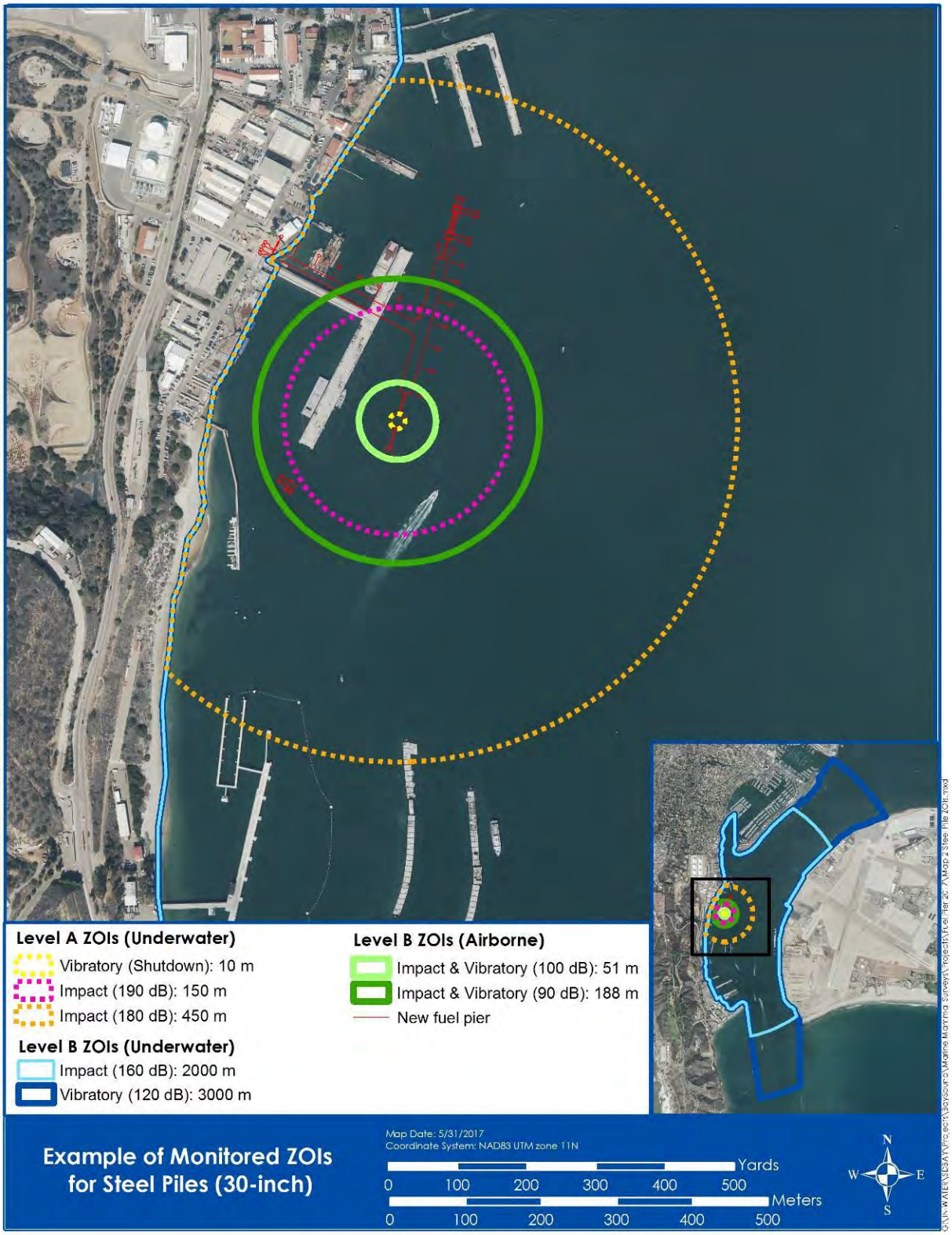

Figure 2-2. 30-inch Piles - Monitored Buffered "Shutdown" and Level B ZOIs Using a Sample Pile Location.

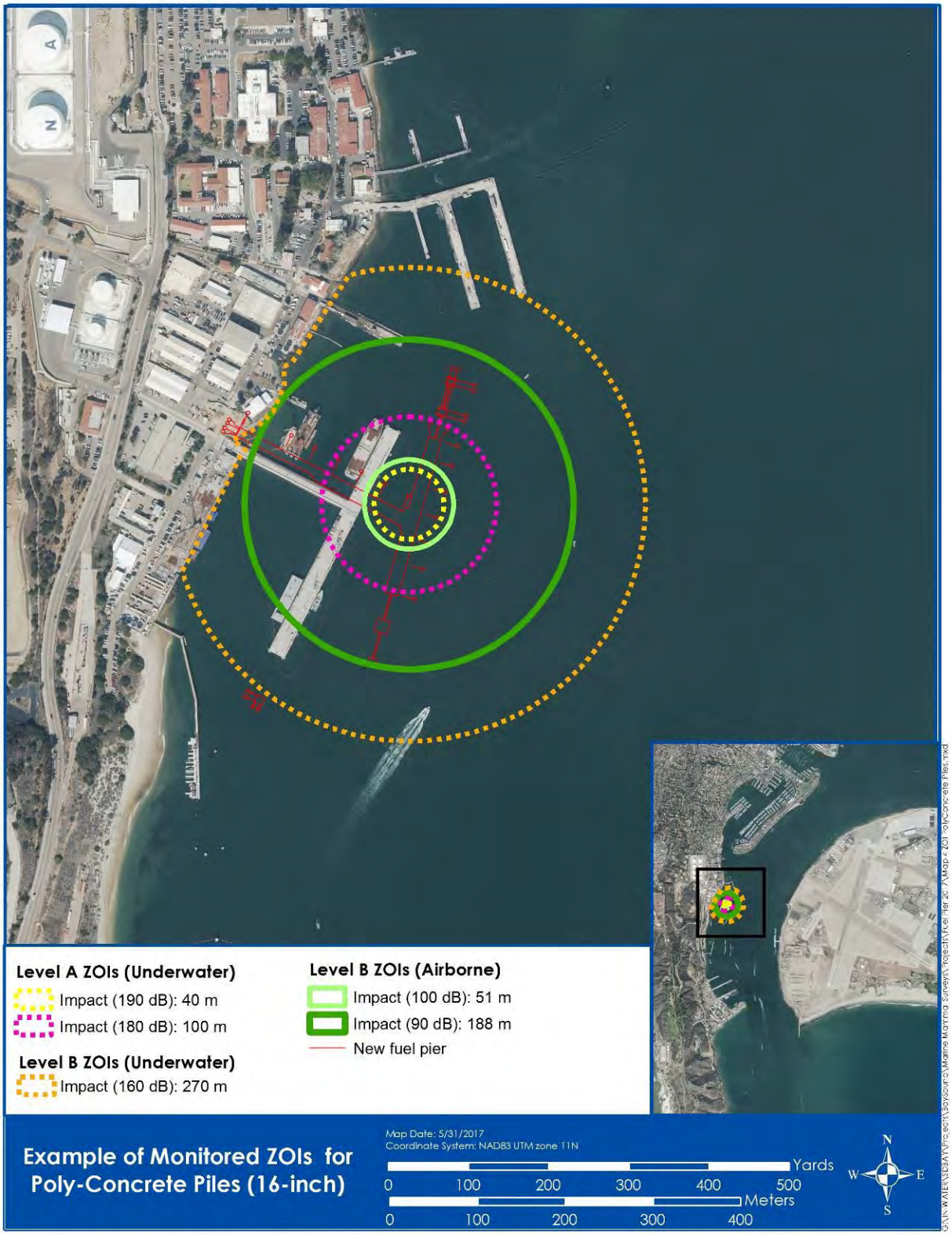

Figure 2-3. 16-inch Piles - Monitored Buffered "Shutdown" and Level B ZOIs Using a Sample Pile Location.

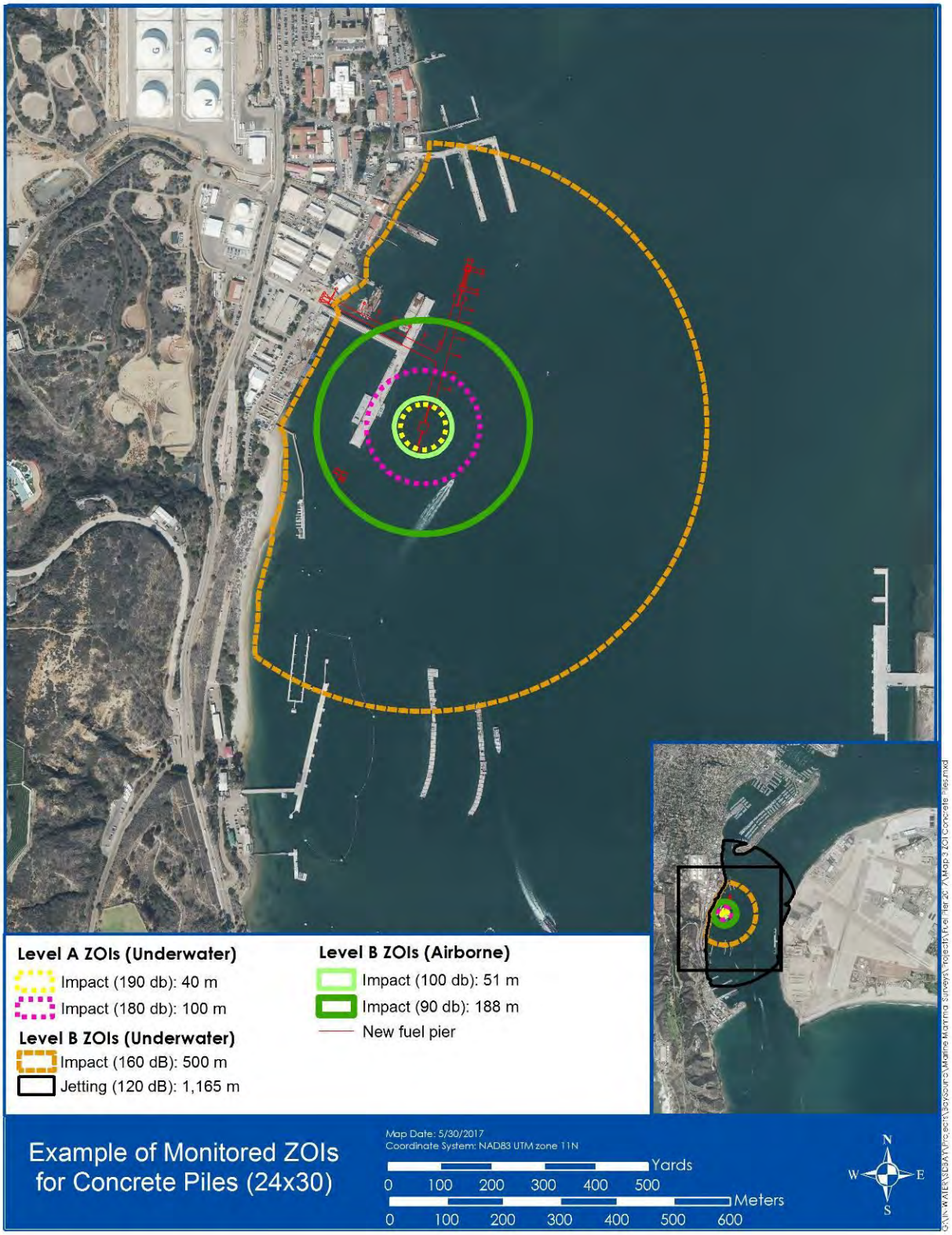

Figure 2-4. 24×30 Piles - Monitored Buffered "Shutdown" and Level B ZOIs Using a Sample Pile Location.

Figure 2-5. Demolition (Caisson Cutting and Pile Clipping) - Monitored "Shutdown" and Level B ZOIs for Demolition Actvities.

2.4.2.2 Monitoring Platforms and Locations

Monitoring platforms were primarily dependent on the type of activity because the monitored ZOIs varied depending on the distances to the Level A/B ZOIs. In all cases, MMOs were on small vessels, piers, docks, buildings, and/or barges that were from 1 to 12 m (3 to 40 ft) above the water line (see Figure 2-6 through Figure 2-8). All vessels were equipped with a VHF radio and chart plotters and all captains were familiar with San Diego Bay. Secondary hand-held VHF radios were also used to communicate with other MMOs. In most cases, ATs and MMOs were on the same boats, or close to one another on the docks/barge/piers. Acoustic data was collected at in-water at 10 m (33 ft) or in air at 15 m (49 ft) from the source.

2.4.2.2.1 Construction Activities

2.4.2.2.1.1 Vessel-Based Monitors

2.4.2.2.1.1.1 30-inch Pile Driving

A single boat-based MMO ("Bait Barge") was used during the 30-inch pile driving activities. This MMO was positioned from 160 to 530 m (524 to 1,738 ft) from pile driving operations and was most often positioned to the south of the new fuel pier adjacent to the Everingham Brothers Bait Barge Company (EBBCO) bait barges. However, when large ships were tied up to the new fuel pier during fueling operations, the pier-based MMOs could not fully observe the buffered Level A "shutdown" ZOI to the east. In those instances, the "Bait Barge" boat was moved closer to the project area to provide coverage for any animals that might approach the buffered "shutdown" ZOIs from the east (see Figure 2-6). Due to the smaller ZOIs, a boat-based MMO was not required during all other construction and demolition activities.

2.4.2.2.1.2 Building-, Barge-, and Pier-Based Monitors

2.4.2.2.1.2.1 30-inch Pile Driving (6 MMOs)

Three dedicated MMOs were positioned at different locations on, or close to, the new fuel pier ("November," "Sierra," and "P-122"). The "November" and "Sierra" MMOs were stationed at the north and south ends, respectively, of the second deck of the new fuel pier, and the "P-122" MMO was positioned on the P-122 pier to the southwest of the new fuel pier. A single MMO ("Mag Si") was positioned on the second-story balcony of a U.S. Navy building on Ballast Point (Figure 2-6). A secondary MMO ("Command") was stationed as close as possible to the pile location and provided secondary observer coverage for all visible areas in the project area. This MMO generally did not record observation data, and usually provided sightings data to other MMOs to log. The "Command" position had a full view of the buffered cetacean and pinniped "shutdown" ZOIs and their primary focus was on the start and stop times of pile driving and to notify the construction crew of imminent, or actual, shutdowns during pile driving activities (Figure 2-6).

2.4.2.2.1.2.2 16-inch Pile Driving (2 MMOs)

A single dedicated MMO was stationed on the second deck of the new fuel pier, close to the mid-point of the new fuel pier. A secondary MMO ("Command") was also positioned near the pile driving equipment with a primary focus on logging start and stop times of pile driving activities. The "Command" position also logged sightings if the primary MMO did not see the animals, but

their primary focus was on the start and stop times of pile driving and to notify the construction crew of imminent, or actual, shutdowns during pile driving activities (Figure 2-7).

2.4.2.2.1.2.3 24×30 Pile Driving (3 MMOs)

Two primary MMOs ("November" and "Sierra") were positioned on north and south ends of the second deck of the new fuel pier with unobstructed fields of view to the east. A secondary MMO ("Command") was also positioned near the pile driving equipment. The "Command" position had a full view of the buffered cetacean and pinniped "shutdown" ZOIs and their primary focus was on the start and stop times of pile driving and to notify the construction crew of imminent, or actual, shutdowns during pile driving activities (Figure 2-7).

2.4.2.2.1.2.4 Pile Jetting (1 MMO)

A single MMO ("Command") was positioned on the crane barge during jetting operations. Pile jetting occurred prior to the 24×30 pile driving. The "Command" position had a full view of the 10 m (33 ft) physical interaction ZOI and their primary focus was on the start and stop times of pile driving and to notify the construction crew of imminent, or actual, shutdowns during pile driving activities. However, this position also logged any animals that were observed within visible range of the MMO (Figure 2-7). The MMO also recorded any increase in sediment plumes as a result of the jetting activities.

2.4.2.2.2 Demolition Activities

2.4.2.2.2.1 Barge-, and Pier-Based Monitors

2.4.2.2.2.1.1 Caisson Cutting (1-2 MMOs)

Two MMOs ("Caisson") were initially positioned on the barge used as a base of operations for the caisson cutting crew. However, the position was very low to the water, leading to poor visibility of the area, and was also deemed unsafe due to the proximity to operations for caisson cutting. The monitoring location was moved to the second deck of the new fuel pier, which addressed both the visibility and safety issues; because of the greater visibility of the area around the caisson cutting operations afforded at that location, a single MMO was used (Figure 2-8). The MMO was in constant radio or phone communication with the dive master for the cutting crew during cutting operations. The "Caisson" MMO position had a full view of the 10 m (33 ft) ZOI and their primary focus was on the start and stop times of caisson cutting and to notify the dive master of imminent or actual shutdowns during cutting activities. This MMO also logged any animals that were observed within their visible range.

2.4.2.2.2.1.2 Turbidity (1 MMO)

A single observer recorded whether there was a sediment plume during sediment removal activities for the caisson cutting at the mudline. The observer visually observed the area directly around the jetting activities, but also used a secchi disk to look for any increases in turbidity in several locations from the old and new fuel piers. Appendix A provides the results of the turbidity monitoring.

Figure 2-6. 30-inch Piles - Representative Observation Locations.

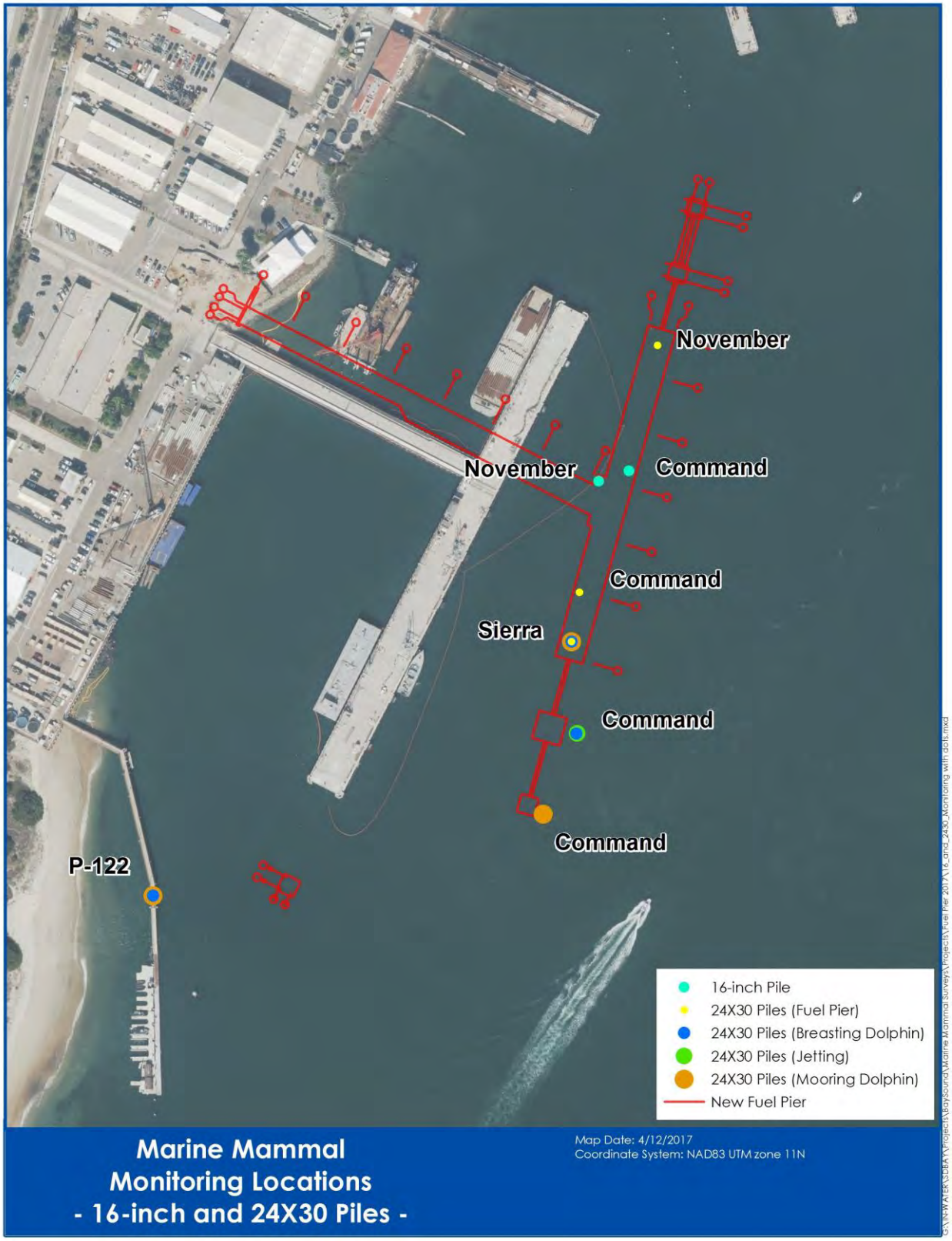

Figure 2-7. 24×30 and 16-inch Piles - Representative Observation Locations.

2.4.2.2.2.1.3 Pile Clipping (1 MMO)

A single MMO ("Clipper") was initially positioned on the old fuel pier but eventually moved to the barge that was used to lift the pile clipper (Figure 2-8). The barge provided a good view of the surrounding waters, as well as moved the MMO away from active concrete cutting, crane operations, and the hazardous deck space on the old fuel pier. Furthermore, this location put the MMO in direct contact with the pile clipper operator and enhanced effective communication of when the clipper was started or stopped. The "Clipper" position had a full view of the 10 m (33 ft) shutdown ZOI at all times and their primary focus was on the start and stop times of pile clipping and to notify the crew of imminent, or actual, shutdowns during clipping activities. This MMO also logged any animals that were observed within their visible range.

2.4.3 Construction and Demolition Activity Data

All tablets and/or watches used during data collection for activity, acoustic, and marine mammal observations were time-synced on a weekly basis. The activity data recorded by the "Command" position was used to cross-reference against observation data to assess the potential for "take."

Acoustic data also were cross-referenced against the Command-recorded activity data to verify the actual start and stop times of pile driving or demolition activities. For example, a single acoustic file may be five minutes long, but the data associated with the actual pile driving activity may only take up one minute of that file. Rather than analyzing the whole file, and potentially skewing the results with data for "quiet" times, the actual start and stop times of the pile driving from the Command data were used to accurately evaluate the acoustic data.

2.4.3.1 Pile Driving Activity Data

The "Command" position recorded construction/demolition activities on a to-the-second basis. Table 2-5 provides an example dataset from the "Command" position identifying the start and stop times according to the type and phase of activity. The five defined phases, two associated with construction and three associated with non-activity data, are as follows:

1. Active construction monitoring:
    a. <u>During Construction/Demolition</u>: When the hammer/wire saw/pile clipper/water jet was actively driving/cutting/jetting a pile or caisson. During pile driving, this monitoring was further broken into soft-start or full-power for pile driving; and
    b. <u>Construction shutdowns</u>: Construction stops due to an animal entering the buffered Level A "shutdown" zones (see Table 2-4).
2. Non-construction monitoring:
    a. <u>Pre-construction</u>: At least 15 minutes before pile driving began. Monitoring before demolition/pile jetting was not required;
    b. <u>Pre-/Post-construction</u>: Time in-between active pile driving/demolition/jetting activities (e.g., when construction/demolition was stopped for equipment adjustments); and
    c. <u>Post-construction</u>: At least 30 minutes after pile driving had been completed. Monitoring after demolition/pile jetting was not required.

Figure 2-8. Demolition Activities - Representative Observation Locations.

Table 2-5. Sample Timeline for Pile Driving Activities.

Start/Stop Time	Sample Activity
08:45:50 to 09:00:51	Pre-Construction monitoring: Stab Piles #1 and #2
09:00:52 to 09:04:25	Pile Driving: Vibratory full power (Pile #1)
09:04:26 to 09:10:45	Pre-/Post-construction: Stop pile driving to switch to Pile #2
09:10:46 to 09:35:12	Pile Driving: Vibratory full power (Pile #2)
09:36:13 to 09:40:56	Shutdown: ALL STOP due to animal in shutdown ZOI
09:40:57 to 10:00:00	Pile Driving: Vibratory full power (Pile #2)
10:00:01 to 10:30:05	Pre-/Post-construction: Switching from vibratory to impact hammer
10:30:06 to 10:33:09	Pile Driving: Impact Soft Start (Pile #1)
10:33:10 to 10:50:22	Pile Driving: Impact Full Power (Pile #1)
10:50:23 to 11:05:56	Pre-/Post-construction: Stop pile driving to switch to Pile #22
11:05:57 to 11:20:20	Pile Driving: Impact Full Power (Pile #2)
11:20:20	Pile Driving complete for Piles #1 and #2
11:20:21 to 11:50:21	Post Construction monitoring

Like the "Command" position, all MMOs collected data on a to-the-second basis so that exact timing of the potential for "take" could be evaluated relative to the monitoring activities defined above. In the timeline in Table 2-5, after the data had been processed, if marine species were observed at 09:01:04, 09:03:52, 09:16:12, and 09:32:52, then they would have been preliminarily considered as a "take" based solely on the fact that the sighting occurred during pile driving, regardless of animal location relative to the pile. However, if observations occurred at 09:05:30 and at 09:38:52, then they would not be considered as a preliminary "take" because they did not occur during active pile driving. The DA read through the MMO notes to further evaluate the potential for "take." While no Level A harassment occurred during pile driving from 8 October 2016 to 30 April 2017, if a marine mammal had been exposed to noise associated with Level A thresholds, a write-up of the interaction would have been generated based on the information provided in the Level A Harassment form provided in Appendix E.

2.4.3.2 Demolition and Pile Jetting Activity Data

During demolition and jetting activities, a single MMO recorded both start and stop times, as well as marine species observations. However, because no pre-construction or post-construction monitoring was required for these activities, the MMO would not initiate monitoring until demolition/jetting had started. To best track marine mammals in the general vicinity of the activities, and because the time between demolition or jetting was usually relatively short, the MMO would also monitor in-between the action(s).

Caisson cutting data collection required the potential for tracking activity for two caissons at the same time. The activity tracking data form in the Microsoft Access form was modified to allow for tracking multiple activities at once (Appendix B). As a result, the data for caisson cutting using two cutters was highly accurate, and a precise assessment of acoustic data associated with either one or two cutters could be evaluated relative to source or far-field data for acoustics.

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3.0 Results

The results of the acoustic and marine species monitoring efforts associated with this project are presented in Sections 3.3 and 3.4, following the Section 3.2 overview of the monitored construction and demolition activities during the October through April monitoring period. Appendices F and G provide more detail on data that is summarized in this report section.

3.1 Summary of Monitoring Effort

A total of 227 days during the IHA #4 time-period (8 October 2016 to 30 April 2017: 205 days; 16 September 2017 to 7 October 2017: 22 days) were initially allotted for both construction and demolition activities. During the time-period presented in this report (8 October 2015 to 30 April 2016), monitoring for both all project-related activities occurred on 83 days for 461 hours and 35 minutes (Table 3-1). Marine species monitoring occurred on 81 days and turbidity-only monitoring occurred on two days. Marine species monitoring was conducted during active construction and demolition, non-pile driving (pre-construction, pre/post construction, post-construction), and non-demolition (pre/post demolition). Most monitoring occurred during non-pile driving or non-demolition periods, over 313 hours and 38 minutes (68% of the total time on station); monitoring during active pile driving and demolition occurred over 146 hours (32% of the total time on station). Monitoring effort was highest in December when both pile driving of 24×30 concrete piles and demolition of caissons occurred at the same time. Regardless of month, for both the pile driving and demolition activities, monitoring was dominated by the timeframes outside of in-water activity (pre-construction, pre-/post-construction, and post-construction) with 84.7% of the time for construction activities, and 60.0% of the time for demolition activities (Table 3-1).

Table 3-1. Monitoring Effort by Month.

Month	Days of Monitoring Effort	Total Observation Time[1,2]	Avg. Hours per Day[1]	Marine Species Monitoring Type				Turbidity
				Construction[1]		Demolition[1]		
				Active Construction	Non-Pile Driving[3]	Active Demolition	Non-Demolition[3]	
October	8	34:58	04:22	00:20	08:42	04:36	21:20	00:00
November	0	00:00	00:00	00:00	00:00	00:00	00:00	00:00
December[4]	12	107:43	08:58	03:01	23:58	44:15	34:32	01:57
January	14	67:35	04:49	00:00	00:00	37:37	29:58	00:00
February	10	71:39	07:09	03:50	21:49	25:46	20:14	00:00
March	21	85:46	04:05	09:46	42:56	06:27	26:37	00:00
April	18	93:54	05:13	06:21	32:02	04:01	51:30	00:00
TOTAL	**83**	**461:35**		**23:18**	**129:27**	**122:42**	**184:11**	**01:57**

Note: [1]All time in hh:mm.
[2]Includes cumulative time for all activities for each day of observation.
[3]Non-Pile Driving and Non-Demolition include times when active construction (e.g., pile driving/jetting) and demolition (e.g., caisson or pile clipping) were not occurring, but MMOs were actively observing for marine species in the Project area.
[4]Includes two days of turbidity monitoring. Marine mammal monitoring did not occur.

The MMOs observed from just under 14 minutes to a maximum of 8.75 hours on a given day. The number of monitoring days was highest in March (n=21 days) and April (n=18) due to more days with multiple pile driving and/or demolition activities occurring on more days than other months. This required at least two MMOs to provide complete coverage for the multiple actions. During all other months, several of the activities occurred throughout the monitoring time-period, but not necessarily at the same time. However, December had the most hours of marine species monitoring effort with approximately 106 hours of effort over 10 days of monitoring effort, leading to the highest number of hours per day of monitoring effort (see Table 3-1 and Figure 3-1). No monitoring occurred in November due to preparation for transitioning to pile driving the 24×30 piles on the west side of the new fuel pier.

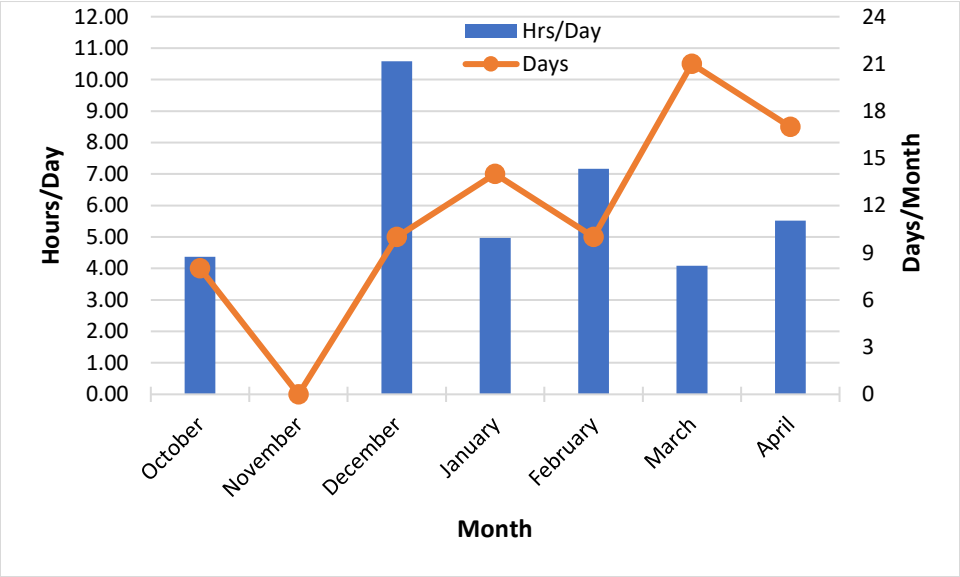


Figure 3-1. Hours per Day and Hours Days per Month for all Monitoring Effort.

The higher number of days in March, but relatively low number of observer hours (85 hours and 46 minutes), was directly correlated with pile driving for 30-inch and jetting for 24×30 piles, as well as pile clipping for the old fuel pier (see Table 3-1 and Figure 3-1). With pile driving and clipping, the actions tended to take less time to complete on a per pile basis, but they required much more time for setup. As a result, the MMOs were not necessarily on station for long periods of time, but the actions required more days to complete. December had the higher number of observer hours because of the caisson cutting, which took approximately six hours per caisson. The cutting process, as well as the time in-between cutting, made for long days, with fewer number of completed actions per day. Because all caissons needed two cuts, and they were usually able to complete one cut per day, caisson cutting took at least two days per caisson to complete. This is reflected in December with the highest number of hours for demolition (44 hours and 15 minutes), but a small number of hours for construction (3 hours and 1 second; see Table 3-1). When comparing the amount of observer days from the first half of the monitoring timeframe, the first three months with monitoring (October, December, and January [November did not include any monitoring efforts]) averaged 11.3 monitoring days per month. This is in comparison to the three months from February to March which averaged 16.3 monitoring days per month. However, while

the number of monitoring days increased, the number of monitoring hours per day decreased by approximately 44 minutes from, on average, 6 hours 3 minutes per day to 5 hours 19 minute per day. This is indicative of shorter days due to pile driving and pile clipping, which didn't take as long to complete on a per pile basis, but took more day's due to more piles to be driven or clipped.

Monitoring effort was different depending on the type of activity, with up to six MMOs during the pile driving, and one observer during jetting and/or demolition activities (Table 3-2). While MMOs recorded all animals observed inside of northern San Diego Bay, their ability to identify individuals at distance was hampered by factors such as visual acuity, weather conditions, sea state, and the size of the observed area. However, with the continued use of the second deck of the new fuel pier, the visual range identified in the IHA #3 reports (NAVFAC SW 2016a, 2016b) remained at 700 m (2,297 ft) with 7X50 binoculars for pier-based MMOs. The distances in the "Visible Range" column in Table 3-2 identify the distances used when determining "take" for animals that were potentially in the area, but may have been missed during pile driving because they were outside of the visual range of the MMOs.

Table 3-2. Visual Range of All MMOs by Construction or Demolition Type.

Pile Size	Monitoring Call Sign	Monitoring Platform	Elevation Above Water (m [ft])[1]	Visible Range (m [ft])
30-inch	November	New Fuel Pier (Upper deck)	10 to 12 (33 to 39)	700 (2,297)
	Sierra	New Fuel Pier (Upper deck)	10 to 12 (33 to 39)	700 (2,297)
	Mag Si	Second-story Balcony with "Big Eye" binoculars	10 to 12 (33 to 39)	1,500 (4,921)
	P-122	Elevated pier	3 to 5 (10 to 16)	500 (1,640)
	Bait barge	Boat	1 (3.3 ft)	300 (984)
	Command	Barge	2.4 (8)	300 (984)
24×30	November	New Fuel Pier (Upper deck)	10 to 12 (33 to 39)	700 (2,297)
	Sierra	New Fuel Pier (Upper deck)	10 to 12 (33 to 39)	700 (2,297)
	Command	Barge/New Fuel Pier (Lower Deck)	2.4 (8)	300 (984)
16-inch	November	New Fuel Pier (Upper Deck)	10 to 12 (33 to 39)	700 (2,297)
	Command	New Fuel Pier (Lower Deck)	3 to 5 (10 to 16)	300 (984)
Caisson Cutting	Caisson	New Fuel Pier (Upper deck)	10 to 12 (33 to 39)	700 (2,297)
Jetting	Command	Barge	2.4 (8)	300 (984)
Pile Clipping	Clipper	Barge	1.8 (6)	300 (984)

Notes: [1]Elevation range was based on general tide range during observations from fixed platforms.

The MMO stationed on Ballast Point ("Mag Si") had the use of a stable platform as well as the use of "Big Eye" binoculars, which allowed the MMO to view a much larger portion of the Level B ZOI. An estimate of the number of animals outside of the visible range of the Level B ZOIs (during demolition and pile driving monitoring efforts) is provided in Section 3.4.6, which also describes the methods used to derive extrapolated observations and "take" based on the Level B ZOI and density estimates for San Diego Bay.

3.2 Summary of Monitored Construction and Demolition

Throughout the 81 days of marine species monitoring effort, there were thirty-four (34) days of pile driving, seven (7) days of monitored high-pressure water jetting, and sixty-nine (69) days of demolition activities. There were twenty-seven (27) days with multiple actions occurring on the same day (i.e., jetting and pile clipping, pile driving and pile clipping), and fifty-four (54) days of a single demolition or pile driving action. During the overlapping dates when multiple actions occurred, monitoring methods were used that provided complete coverage of the Level A and shutdown ZOIs for each location. While other activities related to demolition (i.e., removal of the old pier decking) occurred during the same timeframe, only the in-water demolition activities were visually and/or acoustically monitored.

3.2.1 Pile Driving

Table 3-3 provides a summary of pile driving based on the individual pile type. Over the course of the 34 days of pile driving effort, most of the pile driving was completed using the impact hammer, with eighteen (18) days (53%) with impact driving only, fifteen (15) days (44%) with both impact and vibratory pile driving, and one (1) day (3%) with vibratory pile driving only. Pile driving of the 30-inch steel piles involved both vibratory and impact pile driving activities, while the 16-inch and 24×30 piles included only impact pile driving.

Table 3-3. Summary of Monitored Pile Driving Activities.

Pile Size and Type	Pile Driving Date Ranges	Number of Piles	Days of Pile Driving	Average Piles per Day
24×30 Concrete Fender (New Fuel Pier)	08 Oct 2016	3	1	3.00
16-inch poly-concrete	26 Oct to 27 Oct 2016	1	2	0.50
24×30 Concrete Fender (New Fuel Pier)	08 Dec to 15 Dec 2016	24	5	4.80
30-inch Steel (Plumb)	01 Feb to 22 Feb 2017	8	6	1.33
30-inch Steel (Batter)	28 Feb to 23 Mar 2017	16	14	1.14
24×30 Concrete Fender (Breasting Dolphin)	03 Apr to 14 Apr 2017	16	6	2.67
TOTAL		**68**	**34**	

3.2.2 Jetting During Pile Installation and Caisson Cutting

High pressure water jetting was used during the IHA #4 timeframe to expedite the installation of piles, or the removal of caissons (Table 3-4). Visual monitoring was conducted for marine species near the jetting. In addition, two days of turbidity-specific monitoring occurred for two sediment removal techniques as part of the caisson cutting, with a specific focus on determining whether the sediment plumes exceeded a 10,117 m^2 (2.5 acres) area (per an informal ESA Section 7 consultation with USFWS in January 2017). While sediment plumes were noted during this turbidity-specific monitoring (Appendix A), they did not exceed 10,117 m^2 (2.5 acres) during this monitoring or during any following caisson cutting monitoring efforts. Also, during marine species monitoring efforts for 24×30 concrete fender piles, the area directly around the piles during jetting was also monitored for sediment plumes. During these monitoring efforts, no sediment plumes were noted during any 24×30 concrete fender piles jetting via multiple methods.

Table 3-4. Summary of Monitored Jetting Activities.

Pile Size and Type	Jetting Date Ranges	Number of Caissons/Piles	Days of Jetting	Average Caisson/Piles per Day
84-inch Caissons	23 Dec 2016 & 28 Dec 2016	2	2[1]	1
24×30 Concrete Fender	27 to 30 Mar 2017 & 11 to 12 Apr 2017	16	5	3.2
TOTAL		18	7	

Notes: [1]Jetting for caissons occurred throughout the caisson removal process, but was only specifically monitored for turbidity changes on two separate days. During all other caisson cutting monitoring efforts, sediment plumes were monitored, but jetting as an individual activity was not recorded.

Jetting during pile installation involved multiple techniques, depending on the location of the piles being jetted, and began with the installation of twenty-four 24×30 concrete fender piles on the southwestern side of the new fuel pier. No monitoring was conducted for these piles because the jetting techniques were the same as had previously been used for pile installation. Jetting during the installation of the sixteen 24×30 concrete fender piles associated with the southern breasting dolphin (see Photo 1-2) occurred over five (5) days and used two different water jetting techniques:

- Method 1 (M1) utilized a custom-made spud jet with four nozzles welded to the tip that used a high-pressure water system (900 gallons per minute with a maximum pounds per square inch [psi] of 300), to make the initial break through the bay point formation sediment layer (Photo 3-1).
- Method 2 (M2) used the 24×30 pile, outfitted with two pipes inside the full length of the pile, which then used a high-pressure water system (maximum psi of 300) to remove sediment and place the pile.

The M1 technique was a new jetting technique that hadn't been previously used during pile installation. The 24-inch steel pile was used to bore an initial hole through the Bay Point Formation, and then the internal jet was used as the pile was "stabbed" into the hole. Because the

new technique using the 24-inch steel pile was anticipated to be louder than previous jetting techniques, both acoustic and visual monitoring were conducted to identify source levels and animals in the Project area in anticipation of a potential Level B ZOI.

Photo 3-1. View of the Four Nozzles on the End of the 24-inch Steel Pile for Pile Jetting.

During caisson removal, two techniques were used to remove sediment at the bottom of the caissons. During these activities, the primary concern was that the sediment plume would exceed the 10,117 m^2 (2.5 acres; as identified in the informal Section 7 consultation with USFWS in January 2017). As a result, monitoring occurred over two (2) days to identify the extent of the sediment plume associated with a high-pressure water hose (at 90-110 psi), and during the use of an "air lift" system. The "air lift" system used an approximately 1.5 m (5 ft) by 0.3 m (10-inch) diameter plastic pipe attached to an air hose that was mounted approximately halfway up the pipe. As the air hose was turned on, sediment was sucked through the bottom of the tube and expelled out the top of the tube into the water column above the diver. This contrasts with the other technique which used a high-pressure water hose to redistribute the sediment in relatively close proximity to the diver. While an increase in turbidity during sediment removal for caisson removal was specifically monitored on only two days, the MMOs visually monitoring for marine species during caisson cutting also watched for any extended sediment plumes (Appendix A). Because turbidity as a direct result of jetting during caisson cutting or pile installation did not change in an area that was outside of 10,117 m^2 (2.5 acres), it was not addressed further in this document.

3.2.3 Demolition Activities

Demolition activities included non-overlapping episodes of pile clipping and caisson cutting, along with the removal of the deck of the old pier. Monitored demolition activities only included the underwater activities associated with pile clipping and caisson removal (Table 3-5). All monitored demolition activities occurred over sixty-nine (69) days from February to April, 2017, with pile clipping over forty-two (42) days (61%) and caisson cutting over twenty-seven (27) days (39%).

Table 3-5. Summary of Monitored Demolition Activities.

Demolition Activity	Demolition Activity Date Ranges	Number of Piles/Caissons Cut	Days of Demolition	Average Piles/Caissons per Day
Pile Clipping[1] (Old Pier-North)	10 to 14 Oct 2016	12	5	2.40
84-inch Caissons (Old Pier-North)	12 Dec 2016 to 07 Feb 2017	18[2]	27	0.67
Pile Clipping[1] (Old Pier-South)	15 Feb to 30 Apr 2017	278	37	7.51
TOTAL		**308**	**69**	

Note: [1]Includes concrete square piles (14-inch, 18-inch, 24-inch), and polycarbonate and poly-concrete round piles (13-inch).
[2]One caisson was cut at mid-depth, but not removed. A second mid-depth cut will be required to remove the caisson, but this will occur after 30 April 2017.

3.3 Summary of Acoustic Results

Based on data collected in previous IHAs, the pile driving data collected for the 24×30 and 16-inch piles were considered as adequate to determine the Level A/B ZOIs for these piles. The results for the acoustic data collected as part of IHA #4 are presented below by activity and type of pile to establish applicable marine mammal ZOIs.

3.3.1 Pile Clipping

In October 2016, twelve 24-inch square concrete reactionary piles were removed from the existing fuel pier to facilitate the demolition of the northern section of the old fuel pier. These were plumb piles (vertical) composed of concrete with an internal pre-stressed rebar frame. A Prime® Concrete Pile Cutter Model 24 was used to cut the piles at the mud line. The pressure applied to the pile via the cutter was initially approximately 2,600 psi and took from 45 to 60 minutes per pile. The pressure was then increased to approximately 4,100 psi and pile removal was completed in one to three minutes per pile. Hydroacoustic recordings were collected on eight piles using the vibratory settings on the Hydro DB USLM; however, only the piles that were cut with the higher psi were reported (n=4, Table 3-6). The hydrophones were deployed to half of the water depth (7 m [23 ft]) at 10 m (33 ft) from the pile being removed to establish the source level SPLs. Average SPLs at source ranged from 138.0 to 144.6 dB rms, with maximum SPLs at source ranging from 156.1 to 165.3 dB rms (Table 3-6).

The data recorded on the other piles at the lower psi (n=4) were reviewed and archived, but not included in this analysis because they were not reflective of the actual psi used during the majority of the project. Additional recordings were collected using the Loggerhead and archived.

Table 3-6. Broadband SPLs Recorded Using the Hydro DB USLM at Source (10 m [33 ft]) for 24-inch Square Concrete Pile Clipping.

Date	Pile Number	dB rms	
		Average	Maximum
12-Oct-16	NEB12	143.5	165.3
13-Oct-16[1]	NEB01	144.6	159.9
13-Oct-16[1]	NEB02	139.5	163.8
13-Oct-16[1]	NEB03	138.0	156.1

Note: [1.] Loggerhead recordings were collected and archived

The pile clipping source levels did not exceed the Level A thresholds (190 and 180 dB rms) for marine mammals; however, the distance to the Level B threshold for vibratory sound (considered as the level of ambient noise in San Diego Bay for the Project, or 129.6 dB rms) was not collected using real time data. In place of *in situ* data, the practical spreading loss model was applied based on the maximum recorded SPL source value of 165.3 dB rms, with a projected Level B ZOI extending to 2,511 m (8,238 ft). Additional *in situ* data at multiple far-field locations will be collected after 30 April 2017 to refine the Level B ZOI, if needed.

3.3.2 Caisson Demolition

In December 2016, as part of the demolition of the northern section of the existing fuel pier, eighteen 84-inch concrete-filled caissons were removed. Demolition took place in water depths ranging from 9 to 20 m (29.5 to 66 ft). For all caissons cut, the average duration of cutting was approximately six hours per caisson, and acoustic recordings were collected at various times throughout the cutting period. Underwater acoustic data was collected for seven caissons using the vibratory setting on the Hydro DB USLM. The hydrophone was deployed to half of the water depth (3 to 9 meters [10 to 30 feet]) at varying distances from the caisson(s) being removed to attempt to establish the distance to the Level B ZOI. For some of the recordings, there were two caissons being cut simultaneously and the acousticians captured the SPLs for comparison between a single cutter versus two cutters. If two cutters were running, the distance measured was from the closest caisson to the location of the USLM. Average SPLs at source for a single cutter were 136.1 and 141.4 dB rms. Maximum SPLs at source for a single cutter were 140.9 and 146.5 dB rms (Table 3-7). Average SPLs at source for two cutters running simultaneously were 146.5 and 149.0 dB rms. Maximum SPLs at source for two cutters running simultaneously were 149.0 and 155.6 dB rms (Table 3-8). On average, there was a 10 dB difference between a single cutter and two at source.

Far-field recordings for a single cutter were collected at far-field locations ranging from 20 to 430 m (66 to 1,411 ft), with documented maximum SPL values from 136.6 to 145.5 dB rms (Table 3-7). Far-field recordings for two cutters were also collected at far-field locations ranging from 85 to 810 m (279 to 2,657 ft), with documented maximum SPL values from 133.2 to 146.8 dB rms (Table 3-8). Differences in SPL values collected with the Hydro DB USLM at distance reflected the variability in sound source levels of individual caissons and other anthropogenic noise at the time of the recordings.

Table 3-7. 84-inch Caisson Demolition Summary of the Acoustic Results at Source (10 m [33 ft]) and Far-field (20 to 430 m [66 to 1,411 ft]) Utlizing a Single Cutter.

Date	Pile Number	Station	Distance to Pile (m [ft])	dB rms	
				Average	Maximum
14-Dec-16	P-H-10	Source	10 (33)	136.1	140.9
13-Dec-16	P-H-11		10 (33)	141.4	146.5
14-Dec-16	P-K-6	Far-field	20 (66)	140.8	144.5
14-Dec-16	P-H-6		40 (131)	134.8	140.1
15-Dec-16	P-K-9		60 (197)	137.1	140.6
13-Dec-16	P-H-11		85 (279)	136.0	139.5
15-Dec-16	P-K-9		110 (361)	135.3	136.6
19-Dec-16	P-K-5		200 (656)	129.2	139.1
19-Dec-16	P-K-5		283 (928)	130.3	137.0
13-Dec-16	P-H-7		430 (1411)	142.4	145.5

Table 3-8. 84-inch Caisson Demolition Summary of the Acoustic Results at Source (10 m [33 ft]) and Far-field (85 to 810 m [279 to 2,657 ft]) Utlizing Two Cutters.

Date Pile	Pile Number	Station	Distance to Pile (m [ft])	dB rms	
				Average	Maximum
13-Dec-16	P-H-11	Source	10 (33)	146.5	149.0
14-Dec-16	P-H-10		10 (33)	151.0	155.6
13-Dec-16	P-H-11	Far-field	85 (279)	135.3	138.2
15-Dec-16	P-K-9		110 (361)	135.3	142.4
13-Dec-16	P-H-11		165 (541)	133.0	146.8
19-Dec-16	P-K-5		250 (820)	130.1	133.2
19-Dec-16	P-K-5		537 (1762)	137.9	140.9
19-Dec-16	P-K-5		810 (2657)	135.0	141.0

The caisson cutting source levels for both one cutter or two cutters did not exceed the Level A thresholds (190 and 180 dB rms) for marine mammals; however, the distance to the established ambient noise levels in San Diego Bay (129.6 dB rms) could not accurately be determined using real-time data. Due to the difficulty in locating the Level B ZOI, the practical spreading loss model was used based on the maximum SPL source value of 155.6 dB recorded while two cutters were running simultaneously. The practical spreading loss model projected that the Level B ZOI would extend to 631 m (2,070 ft; Figure 3-2); however, the *in situ* data collected at far-field distances

suggested a smaller ZOI of approximately 250 m (820 ft) with values of approximately 130 dB rms reached at that distance (Table 3-7 and Table 3-8). To asses "take" relative to caisson cutting, the ZOI of 631 m (2,070 ft) based on the model was used.

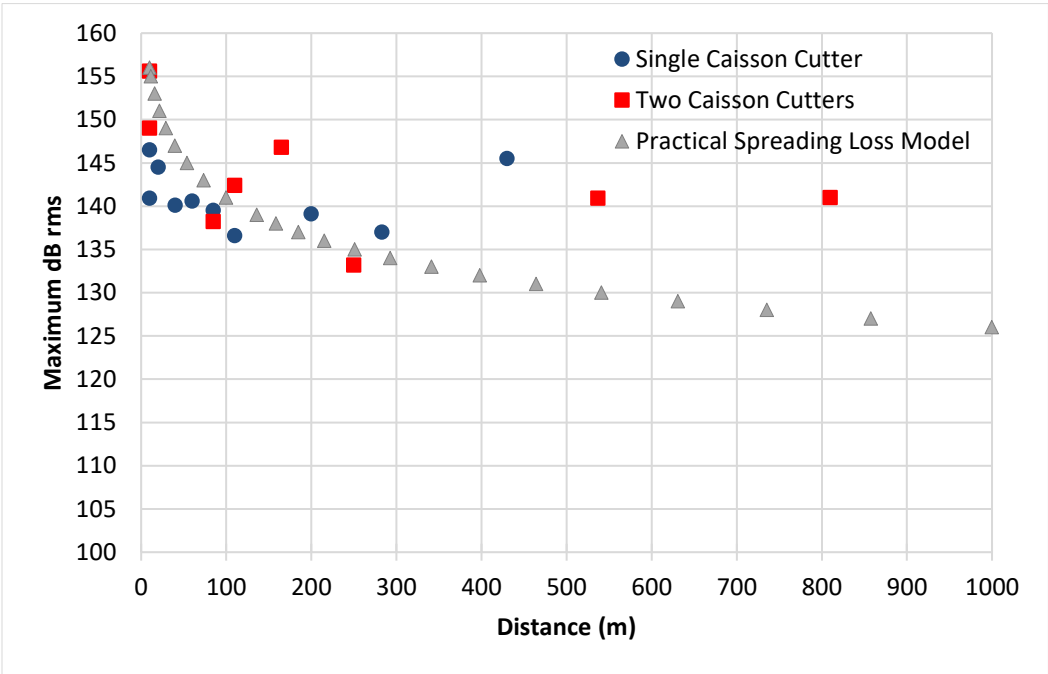


Figure 3-2. Comparison of Measured SPLs Versus the Practical Spreading Loss Model During Demolition of 84-inch Caissons Measured at Multiple Distances using the Hydro DB USLM.

3.3.3 Pile Jetting

SPLs of pile installation activities for the 24×30 concrete piles had not been previously documented. The only jetting data collected during the Project was at NMAWC during the removal of 12-inch and 16-inch concrete piles (NAVFAC SW 2014). In March 2017, a total of sixteen 24×30 concrete non-structural fender piles were driven along the east and west sides (eight per side) of the breasting dolphin. Pile jetting (both methods) averaged 24.5 minutes per pile and acoustic recordings were collected for the entire duration. Collection of underwater acoustic data were completed on six piles using the vibratory setting on the Hydro DB USLM with the hydrophone deployed at half of the water depth (7 m [23 ft]) at source (10 m [33 ft]) and at varying distances (far-field) from the pile. For M1, the average sound pressure levels (SPL) at source ranged from 152.6 dB rms to 155.1 dB rms, and maximum SPLs at source ranged from 156.5 dB rms to 159.9 dB rms (Table 3-9). For M2, the average SPL at source ranged from 133.0 dB to 149.8 dB and maximum SPLs at source ranged from 137.1 dB to 153.2 dB rms (Table 3-9).

Table 3-9. SPLs of 24×30 Pile Jetting Measured at Source (10 m [33 ft]) using the Hydro DB USLM.

Date	Pile Number	Method Type	dB rms	
			Average	Maximum
27-Mar-17	O-8	M1	153.3	156.5
28-Mar-17	O-4	M1	155.1	159.9
28-Mar-17	O-5	M1	153.0	159.0
28-Mar-17	O-6	M1	152.7	158.4
28-Mar-17	O-7	M1	152.6	157.2
28-Mar-17	O-4	M2	133.0	137.1
28-Mar-17	O-5	M2	149.8	153.2
28-Mar-17	O-6	M2	145.0	146.9
28-Mar-17	O-7	M2	141.5	143.4
28-Mar-17	O-8	M2	138.5	140.7

A vessel based drift method was used to obtain far-field recordings during M1 and M2 jetting techniques; The vessel was initially positioned at the closest feasible distance to source, and then the allowed to drift on the natural tidal current until near ambient sound pressure levels were obtained. The SPLs at far-field for the first drift during jetting M1 reached near ambient at 165 m (541 ft) from pile with an SPL of 128.0 dB (Figure 3-3).

The SPLs at far-field for the first drift during pile jetting M2 reached near ambient at 80 m (262 ft) from pile with an SPL of 127.6 dB (Figure 3-4). As seen in Figure 3-3 and Figure 3-4, recordings during the vessel drifts showed that jetting reached near ambient levels for both methods between 80 m (262 ft) and 165 m (541 ft; M1 and M2, respectively). Both methods were recorded early in the morning, with no vessel traffic, which represented the best environmental conditions. As the day progressed, it became more difficult to distinguish pile jetting from other anthropogenic noise associated with San Diego Bay. For example, at 10:30 am, the USLM was deployed at a stationary far-field location 350 m (1,148 ft) away from the pile during M1 and the ambient levels never dropped below 130 dB rms, regardless of the jet spud running (Figure 3-3). The same result was seen during M2 (Figure 3-4). In both examples, vessel traffic had increased and there was no obvious difference between when the jet spud was on versus off (shown by the blue line on each graph). In both figures, the red line indicates the average hydroacoustic ambient sound level within San Diego Bay (129.8 dB rms). This indicated that the increase of vessel traffic in the area played a role in being unable to establish the Level B threshold.

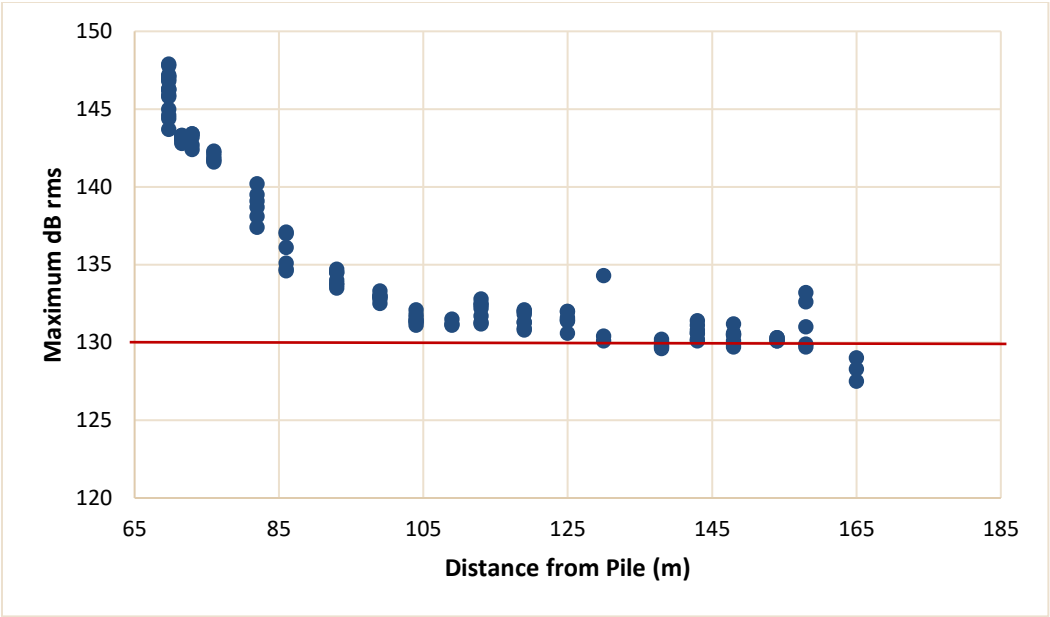


Figure 3-3. SPLs of 24×30 Pile Jetting (Utilizing M1) During a Vessel Drift Using the Hydro DB USLM for Pile O-3.

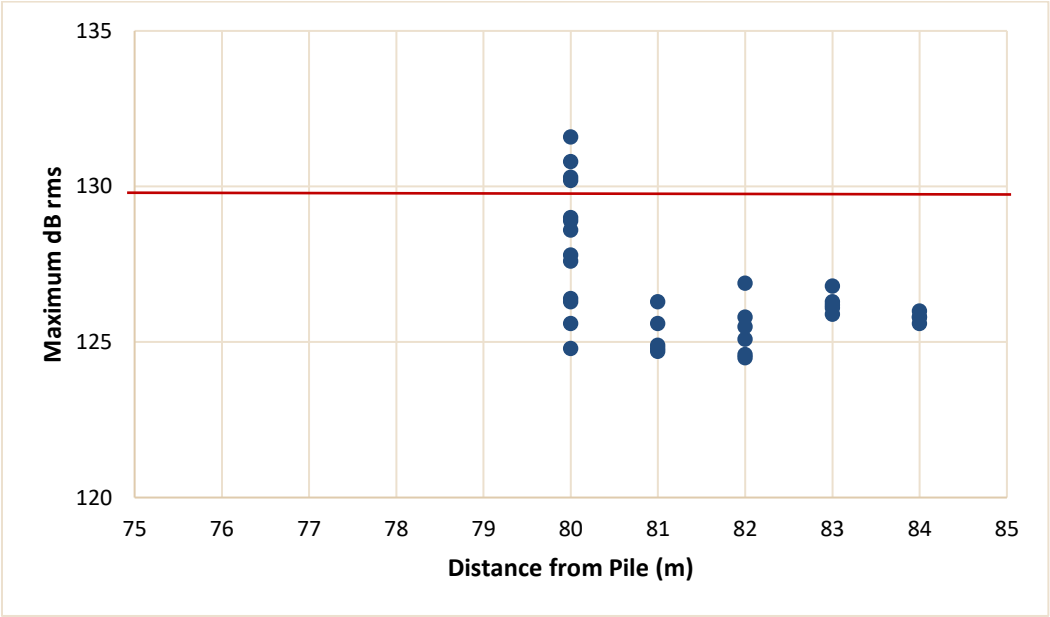


Figure 3-4. SPLs of 24×30 Pile Jetting (Utilizing M2) During a Vessel Drift Using the Hydro DB USLM for Pile O-3.

Note: For both of the above figures, the red line indicates the average hydroacoustic ambient sound level within San Diego Bay at 129.6 dB rms.

Additional drift and non-drift, far-field recordings were collected throughout the day (Figure 3-5 and Figure 3-6); however, vessel traffic within San Diego Bay increased making it difficult to find near ambient SPLs and replicate the values found in Figure 3-3 and Figure 3-4 at the specific distances. The decision to switch from drift to non-drift was due to the changing of the incoming tidal current and being unable to drift away from each pile. The pile jetting source levels for either method did not exceed the Level A thresholds (190 and 180 dB rms) for marine mammals; however, the distance to the Level B threshold for vibratory sound (129.6 dB rms) could not be consistently determined using real time data. Due to the difficulty in locating the Level B ZOI, the practical spreading loss model was applied based on the maximum SPL source value of 159.9 dB rms recorded during the M1 pile jetting. The model projected that the distance to the Level B threshold was 1,165 m (3,822 ft), and that distance was used for the Level B ZOI. Even though data collected during the first drift for the M1 pile jetting suggested a smaller ZOI of 165 m (541 ft), the monitored ZOI remained conservative.

3.3.4 Airborne Sound

As part of the construction of the breasting and mooring dolphins to the south of the new fuel pier, twenty-four 30-inch steel structural piles were installed in water depths averaging 16 m (52 ft). During their installation (using both vibratory and impact pile driving), airborne acoustic measurements were recorded at both source (15 m [49 ft]) and at two locations on a pier (P-122) with direct line of sight to the pile to the southwest of the piles being driven. There were no intermediate distances to capture airborne data using the Larson Davis due to the demolition of the old fuel pier and a lack of a direct line of sight to the pile being driven. Previous IHA reports used conservative distances for the 100 dB (80 m [262 ft]) and 90 dB re 20 µPa (233 m [262 ft]) for Level B airborne ZOIs based on 36-inch steel piles. Because the largest pile driven during the 2016/2017 production year were 30-inch steel piles, airborne acoustic data for the 30-inch piles were collected during their installation and applied to all driven piles to provide a conservative estimate of the distances to the airborne ZOIs.

3.3.4.1 Airborne Vibratory Pile Driving

Airborne sound levels were recorded during vibratory pile driving on fourteen 30-inch steel piles (Table 3-10). The maximum recorded airborne dB rms values at source (15.2 m [50 ft]) was 106.3 dB re 20 µPa, and average values ranged from 96.0 to 102.7 dB re 20 µPa. Additional airborne sound levels were collected at far-field distances on P-122 to evaluate ZOI threshold distances associated with vibratory pile driving. The maximum recorded airborne SPL at far-field of distances of 200 to 250 m (656 to 820 ft) were 104.4 dB re 20 µPa, with average recorded levels at these distances from 82.6 to 94.2 dB re 20 µPa. The transmission loss coefficient of -11.9 was calculated at 1.0 dB re 20 µPa (Figure 3-7). In Figure 3-7, the red line indicates the 90 dB and 100 dB re 20 µPa isopleths. Based on the calculated transmission loss coefficient for LZF_{max} average values, the 100 and 90 dB re 20 µPa isopleths were estimated at 15 and 103 m (49 and 338 ft), respectively.

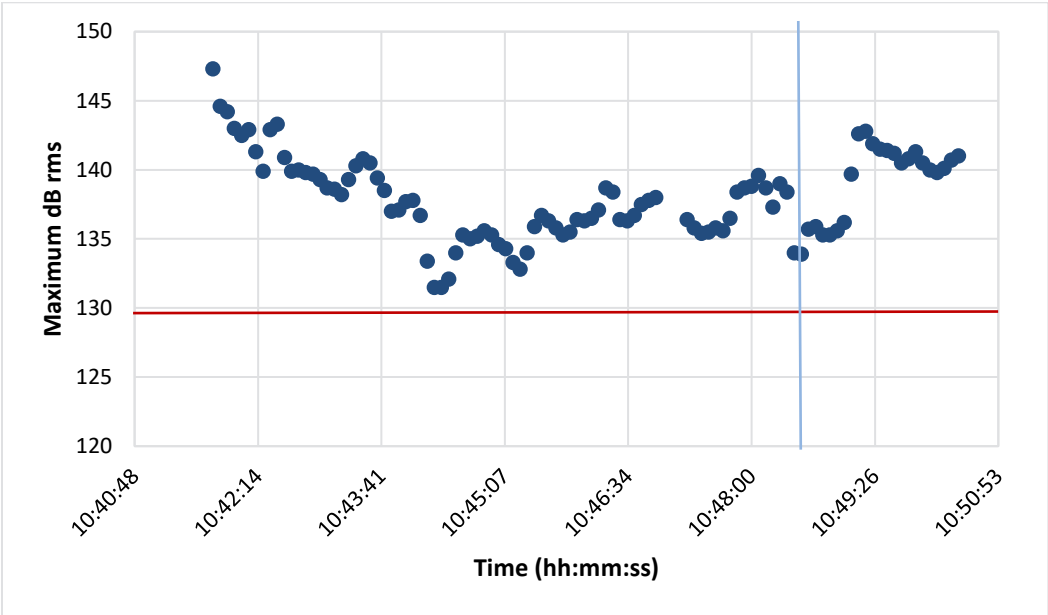


Figure 3-5. Example of a Far-field Stationary (Non-drift) Recording of Pile Jetting Method 1 (M1) at Approximately 350 m (1,148 ft) From the Pile.

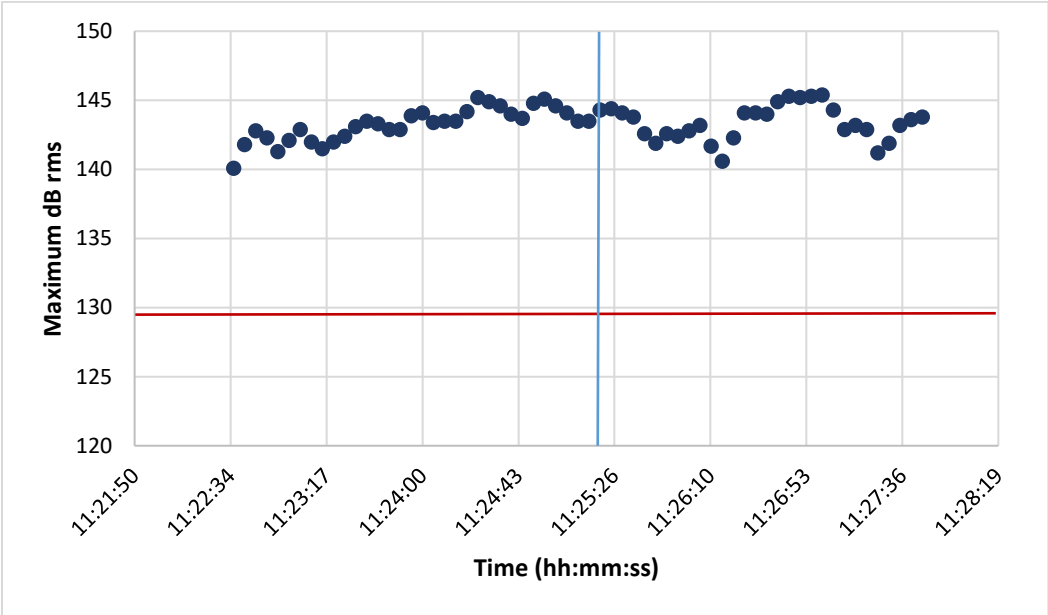


Figure 3-6. Example of a Far-field Stationary (Non-drift) Recording of Pile Jetting Method 2 (M2) at Approximately 350 m (1,148 ft) From the Pile.

Note: For both of the above figures, the red line indicates the average hydroacoustic ambient sound level within San Diego Bay at 129.6 dB rms.

Table 3-10. Vibratory Pile Driving - Airborne SPL Values from Source (15.2 m [50 ft]) and Far-field Distances for 30-inch Steel Piles.

Pile Size, Type And Unit Location	Pile #	Duration (min)	Distance (m[ft])	Values	dB rms (LZF_{max})	dB peak (LZF_{peak})	dB SEL (LZeq)
30-inch Steel (Source)	D5-PB-B2	5	15 (50)	Avg.	101.4	113.0	100.9
				Max	104.1	116.0	103.6
	D5-PD-B1	5	15 (50)	Avg.	102.7	113.8	102.3
				Max	104.8	117.0	104.2
	D5-PD-B2	10	15 (50)	Avg.	101.8	113.3	101.3
				Max	105.2	117.2	104.8
	D6-PB-B2	4	15 (50)	Avg.	100.5	112.1	99.9
				Max	102.8	115.5	102.1
	D7-DA	5	15 (50)	Avg.	96.0	106.4	95.4
				Max	103.0	116.0	102.5
	D8-DA	6	15 (50)	Avg.	97.8	108.6	97.2
				Max	102.4	114.6	102.3
	D8-DB-B1	4	15 (50)	Avg.	100.1	109.6	99.6
				Max	106.3	116.6	106.0
30-inch Steel (Far-field)	D5-PD-B2	10	200 (656)	Avg.	86.0	94.8	83.7
				Max	97.5	103.4	94.5
	D6-PD-B1	4	200 (656)	Avg.	82.6	92.5	81.2
				Max	92.3	99.9	89.5
	D6-PD-B2	5	200 (656)	Avg.	84.7	94.9	83.1
				Max	93.8	101.8	88.8
	D7-DA-B1	2	200 (656)	Avg.	83.7	94.1	82.6
				Max	86.9	97.7	85.4
	D8-DB-B2	13	200 (656)	Avg.	83.2	93.1	81.7
				Max	94.9	102.0	91.3
	D5-PB-B2	5	257 (843)	Avg.	94.2	100.9	90.8
				Max	104.4	111.7	100.9
	D5-PD-B1	5	257 (843)	Avg.	88.2	95.8	85.3
				Max	102.3	108	99.0

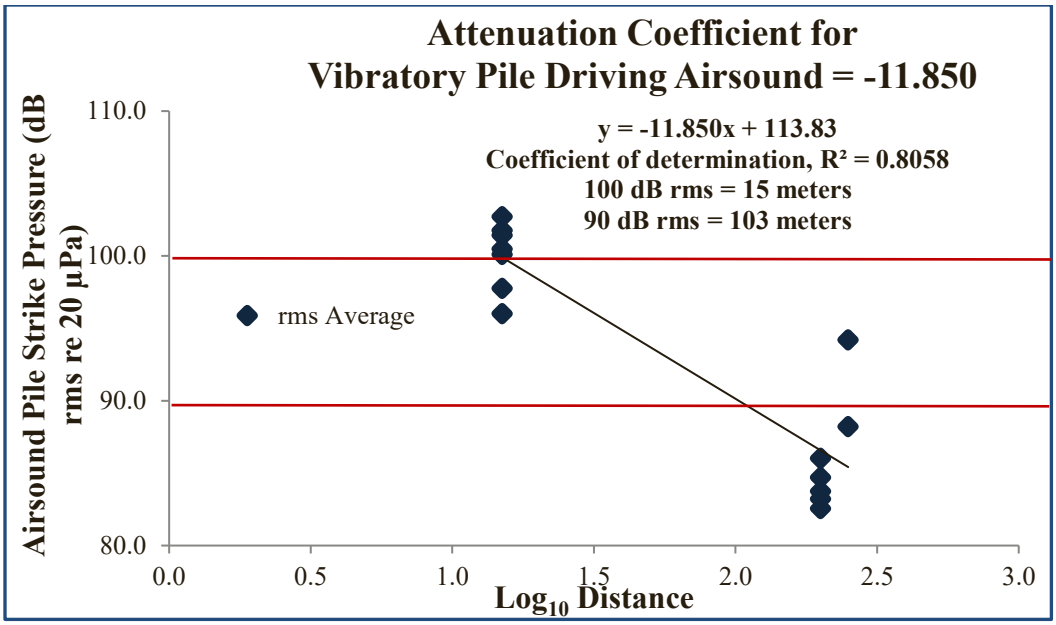


Figure 3-7. Vibratory Pile Driving Airborne Sound Level Transmission Loss Calculated for 30-inch Steel Piles.

3.3.4.2 Airborne Impact Pile Driving

Airborne sound levels were recorded during impact pile driving on sixteen 30-inch steel piles (Table 3-11). The maximum recorded airborne dB values at source (15.2 m [50 ft]) was 118.5 dB re 20 µPa, and average values ranged from 105.8 to 112.5 dB re 20 µPa. Additional airborne sound levels were collected at far-field distances on P-122 to evaluate ZOI threshold distances associated with impact pile driving. The maximum recorded airborne dB rms values at distances of 200 to 250 m (656 to 820 ft) were 107.8 dB re 20 µPa, with average recorded levels ranging from 84.8 to 93.3 dB re 20 µPa. The transmission loss coefficient was -17.7 and was calculated at 1.0 dB re 20 µPa (Figure 3-8). In Figure 3-8, the red line indicates the 90 dB and 100 dB re 20 µPa isopleths. Based on the calculated transmission loss coefficient for LZF_{max} average values, the 100 and 90 dB re 20 µPa isopleths were estimated at 51 and 188 m (167 and 617 ft), respectively.

Table 3-11. Impact Pile Driving - Airborne SPL Values from Source (15.2 m [50 ft]) and Far-field Distances for 30-inch Steel Piles.

Pile Size, Type and Unit Location	Pile #	Duration (min)	Distance (m[ft])	Values	dB rms (LZFmax)	dB peak (LZFpeak)	dB SEL (LZeq)
30-inch Steel (Source)	D5-PB-B2	16	15 (50)	Avg.	108.7	119.2	100.6
				Max	113.4	129.0	107.0
	D5-PD-B1	17	15 (50)	Avg.	111.3	121.8	101.8
				Max	118.5	135.7	111.5
	D5-PD-B2	20	15 (50)	Avg.	109.6	119.6	100.4
				Max	116.9	133.4	110.6
	D6-PB-B2	20	15 (50)	Avg.	107.2	117.2	98.2
				Max	112.8	130.0	107.0
	D6-PD-B1	20	15 (50)	Avg.	105.8	116.7	97.1
				Max	112.4	129.8	105.6
	D7-DA	15	15 (50)	Avg.	111.5	122.4	102.9
				Max	117.4	135.0	110.9
	D8-DA	16	15 (50)	Avg.	109.7	120.5	101.5
				Max	117.1	134.6	110.8
	D8-DB-B1	6	15 (50)	Avg.	112.5	124	104.8
				Max	118.0	135.7	111.3
	D8-DB-B2	10	15 (50)	Avg.	109.2	119.9	100.7
				Max	114.0	130.9	107.8
30-inch Steel (Far-field)	D5-PD-B2	20	200 (656)	Avg.	86.5	96.6	83.3
				Max	99.7	107.3	97.2
	D6-PD-B1	20	200 (656)	Avg.	86.0	97.8	81.8
				Max	99.1	109.1	95.8
	D7-DA-B1	18	200 (656)	Avg.	88.6	101.1	82.9
				Max	93.1	110.8	88.1
	D5-PB-B1	20	257 (843)	Avg.	87.3	99.6	81.7
				Max	93.3	111.9	88.3
	D5-PB-B2	16	257 (843)	Avg.	92.9	101.5	89.4
				Max	106.7	111.9	102.4
	D5-PD-B1	17	257 (843)	Avg.	84.8	96.3	80.3
				Max	99.6	107.2	93.7
	D6-PB-B2	20	257 (843)	Avg.	93.3	102.3	89.5
				Max	107.8	114.9	102.8

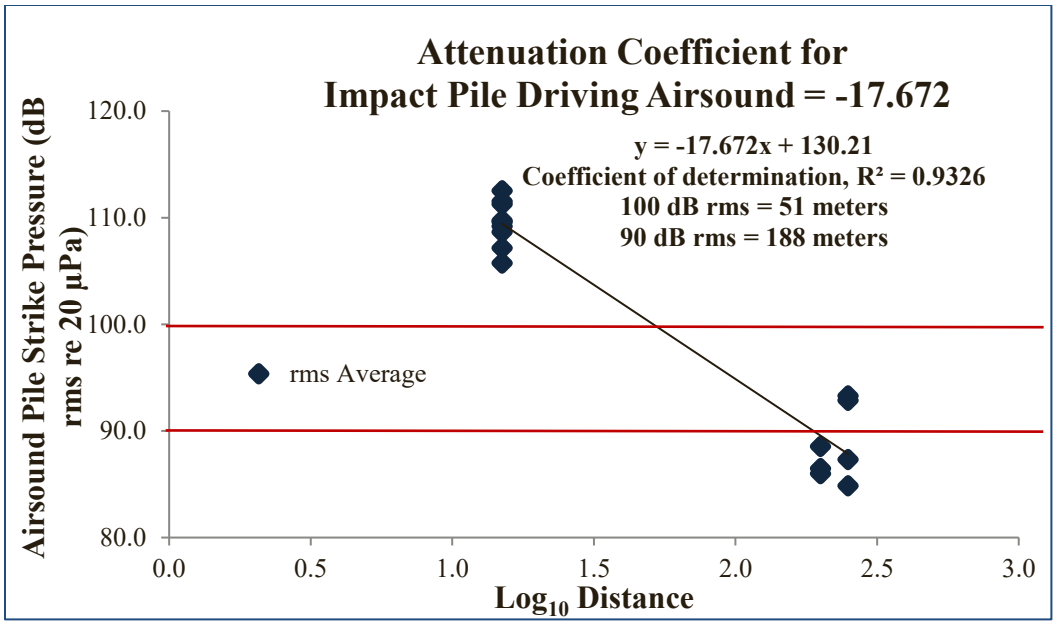


Figure 3-8. Impact Pile Driving Airborne Sound Level Transmission Loss Calculated for 30-inch Steel Piles.

3.4 Summary of Marine Species Monitoring Results

Four marine mammal species were identified in northern San Diego Bay during production pile driving and demolition activities (Table 3-12). There were also two sightings of two unidentified dolphins, and one sightings of an unidentified pinniped. No dead or injured marine mammals were reported during monitoring efforts from 8 October 2016 to 30 April 2017. Data for all sightings is available in each individual species' section below as well as in Appendix F.

During the reporting time-period, there were a total of 911 sightings (including resightings) of 2,344 live marine mammals in the water or hauled out on buoys, barges, or docks. Resightings accounted for 10.4% (n=95) of all sightings and occurred when one MMO "passed off" an animal to another MMO by verifying that the animal was the same individual via both visual and radio-communication between the MMOs. The second MMO would then either "pass off" the animal to another MMO, or watch it as it left visual range. Because the resightings would have inflated the counts, they were not included in the overall analysis, unless otherwise stated. When resighted animals were discounted from the overall numbers, there were 826 sightings of all species with 2,189 animals in the water and hauled out. Of these sightings, there were 20 sightings of cetaceans with 48 animals, 805 sightings of pinnipeds with 2,140 animals, and one sighting of a single green sea turtle. Of the pinniped sightings, there were 256 sightings with 1,410 individuals hauled out, and 549 sightings with 730 animals in the water (Table 3-12). Pinnipeds that were hauled out did not contribute to in-water take, and have been discounted from this analysis, unless specified.

Table 3-12. Total Number of Individuals and Sightings by Species.

Species	Hauled Out					In Water				
	Total Number		Group Size			Total Number		Group Size		
	Indiv.	Sightings	Mean	Max	Min	Indiv.	Sightings	Mean	Max	Min
California sea lion	1,392	243	5.73	84	1	645	474	1.36	25	1
Harbor seal	18	13	1.38	3	1	84	74	1.14	3	1
Unidentified pinniped	-	-	-	-	-	1	1	1.00	1	1
Coastal bottlenose dolphin	N/A					45	18	2.50	6	45
Unidentified dolphin						2	1	2.00	2	2
Gray whale						1	1	1.00	1	1
Green sea turtle						1	1	1.00	1	1
TOTAL	**1,410**	**256**				**779**	**570**			

3.4.1 Modeled versus Measured ZOIs

Relative to the IHA #3 reports (NAVFAC SW 2016a, 2016b), the Level A and Level B ZOIs did not change for those piles also driven during IHA #3 as well as in IHA #4. The *in situ* acoustic data collected during construction or demolition in 2016/2017 confirmed that the distances to the ZOIs were still representative of the Level A and Level B ZOIs (see Table 2-4). The ZOIs for new activities during IHA #4 were evaluated via *in situ* acoustic monitoring, as well as visual monitoring using conservative Level A (if needed) and Level B ZOIs. If the Level B ZOIs were beyond the visual range of MMOs, a calculation for potential abundance of animals missed used the amount of area inside of the Level B ZOIs, but outside of the visual range of the MMOs, density estimates for species, and the amount of time of a construction or demolition activity.

3.4.2 Other Species Monitored

3.4.2.1 California Least Tern

No Terns were observed during production pile driving operations. If individuals or groups had been observed, MMOs would have, to the best of their ability, assessed foraging success by noting whether individuals dove from a hovering position and then rose from the water with a prey item in their beak. Because no individuals were observed during the project timeframe, they will not be addressed further in this document.

3.4.2.2 Green Sea Turtle

A single green sea turtle was observed during caisson cutting operations. The single individual had a shell length of approximately 0.61 m (2 ft) and no flipper tags were observed. The MMO first observed the animal on the west side of the new fuel pier (in-between the old fuel pier and the new fuel pier) as it surfaced. At the time of the observation, the wire saw was cutting a caisson near the trestle of the new fuel pier, approximately 50 m (164 ft) from observation location. The animal was initially observed as it came up for a single breath, and was last seen heading to the northwest, away from cutting operations towards P-302 (the pier directly to the north of the project area). The

MMO immediately alerted the dive master for the caisson cutting crew that a sea turtle was in the area, and to prepare for a shutdown, if needed. No shutdown was required based on the last observed heading of the animals.

3.4.3 Sightings of Marine Mammals Covered Under IHA #4

Marine mammals were sighted during several all phases of the Project, as well as during shutdown events when an animal caused a shutdown or delay of construction after it entered the buffered and/or actual Level A ZOIs for the cetaceans and pinnipeds. The construction shutdowns or delays were small (generally a few minutes) and have also been included as part of pile driving monitoring. Table 3-13 provides a summary the number of individuals and sightings that occurred during each phase of active construction and demolition or, non-construction and non-demolition monitoring. Species covered under the IHA included the California sea lion, harbor seal, coastal bottlenose dolphin, common dolphin, gray whale, northern elephant seal, Pacific white-sided dolphin, and Risso's dolphins.

3.4.3.1 California Sea Lions

California sea lions were the most frequently observed species of marine mammal with 2,038 individuals in the water or hauled out during 718 sightings. Mean group size for all California sea lion observations (hauled out and in-water) was 2.84 individuals per sighting, with 25.48 individuals observed per day. Unless otherwise stated, animals that were hauled out on docks or barges during monitoring efforts were not further assessed because they did not contribute to "take." Of the 2,038 total individuals sighted, 646 individuals were sighted in the water during 475 sightings (Table 3-14). A single unidentified pinniped was observed during the monitoring time-period, but given the likelihood of this individual being a California sea lion, it is included as part of the California sea lion analysis. When only California sea lion sightings in the water are evaluated, overall mean group size was 1.36 individuals per sighting with 5.08 individuals sighted per day. When looking at the number of individual animals per monitoring day and per observer hour, the California sea lion population appeared to be at its largest from February through April, with a peak in March, and a low during January (Table 3-14 and Figure 3-9). This trend is supported when adjusting for effort with the highest number of animals per observer hour also in March (Figure 3-10). However, the largest sighting of 25 animals during March was due to a large group of animals that were initially hauled out, but entered the water from the EBBCO Bait Barges. If that single observation is discounted from the analysis, then the number of animals in the water drops to 243, the average group size in March drops from 1.37 to 1.25 individuals per sighting, the individuals per day drops to 11.57, and the individuals per observer hour drops to 2.83. Even with this single large sighting being discounted, March still shows the highest overall numbers relative to the other months. When evaluating all available data, the population was its smallest in January based on the number of monitoring days (n=10), as well as the number of individuals observed and mean group size.

Table 3-13. Summary of In-water Marine Species Observations During Monitoring of the Fuel Pier Construction Project.

Species	Construction Monitoring [Individuals (Sightings)[1]]					Demolition [Individuals (Sightings)]		Non-Construction/Demolition Monitoring [Individuals (Sightings)[1]]		
	Vibratory Pile Driving	Impact Pile Driving		Shutdown	Jetting	Caisson Cutting	Pile Clipping	Pre-	Pre-/Post-	Post-
		Soft Start	Full Power							
California sea lion	30 (17)	-	64 (48)	11 (9)	18 (11)	44 (37)	17 (15)	125 (89)	230 (183)	97 (57)
Harbor seal	-	-	5 (5)	2 (1)	2 (1)	16 (16)	5 (3)	17 (14)	29 (27)	9 (7)
Unidentified pinniped	-	-	-	-	1 (1)	-	-	-	-	-
Coastal bottlenose dolphin	2 (1)	2 (1)	-	2 (2)	-	1 (1)	-	18 (6)	17 (7)	3 (1)
Gray whale	-	-	-	-	-	1 (1)	-	-	-	-
Unidentified dolphin	-	-	-	-	-	2 (1)	-	-	-	-
Green sea turtle	-	-	-	-	-	1 (1)	-	-	-	-
TOTAL	32 (18)	2 (1)	69 (53)	15 (11)	21 (13)	64 (57)	22 (18)	160 (109)	276 (217)	109 (65)

Notes: [1] "Pre-" = Pre-construction monitoring; "Pre-/Post-" = Pre-/Post-construction monitoring; "Post-" = Post-construction monitoring; Dash indicates no sightings occurred during the monitoring timeframe.

Table 3-14. Summary of California Sea Lion Individuals and Sightings per Month.

Month	Total Number per Month		Group Size per Month			Monitoring Days	Indiv. per Day	Obs. Hours (hh:mm)	Indiv. per Obs. Hour
	Individuals	Sightings	Mean	Min	Max				
October	40	32	1.29	1	5	8	5.00	35:00	1.14
November[1]	-	-	-	-	-	0	-	00:00	-
December	54	42	1.29	1	5	10	5.40	105:47	0.51
January	25	20	1.25	1	3	14	1.79	69:33	0.36
February	109	87	1.25	1	8	10	10.90	71:41	1.52
March	268	196	1.37	1	25	21	12.76	85:48	3.12
April	150	98	1.53	1	12	18	8.33	93:54	1.60
TOTAL	**646**	**475**				**81**			

Notes: [1]No marine mammal monitoring occurred during November 2016.

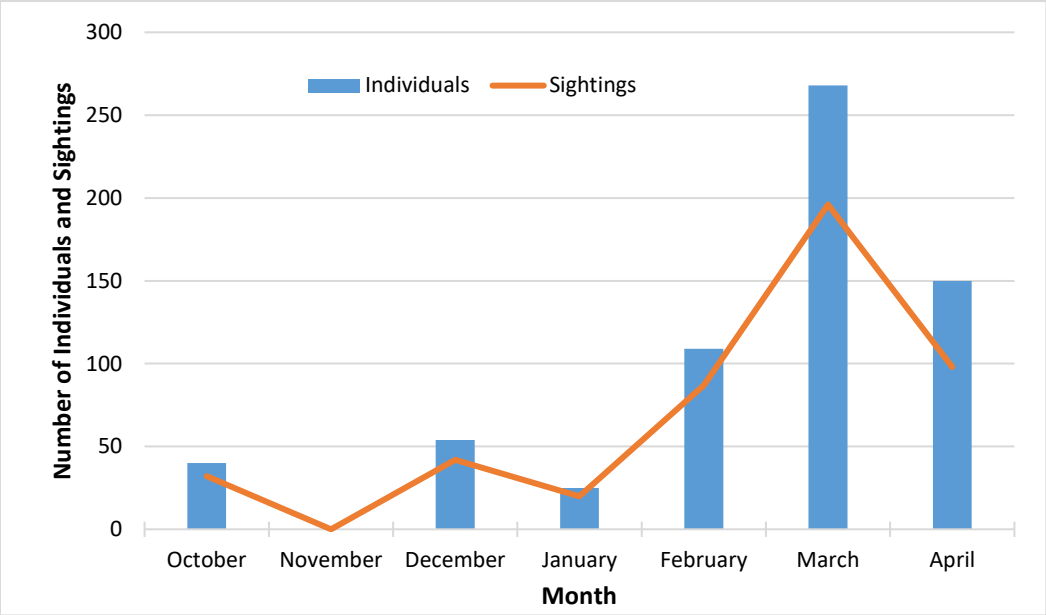


Figure 3-9. California Sea Lion Individuals and Sightings per Month.

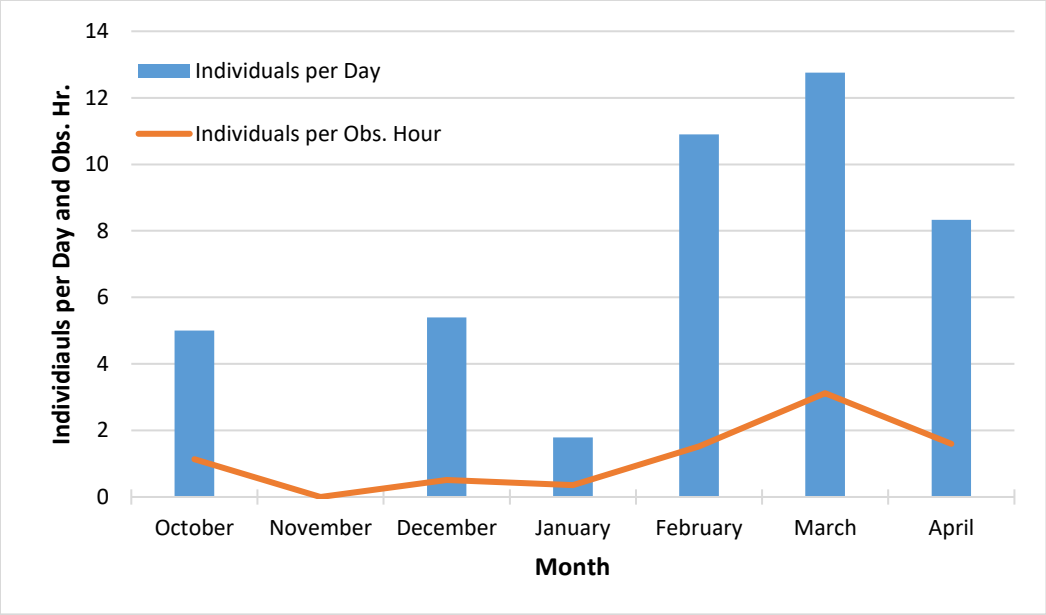


Figure 3-10. California Sea Lion Individuals per Day and per Observer Hour.

Sightings were evenly distributed throughout San Diego Bay during the 30-inch pile driving, with sightings becoming less dense at the extremes of the Level B ZOIs to the north and south of the new fuel pier (Figure 3-11). However, sightings during construction (Figure 3-11) and demolition activities (Figure 3-12), were clustered around the new fuel pier. Figure 3-12 identifies those individuals that were observed when only demolition activities were occurring. During the times when both demolition and pile driving were co-occurring, the demolition MMO acted as a secondary MMO for the pile driving MMOs. Observer location is likely a determining factor in sighting distribution, with sightings during the 30-inch piles extending further from the Project area (indicating a larger Level B ZOI and MMO effort), and sightings during all other demolition and construction activities clustered around the Project area itself due to a reduced number of MMOs needed for monitoring activities (Figure 3-11 and Figure 3-12). Regardless of observer effort, the distribution of sea lions did not appreciably change between the pile driving or demolition activities when compared to non-activity monitoring (time before, in-between, and after active pile driving or demolition). Based on the inset map for the pre-/post-construction monitoring timeframe in Figure 3-11 and Figure 3-12, more observations appeared to occur during the pre-/post-construction monitoring. However, this was a result of an increased time of observation (see Table 3-1) rather than an increase in numbers of individuals in the area during these observation periods.

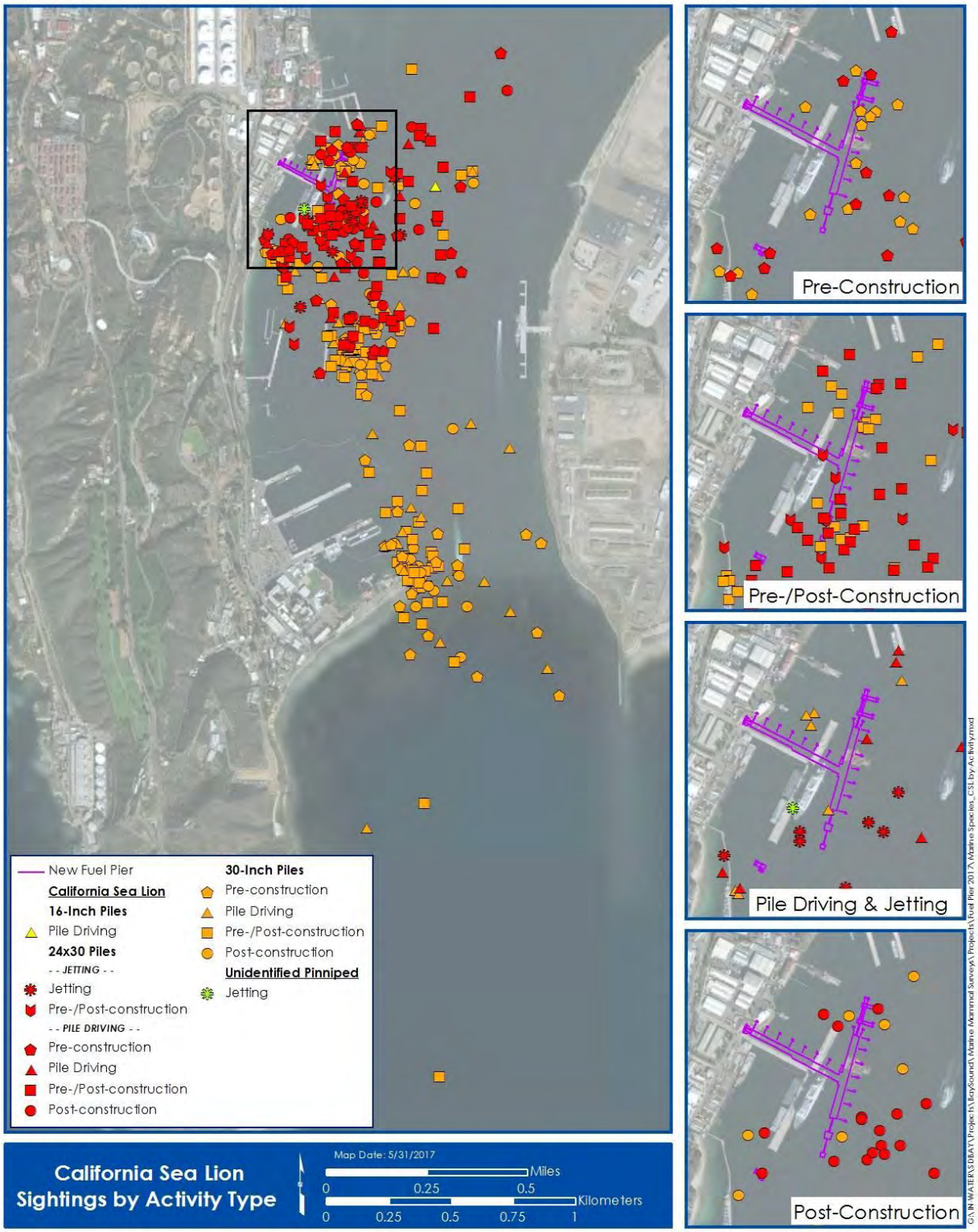


Figure 3-11. All California Sea Lion Sightings During Pile Installation Monitoring Efforts.

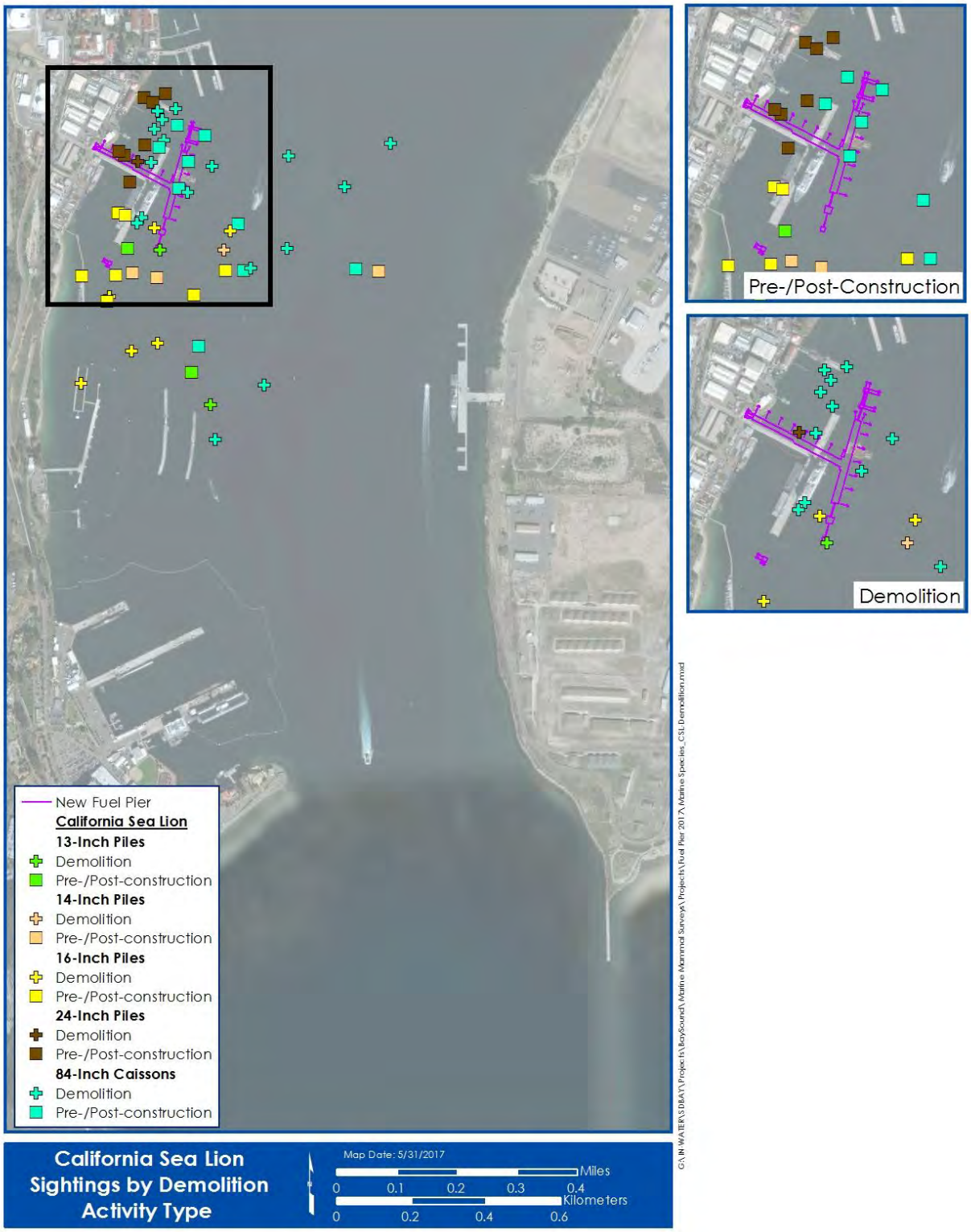


Figure 3-12. All California Sea Lion Sightings During Demolition Monitoring Efforts.

Of the 646 total individuals observed during all monitoring effort, 152 individuals (23.5%) were observed during active construction and demolition, and 494 individuals (76.5%) were observed before, in-between, or after construction or demolition activities (Table 3-15). Mean group size during all monitoring effort for construction and demolition ranged from 1.00 to 1.59 individuals per sighting, with an overall mean group size of 1.38 individuals per sighting.

Table 3-15. Summary of California Sea Lion Sightings During Monitoring Efforts.

Type of Activity	Pile Size	All Monitoring Effort		During Construction/ Demolition			Non-Activity		
		Indiv.	Sightings	Indiv.	Sightings	Indiv. per Sighting	Indiv.	Sightings	Indiv. per Sighting
Construction	16-inch	12	12	1	1	1.00	11	11	1.00
	24×30[1,2]	215	144	35	22	1.59	180	122	1.48
	30-inch	351	261	78	56	1.39	273	205	1.33
	Subtotal	**578**	**417**	**114**	**79**		**464**	**338**	
Demolition	13-inch	4	4	2	2	1.00	2	2	1.00
	14-inch	4	4	1	1	1.00	3	3	1.00
	16-inch	14	14	7	7	1.00	7	7	1.00
	18-inch	0	0	0	0	0.00	0	0	0.00
	24-inch	9	8	1	1	1.00	8	7	1.14
	84-inch	37	28	27	19	1.42	10	9	1.11
	Subtotal	**68**	**58**	**38**	**30**		**30**	**28**	
TOTAL		**646**	**475**	**152**	**109**		**494**	**366**	

Notes: [1]Includes jetting for 24×30 piles (15 Individuals, 10 Sightings)
[2]Includes one observation of one unidentified pinniped

For the 24×30, 16-inch and 30-inch piles, there were more observations during non-pile driving (pre-construction, pre-/post-construction, and post-construction) activities, with 464 individuals (80.3%) observed during these observation periods. In contrast, most of the individuals observed during demolition activities were observed during the active caisson cutting or pile clipping activities, and not during the pre-/post-construction monitoring. Observations during active and non-active demolition were more evenly distributed between the two types of monitoring efforts (see Table 3-15).

California sea lions were more often observed during non-activity monitoring for pile driving/jetting monitoring efforts (Figure 3-13), but most often seen during active demolition activities (Figure 3-14). As noted above, there were over five times the number of hours during construction monitoring associated with non-active phases (pre-, pre/post, and post-construction) than during active pile driving. In contrast, there was less of a difference in observer hours between active and non-active demolition phases; there were only one-and-half times the number of hours for non-activity demolition monitoring than for active demolition monitoring. This was most evident in January, when caisson cutting was the only activity requiring monitoring.

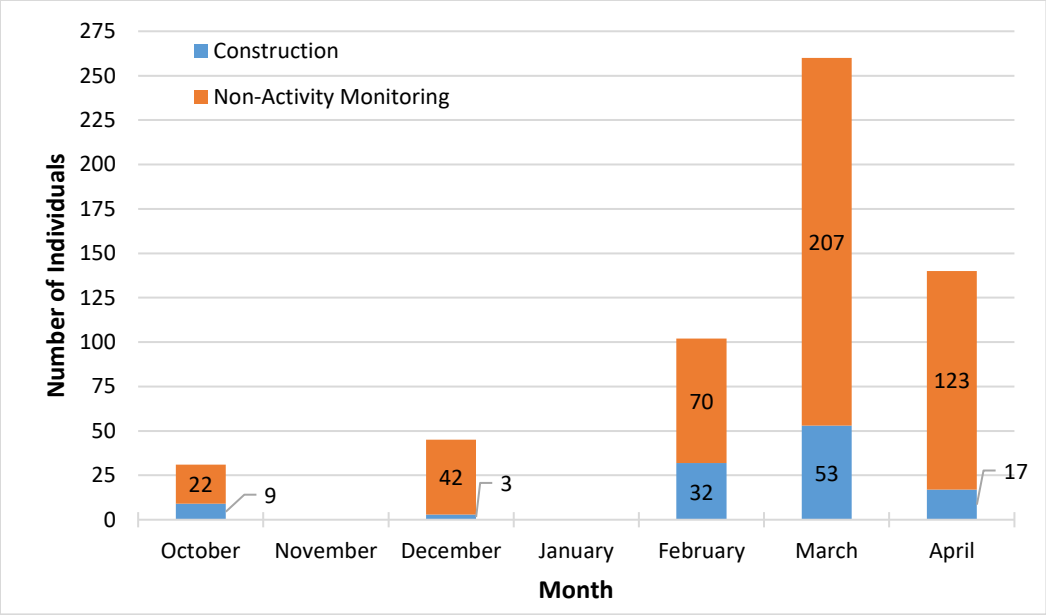


Figure 3-13. California Sea Lion Individuals per Month During Pile Installation and Non-Activity Monitoring.

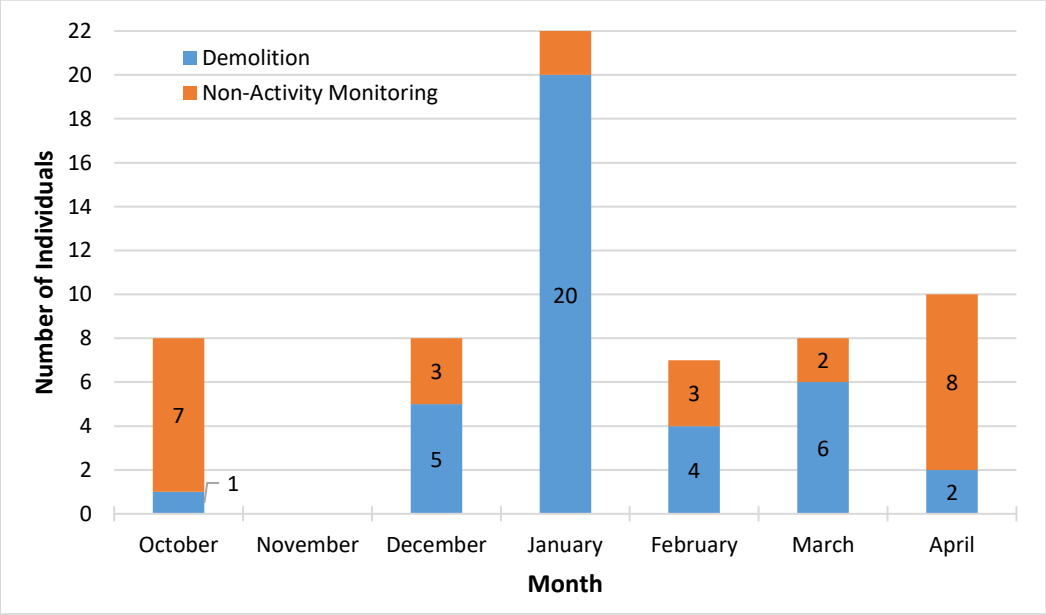


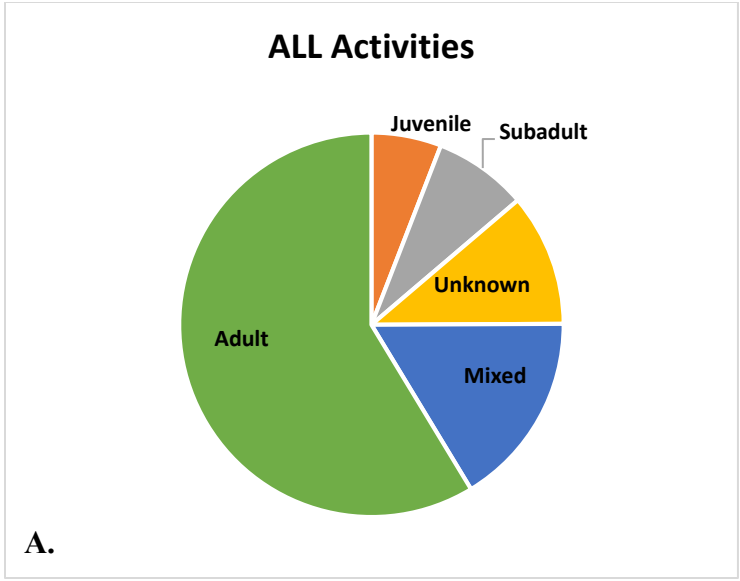
Figure 3-14. California Sea Lion Individuals per Month During Demolition and Non-Activity Monitoring.

There were nine observations where a California sea lion entered the buffered "shutdown" ZOI (but not the actual Level A injury zone) either during pile driving (causing a shutdown of construction) or non-pile driving monitoring efforts (causing a delay; Appendix G). No animals caused shutdowns or delays during demolition activities. Of the nine observations, pile driving was halted two times, with the remaining seven observations causing delays; in the case of delays pile driving had been stopped due to construction-specific issues (i.e., equipment adjustment), and the animal entered the buffered "shutdown" ZOI just before pile driving was about to begin. If pile driving was stopped and the animal entered the buffered shutdown ZOI, the Command position would not let pile driving begin until the animal was seen to have left the shutdown ZOI, or was not observed for fifteen minutes after its last observation inside of the buffered shutdown ZOI. For the nine shutdowns or delays, the total amount of time was thirty-nine minutes and sixteen seconds over the 81 days of observation effort (or on average twenty-nine seconds per day), and averaged four minutes and twenty-two seconds per event.

When evaluating all observations for construction and demolition activities, a majority of California sea lion sightings were of adults (n=379, 58.7%), followed by groups of mixed ages (n=106, 16.4%), unknown age class (n=69, 10.7%), subadults (n=51, 7.9%), and juveniles (n=38, 5.9%; Figure 3-15a). It should be noted that observations of adults, mixed age classes, and unknown age classes were the only age classes observed during all months of effort. Juveniles were observed only from January to April, and subadults observed only from February to April. When the data is separated out into construction (Figure 3-15b) and demolition (Figure 3-15c), the data shows the same basic trend of adults dominating the observations; however, for construction, the next most observed age class is mixed, while for demolition it is the unknown age class.

Adult sea lions had the largest number of sightings in March (n=143), followed by February (n=81), April (n=79), and December (n=33). In Table 3-14, March also had the highest individual per observer hour as well, with 3.12 individuals per observer hour, and these individuals were most often adults. All other age classes followed this same pattern, with highest number of individuals in each age class observed in March.

For all construction and demolition activities, the overall number of California sea lions sighted were generally consistent throughout the early to mid-morning, with a decrease in sightings in the late morning to early afternoon (Figure 3-16). The number of observed animals peaked in the early morning (during the 9:00 hour) and decreased until between 12:00 and 13:00 when there was a smaller increase in the number of individuals and sightings (Figure 3-16). Overall the group size dropped from 1.42 individuals per sighting in the morning hours (07:00 to 11:59) to 1.16 individuals per sighting in the afternoon hours (12:00 to 18:59). The highest mean group size occurred during the 07:00 hour with 2.05 individuals per sightings and the lowest group size was during the 18:00 hour with no individuals observed.



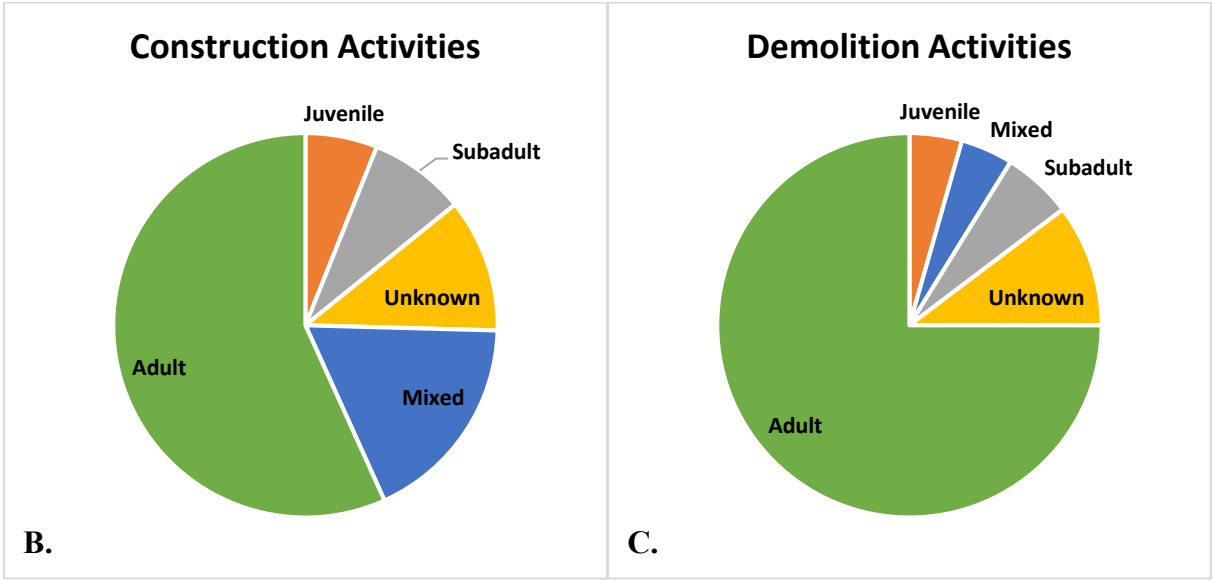


Figure 3-15a,b,c. Distribution of Age Classes for All California Sea Lion Sightings During: A. All Monitored Activities, B. Pile Driving, and C. Demolition.

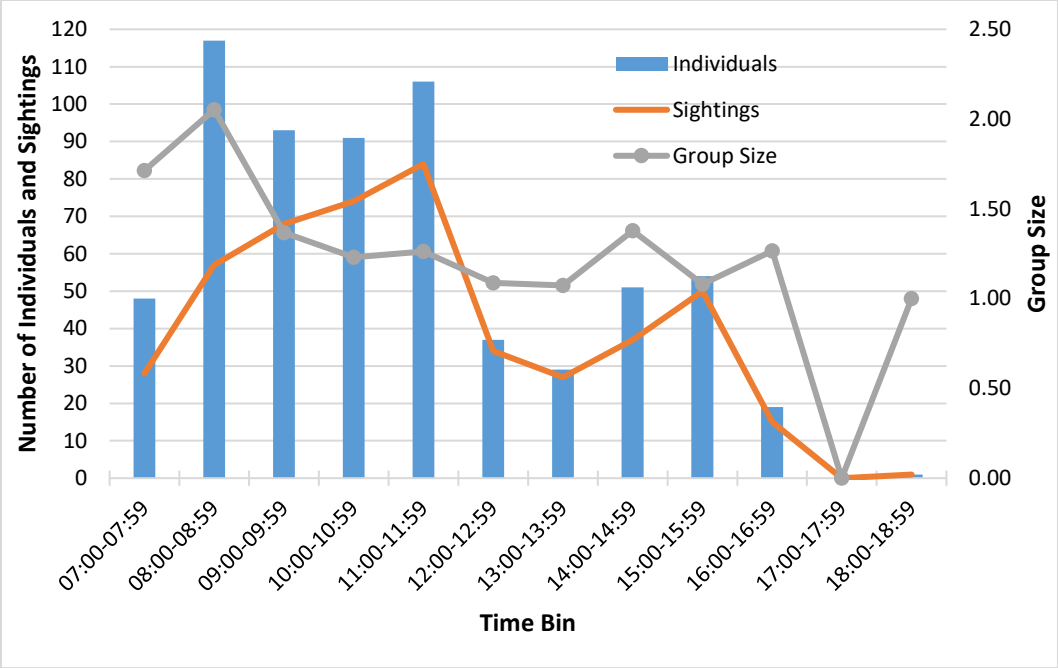


Figure 3-16. California Sea Lion Sightings and Individuals per Hour During All Monitored Activities

Individuals observed during construction monitoring efforts only (Figure 3-17a) remained steady until the 12:00 hour before dropping during the 13:00 hour, then rising during the 14:00 hour, and then dropping again after the 15:00 hour. During these same activities, the average group size per hour consistently dropped though the morning, then plateaued in the early afternoon, with no observations during the 17:00 hour. The number of individuals observed during demolition activities remained consistent throughout the morning before dropping off after 14:00 (Figure 3-17b). In contrast to the construction group size per hour, the group size during demolition, was consistent in the morning, with a spike during the 16:00 hour. This spike during the 16:00 hour was based on a single sighting of four individuals and should not be construed as indicating a general overall increase in group size at this hour. Overall, hourly observations during construction only (Figure 3-17a) closely mirrored those during all monitored activities (Figure 3-16), as expected since most monitoring observations were during construction.

California sea lions were most often noted as swimming (n=333, 70.1%), followed by milling (n=55, 11.6%), and entering the water off docks or buoys in the area (n=21, 4.4%). All other behaviors were noted less than 3.4% of the time during sightings. These behaviors included rafting, diving, exiting the water, porpoising, hauled out, looking, successful foraging, spyhopping, and unsuccessful foraging. When evaluating the percentage of behaviors relative to all behaviors, there was a higher percentage of individuals entering the water during construction and/or demolition (n=9, 8.3%) as opposed to during non-activity monitoring (n=12, 3.3%); however, with such a small sample size, this behavior may not necessarily be reflective of a difference between the two activity types.

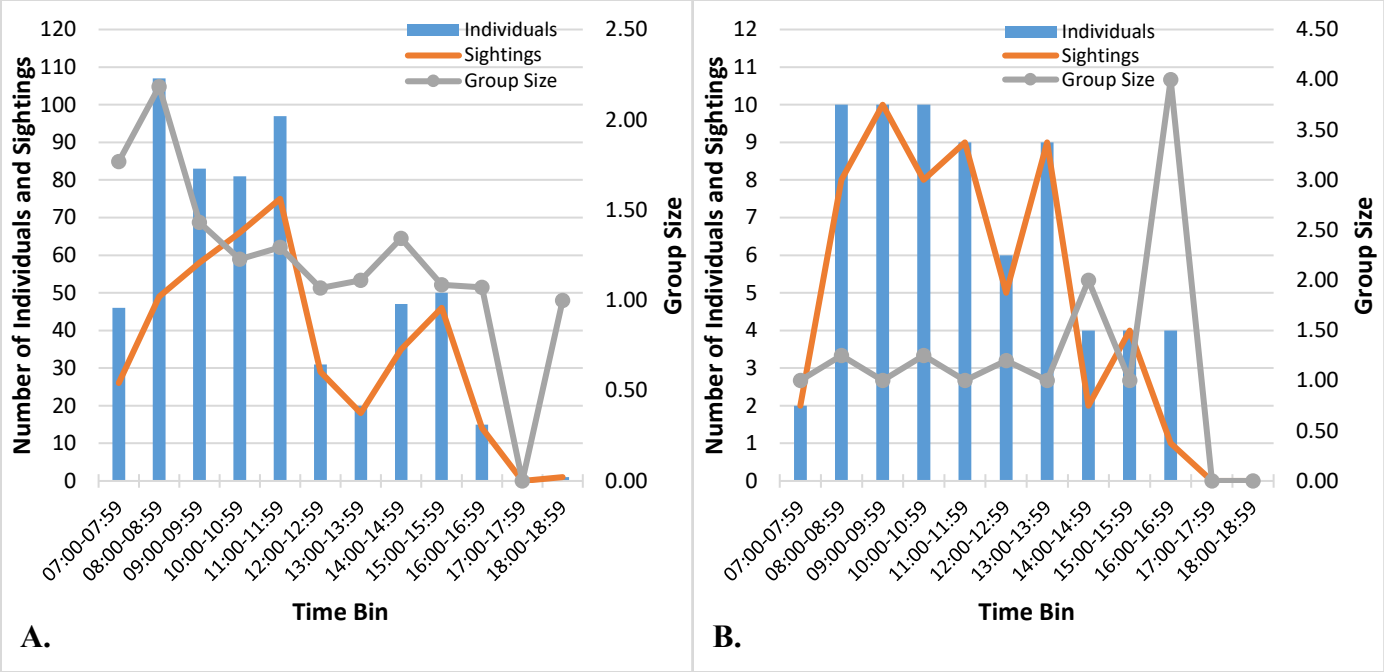


Figure 3-17a,b. California Sea Lion Sightings and Individuals per Hour During: A. Construction, and B. Demolition.

When comparing behaviors observed during construction and demolition, swimming was still the dominant behavior with 294 (70.5%; Figure 3-18) observations of swimming during construction and 39 (67.2%; Figure 3-19) observations of swimming during demolition. The second most observed behavior differed between construction and demolition with fifty observations of milling (12.0%) during construction and six observations of rafting (10.3%) for demolition. The number of individuals observed to enter the water during construction monitoring was slightly more during non-active (n=12) than the active phase (n=8) of construction; only one individual was observed to enter the water during demolition. As previously noted, there was more observation time during construction monitoring that was associated with non-activity phases than active pile driving that should be taken into account when comparing results among active and non-active phases of construction (see Table 3-1).

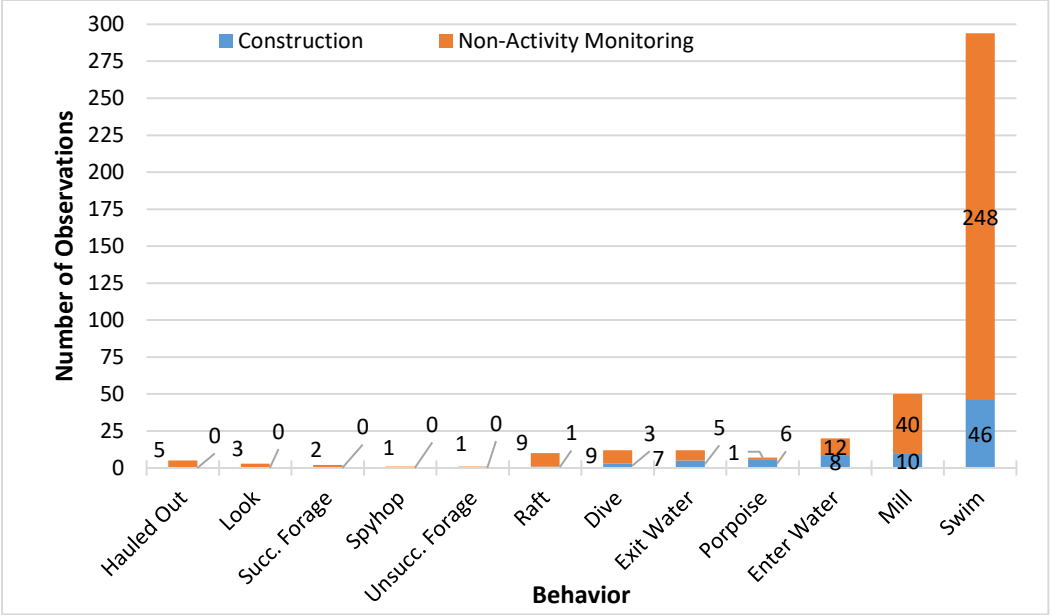


Figure 3-18. Behaviors During California Sea Lion Observations Associated with Construction Activities.

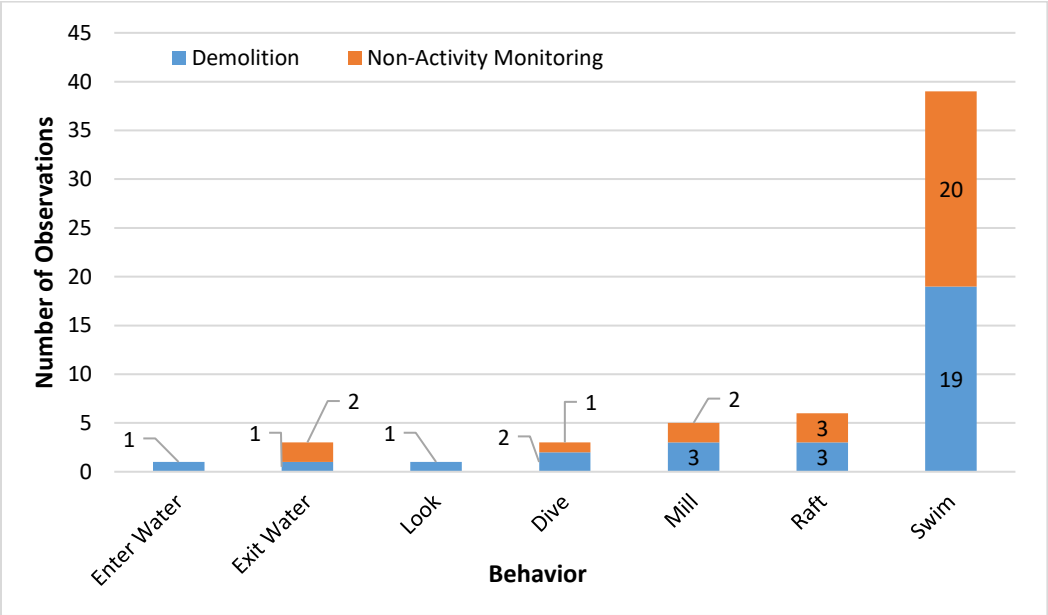


Figure 3-19. Behaviors During California Sea Lion Observations Associated with Demolition Activities.

During the 475 observations for all California sea lions, ten (2.1%) were noted as having a reaction to a stimulus. These reactions included nine instances of animals noted as specifically "flushing" into the water because of an obvious disturbance of some sort, and one abrupt change in direction. The behavior of "entering the water" is different from "flushing" in that there is an obvious disturbance (project-related or not) that caused animals to enter the water ("flushing") while an animal may simply "enter the water" to change positions or to thermo-regulate of its own accord. Of those nine instances of "flushing," four were noted at the EBBCO bait barges (and were unrelated to project activities), four were noted at the floating docks at P-122, and one was noted at P-302 (the pier directly to the north of the new fuel pier). Of the observations at P-122, P-302 and the EBBCO bait barges, all but one flush was due to human presence on the docks or barges where the sea lions were originally located. The only observation of an animal being flushed that may have been related to Project activities was of a single female sea lion that was first noted at 07:33 as hauled out on P-122 near the Project. Pile driving for 24×30 piles began at 07:46, and the individual looked in the direction of the hammer just after it began and seemed "nervous" (based on the MMOs notes) before it entered the water at 07:50. It was not observed again at that same location. The observation of an abrupt change in direction may also have been related to Project activities. An adult male was observed approximately 200 m (656 ft) to the south of the 30-inch pile driving activities, and was initially observed swimming north towards the new fuel pier; as pile driving began, it abruptly changed directions and headed back to the south.

3.4.3.2 Harbor Seals

Harbor seals were the second most observed species with 102 individuals in the water and hauled out during 87 sightings. Of these, 84 individuals during 74 sightings were observed in the water, and 18 individuals during 13 sightings were observed hauled out on docks around the Project vicinity or on the rocks to the south of Ballast Point. Mean group size for all harbor seal observations (hauled out and in-water) was 1.17 individuals per sighting, with 1.04 individuals observed per day. Because no animals were exposed to sound levels for airborne "take," only individuals identified as being observed in water will be further assessed as part of this analysis, unless otherwise stated.

Table 3-16 summarizes the number of in-water harbor seal observations according to month and monitoring effort. Mean group size was 1.14 individuals, with an average of 1.05 individuals were observed per day. When comparing month-to-month, mean group size ranged from no individuals (in October) to 1.38 (in March; Table 3-16). In looking at Figure 3-20 and Figure 3-21, both show a steady increase in numbers of animals in the Project area, with highest numbers in February through April. When adjusting for observer effort (Figure 3-21), February and March had the highest number of individuals per observer hour. These numbers indicate that there may have been a seasonal influx of harbor seals into the Bay in February and March (Table 3-16, Figure 3-21, and Figure 3-21). However, it should also be noted that the highest monitoring effort (for 30-inch piles with six MMOs) occurred in February and March, and observer effort may have influenced the larger numbers in February and March.

Table 3-16. Summary of Harbor Seal Individuals and Sightings per Month.

Month	Total Number per Month		Group Size per Month			Monitoring Days	Indiv. per Day	Obs. Hours (hh:mm)	Indiv. per Obs. Hour
	Individuals	Sightings	Mean	Min	Max				
October	0	0	0.00	0	0	8	0.00	35:00	0.00
November[1]	-	-	-	-	-	0	-	00:00	-
December	3	3	1.00	1	1	10	0.30	105:47	0.03
January	6	6	1.00	1	1	14	0.43	69:33	0.09
February	17	17	1.00	1	1	10	1.70	71:41	0.24
March	33	24	1.38	1	3	21	1.57	85:48	0.38
April	25	24	1.04	1	2	18	1.38	93:54	0.27
TOTAL	**84**	**74**				**81**			

Notes: [1]No marine mammal monitoring occurred during November 2016.

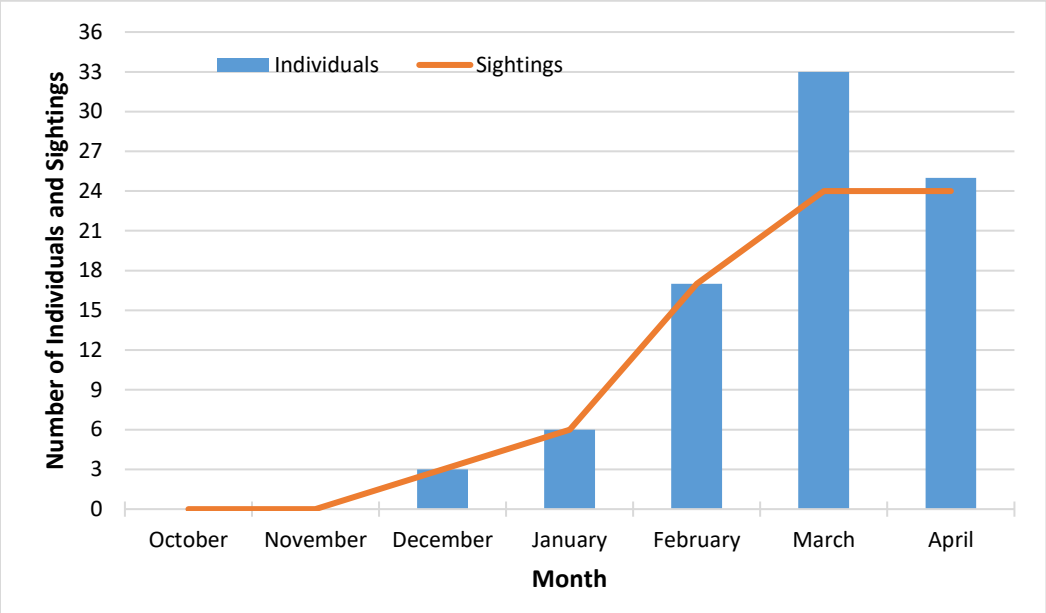


Figure 3-20. Harbor Seal Individuals and Sightings per Month Sightings.

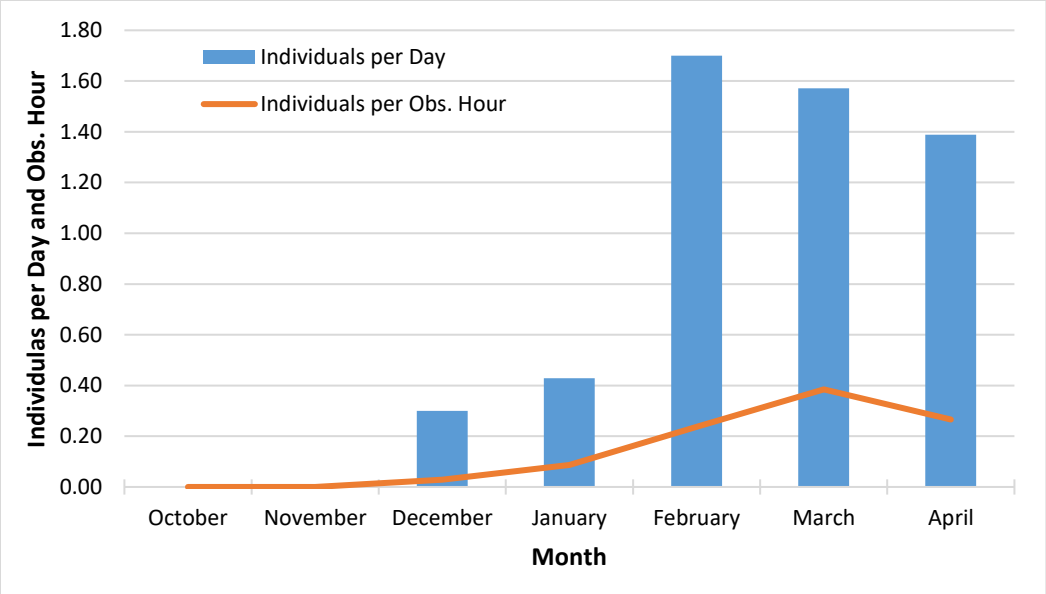


Figure 3-21. Harbor Seal Individuals per Day and per Observer Hour.

A majority of the harbor seals were sighted in the vicinity of the old and new fuel piers and by the Mag Si MMO position (Figure 3-22). The Mag Si MMO was only used during the 30-inch piles (with a total of six MMOs in the northern portion of the Bay), but had the second highest number of harbor seals observed (n=19, 25.7%), after the P-122 MMO (n=21, 28.4%), which was used for both 30-inch (during 20 days in February and March) and 24×30 pile driving (during 12 days in October, December, and April). For those individuals observed by the Mag Si MMO, they were likely transitioning to inside the Bay from the known natural haulout location to the southwest of Ballast Point, or potentially to rest on the docks at P-122. The Clipper and Caisson MMOs, which were very near to the new fuel pier, observed the next highest number of individuals with 12 (16.2%), and 8 (10.8%) individuals observed, respectively.

During all monitoring efforts, sixty-three (78.8% of all observations) harbor seals were observed during construction activities (including both pile driving [n=42, 66.7%] and pile jetting [n=21, 33.3%]) and twenty-one (26.3% of all observations) were observed during demolition activities for all pile/caisson sizes (Table 3-17, Figure 3-24, and Figure 3-25). This disparity in the observed individuals between the activities is likely because most of the observation period for the demolition activities were when pile driving and demolition co-occurred, and the demolition MMOs were acting as secondary MMOs for the pile driving MMOs. Depending on the pile or caisson size being removed or installed, mean group size remained relatively constant throughout the monitoring effort, ranging from one to two individuals per sighting; however, the average group size of 2.00 (for jetting during 24×30 piles) was based on a single observation of two animals, and was not likely indicative of any differences between the different demolition or pile installation actions. When these results are eliminated from the analysis of pile installation versus pile/caisson demolition activities, mean group size ranged from 1.00 to 1.67 individuals per sighting (Table 3-17). If we evaluate only monitoring during all pile installation activities (which had the largest monitoring effort in terms of the number of days and MMOs), the mean group size ranged from 1.00 to 1.25 individuals per sighting (Table 3-17).

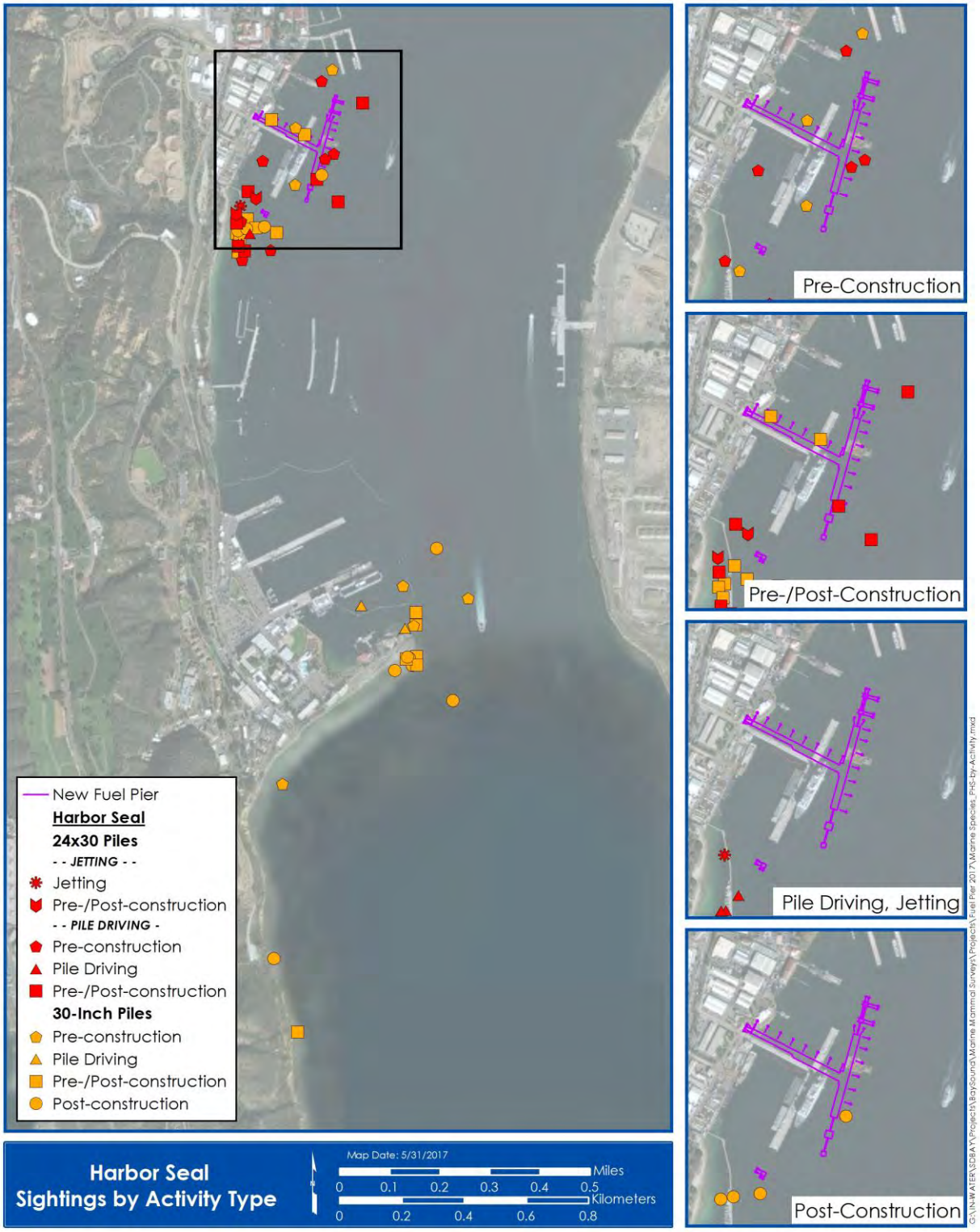


Figure 3-22. All Harbor Seal Sightings During Pile Installation Monitoring Efforts.

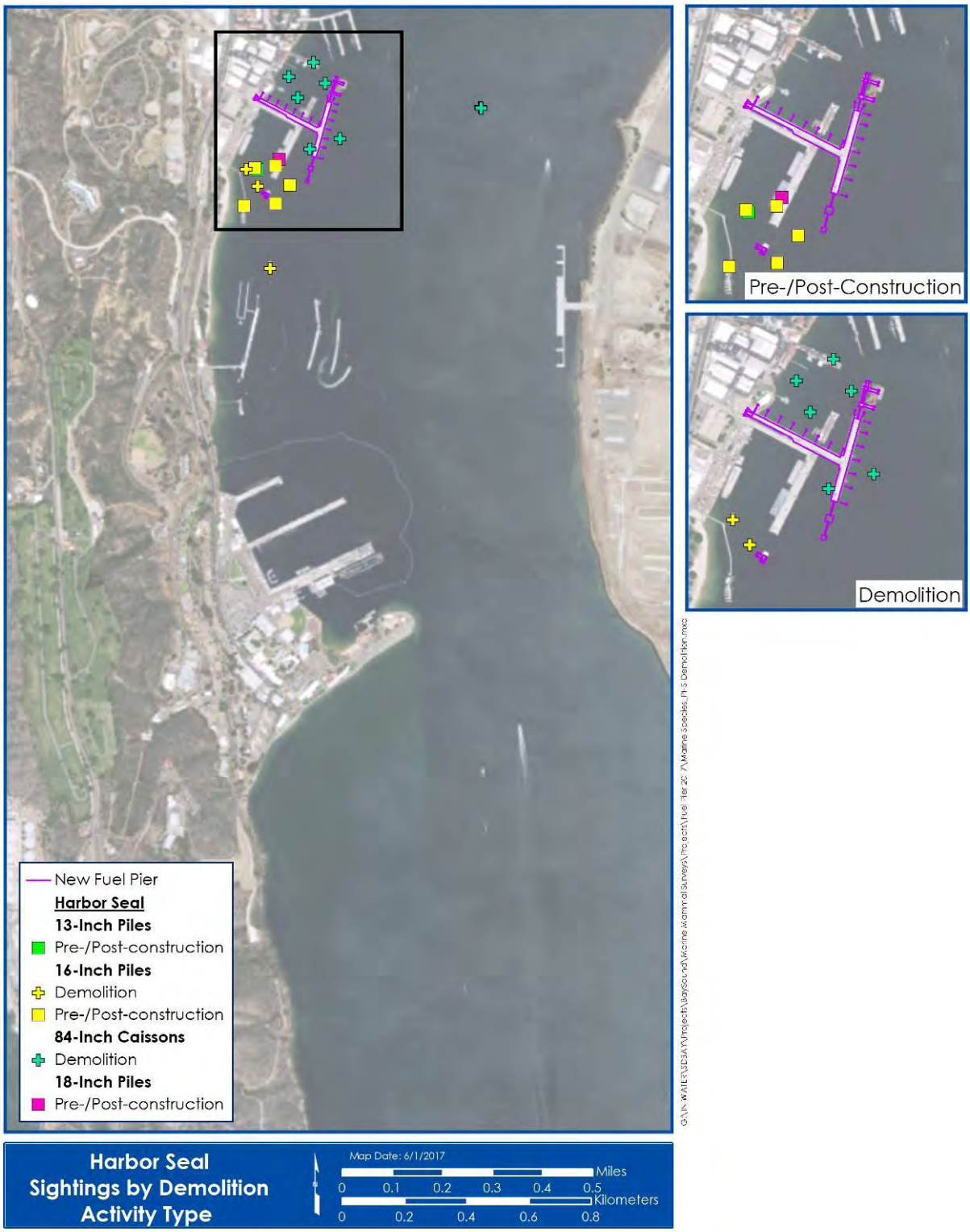


Figure 3-23. All Harbor Seal Sightings During Demolition Monitoring Efforts.

Table 3-17. Summary of Harbor Seal Sightings During Monitoring Efforts.

Type of Activity	Pile Size	All Monitoring Effort		During Construction/ Demolition			Non-Activity		
		Indiv.	Sightings	Indiv.	Sightings	Indiv. per Sighting	Indiv.	Sightings	Indiv. per Sighting
Construction	16-inch	0	0	0	0	0.00	0	0	0.00
	24×30[1]	21	20	5	4	1.25	16	16	1.00
	30-inch	42	36	2	2	1.00	40	34	1.18
	Subtotal	**63**	**56**	**7**	**6**		**56**	**50**	
Demolition	13-inch	1	1	0	0	0.00	1	1	1.00
	14-inch	0	0	0	0	0.00	0	0	0.00
	16-inch	11	8	5	3	1.67	6	5	1.20
	18-inch	1	1	0	0	0.00	1	1	1.00
	24-inch	0	0	0	0	0.00	0	0	0.00
	84-inch	8	8	8	8	1.00	0	0	0.00
	Subtotal	**21**	**18**	**13**	**11**		**8**	**7**	
TOTAL		**84**	**74**	**20**	**17**		**64**	**57**	

Notes: [1]Includes Jetting for 24×30 piles (2 Individuals, 1 Sightings).

Harbor seals were more often observed during non-activity phases for construction monitoring (Figure 3-24), but most often seen during active demolition activities (Figure 3-25). As previously noted (Table 3-1), there was greater construction monitoring effort during non-activity phases (over five times the number of hours) when compared to active construction monitoring, which likely contributed to the apparent higher number of individuals observed during the non-activity monitoring efforts. In contrast, monitoring effort during demolition activities was less influential on species count data than for active demolition monitoring. This was most evident in January, when caisson cutting was the only activity requiring monitoring.

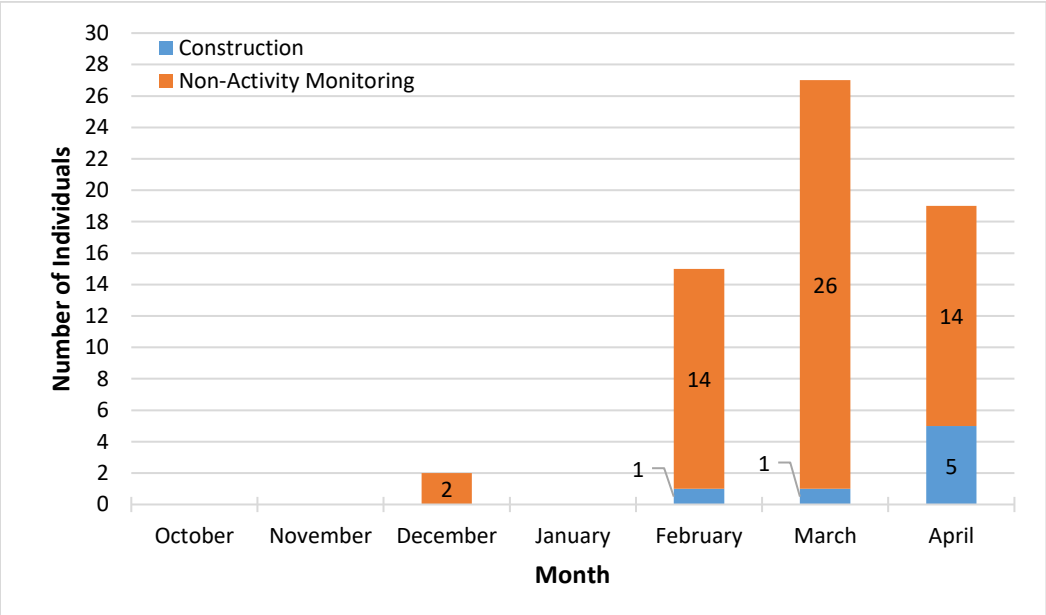


Figure 3-24. Harbor Seal Individuals per Month During Pile Installation and Non-activity Monitoring.

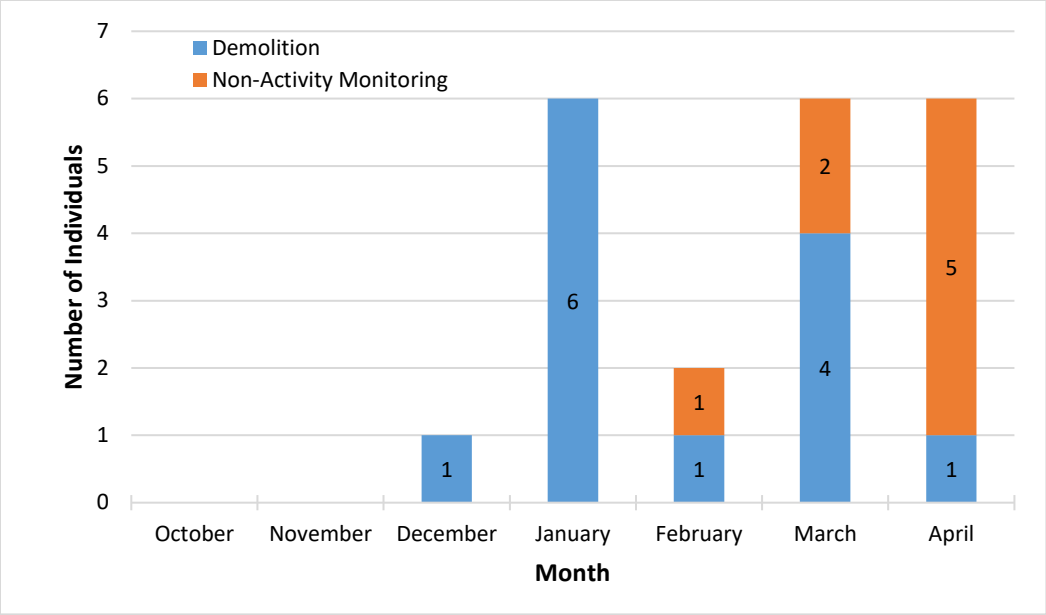


Figure 3-25. Harbor Seal Individuals per Month During Demolition and Non-activity Monitoring.

Throughout the monitoring efforts, two harbor seals caused a delay of construction during 30-inch pile driving. The group of two was initially observed outside of the Level A "shutdown" ZOI, and construction was stopped because they were heading into the buffered shutdown ZOI. One of the two was not observed again, and the second individual was observed inside of the ZOI. The individual lingered in the ZOI for approximately 5 minutes before it dove and was not observed again. Pile driving was allowed to resume after the full fifteen minutes after the animal dove. While harbor seals were present in the area during monitoring efforts, they were usually observed either outside of the ZOI, or not in the water (e.g., hauled out on the docks at P-122). The MMOs were specifically instructed to only document the individuals that were hauled out, and to minimize any interaction that may cause them to enter the water. Most of the individuals that hauled out near the project area remained in the same position for long periods of time and were not in the water during pile installation or demolition activities.

Of the 84 individual harbor seals observed during the all monitoring efforts, the majority were categorized as adults (n=63, 75.0%), followed by mixed, (n=15, 17.9%), unknown (n=5, 6.0%), and the least observed age class of pup (n=1, 1.2%). However, it should be noted that all of observations (n=7) of the mixed category were of mother/pup pairs starting on March 8, with the last mother/pup pair noted on March 31. The individual pup was observed on April 3 in the water off the P-122 docks, but was not directly associated with another individual close by. An adult was observed approximately five minutes prior to the pup observation, but the adult and pup were not in close enough proximity to definitively say that they were a mother/pup pair. This indicates that that pup was potentially abandoned, in the process of weaning from the mother, or recently weaned. The individuals of unknown age, were all over 120 m (394 ft) away from the MMO and were too far away to determine their age. Most of the harbor seal observations occurred during construction (n=63, 75.0%) and were mostly adults (n=49, 77.8%), followed by the mixed age

class (n=9, 14.3%). Monitoring during the demolition activities also identified a majority of observations as adults (n=14, 66.7%), but the mixed age class had a higher percentage of the observations (n=6, 28.6%, all in March), indicating that one, or more, mother/pup pairs may have been in the area during March. Regardless, the distribution of age classes during both construction and demolition activities did not appreciably differ from the results for all monitoring efforts, with the adults making up a majority of the observations, followed by the mixed age class.

Harbor seals were sighted most often in the morning with an overall drop in sightings as the afternoon progressed. The number of individual and observations increased steadily until the 10:00 hour, with a secondary peak during the 13:00 hour, and no sightings occurred between 17:00 and 18:59 (Figure 3-26). Mean group size was also consistent throughout the day with an overall mean group size of 1.14 individuals per sighting, but this also peaked during the 10:00 and 13:00 hours. The P-122 MMO had the most observations (n=21), with largest number of observations during the 13:00 and 14:00 hours. During the peak hours of observations (10:00 and 14:00 hours) the direction of travel was predominantly in a southerly direction during both periods. However, during the 09:00 hour, more individuals were observed traveling in a northerly direction (into the Bay), and during the 15:00 hour more individuals were observed heading in a southerly direction (out of the Bay).

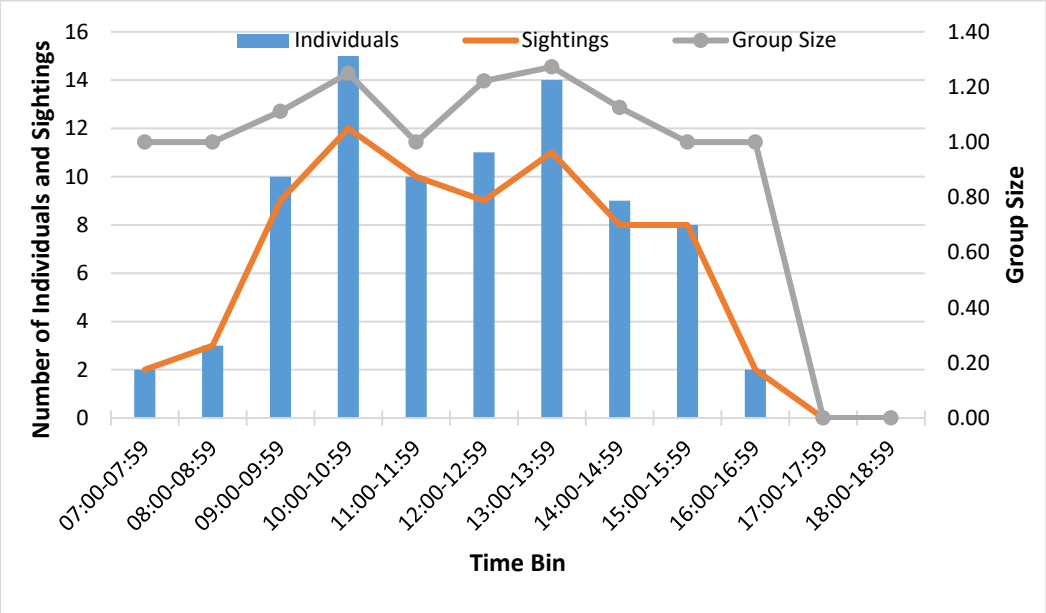


Figure 3-26. Harbor Seal Sightings and Individuals per Hour During All Monitored Activities.

Individuals observed during construction monitoring efforts followed the same basic pattern of observations per time bin as identified in Figure 3-26, with peaks of individuals observed during the 10:00 and 14:00 hours (Figure 3-27a), but with more individual observed during the afternoon peak. Individuals observed during demolition activities also followed the same pattern, but also had a higher peak group size in the morning (Figure 3-27b). However, the low relative number of individuals observed during demolition may not necessarily reflect a difference in time of observation relative to construction observations.

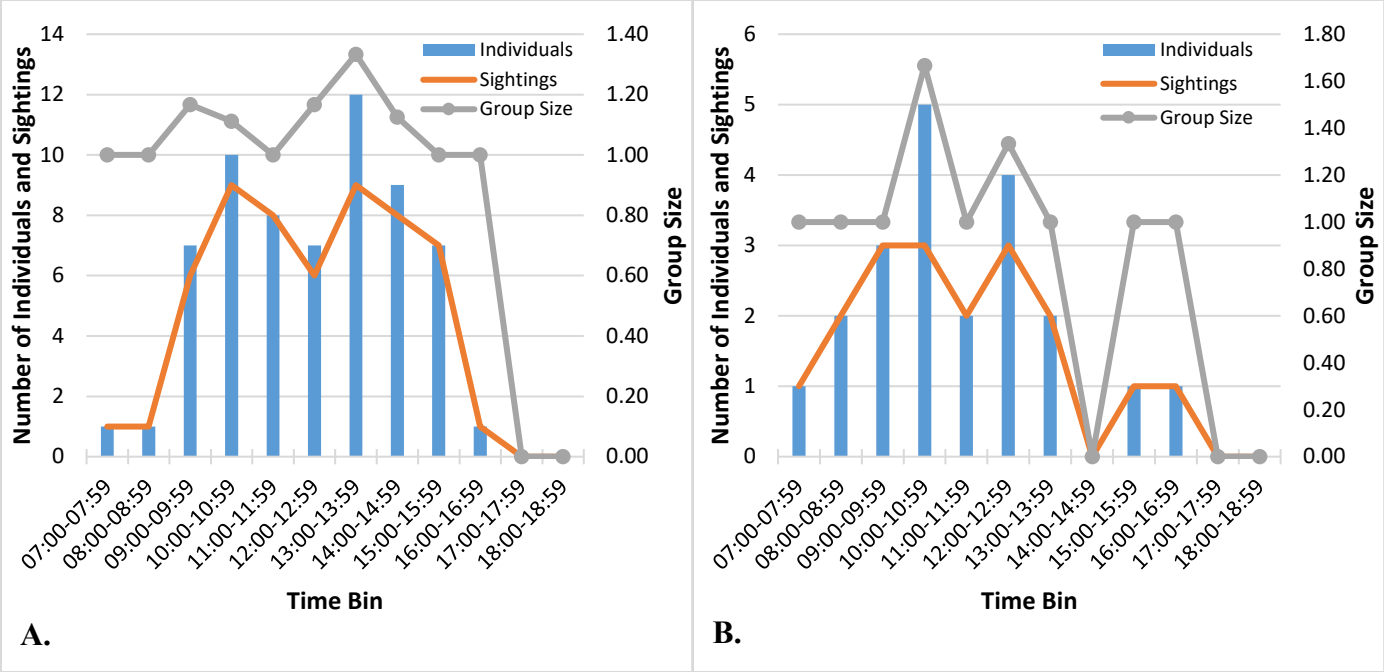


Figure 3-27. Harbor Seal Sightings and Individuals per Hour During: A. Construction, and B. Demolition.

Harbor seals were most often seen milling (n=37, 44.0%), followed by swimming (n=35, 41.7%). There were from one to four individuals observed with behaviors of diving, entering the water (from a dock), looking while in the water, or exiting the water (to a dock). When comparing behaviors noted during construction activities versus demolition activities, swimming (construction: n=29, 46.0%; demolition: n=6, 28.6%) and milling (construction: n=27, 42.9%; demolition: n=10, 47.6%) were still observed the most. During construction monitoring efforts, most of the observations for the two dominant behaviors (swimming and milling) occurred during the non-activity phases (pre-construction, pre-/post-construction, or post-construction) (n=50) as compared to active pile driving (n=4). As previously noted, this difference was likely due to the greater construction monitoring effort during non-activity phases (approximately 129.5 hours) compared to active phases (see Table 3-1). During demolition monitoring, more individuals (n=13) were observed during active demolition (pile clipping and caisson cutting) when compared to observations during the non-active phase of demolition (n=8). Unlike the construction observations, caisson removal occurred over long periods of time (approximately six three hours per caisson, divided into two cuts) and most of the observations of these two behaviors (n=14 [of the 21 total observation for all behaviors]) during demolition occurred during caisson cutting.

3.4.3.3 Coastal Bottlenose Dolphins

Coastal bottlenose dolphins were observed during 18 sightings with 45 individuals. A single sighting of two unidentified dolphins was recorded in January during caisson cutting; however, given that the primary dolphin species observed inside the Bay are coastal bottlenose dolphins, this group was included in this analysis due to the high probability of being coastal bottlenose dolphins. With this sighting included, there were 19 sightings of 47 individual coastal bottlenose dolphins observed during monitoring efforts. The overall mean group size for the sightings was

2.47 individuals per sighting, and 0.58 individuals sighted per day. Coastal bottlenose dolphins were not observed in October or December (no monitoring efforts occurred in November), and increased between January and March; there was an increase in overall mean group size from 1.33 in January to 3.60 in April (Table 3-18 and Figure 3-28). This general trend also occurred when adjusting for effort, with an increase in overall numbers per observer hour from January to March, with a stabilization in April (Table 3-18 and Figure 3-29); the pattern appeared as smaller stable numbers in January/February, followed by an increase and second stabilization of numbers in March/April (Figure 3-28 and Figure 3-29).

Table 3-18. Summary of Coastal Bottlenose Dolphin Individuals and Sightings per Month.

Month	Total Number per Month		Group Size per Month			Monitoring Days	Indiv. per Day	Obs. Hours (hh:mm)	Indiv. per Obs. Hour
	Individuals	Sightings	Mean	Max	Min				
October	0	0	0.00	0	0	8	0.00	35:00	0.00
November[1]	-	-	-	-	-	0	-	00:00	
December	0	0	0.00	0	0	10	0.00	105:47	0.00
January	4	3	1.33	2	1	14	0.29	69:33	0.06
February	3	2	1.50	2	1	10	0.30	71:41	0.04
March	22	9	2.44	4	1	21	1.05	85:48	0.26
April	18	5	3.60	6	3	18	1.00	93:54	0.19
TOTAL	**47**	**19**				**81**			

Notes: [1]No marine mammal monitoring occurred during November 2016.

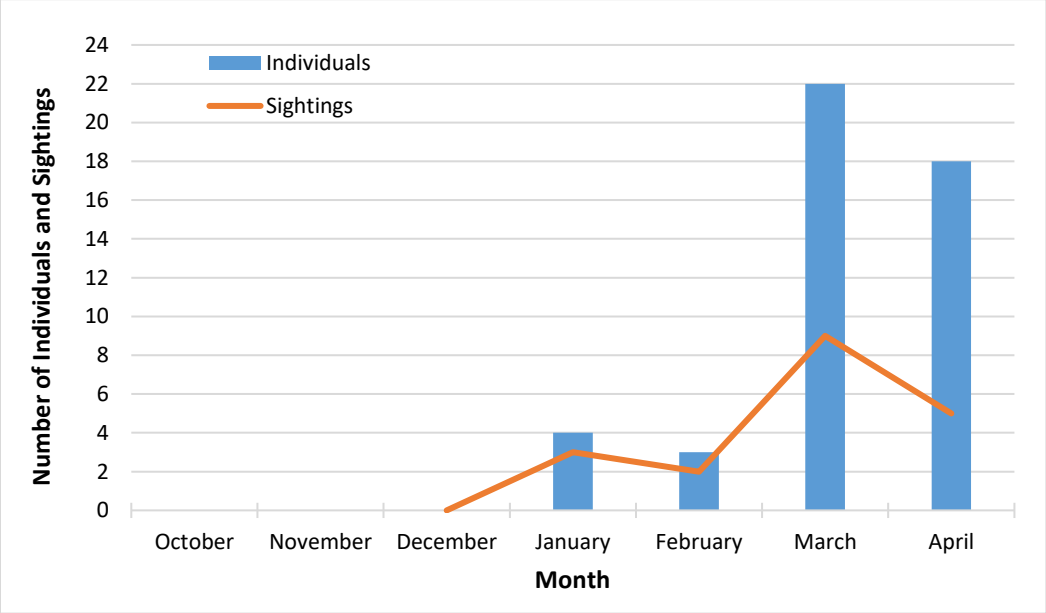


Figure 3-28. Coastal Bottlenose Dolphin Individuals and Sightings per Month.

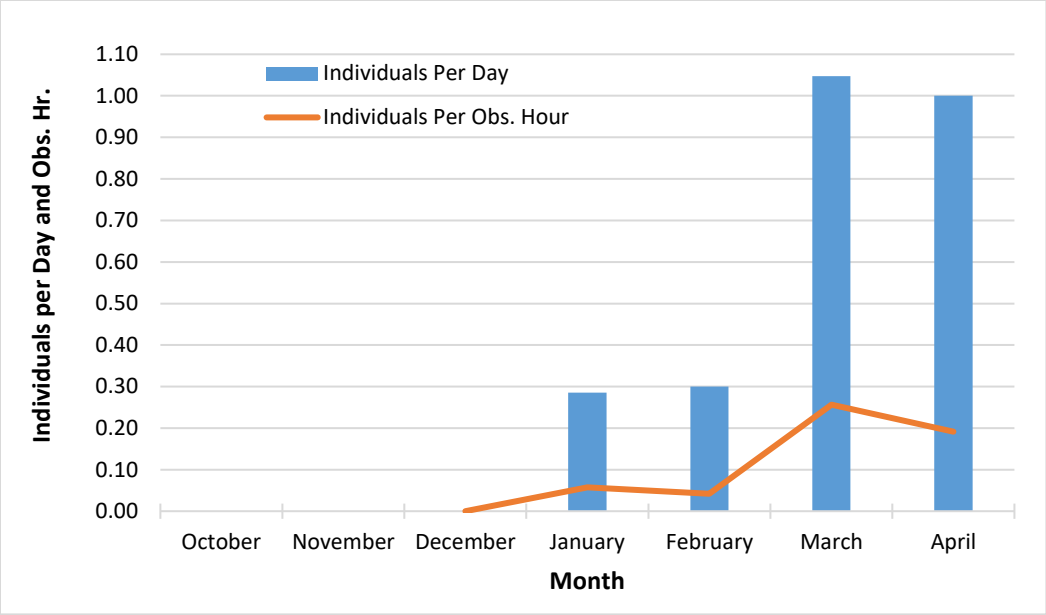


Figure 3-29. Coastal Bottlenose Dolphin Individuals per Day and per Observer Hour.

During the project time frame, coastal bottlenose dolphin sightings were primarily to the east and southeast of the new fuel pier, with a distinct clustering in the vicinity of the pier itself (Figure 3-30). During pile driving for the 30-inch piles, coastal bottlenose dolphin sightings were mostly due east and south of the new fuel pier, but still within the Level B ZOI. During pile driving for the 24×30 piles, most of the sightings were generally to the south of the new fuel pier (Figure 3-30), with all of those observations during pre-construction surveys. During demolition activities, coastal bottlenose dolphin sightings were generally to the south and east of the new fuel pier with one observation to the west (Figure 3-31). These distribution patterns were more likely reflective of the monitoring effort (a single MMO was used for all demolition activities, versus from three to six MMOs for pile driving), rather than a reflection of a change in distribution patterns of the animals between construction and demolition.

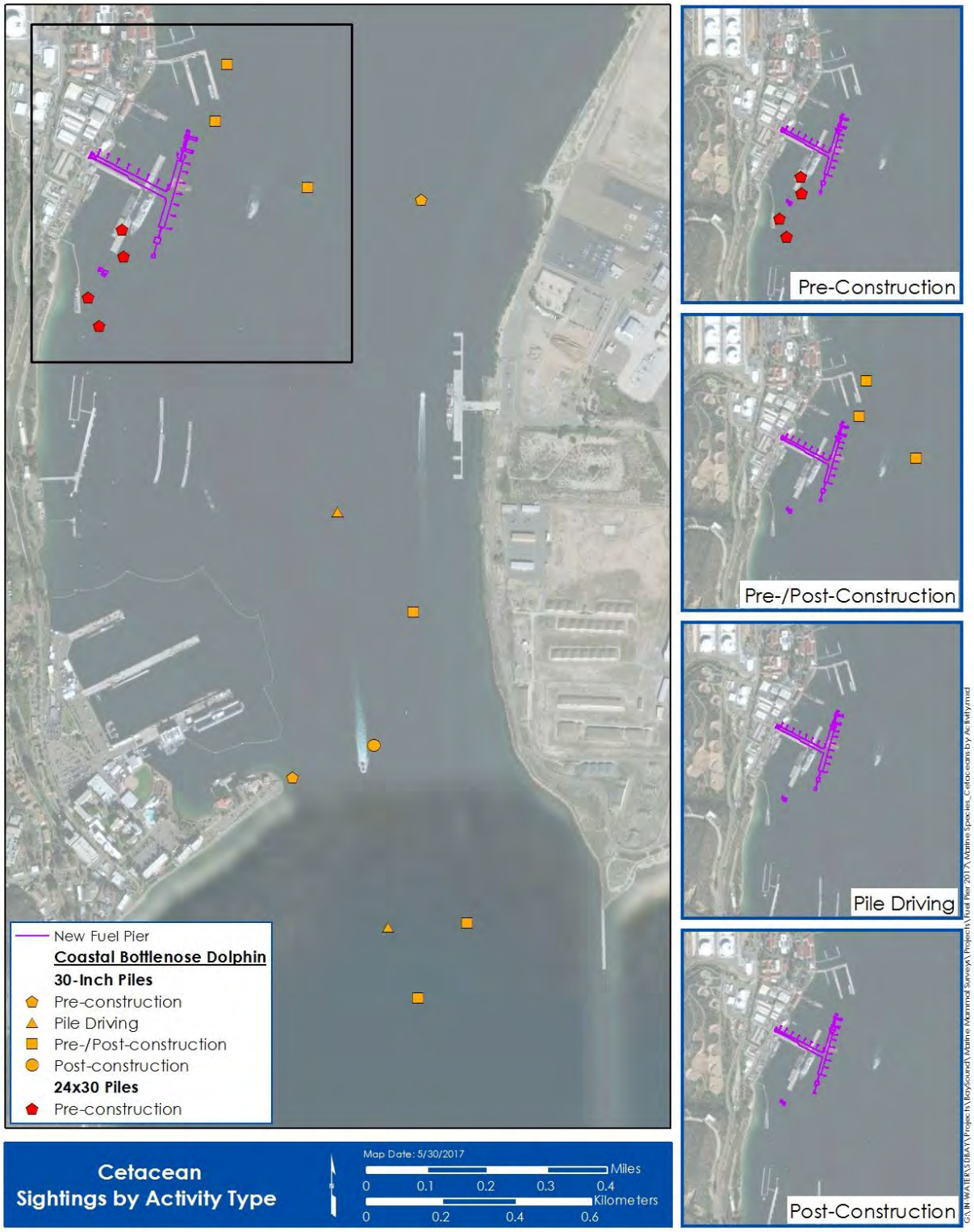


Figure 3-30. All Cetacean Sightings During Pile Installation Monitoring Efforts.

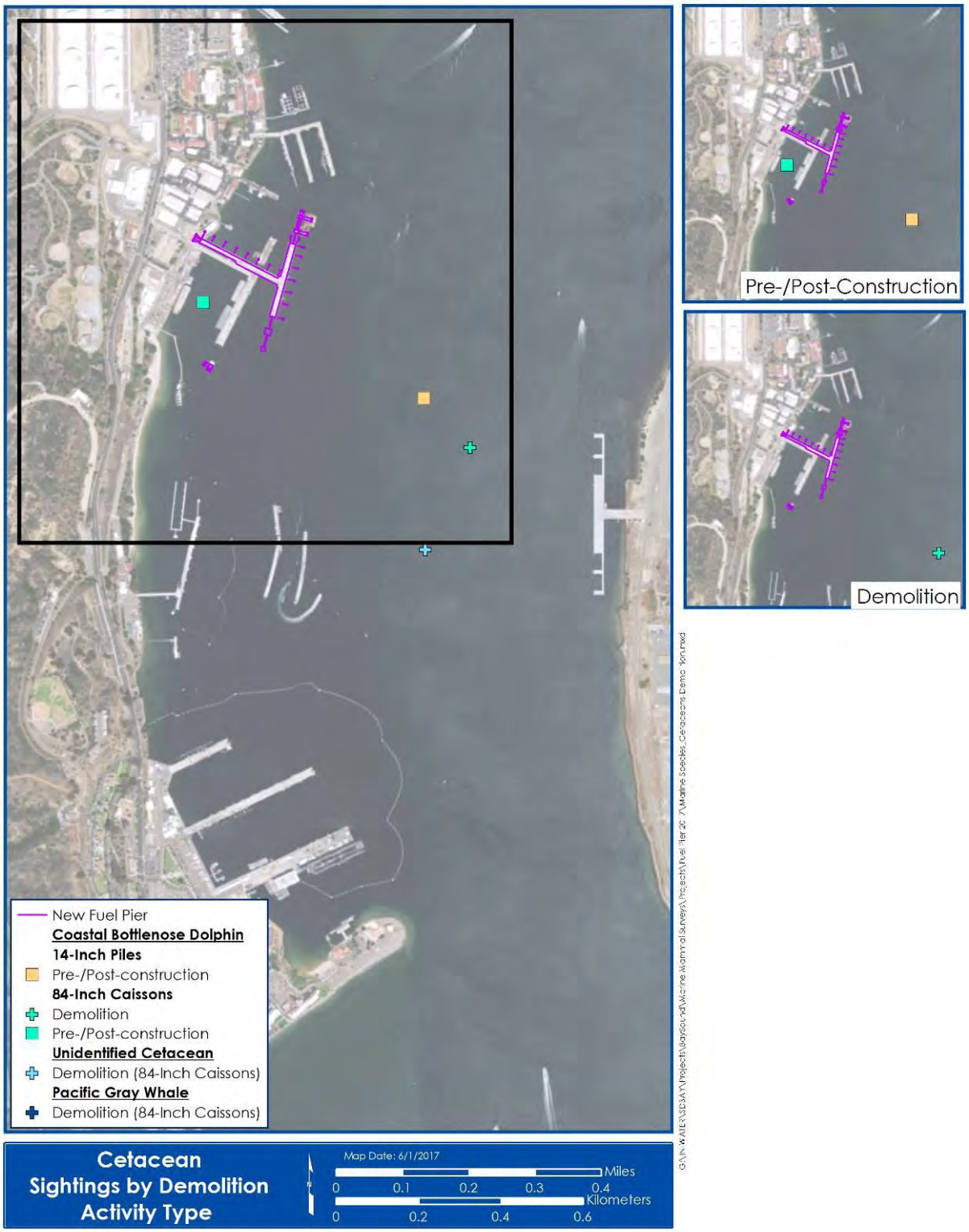


Figure 3-31. All Cetacean Sightings During Demolition Monitoring Efforts.

Of the 47 individuals observed during monitoring efforts, seven individuals (14.9%) were observed during active construction and demolition activities, and forty animals (85.1%) were observed during non-activity monitoring (Table 3-19). Of the seven individuals seen during active construction and demolition activities, four (57.1%) were observed during construction activities, and three (42.8%) were observed during demolition activities. Mean group sizes were consistent during the demolition (2.50 individuals per group) and construction (2.47 individuals per group) monitoring. Mean group size during pile installation activities was 3.00 for 24×30 piles and 2.27 for the 30-inch piles. Mean group size during demolition activities ranged from 1.33 during the caisson cutting to 6.00 during the 14-inch pile cutting. It should be noted that the mean group size of 6.00 was based on a single observation of six individuals while no active demolition was occurring. As would be expected based on the observer effort, the greatest number of individuals observed was during the 30-inch monitoring (n=25, 53.2%), followed by the 24×30 piles (n=12, 25.5%).

Table 3-19. Summary of Coastal Bottlenose Dolphin Sightings During Monitoring Efforts.

Type of Activity	Pile Size	All Monitoring Effort		During Construction/ Demolition			Non-Activity		
		Indiv.	Sightings	Indiv.	Sightings	Indiv. per Sighting	Indiv.	Sightings	Indiv. per Sighting
Construction	16-inch	0	0	0	0	1.00	0	0	0.00
	24×30[1]	12	4	0	0	1.59	12	4	3.00
	30-inch	25	11	4	2	1.39	21	9	2.33
	Subtotal	**37**	**15**	**4**	**2**		**33**	**13**	0.00
Demolition	13-inch	0	0	0	0	1.00	0	0	0.00
	14-inch	6	1	0	0	1.00	6	1	6.00
	16-inch	0	0	0	0	1.00	0	0	0.00
	18-inch	0	0	0	0	0.00	0	0	0.00
	24-inch	0	0	0	0	1.00	0	0	0.00
	84-inch	4[1]	3	3	2	1.42	1	1	1.00
	Subtotal	**10**	**4**	**3**	**2**		**7**	**2**	
TOTAL		**47**	**19**	**7**	**4**		**40**	**15**	

Notes: [1]Includes one observation of two unidentified dolphins.

Coastal bottlenose dolphins were more often observed during non-activity monitoring for pile driving/jetting monitoring efforts (Figure 3-32), but most often seen during active demolition activities (Figure 3-33). As previously noted (Table 3-1), there was greater construction monitoring effort during non-activity phases (over five times the number of hours) compared to active construction monitoring, which likely contributed to the apparent greater number of individuals observed during the non-activity construction monitoring efforts. In contrast, during demolition activities, there were only one-and-half times the number of hours for non-activity demolition monitoring than for active demolition monitoring. This was most evident in January, when caisson cutting was the only activity requiring monitoring.

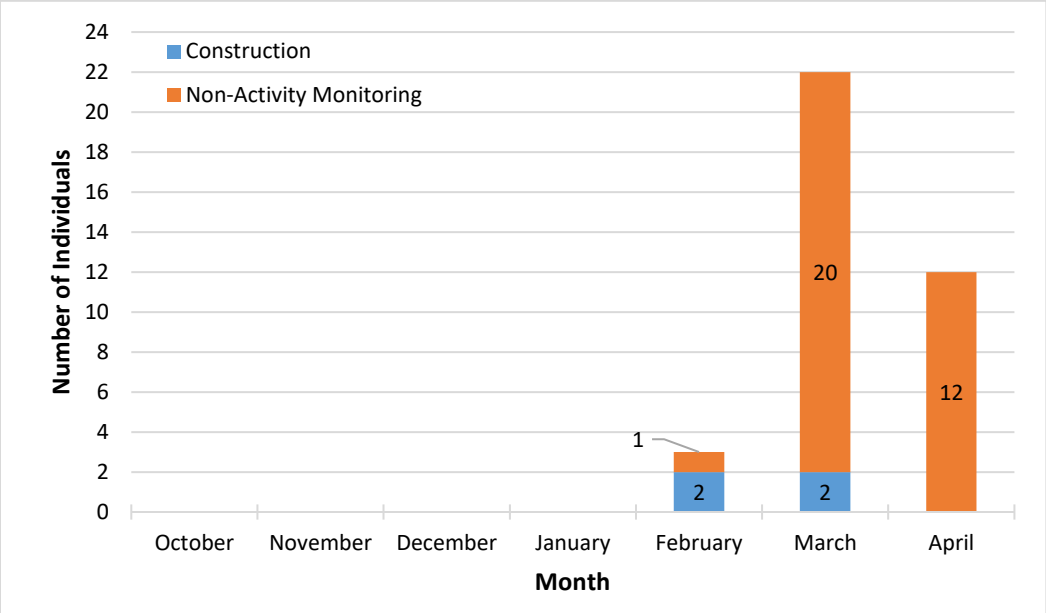


Figure 3-32. Coastal Bottlenose Dolphin Individuals per Month During Pile Installation and Non-Activity Monitoring.

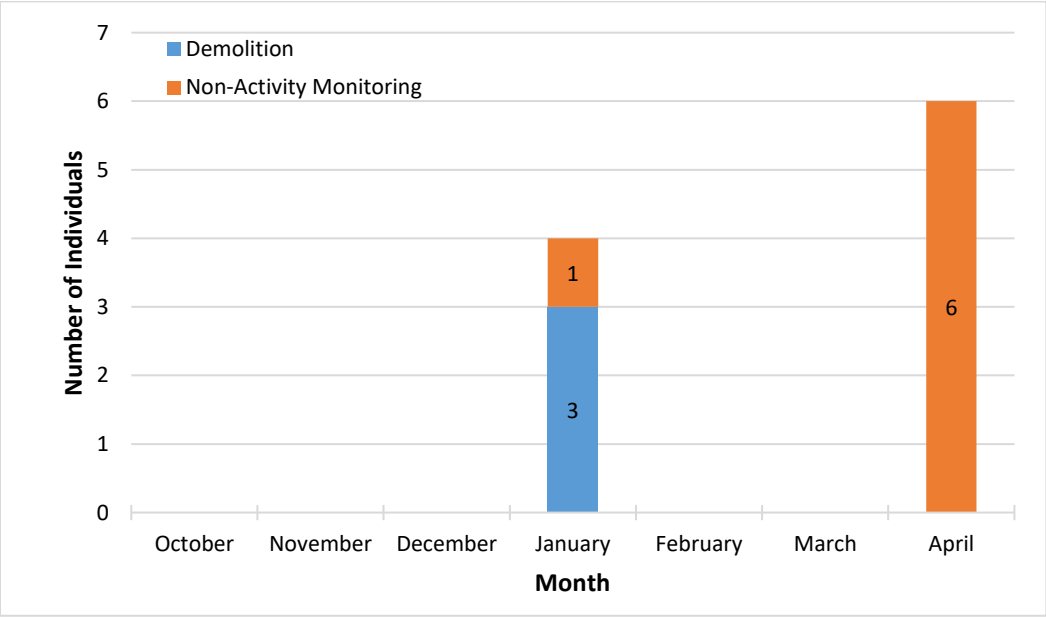


Figure 3-33. Coastal Bottlenose Dolphin Individuals per Month During Demolition and Non-Activity Monitoring.

There was a single group of two coastal bottlenose dolphins that caused a delay of approximately five minutes during 30-inch pile driving activities (Appendix G). The animals entered the buffered "shutdown" ZOI (450 m [1,476 ft]) from the north during a pre-/post-construction period. Both pile driving and pile clipping were taking place approximately three minutes before the individuals were observed. The two individuals swam through the ZOI and were cleared as outside of the ZOI approximately five minutes after the they had entered the ZOI. Pile driving commenced approximately one-and-a-half minutes after the ZOI was cleared. No behavioral changes were noted during the construction delay, or after they were cleared of the ZOI. No coastal bottlenose dolphins caused construction to stop due to being observed inside the actual Level A ZOIs, nor did any coastal bottlenose dolphins cause shutdowns during the any other construction or demolition activities.

Of the 47 coastal bottlenose dolphins observed, two defined age classes were noted, with a majority of the observations noted as adults (n=24; 51.1%), followed by observations of mixed age class (n=21; 44.7%). There were also two individuals of an unknown age class because they were too far away to readily identify.

During all monitoring activities, coastal bottlenose dolphins were most often seen during the early afternoon (13:00 hour) and, to a lesser extent, during the morning hours (Figure 3-34). There were two peaks in observations with an early to mid-morning peak from 08:00 to 10:59, and a larger peak during the 13:00 hour. No individuals were observed after 16:00. Mean group size for all monitoring efforts appears to be highest during the 09:00 hour, with six individuals per sighting; however, this is based on a single observation of six individuals, which skewed the results. When this single observation was eliminated from the analysis, the average group size was 2.28 individuals per group, as opposed to a group size of 2.47 with this observation included. The next highest mean group size was 3.50 individuals per group during the 08:00 hour. All other group sizes during the day fluctuated from 1.00 to 2.80 individuals per group.

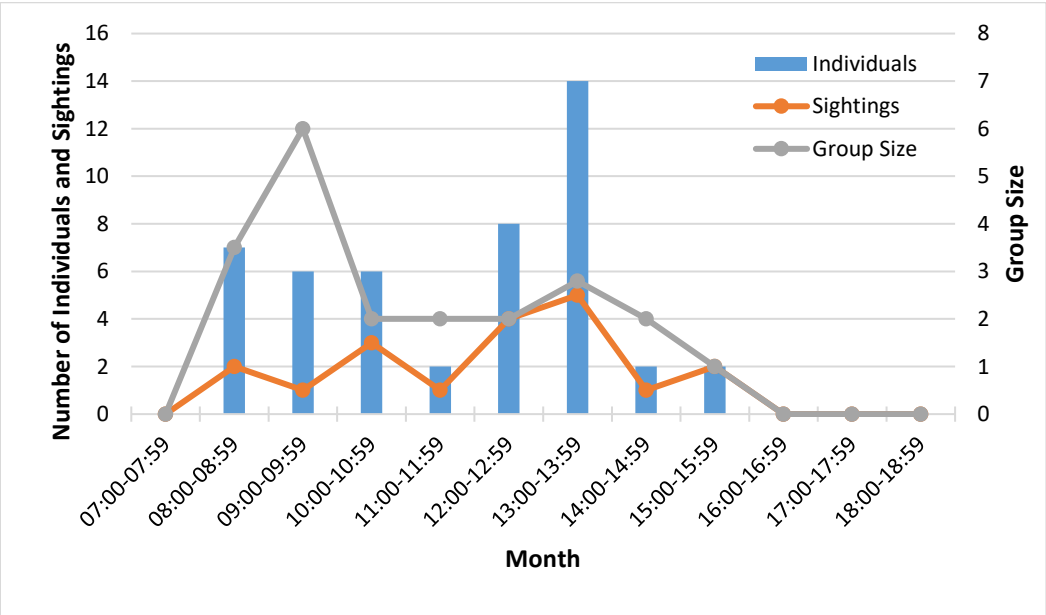


Figure 3-34. Coastal Bottlenose Dolphin Sightings and Individuals per Hour During All Monitored Activities.

Individuals and sightings observed during construction monitoring efforts (Figure 3-35a) followed the same basic pattern of observations per time bin as described above for all monitoring efforts (see Figure 3-34). However, group size was more variable during construction when compared to all monitoring efforts. Group size also fluctuated considerably when comparing the construction (Figure 3-35a) to demolition (Figure 3-35b) activities. The overall number of sightings for demolition were quite a bit smaller (n=10) when compared to construction (n=37), and the single sighting of six individuals skewed the demolition observations, making it appear that more individuals per hour occurred during the 09:00 hour. Outside of the relatively large sighting of six individuals, observations during demolition were relatively small and consistent, but also showed a slight increase during the 13:00 hour, like the construction data.

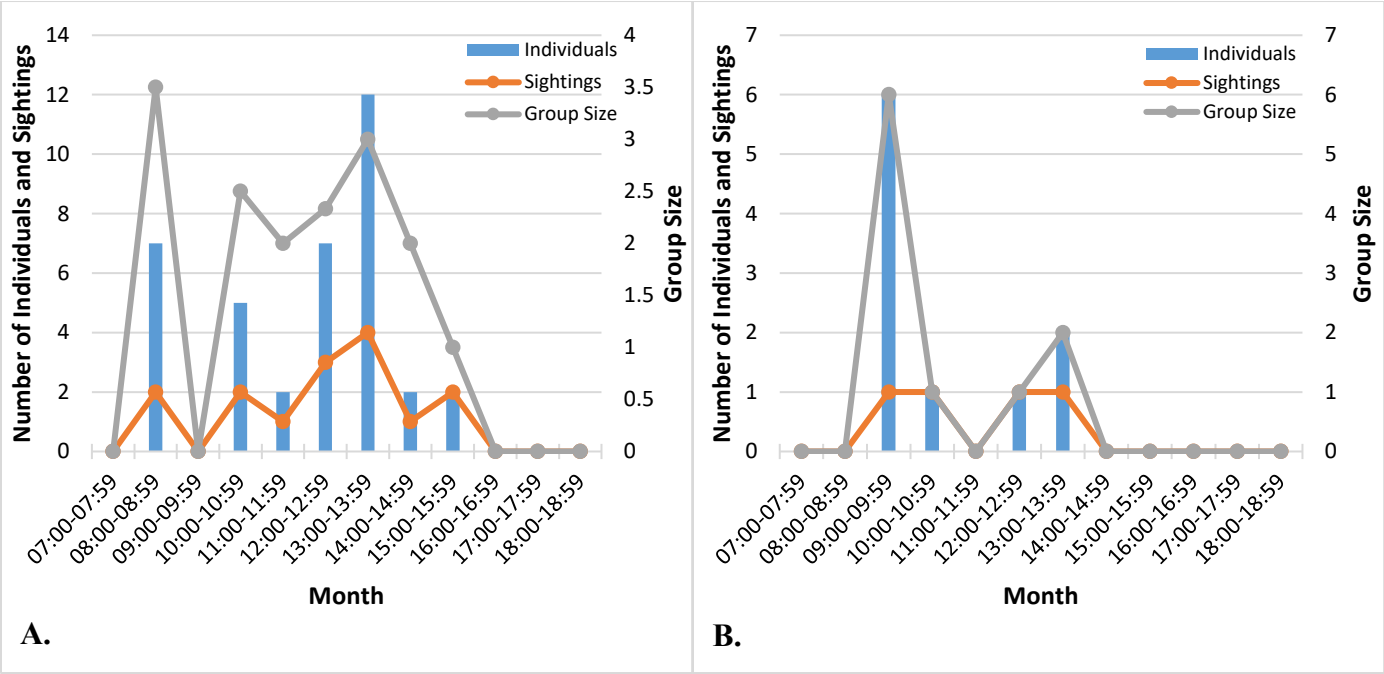


Figure 3-35. Coastal Bottlenose Dolphin Sightings and Individuals per Hour During: A. Construction, and B. Demolition.

A majority of the coastal bottlenose dolphins were observed swimming (n=45, 95.7%), followed by two individuals bow riding (n=2, 4.3%) on a ship as it left the Bay. When comparing construction and demolition, swimming was the only behavior to be noted during all monitoring activities, with a majority of the individuals observed swimming during construction monitoring efforts (n=35, 77.8%). The remaining ten (22.2%) of the observations were during demolition monitoring efforts. Behaviors between active and non-active construction and demolition showed similar characteristics to the California sea lion and harbor seal in that a majority of the behaviors were noted during non-activity (n=40, 85.1%) compared to active construction and demolition (n=7, 14.9%) monitoring.

A single group of two coastal bottlenose dolphins was observed abruptly changing direction on one occasion, but it is unclear what stimulus may have prompted the behavior change. These two individuals were first observed swimming south from inside the Bay, but changed direction and

were last seen swimming to the north back into the Bay. These individuals caused a construction delay of approximately five minutes after they were initially observed swimming into the shutdown ZOI during a pre-/post-construction phase of monitoring. However, pile driving had been stopped for approximately two minutes before they were initially seen. Given that pile driving had been stopped for a time, it is unclear what prompted the dolphins to change directions and go back into the Bay.

3.4.3.4 Gray Whale

A single gray whale was observed during caisson cutting activities in January 2017. The individual was observed just to the west of Zuniga Jetty (see Figure 3-31) at the entrance to the Bay. The individual was initially observed during a pre-/post-construction phase of monitoring in-between bouts of caisson cutting. Based on the Level B ZOI associated with caisson cutting (631 m [2,0701 ft]), this individual was not exposed to noise that would be considered as a Level B "take." The individual was noted as traveling south (out of the Bay) and likely came around Point Loma heading south along the coastline during its migration, started to enter the Bay, and then headed out of the Bay once it encountered unfavorable conditions.

3.4.3.5 Unidentified Marine Mammals

Two sightings of two unidentified dolphins and one unidentified pinniped were noted in January (unidentified dolphin) and April (unidentified pinniped). The unidentified pinniped was observed near the new fuel pier (see Figure 3-11), but only observed once as it dove, while the unidentified dolphin was observed from the new fuel pier when they were 800 m (2,625 ft) moving away from the MMO (see Figure 3-31). At that distance, the MMO could not immediately identify the dolphin species, and they continued out of the Bay away from the MMO. Given that the two cetacean and pinniped species most likely to be in the Bay are the coastal bottlenose dolphin and California sea lion, these observations were included in the respective section for these two species.

3.4.4 Sightings of Marine Mammals Not Covered Under IHA #4

All species observed during the pile driving activities from 8 October 2016 to 30 April 2017 were addressed as part of the IHA #4. There were no sightings of marine mammal species not covered under IHA #4.

3.4.5 Sightings of Marine Mammal and Environmental Conditions

Most marine mammal sightings during the project timeframe occurred during a BSS of 2 (Figure 3-36), clear or partly cloudy conditions (Figure 3-37), and with good visibility of from 10 to 20 kilometers (km; 6.2 to 12.4 miles; Figure 3-38). Sea surface temperatures[1] during monitoring were on average 65.6 degrees Fahrenheit (°F; 18.7 degrees Celsius [°C]), with minimum and maximum temperatures of 60.1°F (15.6°C) in January and 74.1°F (23.4°C) in October, respectively. Average water temperatures initially declined starting in October through January, and then increased each month from January through April (Figure 3-39). There were more sightings during the ebb tide (52.3%) than during the flood tide (47.7%).

[1] Water temperature data are from the National Data Buoy Center (Station #: 9410170) located in San Diego Bay at 32.714, -117.174 (NDBC 2017a)

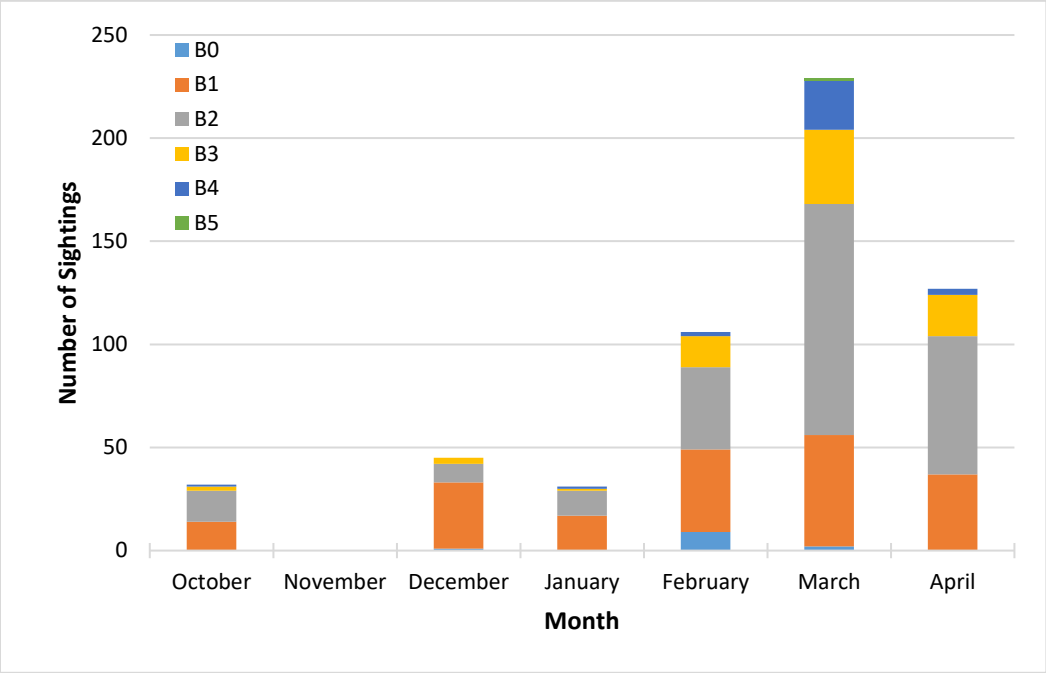


Figure 3-36. Sightings by Beaufort Sea State per Month.

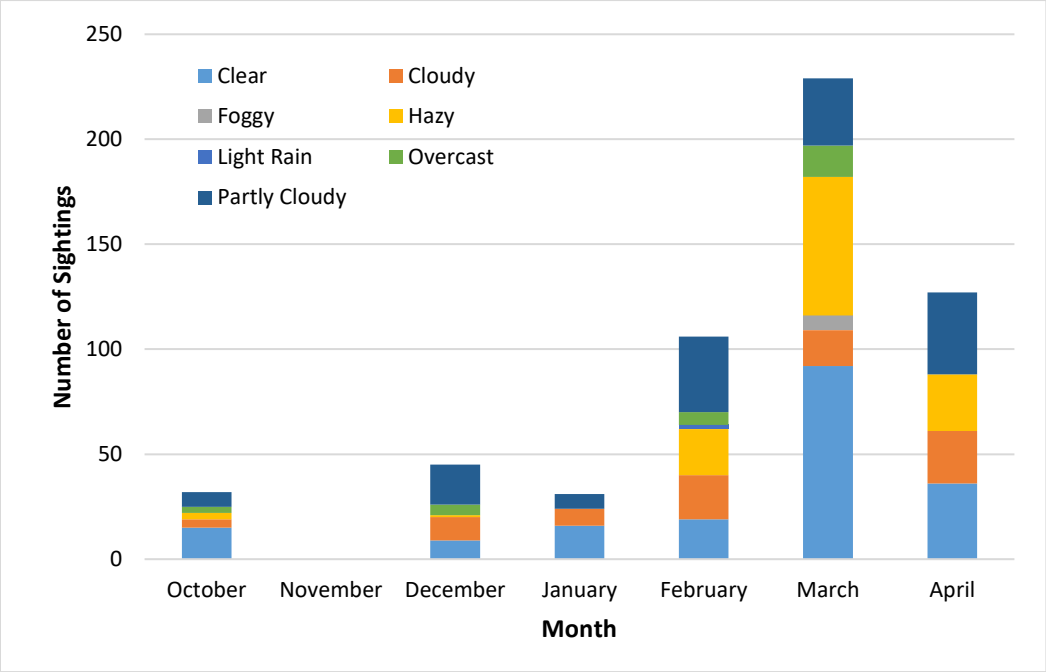


Figure 3-37. Sightings by Sky Cover per Month.

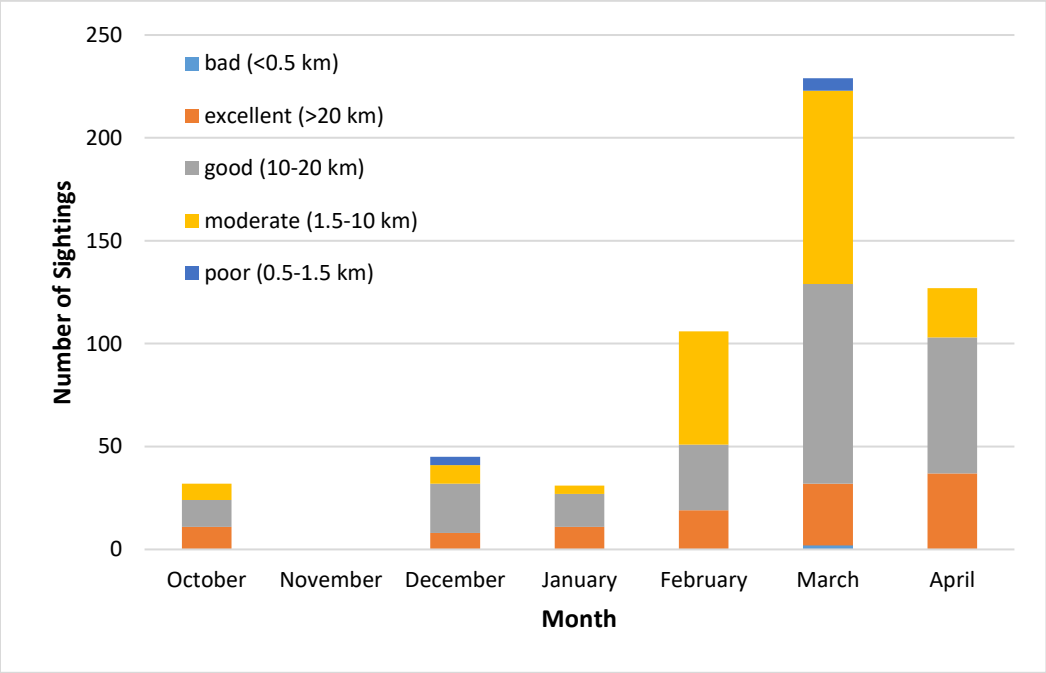


Figure 3-38. Sightings by Visibility per Month.

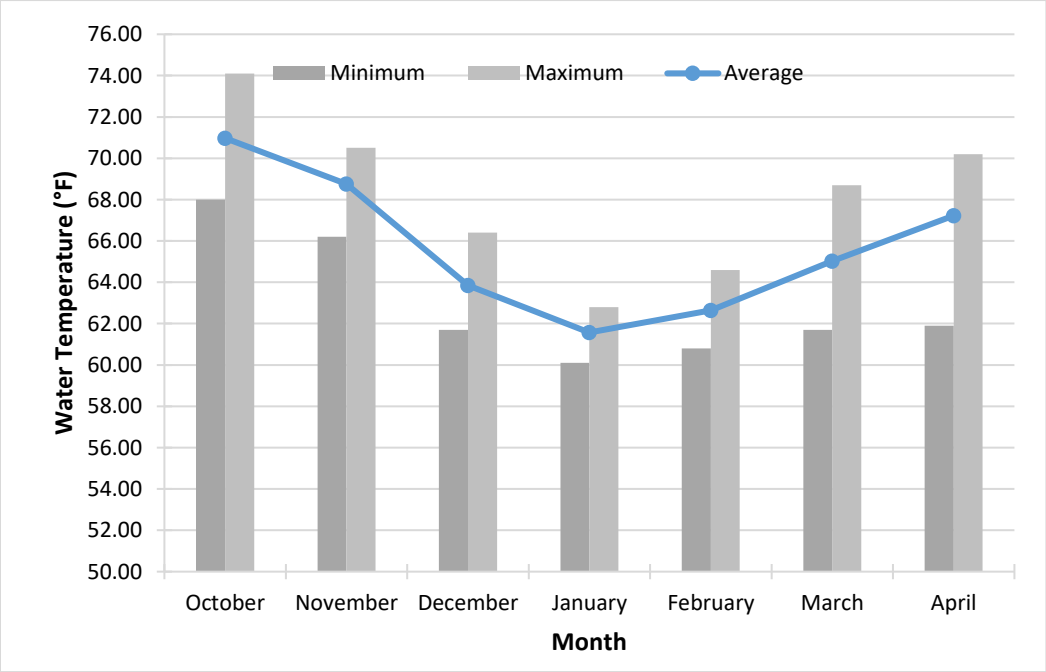


Figure 3-39. Water Temperature by Month.

While the BSS values associated with the observations during monitoring efforts were low, the BSS did vary based on the observer location. The "Bait Barge" and "P-122" and "Command" positions had the highest average BSS with 2.38, 2.12, and 2.12 respectively, and "Sierra" had the lowest average BSS (1.41). The "Clipper" position had the third highest average BSS (1.90). All other stations ("Mag Si," "November," "Caisson," "Clipper," and "Sierra") had average BSS values of 1.90 or less. The "Bait Barge" position was in the middle of the channel adjacent to the EBBCO bait barges, and was fully exposed to all weather. All the other positions were protected from the majority westerly winds, to some extent, by Point Loma, buildings, or construction equipment. It should be noted that the stations with the highest average BSS values were not necessarily the locations with the fewest observations (hauled out or in the water); Of the 816 sightings of animals hauled out or in the water, the "Mag Si" had the most sightings (n=175, 21.4%), followed by the "Bait Barge" position (n=145, 17.8%), and the "Sierra" position (n=122, 15.0%).

To provide a comparison of BSS during monitoring efforts, the BSS was separated into two categories: 1) BSS of 0 to 2, and 2) BSS of 3 to 5 (Table 3-20). For all species, there were more observations during BSS of 0 to 2 than for BSS of 3 to 5, but it appears that the ability to observe animals' relative to the BSS was not adversely affected for two of the three species observed during both BSS categories. While mean group size decreased from 1.40 to 1.18 individuals per sighting for the California sea lion, and from 1.16 to 1.00 for harbor seals, these differences were not substantial. Observations of coastal bottlenose dolphins appeared to be influenced by BSS with a reduction in the number of observations (BSS 0 to 2: n=12; BSS 3 to 5: n=6) as well as in the average group size from 2.83 to 1.83; however, there were relatively few coastal bottlenose dolphin observations (n=18) throughout the monitoring timeframe, and a larger dataset would be needed to clarify the relative strength of such a relationship. All other species were only observed during lower BSS of 0 to 2.

Table 3-20. Summary of Sightings and BSS During the Production Pile Driving.

Species	Beaufort Sea State (Number of Sightings [Percentage of Sightings at that BSS])								
	Total No. of Sightings	0	1	2[1]	Mean Group Size (BSS 0-2)	3	4	5	Mean Group Size (BSS 3-5)
California sea lion	474	12 (2.5%)	163 (34.4%)	207 (43.7%)	1.40	65 (13.7%)	26 (5.5%)	1 (0.2%)	1.18
Harbor seal	74	-	24 (32.4%)	39 (52.7%)	1.16	8 (10.8%)	3 (4.1%)	-	1.00
Unidentified pinniped	1	-	-	1 (100%)	1.00	-	-	-	-
Coastal bottlenose dolphin	18	-	6 (33.3%)	6 (33.3%)	2.83	4 (22.2%)	2 (11.1%)	-	1.83
Gray whale	1	-	-	1 (100%)	1.00	-	-	-	-
Unidentified dolphin	1	-	1 (100%)		2.00	-	-	-	-
TOTAL	**570**	**12 (2.1%)**	**194 (34.1%)**	**254 (44.6%)**		**77 (13.5%)**	**31 (5.4%)**	**1 (0.2%)**	

Notes: [1]The single green sea turtle was observed at a BSS of 2.

3.4.6 Summary of Observed and Extrapolated "Take" (8 October 2016 to 30 April 2017)

The ability to observe marine mammals in northern San Diego Bay was enhanced by the use of the top deck of the new fuel pier, enabling a visible range of 700 m (2,297 ft) for the MMOs stationed at this location. This allowed the MMOs to see the fullest extent of several of the Level B ZOIs (see Table 2-3). Table 3-2 provides the distances for each of the MMO locations based on their elevation above the water, as well as any potential restrictions on unimpeded sightlines during monitoring efforts. For Level B ZOIs that exceeded the visible range of the MMOs, "take" was extrapolated. Specifically, extrapolated "take" was calculated for pile driving of 30-inch piles (vibratory and impact pile driving), 16-inch poly-concrete pile (impact pile driving only), 24×30 piles (jetting only), and some demolition activities (pile clipping only). To be conservative with our estimation of "take" for all pile clipping activities, the Level B ZOI for the largest pile size (24-inch concrete square piles) was used to estimate the Level B ZOI for all clipped piles (see Section 3.3.1). All other activities had Level B ZOIs that were wholly within the visible range of the MMOs. Because an animal can only be "taken" once in any given 24-hour timeframe, resightings were not included in the estimation of "take."

The total number of Level B harassment "takes" (including actual and extrapolated) for marine mammals during production pile driving activities are summarized in Table 3-21. No Level A harassment occurred during any project-related activities. Observed "take" was based on the actual observations that the MMOs recorded during all construction or demolition monitoring efforts. Of the 779 individuals observed, 181 (23.26%) were identified as observed "take" based on an assessment of the observation relative to the activity that was occurring at the time of the observation. Of the observed "take," a single California sea lion had an apparent reaction to pile driving activities while exposed to Project-related pile driving. The animal was initially observed 200 m (646 ft) to the south of mooring dolphins by the P-122 MMO. It was noted as swimming to the north towards the new fuel pier; however, as pile driving began, it changed direction and swam south and was lost from sight. If the animal had continued its original course, it would have caused a shutdown of construction.

Airborne "take" was evaluated relative to those individuals that were observed hauled out on docks that were within the maximum airborne threshold ZOIs for pile driving of 30-inch piles (51 m [167 ft] for 100 dB, and 188 m [617 ft] for 90 dB) and did not enter the water during pile driving. While the airborne ZOIs were smaller for the all other project-related activities, to be conservative, the larger ZOIs for the impact pile driving for 30-inch piles were evaluated for "take." However, when individual observations of hauled out pinnipeds were evaluated relative to the airborne ZOIs, none were exposed to sound that could be considered as airborne "take." A single California sea lion was observe potentially reacting to airborne noise during pile driving of the 30-inch piles when it looked towards the hammer, and then entered the water (identified as a "flush" by the MMO); however, the individual was outside of the airborne Level B ZOI, and was not considered as an airborne "take." Because it entered the water and was within the 30-inch pile in-water Level B ZOI, it was included as an in-water Level B "take."

Table 3-21. Summary of Observed "Take" in the Acoustic ZOIs for Project-related Activities.

Species	Total Number of Animals Observed in the Water		Authorized Level B "Take"		Observed Level B "Take"	
	Indiv.	Sightings	Total[1]	Per Day[2]	Total	Per Day[3] (% of Authorized "Take" per Day)
California sea lion[4]	646	475	3,757	16.55	156	1.93 (11.6%)
Common dolphin	-	-	361	1.59	-	-
Coastal bottlenose dolphin[4]	47	19	295	1.30	4	0.05 (3.8%)
Harbor seal	84	74	118	0.52	21	0.26 (49.9%)
Risso's dolphin	-	-	48	0.21	-	-
Pacific white-sided dolphin	-	-	12	0.05	-	-
Gray whale	1	1	27	0.12	-	-
Northern elephant seal	-	-	12	0.05	-	-
TOTAL	**778**	**569**	**4,630**		**181**	

Notes: [1] Includes underwater Level B "take" only; [2] Based on an estimated 227 days of construction and demolition; [3] Based on an actual 81 days of monitoring during project-related activities; [4] Includes one unidentified pinniped and two unidentified dolphins.

There was one sighting each of two unidentified dolphins and one unidentified pinniped observed during monitoring efforts. While the species associated with these two sightings cannot be definitively identified, they were considered in the above-described results to be most likely California sea lion and coastal bottlenose dolphin based on their relatively common occurrence in the Bay, there was considerable monitoring effort during the IHA #4 timeframe covered in this report, and non-IHA species were not observed as part of the monitoring efforts. In the case of the two unidentified dolphins, they were observed during caisson cutting activities, but were observed outside of the Level B ZOI (631 m [2,070 ft]) for that activity and, therefore, were not included in the "take" estimates. The unidentified pinniped was observed during active pile clipping activities and was within the approximate Level B ZOI (2,511 m [8,238 ft]) and, therefore, this individual was incorporated into the "take" analysis for California sea lions.

Section 2.4.2 provides the method that was used to extrapolate "take" during the project-related activities; extrapolated "take" during project-related activities using this methodology is summarized in Table 3-22. To extrapolate "take," density estimates were multiplied by the area for each construction or demolition phase that was outside of the visible range of the MMO to generate an estimated abundance in the unobservable area. The estimated abundance was then multiplied by the amount of time of each activity to account for the time that an animal may have been exposed to potential Level B harassment. The extrapolated "take" estimates are conservative. The extrapolated "take" estimates assume that each activity occurred independent of all other activities, when, in fact, there was some overlap of demolition and pile driving activities. In cases of co-occurring activities, there was the potential for an animal to have been counted more than once as a "take." Furthermore, density estimates were derived from the IHA #2 monitoring period, when there was a large influx of species more commonly observed inside the Bay, as well as species not observed very often. In comparison, species abundance and diversity were relatively lower in the last reporting period

(NAVFAC SW 2016a, 2016b) and as identified in this report. In addition, no adjustments to total construction/demolition monitoring times were made to account for seasonal variability in species occurrence, as applicable.

Table 3-22. Summary of Extrapolated "Take" for Project-related Activities.

Species	Density Estimate (animals/km^2)[1]	Unmonitored Level B ZOI (km^2)	Estimated Abundance	Construction/ Demolition Time (hh:mm)	Extrapolated Takes
Impact Pile Driving (30-inch piles)					
California sea lion	15.9201	1.24	19.74	19:44	389.6
Harbor seal	0.4987		0.62		12.2
Coastal bottlenose dolphin	1.249		1.55		30.6
Gray whale	0.1150		0.14		2.8
Vibratory Pile Driving (30-inch piles)					
California sea lion	15.9201	2.23	35.50	2:43	96.4
Harbor seal	0.4987		1.11		3.0
Coastal bottlenose dolphin	1.249		2.79		7.5
Gray whale	0.1150		0.26		0.7
Jetting (24×30 piles)					
California sea lion	15.9201	2.07	32.95	6:32	215.3
Harbor seal	0.4987		1.03		6.7
Coastal bottlenose dolphin	1.249		2.59		16.9
Gray whale	0.1150		0.24		1.5
Demolition (All pile clipping)					
California sea lion	15.9201	4.37	69.57	16:18	1,134.0
Harbor seal	0.4987		2.18		35.5
Coastal bottlenose dolphin	1.249		5.46		89.0
Gray whale	0.1150		0.50		8.2
TOTAL		**9.91**		**45:17**	**2050.1**

Note: [1] Density estimates were based on those included in the IHA #3 application for this project.

No extrapolation of "take" was performed for the four species authorized for taking under IHA #4 (Navy 2016) but not observed during monitoring. While it was not possible to unequivocally rule out the potential presence of any of these four species within the unobserved portion of the larger Level B ZOIs extending beyond the visual range of the MMOs, the likelihood of their occurrence was very low. Three of the species are known to have rare occurrence within the Bay (common dolphin, Pacific white-sided dolphin, northern elephant seal) and one species (Risso's dolphin) has the potential to occur but has not been previously reported within the Bay (Navy 2016). Furthermore, the potential abundances of these species, had they been present, would have been expected to be low based on historical density (Table 3-23).

Table 3-23. Potential Occurrence of Species Not Observed During IHA #4 Monitoring (If Assumed Within the Unobserved Portion of the Level B ZOIs During Project-related Activities).

Species	Density Estimate (animals/km^2)[1]	Unmonitored Level B ZOI (km2)	Estimated Abundance	Construction/ Demolition Time (hh:mm)	Potential Abundance if Present Throughout Pile Driving
Impact Pile Driving (30-inch piles)					
Common dolphin	1.5277	1.24	1.89	19:44	37.4
Risso's dolphin	0.2029		0.25		5.0
Pacific white-sided dolphin	0.0493		0.06		1.2
Northern elephant seal	0.0508		0.06		1.2
Vibratory Pile Driving (30-inch piles)					
Common dolphin	1.5277	2.23	3.41	2:43	9.3
Risso's dolphin	0.2029		0.45		1.2
Pacific white-sided dolphin	0.0493		0.11		0.3
Northern elephant seal	0.0508		0.11		0.3
Jetting (24×30 piles)					
Common dolphin	1.5277	2.07	3.16	6:32	20.7
Risso's dolphin	0.2029		0.42		2.7
Pacific white-sided dolphin	0.0493		0.10		0.7
Northern elephant seal	0.0508		0.11		0.7
Demolition (All pile clipping)					
Common dolphin	1.5277	4.37	6.68	16:18	108.8
Risso's dolphin	0.2029		0.89		14.5
Pacific white-sided dolphin	0.0493		0.22		3.5
Northern elephant seal	0.0508		0.22		3.6

Note: [1] Density estimates were based on those included in the IHA #3 application for this project.

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4.0 Discussion

4.1 Acoustics

Several activities associated with construction of the new fuel pier and demolition of the old fuel pier were acoustically evaluated between 08 October 2016 and 30 April 2017. Because considerable acoustic data have been collected during previous IHA monitoring years for the Project, the focus of the acoustic data collection during this IHA #4 monitoring period was to obtain underwater SPLs for construction or demolition activities that were new or used new techniques, and to obtain airborne SPLs for the largest of the installed piles. In-water acoustic measurements were recorded during the demolition of 24-inch square concrete piles (pile clipping) and 84-inch concrete caissons (cutting) on the north section of the old fuel pier, and the installation of 24×30 concrete piles (jetting) along the breasting dolphin of the new Fuel Pier. Airborne data were collected during installation of 30-inch steel pipe piles (impact and vibratory pile driving) at the new fuel pier. The purpose of the acoustic data evaluation was to assess whether source levels exceeded the Level A thresholds, and to determine distances to the Level B harassment criteria, if appropriate.

4.1.1 Production Pile Driving

4.1.1.1 *Pile Jetting*

Underwater SPLs during pile installation (impact driving) for 24x30 concrete piles were obtained during previous IHA monitoring periods for this Project (NAVFAC SW 2015, 2016b); however, jetting during the installation of the 24×30 concrete piles had not been previously reported. The only jetting data previously collected during the Project was at NMAWC during the removal of 12-inch and 16-inch concrete piles (NAVFAC SW 2014). Therefore, representative *in situ* data were collected at source and graduated far-field distances during jetting of the 24×30 piles to establish distances to the marine mammal thresholds.

Two methods of jetting were employed during installation of the 24×30 piles and acoustic data were collected for each. Measured SPLs did not exceed 159.9 dB at source (10 m [33 ft]); therefore, they were lower than the Level A but within the Level B threshold criteria. Far-field measurements were recorded employing both vessel drift and stationary recording locations. Early morning measurements, with no vessel traffic, indicated that pile jetting reached near ambient levels for both methods between 80 m (262 ft) and 165 m (541 ft) for M1 and M2, respectively. However, as the day progressed, it became more difficult to distinguish pile jetting from other anthropogenic noise (i.e., vessel traffic) in the Bay and the Level B threshold for vibratory sound could not be consistently determined using real-time data. The practical spreading loss model was used to estimate the Level B threshold distance as 1,166 m (3,825 ft), which appeared to be conservative based on the collected data. Additional data collection would be required to confirm a Level B ZOI for this activity using real-time data in the Bay.

4.1.1.2 Pile Driving

Piles driven during the monitoring timeframe of this report included 24x30 concrete piles, 30-inch steel pipe piles, and a single 16-inch concrete pile. Underwater SPLs had been obtained during the driving of these piles sizes and types during previous IHA monitoring periods for this Project (NAVFAC SW 2015). Airborne SPLs during previous IHA monitoring periods were based on

impact driving of 36-inch steel piles. Since the largest pile driven during this IHA #4 monitoring timeframe was the 30-inch steel pipes, *in situ* airborne data were collected and the airborne ZOIs were adjusted accordingly. The installation of the 30-inch piles included both impact and vibratory driving, and airborne acoustic data were collected for both.

The airborne 90 dB Level B harassment threshold for harbor seals was measured at a distance of 188 m (617 ft) during impact driving of 30-inch steel piles, which was slightly greater when compared to the 182 m (597 ft) distance measured during driving of 36-inch piles during the 2014/2015 production pile driving, and less than the 233 m (764 ft.) distance documented for 36-inch steel piles for the IPP (NAVFAC SW 2014, 2015). The 100 dB Level B airborne harassment threshold for California sea lions was measured at 51 m (167 ft) during impact driving of 30-inch steel piles, compared to 71 m (233 ft) previously measured for 36-inch steel piles for the IPP and 78 m (256 ft) as measured for 2014/2015 production pile driving (NAVFAC SW 2014, 2015).

Differences in airborne threshold distances may be attributed to pile size/type, boundary conditions, and other airborne anthropogenic noise during pile driving. The 30-inch pile driving took place on the southern end of the new fuel pier, which allowed for unobstructed data collection at the far-field location. This is in comparison to previous years when data were collected in areas with portions of the old fuel pier still intact, which likely caused boundary conditions for airborne sound sources. These factors could have contributed to some of the higher airborne SPLs observed during the impact driving of the 30-inch piles compared to driving of 36-inch piles during the 2014/2015 production pile driving.

During vibratory driving of the 30-inch steel piles during this IHA #4 monitoring timeframe, the 100 dB and 90 dB thresholds were located at 15 and 103 m (49 and 338 ft), respectively. Similar to previous IHA monitoring periods, a conservative approach was used in establishing the marine mammal airborne ZOI's, which were based on the acoustic data during impact driving of the largest pile size (30-inch piles in this monitoring period) and applied to both impact and vibratory activities.

4.1.2 Demolition

4.1.2.1 *Pile Clipping*

Prior to the 2016/2017 production year, acoustic data for pile clipping activities associated with this Project had only been collected on 18-inch concrete piles (NAVFAC SW 2016). Since pile clipping activities were expected to occur on a larger diameter pile than previously recorded, *in situ* source field measurements were collected during clipping of 24-inch square concrete piles on the northern section of the old Fuel Pier.

Pile clipping data for the 24-inch concrete piles showed that Level A harassment thresholds were not reached, with the source levels never exceeding 165.3 dB rms. As expected, acoustic data at source during clipping of the 24-inch piles were higher by approximately 15 dB than the 18-inch piles (150.1 dB rms) recorded during IHA #3 (NAVFAC SW 2016b). The model developed in Dahl et al. (2012) was initially used to establish the distance to the 120 dB rms threshold; however, upon further analysis of the *in situ* data, the distances at which the 160 and 120 dB rms thresholds were reached did not fit the modelled predictions. This was likely because the contours identified

in the Dahl et al. (2012) model were based on an evaluation of pile driving of 36-inch steel pipe piles. Because the data did not fit the model, the practical spreading loss model was used to conservatively estimate the distance to the Level B threshold as 2,511 m (8,238 ft). Far-field data collection would be required to verify whether the distance to the Level B threshold during pile clipping can be readily distinguished *in situ* amidst the ambient noise environment of the Bay. Based on other available far-field data collected during pile jetting and caisson cutting (Section 4.1.1.1 and Section 4.1.2.2, respectively), the practical spreading loss model provided a conservative approach for estimating the Level B ZOI.

4.1.2.2 Caisson Demolition

SPLs of demolition activities for the 84-inch caissons had not been previously documented; therefore, it was necessary to obtain *in situ* data at source and graduated far-field distances to establish distances to the marine mammal harassment ZOI's. The Level A harassment thresholds were never reached, with source levels remaining below 155.6 dB rms. Far-field SPLs varied substantially. For example, SPLs recorded at a distance between 537 m and 810 m (1,762 ft and 2,657 ft) were 7 to 8 dB higher than those recorded at 250 m (820 ft). Differences in the SPL values at distance were largely attributed to other anthropogenic noise (i.e., vessel traffic), which depended on location and time of day of the recordings. Every effort was made to collect recordings early in the morning and in locations with the least amount of vessel traffic; however, this was not always possible because of the timing of the caisson demolition. Due to the difficulty in finding the Level B threshold for vibratory sound, source SPLs of the 84-inch caisson piles were evaluated using the model developed to examine steel pipe pile acoustic propagation to estimate harassment ZOIs (Dahl et al. 2012). Similar to the pile clipping analysis, the 160 and 120 dB rms ZOIs did not fit the modelled predictions. The practical spreading loss model was used to estimate the Level B threshold distance as 631 m (2,070 ft), which appeared to be conservative based on the collected data. Additional data collection would be required to confirm a Level B ZOI in the Bay for this activity based on real-time data.

4.2 Marine Mammals

Monitoring efforts associated with the Project occurred from 8 October 2016 to 30 April 2017. Monitoring associated with previous IHAs for the Project primarily occurred between January and April. Review of data collected during those months indicates there were fewer individuals and sightings during this IHA #4 (2016/2017) and the prior IHA #3 (2015/2016) compared to IHA #2 (2014/2015). Monitoring efforts during IHA #1 (2013/2014) also occurred during these months, but only on nine days at the new fuel pier, or in a different location, and were not necessarily comparable. When adjusting for effort during IHA #s 2, 3, and 4 (Table 4-1), the three species that were observed in all years were seen more often in 2014/2015 than in the past two years of monitoring effort in the same general area. However, when comparing last year (2015/2016) to the current year, and adjusting for effort, harbor seals and coastal bottlenose dolphins both increased in numbers per day during the same time-period (Table 4-1). This would indicate that there may be a slight increase, or stabilization, in the numbers of these two species in the Bay. In contrast, California sea lions appear to have decreased in numbers per day when compared to the previous two monitoring time periods, but the decrease was substantially less between IHA #3 and IHA #4, than between the IHA #2 and IHA #3 monitoring timeframe. Because the last two years of monitoring effort showed only relatively small changes in individuals per monitoring day, the species occurrence appears to have been relatively stable in the Bay since 2015.

Table 4-1. Summary of Previous and Current Years' Individuals per Day (January Through April).

Species	Individuals per Day		
	IHA #2 (2014/2015)[1]	IHA #3 (2015/2016)[1]	IHA #4 (2016/2017)[1]
California sea lions	88.52	8.05	6.81
Harbor seals	2.48	0.47	1.00
Coastal bottlenose dolphins	6.95	0.48	0.58

Notes: [1]Based on 100 (IHA #2), 51 (IHA #3), and 81 days of monitoring effort

More than likely the trend noted in Table 4-1 has been influenced by environmental fluctuations as part of the on-going El Niño/La Niña event that has been occurring in the Pacific Ocean. More specifically, the water temperatures during the same months (January through April) during the IHA #2 were, on average, 63.3°F (17.4°C), while the average water temperatures during IHA #3 and IHA #4 were 65.1°F (18.4°C), and 63.6°F (17.5°C), respectively. While these average temperatures were higher than the average water temperatures for the region prior to the current El Niño event (January to April [2005-2012]: 60.4°F [15.8°C]), it shows that the effects of the El Niño event may be dissipating (Figure 4-1).[2] Furthermore, as another indication of changing conditions in the area, An Unusual Mortality Event was declared for California sea lions in 2013 (NOAA 2017a). California sea lion strandings data for 2016 (as of 01-July-2016) showed that strandings were much lower in 2016 than in 2015, but were still four times higher than from 2003 to 2012 (NOAA 2017b), and strandings data through 2017 indicates that average California sea lion strandings may be returning to closer to normal (NOAA 2017b). During the project timeframe discussed in this report, no stranded or dead animals were observed as part of our monitoring efforts. This lack of observations of stranded animals (California sea lions specifically) is consistent with last year's monitoring efforts.

The California sea lion was the most sighted marine mammal during the monitoring, with a relatively consistent distribution throughout the Bay during the largest monitoring efforts for 30-inch piles (see Figure 3-11). The total number of sightings (2,038 hauled out and in the water) constituted 93.1% of all marine mammal sightings, followed by harbor seals (n=102, 4.7% of all sightings), and coastal bottlenose dolphin (n=47, 2.1% of all sightings). Because the unidentified pinniped and unidentified dolphins were most likely a California sea lion and coastal bottlenose dolphins, respectively, they were included in the total number of these two species. A single gray whale and a green sea turtle made up less than 1% of the remaining observations. These observations are consistent when comparing previous years data (NAVFAC SW 2014, 2015, 2016), with California sea lions comprising most of the observations in all years of monitoring.

[2] Current (NDBC 2017a) and Historical (NDBC 2017b) water temperature data are from the National Data Buoy Center (Station #: 9410170) located in San Diego Bay at 32.714, -117.174.

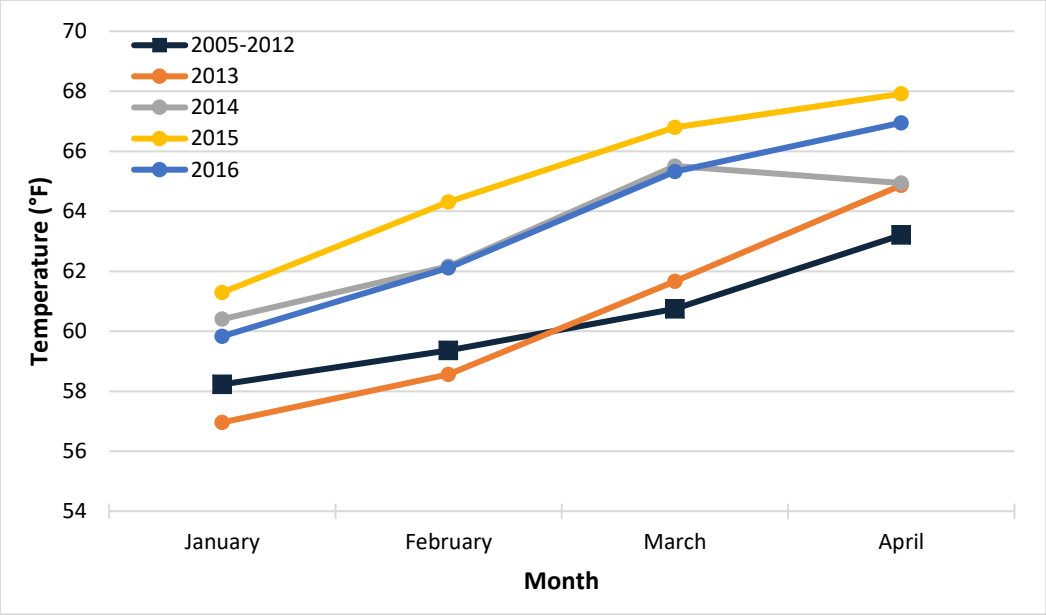

Figure 4-1. Comparison of Monthly Average Sea Surface Temperatures from 2005 to 2012, and 2013 to 2016[4].

Similar to San Diego Bay, other construction projects have occurred along the western coast of the United States involving the installation of steel and concrete piles using vibratory and impact pile driving. In many of these areas, California sea lions are also common visitors or residents of the area and are known to haul out on man-made structures such as piers, docks, navigation buoys, and Naval vessels (Navy 2011; HDR 2012; HartCrowser 2013; USCG 2013). In most cases, reported disturbance to marine mammal was minimal and included behavioral responses such as an increased alertness, barking, and/or looking in the general direction of the sound source (Navy 2011; USCG 2013). Animals occasionally left the immediate area but it was also reported that many individuals did not exhibit any change in behavior and either remained in the area or continued on their original path of travel (HDR 2012; HartCrowser 2013). In no report were behavioral changes such as increased swimming speeds, increased surfacing time, or decreased foraging observed (Navy 2011; HDR 2012; HartCrowser 2013; USCG 2013). For the 8 October 2016 to 30 April 2017 timeframe, there were two observations of California sea lions that apparently reacted to pile driving during the 30-inch piles. These two observations were of a single adult female looking towards the hammer, and then entering the water off a dock, and an adult male abruptly changing direction while swimming towards the new fuel pier. Similarly, overall reactions to Project-related stimuli have been a rare occurrence during previous IHA monitoring periods for this Project (NAVFAC SW 2014, 2015, 2016) when compared to the overall number of observations.

The overall behavior of individuals across all species did not show any atypical behaviors during pile driving when compared to non-pile driving observations. California sea lions were most often observed swimming (n=333, 70.1% of all observed behaviors). Relative to construction (pile driving or jetting), swimming was more often noted during non-active construction (n=248, 84.4%) than active construction (n=46, 45.6%). This is in contrast to the IHA #3 time-period

(NAVFAC SW 2016a,b), when swimming was relatively evenly distributed between active pile driving (54.7% of the observations) and non-active monitoring (45.3% of the observations). Based on the data presented in Table 3-1, the greater amount of time spent during non-activity monitoring effort (84.7% of all pile installation monitoring efforts) may have had a major influence on the number of observations, and subsequent behaviors noted, during pile installation. This contrasts with demolition time which had a more evenly distributed amount of monitoring effort between active demolition (40% of the time) and non-activity monitoring (60% of the time). Harbor seals were mainly observed swimming and milling, and coastal bottlenose dolphins were observed swimming. Similar to California sea lions, the percentage of observed individuals reflect the amount of time between the active and non-activity monitoring efforts.

Similar to previous years, March had the highest number of observer days (n=21), but December had the most hours of observation (107 hours and 43 minutes). When looking at the data for the species most often observed relative to individuals per month, as well as the data after adjustment for monitoring effort (see individual species write-ups in Section 3.4.3), the California sea lions and coastal bottlenose dolphins both had the highest number of individuals observed and individuals per observer hour in March, indicating that monitoring effort did not have an effect on the numbers of individuals observed in the Bay relative to monitoring efforts. The harbor seals, on the other hand, had the highest number of individuals observed in March, but the highest number of individuals per observer hours in February. Evaluation of the data indicated there was an apparent seasonal influx of harbor seals in the Project area starting in the February/March timeframe, with a stabilization or slight drop in abundance through April.

Environmental conditions during the Project did not limit monitoring efforts. The majority of the monitoring was during conditions with a BSS 2, clear or partly cloudy conditions, and good visibility of from 10 to 20 km (6.2 to 12.4 miles). Mean BSS values per observation station ranged from 1.41 ("Sierra") to 2.38 ("Bait barge"), and varied based on the position of the observation location inside the Bay. Regardless of the average BSS values per station, weather conditions during the project timeframe were favorable for sighting marine species. This was demonstrated by only two observations of "unknown" species distinction out of all observations associated with the Project. Furthermore, the BSS did not appear to appreciably influence the number of observations for California sea lions or harbor seals during the Project timeframe. The coastal bottlenose dolphin average group size decreased from 2.83 (BSS 0/1/2) to 1.75 (BSS 3/4/5) individuals per sighting coincident with an increase in BSS. However, the influence of BSS on the sightability of coastal bottlenose dolphins during the monitoring timeframe was limited, if any, because of the relatively few animals observed (n = 18) and the overall favorable environmental conditions during the monitoring timeframe.

Per the monitoring protocol, a construction or demolition shutdown was called if an animal was seen crossing into, or was first observed inside, the buffered "shutdown" ZOI. During monitoring for production pile driving, there were a total of 11 construction shutdowns or delays as a result of 15 animals entering the buffered "shutdown" ZOIs. No animals were first observed inside the actual Level A ZOIs. Table 4-2 provides a summary of the project-related shutdowns, and Appendix G provides a detailed account of each shutdown occurrence.

Table 4-2. Summary of Project-related Shutdowns.

Pile Size	Days of Pile Driving	Species	Individuals	Number of Delays/Shutdowns	Individuals per Day
16-inch	2	California sea lion	1	1	0.50
24×30	11	California sea lion	1	1	0.09
30-inch	20	California sea lion	9	7	0.45
		Coastal bottlenose dolphin	2	1	0.10
		Harbor seal	2	1	0.10
TOTAL	**33**		**15**	**11**	**0.45**

A total of one hour and four minutes of shutdowns or delays were noted during monitoring efforts for all species, with an average of five minutes and forty-nine seconds per shutdown or delay. The longest delay of nineteen minutes and fifty-one seconds was initially caused by two harbor seals that entered the ZOI from the north. One of the individuals was not observed again, but the second individual loitered inside of the project area, dove, then was not observed again. The monitoring crew waited a full 15 minutes before allowing pile driving to begin. All other observations were of single individuals, or of a group of two individuals, and lasted from just over one minute to a half minutes to sixteen minutes. This is comparable to the limited shutdowns or delays during IHA #3, but is in contrast to IHA #2, which had 138 shutdowns over 100 days of pile driving effort.

Of the 11 observations that resulted in a construction shutdown or delay, a majority (n=9; 81.2%) of the sightings occurred during a pre-/post-construction survey time-period, followed by active impact pile driving (n=2; 18.8%). No shutdowns occurred during vibratory pile driving. For the delays, the pile driving crew was generally performing maintenance to the hammer/crane and the shutdown did not directly affect their ability to drive piles. However, pile driving was considered as delayed because the pile driving crew was ready to drive at some point while the animals were inside of the shutdown ZOI. No animals were first observed inside the actual Level A ZOIs (10 m [33 ft], 20 m [66 ft], 50 m [164 ft], 75 m [246 ft], or 350 m [1,148 ft]) associated with the project, and no Level A "take" occurred during this project.

Based on acoustic data collected during the previous IHAs, the maximum modeled Level B (behavioral) harassment zone extended up to 3,000 m (9,843 ft) for vibratory pile driving and 2,000 m (6,561 ft) for impact pile driving. The Level B ZOIs for all other pile sizes and activity types were smaller, depending on the pile size (see Table 2-3). Acoustic data collected during IHA #4 did not verify the distances to the Level A/B ZOIs for pile driving because the distances collected previously were considered as adequate for these actions. However, an assessment of the distances to the Level A (if applicable) and the Level B ZOIs for demolition and pile jetting were needed to determine the potential impacts on marine mammals in the vicinity. After an analysis of this data, it became apparent that: 1) source levels did not exceed existing Level A regulatory thresholds, and 2) after collecting data at far-field locations for each type of action, the Level B ZOIs were not as defined as with pile driving due to the lower source levels and masking by other anthropogenic noise (mainly vessel traffic in the Bay). As a result, for all demolition activities and

pile jetting, a simplistic practical spreading loss model was used to conservatively determine the Level B ZOIs (see Table 2-4).

Level B "take" did not exceed the authorized "take" for any species specified in the IHA #4 (NMFS 2016). The data presented in Table 3-21 show that the observed "takes" per day during the project timeframe were lower than were anticipated, but higher relative to the overall 'take" in IHA #3. When accounting for observed and extrapolated "take" the harbor seal (66.5 % of authorized) was the species that was closest to the authorized "take," followed by the California sea lion (53.0% of authorized), and the coastal bottlenose dolphin (50.2% of authorized). It should be noted that the observed "take" for the California sea lions and coastal bottlenose dolphin were comparable to those during IHA #3 (2015/2016), with only the harbor seal showing a substantial increase relative to the previous monitoring timeframe (IHA #3: n=9, IHA #4: n=21). The increase in overall harbor seal numbers could be related to an increase in the abundance in the Bay, as evidenced by an increase in the total harbor seals observed (see Table 3-12 in this report and Table 3-4 in NAVFAC SW 2016b). The total observed "take" across species for the IHA #4 timeframe of this report (181) was similar to that reported for IHA #3 (151) (NAVFAC SW 2016b). The largest difference between this and the pervious IHA #3 monitoring period was the greater extrapolated "take" reported herein. This is likely a reflection of the greater amount of construction/demolition time monitored with the potential for Level B "take."

The observation data provides a good update to the presence/absence data for species specific to the project area; however, because the monitoring for this project was not based on a comprehensive survey protocol to assess abundance, this data should not be viewed as representative of the overall population of these species in northern San Diego Bay, but rather a simple estimate of the number of animals that occurred in the Project area.

Table 4-3. Summary of Total "Take" During All Construction Activities.

Species	Authorized Level B "Take"	All Level B "Take"			
		Observed	Extrapolated	Total (% of Authorized)	Per Day[1]
California sea lion	3,757	156	1,835	1,991 (53.0%)	24.58
Common dolphin	361	-	-	0	0.00
Coastal bottlenose dolphin	295	4	144	148 (50.2%)	1.83
Harbor seal	118	21	57	78 (66.5%)	0.97
Risso's dolphin	48	-	-	0	0.00
Pacific white-sided dolphin	12	-	-	0	0.00
Gray whale	27	-	13	13 (49.1%)	0.16
Northern elephant seal	12	-	-	0	0.00
TOTAL	**4,630**	**181**	**2,050**	**2,231 (48.2%)**	

Notes: [1]Based on 81 days of actual pile driving (8 October 2016 to 30 April 2017)

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5.0 Conclusion

No Level A "take" occurred during this IHA #4 reporting timeframe. The implementation of conservative marine species monitoring ZOIs and buffered shutdown zones reduced the likelihood of Level A injury "takes" without jeopardizing project objectives. There were relatively few shutdowns and the total time associated with shutdown delays (approximately 1 hour) was very small relative to the total monitoring effort for construction and demolition (over 461 hours during 81 days).

Acoustic data collection as part of IHA #4 accomplished the stated goals as identified in the IHA Application and Monitoring Plan, submitted as part of the IHA Application (Navy 2016). The comprehensive evaluation of demolition activities and construction jetting techniques during the 2016/2017 production year (IHA #4) was critical to assessing location specific SPLs for these activities. After an analysis of this data, it became apparent that: 1) source levels did not exceed existing Level A regulatory thresholds, and 2) after collecting data at far-field locations, the Level B ZOIs were not as defined as with pile driving due to the lower source levels and influence of other anthropogenic noise (vessel traffic) in the Bay. As a result, for all demolition activities and pile jetting, a simplistic practical spreading loss model was used to determine the Level B ZOIs, which based on the available far-field data were determined to be conservative.

Demolition activities, including high pressure water jetting and sediment removal ("airlifting"), resulted in only small turbidity plumes that were visible at the surface. No plumes were observed that approached the 2.5 acres (10,117 m^2) criteria that would have required halting and modifying those activities.

The total observed "take" across species was similar for the timeframe of this report (181) with that reported for IHA #3 last year (151) (NAVFAC SW 2016b). The largest difference between this and the pervious IHA #3 monitoring period was the greater extrapolated "take" reported herein. This is likely a reflection of the total combined observed and extrapolated Level B "take" represented 48.2% of the total Level B "take" authorized for IHA #4. On a per species basis, the combined observed and extrapolated Level B "take" was 66.5%, or less than, the authorized amount.

Only four of the eight species associated with IHA #4 were observed during monitoring. This was similar to IHA # 3, when only three of the eight species covered under that IHA were observed. These last two years of monitoring efforts have not detected some of the species that had rare occurrence in the Bay during IHA #2. Some of the differences between years in species occurrence in the Bay likely relate to the most recent El Niño event. No marine mammal species was observed during monitoring that was not covered under IHA #4. Overall, this project did not approach levels of "take" that would have required a re-consultation with NOAA.

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6.0 Acknowledgements

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7.0 List of Preparers

Project Oversight

Mitchell Perdue, Senior Biologist and Deputy Dive Safety Coordinator, NAVFAC SW, San Diego, CA.

Document Preparation

Karen Green, Project Manager/Senior Marine Scientist, Tierra Data Inc., Escondido, CA.

Todd McConchie, Senior Marine Scientist, Tierra Data Inc., Escondido, CA.

Shannon Coates, Marine Scientist, Tierra Data Inc., Escondido, CA.

Mark Cotter, Marine Scientist, Tierra Data Inc., Escondido, CA.

Jim Kellogg, GIS Analysis/Data Analyst, Tierra Data Inc., Escondido, CA.

Scott Snover, GIS Analysis/Mapping, Tierra Data Inc., Escondido, CA.

Chelsea Snover, Publication Specialist, Tierra Data Inc., Escondido, CA.

Scientific Team

Dr. Peter Dahl, Principal Engineer and Professor, Applied Physics Laboratory and Department of Mechanical Engineering, University of Washington, Seattle, WA.

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Appendix A: Turbidity Monitoring

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Turbidity Monitoring for Caisson Jetting (23 December 2016)

Introduction:

Turbidity monitoring for sediment jetting around Caisson P-K-3 occurred on 23 December 2016 from approximately 1050 to 1330. Monitoring of turbidity occurred using a secchi disk at multiple locations along the piers (Figure 1), as well as visual monitoring during the entirety of jetting operations. The monitoring stations were chosen as representative locations that would provide the best assessment of whether any turbidity plumes exceeded 2.5 acres (10,117 square meters [m^2]).

Figure 1. Turbidity Monitoring Stations.

Methods:

Ambient conditions were established between 1050 and 1130 at the eight locations on the new pier trestle, the new pier itself, and the old pier (see Figure 1). The secchi disk was lowered into the water until it was no longer visible, with marks on the line in increments of 3.28 feet (ft; 1 meter [m]). The depth at which the disk was not visible in the water column was recorded at each station. After jetting had started, at approximately 1200 and 1300, measurements were taken using the same methods as used to collect ambient conditions.

Results:

The low tide was at approximately 1220, and the jet was in use from 1143 to 1330. After the jet had been turned on and applied to the sediment, the visible plume extended to a maximum area of approximately 0.005 acres (20 m^2; Figure 2). However, a majority of the plume dissipated quickly (within 3 to 5 minutes), and was not visible other than in the area near the caissons right after the jet was turned on (Photos 1, 2, & 3). In Figure 2, the red plume is at 1221 (11 minutes after a jetting session began and approximately at slack tide), the purple plume is at 1258 (6 minutes after a jetting session began) and the green plume is at 1326 (10 minutes after a jetting session began).

Start	Stop	Duration
11:43	12:06	0:23
12:10	12:15	0:05
12:25	12:30	0:05
12:35	12:49	0:14
12:52	13:10	0:18
13:16	13:28	0:12
13:34		Diver out

Figure 2. Visible Plumes at 1221 (Red), 1258 (Purple), and 1326 (Green).

Photo 1,2,3. Plume During Jetting (Photo 1: 1143, Photo 2: 1145, Photo 3: 1155)

The stations closest to the jetting (Stations #2 and 3) showed very little difference from ambient conditions (Table 1). There were some reductions in the secchi disk readings during the 1200 timeframe (1.6 to 3.28 ft [0.5 to 1 m] difference at three locations). The readings at the 1300 timeframe had more differences (<1 ft to 2.4 ft [0.25 to 0.75 m] difference at five locations).

Table 1. Results of Secchi Disk Readings.

Station #	Ambient		Measurement #1 (app 1200)			Measurement #2 (app 1300)		
	Time	Value	Time	Value	Value Diff from Ambient[2]	Time	Value	Value Diff from Ambient[2]
1	11:22	3.00	12:06	3.00	0.00	13:17	2.75	-0.25
2	10:50	3.50	12:00	3.00	-0.50	13:19	3.00	-0.50
3	10:55	3.00	11:55	3.00	0.00	13:15	3.25	0.25
4	11:12	3.50	12:08	3.00	-0.50	13:11	3.25	-0.25
5	11:08	4.00	12:10	3.00	-1.00	13:08	3.25	-0.75
6[1]	11:20	3.00	12:11	3.25	0.25	-	-	-
7	11:30	3.50	12:33	3.50	0.00	13:22	3.75	0.25
8	11:25	3.00	12:28	3.25	0.25	13:00	2.75	-0.25

Notes: [1]Jetting stopped before a reading at Station 6 could be collected for Measurement #2.
[2]Yellow highlight indicates a negative change (decrease in visibility) from ambient.

Conclusions:

Overall, the visible plume during jetting was small, and did not approach the 2.5 acres (10,117 m^2) area needed to stop jetting activities. The reduction in the overall plume over time may have been associated with the change from the incoming tide to the outgoing tide; however, no visible plume was observed to the south of the piers during jetting activities, or after jetting was completed.

Turbidity Monitoring for Caisson Jetting (28 December 2016)

Introduction:

Turbidity monitoring for sediment displacement around Caisson P-K-11 occurred on 28 December 2016 from approximately 0805 to 0850. Sediment removal utilized a pipe that sucked the sediment away from the caisson and discharged it into the water column ("airlifting"). Turbidity was monitored for this operation because it was a different technique than was used on 23 December 2016 ("jetting"). Monitoring of turbidity occurred using a secchi disk at multiple locations along the piers (Figure 1). The monitoring stations were chosen as representative locations that would provide the best assessment of whether any turbidity plumes exceeded 2.5 acres (10,117 square meters [m^2]).

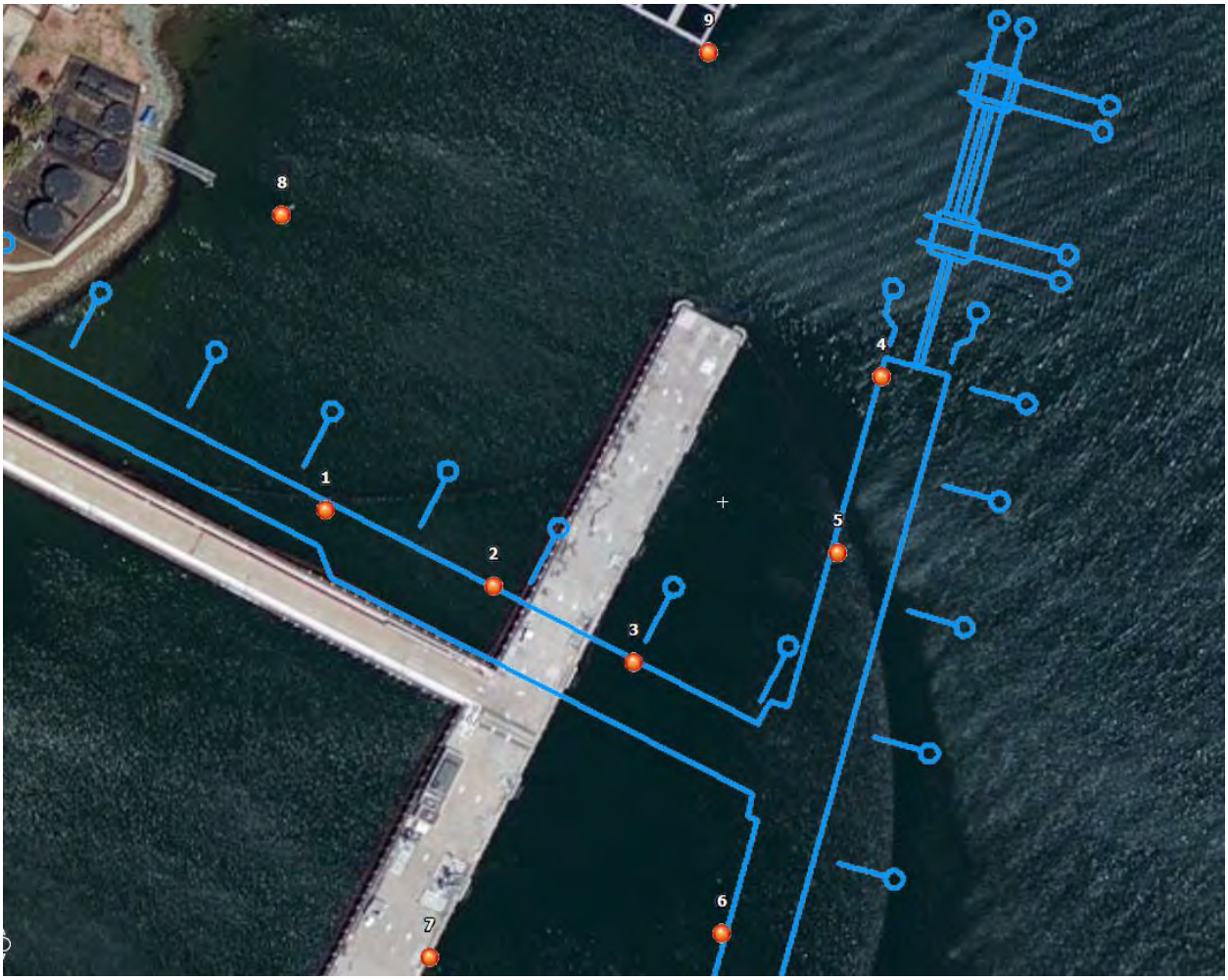

Figure 3. Turbidity Monitoring Stations.

Methods:

Ambient conditions were established between 0705 and 0750 at the nine locations on the new pier trestle, the new pier itself, the old pier, and one location via boat to the north of the piers (see Figure 1). A ninth monitoring location was added to the eight stations from 23 December 2016 due to the incoming tide. The

secchi disk was lowered into the water until it was no longer visible, with marks on the line in increments of 3.28 feet (ft; 1 meter [m]). For readings during ambient and airlifting operations, the depth at which the disk was not visible in the water column was recorded at each station.

Results:

After the airlifter had been turned on and applied to the sediment, the visible plume extended to a maximum area of approximately 0.001 acres (5 m^2; Figure 4). High tide was at approximately 0800, transitioning to an outgoing tide until a low at approximately 1500. During both sessions of airlifting (at 0805 and 0848), the visible plume was small and dissipated quickly in the water column (within 3 to 5 minutes) and was not visible in the water column near the caissons (Photos 1, 2, & 3). At approximately 0900, airlifting was stopped due to a fuel leak from a hose that had been disturbed during airlifting operations.

Airlifter on	Airlifter off	Duration
8:05	8:39	0:34
8:48	8:55	0:07
9:00		Work stoppage due to fuel leak

Figure 4. Area of Visible Plume After the Airlifter was Turned On.

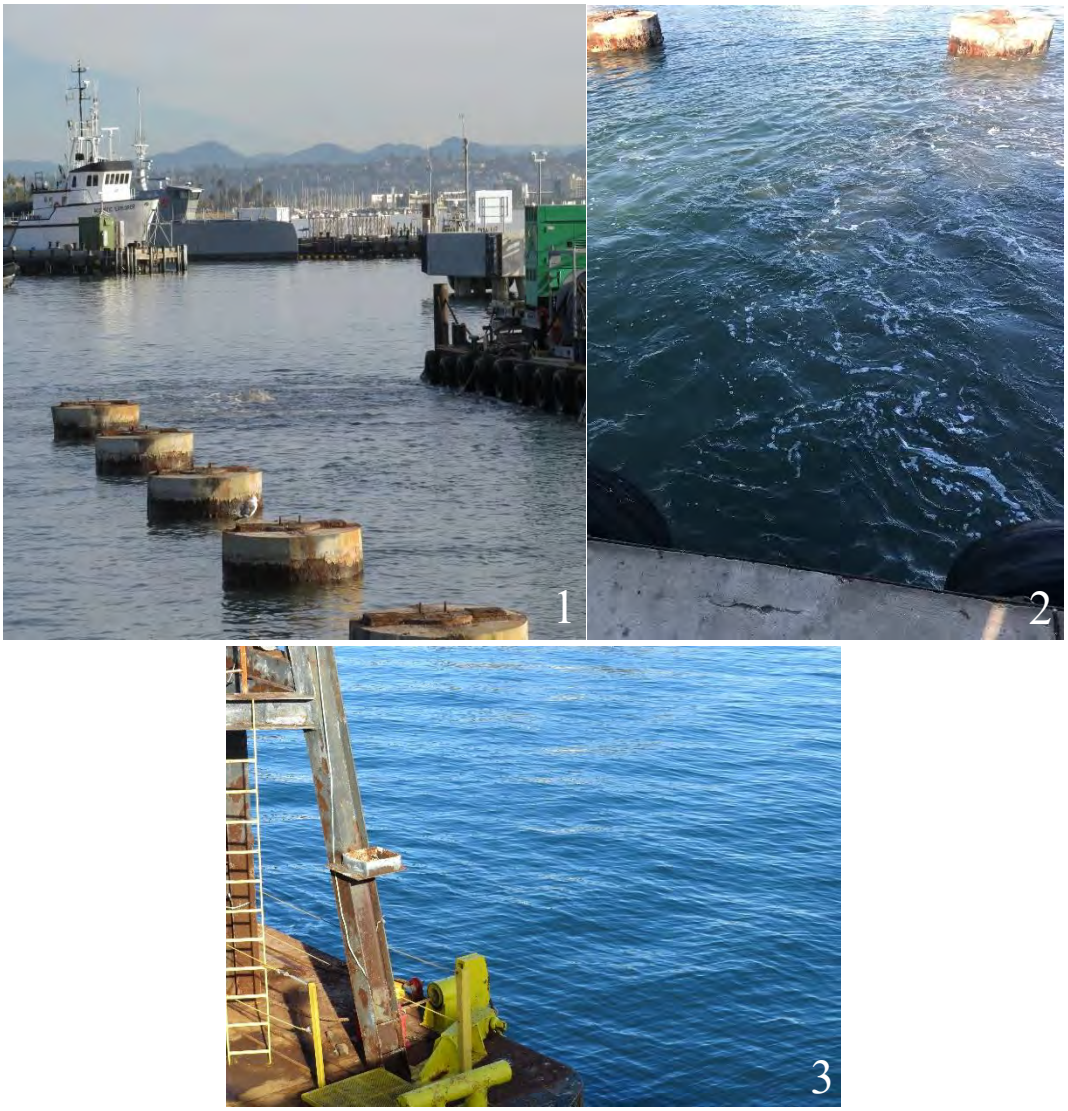

Photo 2. Airlifting Operations (Photos 1 & 2: ~0815, Photo 3: ~0915)

During ambient data collection, a tugboat was in the area, and ambient readings at Stations 2 and 7 were likely influenced as a result. Looking at ambient data from 23 December 2016, values were 3.50 m (11.5 ft) for both stations and are likely a better representation of ambient conditions at these two stations. Based on the 23 December 2016 ambient values, visibility increased relative to the data collected during airlifting.

The stations closest to the jetting (Stations #4, 5, and 9) showed very little difference from ambient conditions (Table 1). Only Stations 3 and 9 showed a change in visibility, but the differences were small and may have been influenced by factors outside of the airlifting operations.

Table 2. Results of Secchi Disk Readings.

Station #	Ambient		Measurement #1		
	Time	Value	Time	Value	Value Diff from Ambient[2]
1	7:10	3.00	8:12	3.75	0.75
2[1]	7:13	1.00	8:15	3.75	2.75
3	7:16	4.00	8:17	3.25	-0.75
4	7:20	3.50	8:20	3.75	0.25
5	7:25	3.50	8:22	3.50	0.00
6	7:30	3.50	8:25	4.00	0.50
7[1]	7:36	2.00	8:29	3.75	1.75
8	7:05	3.00	8:06	4.00	1.00
9	7:50	4.50	8:50	4.25	-0.25

Notes: [1]The ambient values were influenced by a sediment plume caused by a tugboat in the area.
[2]Yellow highlight indicates a negative change (decrease in visibility) from ambient.

Conclusions:

Overall, the visible plume during airlifting was small, and did not approach the 2.5 acres (10,117 m^2) area needed to stop airlifting activities. The reduction in the overall plume over time may have been associated with the change from the incoming tide to the outgoing tide; however, no visible plume was observed to the south of the piers during jetting activities, or after jetting was completed.

Appendix B: Marine Species and Acoustic Datalogging Systems

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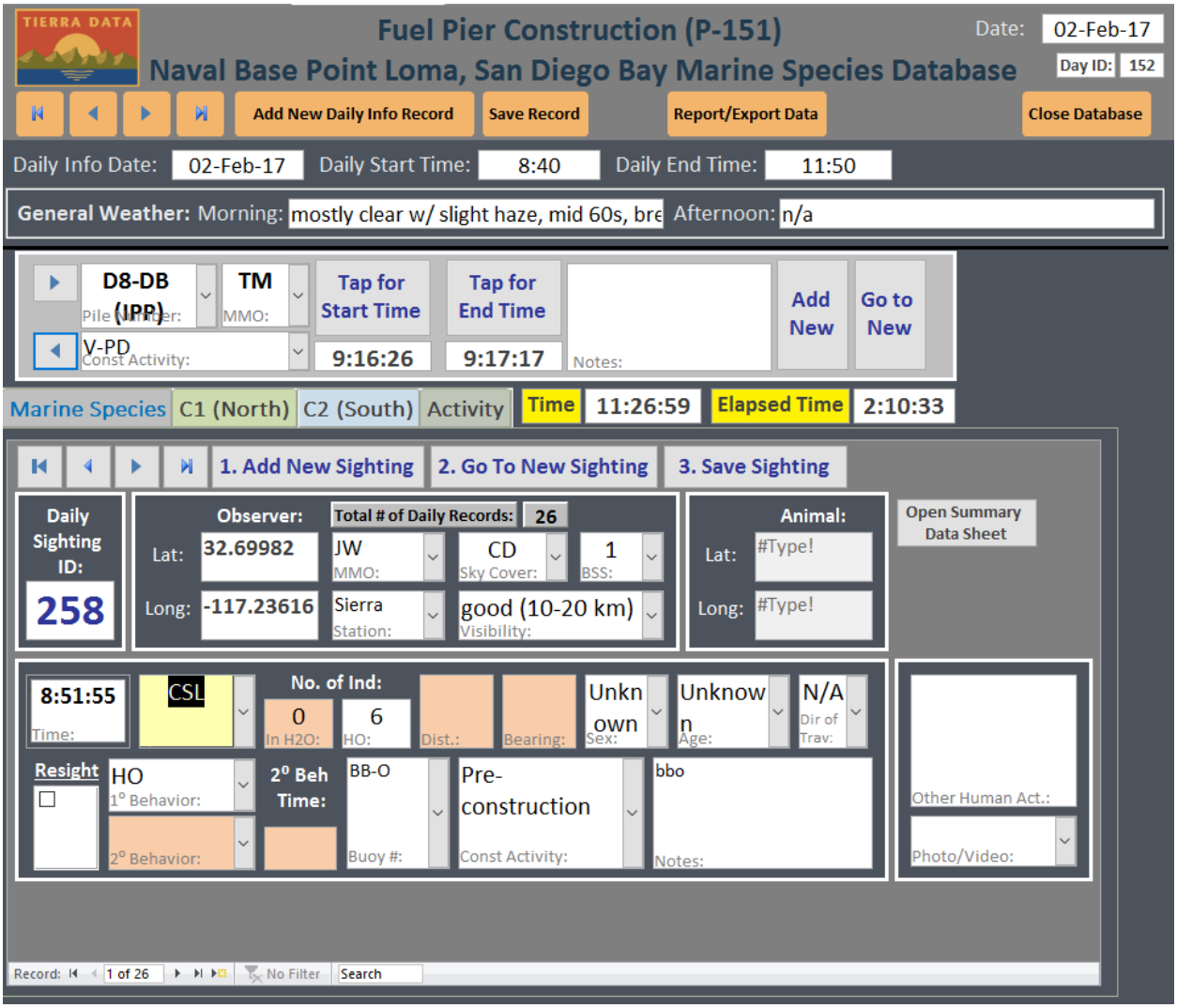
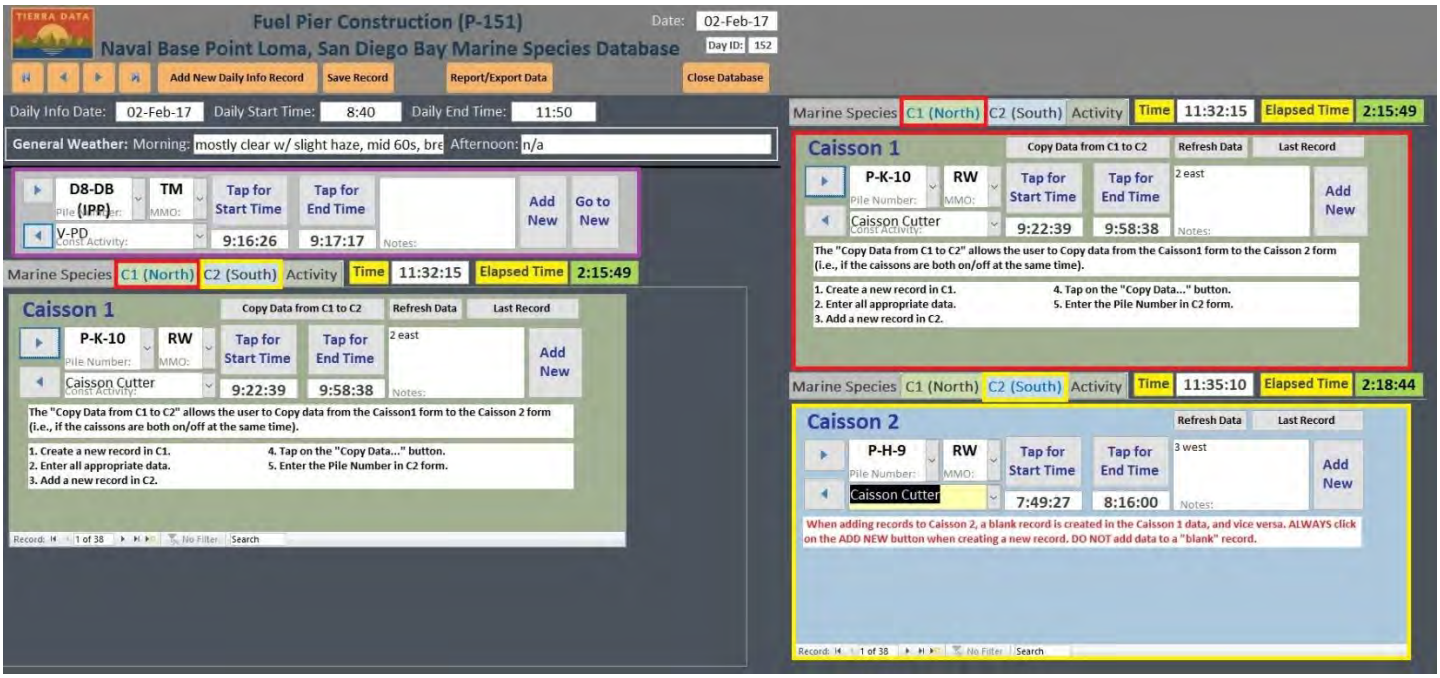
A. Marine Species Data Entry Screen



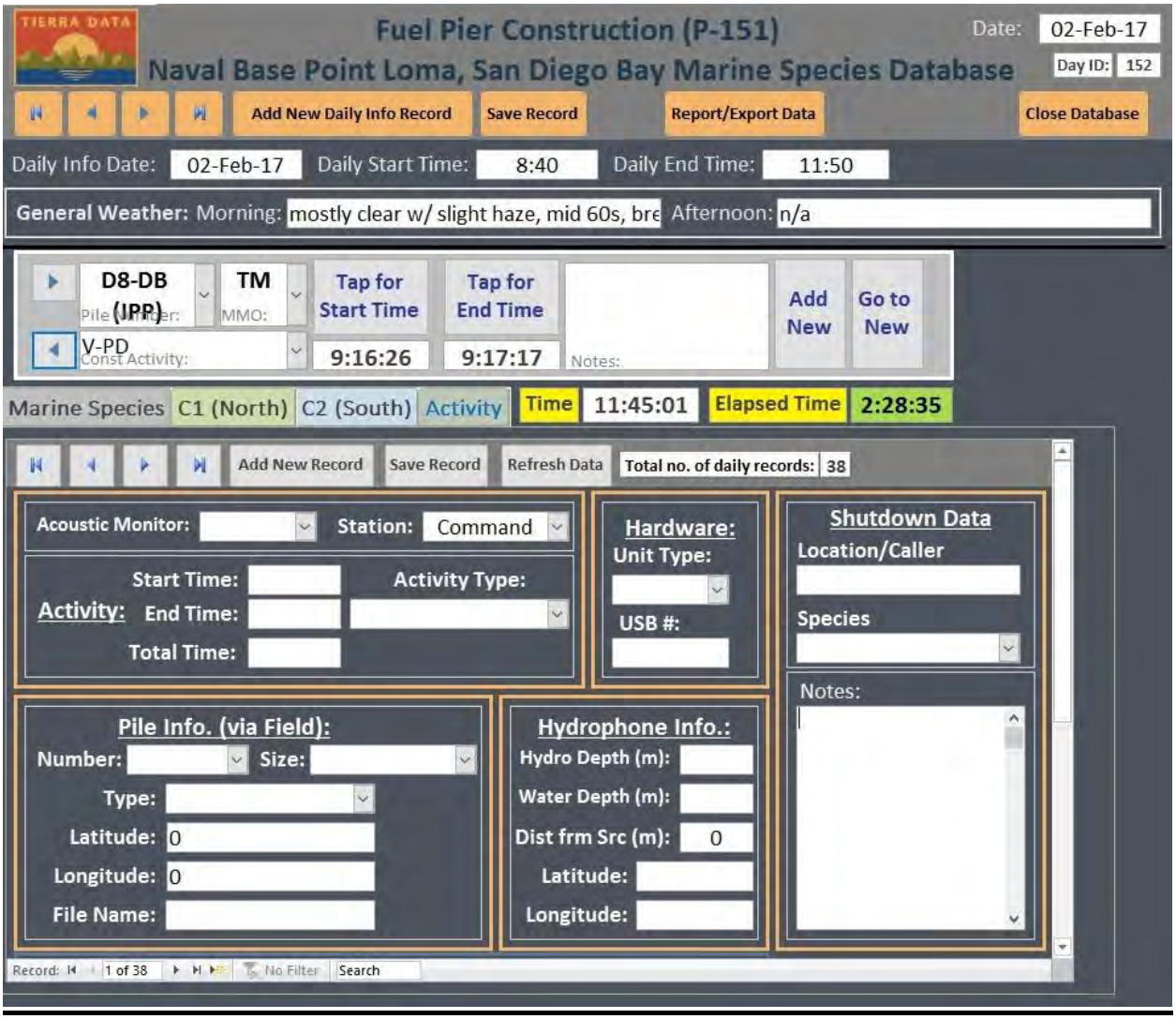
B. Activity Data Data Entry Screen

Note that the user can enter data for start/stop times for one activity (purple box), or for up to three activities at once by using the primary data entry fields (purple box), or the secondary data entry screens (red and yellow boxes).



C. Acoustic/Activity Data Entry Screen

This screen allows for acoustic data entry as well as activity data review.



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Appendix C: Hardcopy Marine Mammal Sightings Datasheet

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Date: _____ Observer: _____

General Weather AM _____ Daily Start Time: _____

PM _____ Daily End Time: _____

	Time	Species	# of Ind Water	# of Ind HO	Dist (m)	Bear	Sex	Age Class	Dir. of Travel/ Census	1° Beh	2° Beh	2° Beh Time	Buoy #	Activity Type	Resight? (Y/N)	Notes/Other Human Activity
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																

Species Abbreviations

CSL	CA Sea Lion	CSL DD	Dead CSL	ELS	N. Elephant Seal	GST	Green sea turtle	Mixed	Mutiple Species	PWH	Pilot Whale
CBD	Coastal B'nose Dolphin	SSL	Steller Sea Lion	Unk	Unknown	Other	Other Species	UDOL	Unknown Dolphin	ULWH	Unk Large Whale
RDO	Risso's dolphin	PGW	Pacific Grey Whale	CLT	CA Least Tern	PHS	Harbor Seal	CMD	Common Dolphin	UPIN	Unknown Pinniped
PWS	Pac White-sided Dolphin										

Sheet ____ of ____

	Station	Lat	Long	Sky Cover	Visibility	Beauf	Photo
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Sex

F	female		Mixed	mixed	
M	male		U	unknown	

Primary Behavior Codes

DV	Dive	All	ML	Milling	Cet/Pin
O	Other	All	PP	Porpoising	Cet/Pin
SF	Suc Foraging	All	SW	Swimming	Cet/Pin
UF	Unsuc Foraging	All	JH	Jug Handling	CSL
LG	Logging	CBD	RF	Rafting	CSL
BR	Bow Riding	Cet	EN	Enter Water	Pin
TS	Fluke/Tail Slap	Cet	EX	Exit Water	Pin
SH	Spy Hopping	Cet	HO	Hauled Out	Pin
			LO	Look	Pin

Secondary Behavior Codes

AD	Ab Change in Dir.	All	BC	Breaching	Cet
IB	Incr. Breath Rate	All	FL	Flush	Pin
IS	Incr.Swim Rate	All			

Sky Cover

C	Clear		F	Fog	
CD	Cloudy		HZ	Hazy	
PC	Partly Cloudy		LR	Light Rain	
O	Overcast		HR	Heavy Rain	

Sheet ____ of ____

Appendix D: Description of Standard Operating Procedures Modifications During the Monitoring Efforts

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- Monday (10/17):
  - Based on acoustic data analysis for 24×30 piles, the Level B has been extended to 500 m (from 470 m). Level A ZOIs remain unchanged. The previous weekly "take" estimates from pile driving of 24×30 piles during this IHA were not impacted.
- Monday (12/12):
  - Based on strict reading of IHA, no pre-con or post-con survey are required for caisson cutting. This also means that the caisson cutting can occur at sunset/sunrise. However, due to safety concerns with low-light during the use of a boat, 15 minutes post-sunrise, and 15 min pre-sunset will be used for caisson cutting until a single pier-based MMO is used.
- Tuesday (12/13):
  - Based on current communication with caisson cutting crew, starting on Saturday (12/17), we will implement a single MMO for the caisson cutting. They will be based on the top deck of the Fuel Pier and will communicate any shutdowns via radio.
- Saturday (12/17):
  - First day of one MMO for caisson cutting.
- Tuesday (12/20):
  - Caisson cutting can now start/stop at sunrise/sunset because of single pier-based MMO (i.e., no boat, therefore no safety issues with driving boat during low-light conditions)
- Tuesday (1/17):
  - Based on available data from acoustic data collection for the caissons, it was determined that the most applicable Level B ZOI was 631 m (as was presented in the IHA app using a simple Practical Spreading Loss calculation). If this needs to be amended, it will be noted in subsequent weekly reports.
- Wednesday (2/1) & Thursday (2/2):
  - Moved boat-based station from the bait barges to app 200 m (656 ft) to the east of the pile due to a large boat refueling at the pier. This blocked the easterly visibility for the pier-based MMOs. The boat-based MMO watched for any animals entering the shutdown ZOI from the east.
- Wednesday (2/15):
  - First day of pile clipping. Demolition crew clipped the first pile without an MMO on site. The lead MMO spoke with the demolition foreman, and the construction project manager regarding requiring an MMO on-site.
- Thursday (3/9):
  - Moved Clipper MMO from the pier to the crane barge due to safety issues with construction equipment on the old observation position on the old Fuel Pier. This also provided a better view of the clipper due to the proximity to the clipper operator. Therefore, we implemented tracking actual start/stop times of clipping activities. Previous SOP had been to enter track the time that the clipper entered/exited the water because we could not tell that it was on. Since we are now standing next to the pile clipper operator, we can tell when the clipper is on/off.
- Thursday (3/16):
  - The pile driving crew started vibratory pile driving on the 30-inch piles before the pre-con survey was completed. Command was inside the Conex box preparing for the day when driving began. Command heard the hammer start while inside the box, and could get the attention of the crew after it had been on for approximately 10 seconds. Because it

was a safety issue at that point, the crew completed the vibratory pile driving until the hammer/pile/crane were in safe positions. Below is a timeline of events:

- 13:50 - Command given 45-minute notification before driving to begin
- ~14:00 to 14:05 - Observer crew mobilized to their stations from the office (Hammer observed on the pile prior to Command arriving on station)
- 14:11:30 - Command started 15-min pre-construction survey
- 14:14:56 - V-PD started
- 14:15:05 - V-PD stopped by Command
- Crew foreman explained that the crane operator did not feel comfortable with a side-loaded crane/hammer, and that they needed to drive due a safety concern for those on the barge.
- 14:18:38 to 14:22:37 - V-PD completed

Appendix E: Level A Harassment Form

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Potential Level A Harassment Information

Date: _____ Beaufort Sea State: _____

Time: _____ Cloud Cover: _____

Wind Speed: _____ Visibility: _____

Wind Direction: _____

Description of incident:

_____
_____
_____
_____
_____

Species and Description of Animal(s) Involved:

_____
_____
_____
_____
_____

Outcome/Fate of Animal(s):

_____
_____
_____
_____
_____

Other Notes:

_____
_____
_____
_____

REMEMBER TO TAKE PHOTOGRAPHS AND/OR VIDEO

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Appendix F: All Marine Mammal Sightings During Monitoring Efforts

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Color-codingKey:

	Impact Soft Start (ISS-PD) of Impact Pile Driving (I-PD)
	Vibratory Pile Driving (V-PD)
	Demolition (Pile clipping or caisson cutting)
	During Shutdown of Pile Driving

Date	Time	Station	Activity	Species	No. of Indiv		Animal Location		Beh 1º	Beh 2º	Pile Number	Sex	Age	Tide	Sky Cover	BSS	Visibility
					HO	Water	Lat	Long									
08-Oct-16	7:55:09	Sierra	Pre-	CSL	12	0	32.69500	-117.23438	HO			Mixed	Mixed	Flood	C	1	excellent
08-Oct-16	8:00:37	Command	Pre-	CSL	0	1	32.70195	-117.23597	ML			Male	Adult	Flood	C	1	good
08-Oct-16	8:05:24	Sierra	Pre-	CSL	1	0	32.69626	-117.23190	HO			Female	Adult	Flood	C	1	excellent
08-Oct-16	8:08:22	November	Pre-	CSL	1	0	32.70246	-117.23649	HO			Male	Adult	Flood	C	1	excellent
08-Oct-16	8:13:32	November	Pre-/Post-	CSL	2	0	32.70279	-117.23565	HO			Unknown	Mixed	Flood	C	1	excellent
08-Oct-16	8:15:51	November	I-PD	CSL	0	4	32.70218	-117.23268	SW		O-05B	Male	Adult	Flood	C	1	excellent
08-Oct-16	8:40:06	Sierra	Pre-/Post-	CSL	2	0	32.69671	-117.22998	HO			Female	Adult	Flood	C	1	excellent
08-Oct-16	9:04:24	November	I-PD	CSL	0	4	32.70262	-117.23476	SW		O-05D	Mixed	Mixed	Flood	C	1	excellent
08-Oct-16	9:22:05	November	Pre-/Post-	CSL	0	1	32.70203	-117.23516	SW			Female	Subadult	Flood	C	1	excellent
08-Oct-16	9:41:31	November	Pre-/Post-	CSL	0	1	32.70204	-117.23466	SW			Male	Adult	Flood	C	1	excellent
08-Oct-16	9:43:13	November	Pre-/Post-	CSL	0	1	32.70196	-117.23521	SW			Unknown	Subadult	Flood	C	1	excellent
08-Oct-16	10:09:59	November	Post-	CSL	0	2	32.70412	-117.22843	SW			Unknown	Unknown	Flood	C	1	excellent
08-Oct-16	10:12:47	Sierra	Post-	CSL	0	1	32.69953	-117.23513	SW			Female	Subadult	Flood	C	1	excellent
08-Oct-16	10:13:02	November	Post-	CSL	0	1	32.70154	-117.23610	SW			Male	Adult	Flood	C	1	excellent
08-Oct-16	10:13:27	November	Post-	CSL	0	1	32.70177	-117.23643	RF			Male	Adult	Flood	C	1	excellent
08-Oct-16	10:21:52	November	Post-	CSL	0	1	32.70188	-117.23517	SW			Male	Adult	Flood	C	1	excellent
08-Oct-16	10:28:01	Sierra	Post-	CSL	0	1	32.69984	-117.23474	SW			Male	Adult	Flood	C	1	excellent
11-Oct-16	7:05:24	Clipper	Pre-	CSL	1	0	32.70248	-117.23678	HO			Male	Adult	Ebb	O	2	moderate
11-Oct-16	10:00:25	Clipper	Pre-/Post-	CSL	0	1	32.70276	-117.23621	SW			Male	Adult	Ebb	CD	2	good
11-Oct-16	13:35:34	Clipper	Pre-	CSL	1	0	32.70235	-117.23675	HO			Male	Adult	Flood	CD	2	good
11-Oct-16	15:42:24	Clipper	Pre-/Post-	CSL	0	1	32.70127	-117.23740	SW			Male	Adult	Flood	CD	2	good
12-Oct-16	10:35:44	Clipper	Pre-	CSL	0	2	32.70153	-117.23681	SW			Male	Adult	Ebb	O	2	moderate
12-Oct-16	11:42:47	Clipper	Clipping	CSL	0	1	32.70113	-117.23701	SW		NEB11	Male	Subadult	Ebb	O	2	moderate
12-Oct-16	11:59:22	Clipper	Post-	CSL	0	1	32.70062	-117.23723	SW			Male	Adult	Ebb	O	2	moderate
12-Oct-16	14:55:20	Clipper	Pre-	CSL	1	0	32.70241	-117.23704	HO			Male	Adult	Flood	PC	3	excellent
12-Oct-16	14:55:44	Clipper	Pre-	CSL	5	0	32.70254	-117.23674	HO			Male	Adult	Flood	PC	3	excellent
12-Oct-16	14:57:18	Clipper	Pre-	CSL	7	0	32.70285	-117.23633	HO			Unknown	Mixed	Flood	PC	3	excellent
13-Oct-16	9:47:34	Clipper	Pre-	CSL	2	0	32.70271	-117.23656	HO			Male	Adult	Ebb	C	2	good
13-Oct-16	13:09:43	Clipper	Pre-	CSL	0	1	32.70267	-117.23684	EX			Male	Adult	Ebb	C	2	good
13-Oct-16	13:12:28	Clipper	Pre-	CSL	0	1	32.70255	-117.23659	SW			Male	Adult	Ebb	C	2	good
13-Oct-16	13:14:52	Clipper	Pre-	CSL	1	0	32.70270	-117.23655	HO			Female	Adult	Ebb	C	2	good
13-Oct-16	13:42:10	Clipper	Pre-	CSL	0	1	32.70137	-117.23755	RF			Male	Subadult	Ebb	C	2	good
26-Oct-16	12:44:01	November	Pre-	CSL	2	0	32.70636	-117.22875	HO			Unknown	Unknown	Ebb	PC	3	good
26-Oct-16	12:45:01	November	Pre-	CSL	1	0	32.69561	-117.23099	HO			Unknown	Unknown	Ebb	PC	3	good

26-Oct-16	12:45:44	November	Pre-	CSL	2	0	32.69577	-117.23318	HO			Mixed	Adult	Ebb	PC	3	good
26-Oct-16	13:14:04	November	Pre-	CSL	0	1	32.70227	-117.23620	SW			Male	Adult	Ebb	PC	3	good
26-Oct-16	13:23:52	Command	Pre-	CSL	0	1	32.70080	-117.23474	SW			Male	Adult	Ebb	PC	4	good
26-Oct-16	14:09:43	Command	Pre-	CSL	0	1	32.70096	-117.23541	SW			Female	Adult	Flood	PC	3	good
26-Oct-16	15:02:04	Command	Pre-	CSL	0	1	32.70064	-117.23451	SW			Male	Adult	Flood	PC	2	good
26-Oct-16	15:30:10	Command	I-PD	CSL	0	1	32.70064	-117.23152	RF		I-07A	Male	Adult	Flood	PC	2	good
26-Oct-16	15:38:03	Command	Pre-/Post-	CSL	0	1	32.70052	-117.23500	SW			Male	Adult	Flood	PC	2	good
26-Oct-16	16:48:09	Command	Pre-/Post-	CSL	0	1	32.70064	-117.23526	SW			Male	Adult	Flood	PC	2	good
27-Oct-16	13:16:07	November	Pre-	CSL	2	0	32.69561	-117.23099	HO			Unknown	Unknown	Ebb	HZ	2	moderate
27-Oct-16	13:17:01	November	Pre-	CSL	2	0	32.69577	-117.23318	HO			Male	Mixed	Ebb	HZ	2	moderate
27-Oct-16	13:44:04	Command	Pre-	CSL	0	1	32.70132	-117.23544	SW			Male	Adult	Ebb	CD	1	moderate
27-Oct-16	13:51:31	Command	Pre-/Post-	CSL	0	1	32.70010	-117.23541	SW			Male	Adult	Ebb	CD	1	moderate
27-Oct-16	13:59:18	November	Pre-/Post-	CSL	0	1	32.70215	-117.23645	SW			Male	Adult	Ebb	HZ	2	moderate
27-Oct-16	14:57:41	November	Post-	CSL	0	1	32.70274	-117.23596	SW			Male	Adult	Flood	HZ	2	moderate
27-Oct-16	15:00:59	November	Post-	CSL	0	1	32.70215	-117.23686	SW			Male	Adult	Flood	HZ	2	moderate
08-Dec-16	10:02:32	Sierra	Pre-	CSL	6	0	32.69435	-117.23540	HO			Mixed	Mixed	Ebb	C	1	excellent
08-Dec-16	10:03:40	Sierra	Pre-	CSL	2	0	32.70177	-117.22927	HO			Unknown	Adult	Ebb	C	1	excellent
08-Dec-16	10:13:34	November	Pre-	PHS	0	1	32.70251	-117.23593	ML			Unknown	Adult	Ebb	C	1	good
08-Dec-16	11:10:25	November	Pre-	CSL	0	1	32.70550	-117.22869	SW			Unknown	Unknown	Flood	C	1	good
08-Dec-16	11:18:45	November	Pre-/Post-	CSL	0	1	32.70390	-117.23003	SW			Unknown	Unknown	Flood	C	1	good
08-Dec-16	12:10:29	Sierra	Pre-/Post-	CSL	0	1	32.69981	-117.23604	SW			Male	Adult	Flood	C	1	excellent
08-Dec-16	12:28:47	November	Pre-/Post-	CSL	0	1	32.70261	-117.23582	SW			Male	Adult	Flood	C	1	good
08-Dec-16	12:38:07	Sierra	Pre-/Post-	PHS	0	1	32.69966	-117.23609	SW			Unknown	Adult	Flood	C	1	excellent
12-Dec-16	15:41:35	Sierra	Caisson	CSL	0	1	32.69893	-117.23618	SW		P-K-7	Female	Adult	Flood	PC	2	good
12-Dec-16	15:50:13	November	Caisson	CSL	0	1	32.69905	-117.23221	SW		P-K-7	Unknown	Unknown	Flood	PC	2	good
12-Dec-16	15:52:49	November	Caisson	CSL	0	1	32.70280	-117.23254	SW		P-K-7	Unknown	Unknown	Flood	PC	2	good
13-Dec-16	8:41:53	Sierra	Pre-	CSL	7	1	32.69386	-117.23644	SW			Mixed	Mixed	Ebb	CD	1	moderate
13-Dec-16	9:30:26	Sierra	Pre-	CSL	0	1	32.69754	-117.23039	SW			Male	Adult	Ebb	CD	1	moderate
13-Dec-16	9:56:05	Sierra	Caisson	CSL	0	1	32.69493	-117.23517	RF		P-H-11	Unknown	Adult	Ebb	CD	1	good
13-Dec-16	11:21:11	Sierra	Caisson	CSL	0	1	32.69870	-117.23388	SW		P-H-7	Female	Adult	Ebb	CD	1	good
13-Dec-16	11:26:00	Sierra	Caisson	CSL	0	1	32.69978	-117.23555	SW		P-H-7	Female	Adult	Ebb	CD	1	good
13-Dec-16	12:28:55	Caisson1	Caisson	CSL	0	1	32.70190	-117.23654	SW		P-H-11	Male	Adult	Ebb	PC	3	moderate
13-Dec-16	14:35:00	Sierra	I-PD	CSL	0	1	32.69924	-117.23417	PP		I-12C	Male	Adult	Ebb	CD	2	excellent
13-Dec-16	15:28:08	Sierra	Pre-/Post-	CSL	0	1	32.69893	-117.23434	SW			Male	Adult	Flood	CD	2	excellent
14-Dec-16	7:18:20	Sierra	Pre-	CSL	4	0	32.69464	-117.23397	HO			Mixed	Mixed	Flood	PC	1	good
14-Dec-16	7:22:28	Sierra	Caisson	CSL	0	1	32.69467	-117.23374	SW		P-H-10	Unknown	Unknown	Flood	PC	1	good
14-Dec-16	7:28:44	Sierra	Caisson	CSL	0	1	32.69454	-117.23417	SW		P-H-10	Male	Adult	Flood	PC	1	good
14-Dec-16	7:42:41	Sierra	Pre-/Post-	CSL	0	1	32.69518	-117.23503	ML			Male	Adult	Flood	PC	1	good
14-Dec-16	7:47:23	Sierra	Pre-/Post-	CSL	2	0	32.69577	-117.23318	HO			Unknown	Unknown	Flood	PC	1	good
14-Dec-16	7:52:46	November	Pre-/Post-	CSL	1	0	32.70636	-117.22875	HO			Male	Adult	Flood	HZ	1	moderate
14-Dec-16	7:59:28	Sierra	Pre-/Post-	CSL	2	0	32.69464	-117.23397	HO			Mixed	Mixed	Flood	PC	1	good
14-Dec-16	8:03:36	Sierra	Pre-/Post-	CSL	0	1	32.69867	-117.23391	SW			Female	Adult	Flood	PC	1	good
14-Dec-16	8:05:39	Sierra	Pre-/Post-	CSL	0	5	32.69732	-117.23163	ML			Unknown	Unknown	Flood	PC	1	good
14-Dec-16	8:39:23	Sierra	Caisson	CSL	0	1	32.69940	-117.23142	SW		P-H-6	Male	Adult	Ebb	PC	1	good

14-Dec-16	8:54:58	Sierra	Caisson	CSL	1	0	32.69561	-117.23099	HO		P-H-6	Unknown	Unknown	Ebb	PC	1	good
14-Dec-16	9:30:16	November	I-PD	CSL	0	1	32.70286	-117.23471	SW		I-11G	Male	Adult	Ebb	HZ	1	moderate
14-Dec-16	9:46:52	Sierra	Pre-/Post-	CSL	0	1	32.69814	-117.23125	SW			Male	Adult	Ebb	PC	1	good
14-Dec-16	9:49:38	Sierra	Pre-/Post-	CSL	0	4	32.69546	-117.23156	RF			Mixed	Unknown	Ebb	PC	1	good
14-Dec-16	10:11:36	Sierra	Caisson	CSL	0	1	32.69604	-117.23589	SW		P-H-6	Unknown	Unknown	Ebb	PC	1	good
14-Dec-16	10:17:07	Sierra	Pre-/Post-	CSL	0	1	32.70081	-117.23265	SW			Unknown	Adult	Ebb	PC	1	good
14-Dec-16	11:44:02	Sierra	Pre-/Post-	CSL	0	1	32.69732	-117.23791	SW			Male	Adult	Ebb	PC	1	good
14-Dec-16	11:53:17	Sierra	Pre-/Post-	CSL	0	1	32.69841	-117.23725	SW			Male	Adult	Ebb	PC	1	good
14-Dec-16	13:12:42	Sierra	Pre-/Post-	CSL	1	0	32.69588	-117.23422	HO			Male	Adult	Ebb	PC	2	good
14-Dec-16	14:38:53	Sierra	Pre-/Post-	CSL	0	1	32.69768	-117.23538	SW			Male	Adult	Ebb	O	2	good
14-Dec-16	15:02:23	November	Pre-/Post-	CSL	0	1	32.70228	-117.23645	SW			Male	Adult	Ebb	PC	2	moderate
14-Dec-16	15:19:20	Sierra	I-PD	CSL	0	1	32.70242	-117.23183	DV		I-11D	Unknown	Unknown	Ebb	PC	2	good
15-Dec-16	7:29:35	Sierra	Caisson	CSL	1	0	32.69577	-117.23318	HO		P-K-6	Male	Adult	Flood	O	1	poor
15-Dec-16	7:32:02	Sierra	Caisson	CSL	0	1	32.70063	-117.23042	SW		P-K-6	Male	Adult	Flood	O	1	poor
15-Dec-16	7:40:40	November	Caisson	CSL	0	1	32.70207	-117.23533	SW		P-K-6	Male	Adult	Flood	CD	1	poor
15-Dec-16	7:43:58	Sierra	Pre-/Post-	CSL	0	1	32.69849	-117.23628	SW			Male	Adult	Flood	O	1	poor
15-Dec-16	8:15:07	Sierra	Caisson	CSL	1	0	32.69561	-117.23099	HO		P-K-6	Male	Adult	Flood	O	1	poor
15-Dec-16	10:05:47	Sierra	Pre-/Post-	CSL	0	1	32.70002	-117.23463	SW			Unknown	Unknown	Ebb	O	1	poor
15-Dec-16	10:08:29	Sierra	Pre-/Post-	CSL	0	1	32.70132	-117.23117	SW			Unknown	Unknown	Ebb	CD	1	moderate
15-Dec-16	11:11:17	Sierra	Caisson	CSL	0	2	32.69586	-117.23371	ML		P-K-8	Unknown	Unknown	Ebb	CD	1	moderate
15-Dec-16	12:06:57	Caisson2	Post-	CSL	0	2	32.70200	-117.23588	SW			Male	Adult	Ebb	CD	1	moderate
15-Dec-16	14:18:43	Sierra	Caisson	CSL	0	1	32.69665	-117.23422	SW		P-K-9	Male	Adult	Ebb	O	3	moderate
17-Dec-16	9:38:07	Caisson1	Pre-/Post-	CSL	0	1	32.70175	-117.23508	SW			Unknown	Adult	Flood	PC	1	excellent
19-Dec-16	9:08:52	Caisson1	Caisson	CSL	1	0	32.69577	-117.23318	HO		P-H-4	Unknown	Adult	Flood	C	0	excellent
19-Dec-16	11:36:30	Caisson1	Caisson	CSL	1	0	32.70246	-117.23649	HO		P-H-4	Male	Adult	Flood	C	0	excellent
19-Dec-16	15:52:14	Caisson1	Pre-/Post-	CSL	0	1	32.70113	-117.23556	SW			Male	Adult	Ebb	C	0	excellent
19-Dec-16	16:18:43	Caisson1	Caisson	PHS	0	1	32.70191	-117.23582	SW		P-H-5	Unknown	Adult	Ebb	C	2	excellent
19-Dec-16	16:19:30	Caisson1	Caisson	CSL	1	4	32.70234	-117.23645	ML		P-H-5	Mixed	Adult	Ebb	C	3	excellent
21-Dec-16	10:18:00	Caisson1	Pre-/Post-	CSL	1	0	32.70279	-117.23565	HO			Male	Subadult	Flood	CD	1	good
27-Dec-16	7:44:43	Caisson1	Caisson	CSL	1	0	32.70636	-117.22875	HO		P-K-3	Unknown	Adult	Ebb	C	1	excellent
27-Dec-16	7:45:19	Caisson1	Caisson	CSL	1	0	32.69577	-117.23318	HO		P-K-3	Unknown	Unknown	Ebb	C	1	excellent
10-Jan-17	8:37:48	Caisson1	Caisson	PHS	0	1	32.70210	-117.23707	SW		P-H-11	Unknown	Adult	Ebb	PC	1	good
10-Jan-17	9:25:25	Caisson1	Caisson	PHS	0	1	32.70123	-117.23050	SW		P-H-11	Unknown	Adult	Ebb	PC	1	good
10-Jan-17	13:28:50	Caisson1	Caisson	UDOL	0	2	32.69467	-117.23223	SW		P-H-11	Unknown	Unknown	Ebb	PC	1	good
10-Jan-17	13:51:00	Caisson1	Caisson	CSL	0	1	32.70111	-117.23663	SW		P-H-11	Male	Adult	Ebb	PC	1	good
10-Jan-17	14:32:22	Caisson1	Jetting	CSL	0	3	32.70123	-117.23157	SW		P-H-11	Mixed	Mixed	Flood	PC	1	good
10-Jan-17	15:05:32	Caisson1	Jetting	CSL	0	1	32.70260	-117.23491	ML		P-H-11	Male	Adult	Flood	PC	1	good
10-Jan-17	15:15:45	Caisson1	Pre-/Post-	CSL	0	1	32.69849	-117.23397	SW			Male	Adult	Flood	PC	1	good
11-Jan-17	9:32:24	Caisson1	Caisson	CSL	0	1	32.70052	-117.23108	LO		P-H-11	Male	Adult	Ebb	CD	3	moderate
16-Jan-17	9:29:45	Caisson1	Pre-/Post-	CSL	0	1	32.69962	-117.23414	SW			Male	Adult	Flood	CD	2	moderate
17-Jan-17	15:18:38	Caisson1	Caisson	CSL	1	0	32.70226	-117.23663	HO		P-H-6	Male	Adult	Ebb	C	2	good
18-Jan-17	9:30:14	Caisson1	Caisson	CSL	1	0	32.69577	-117.23318	HO		P-H-6	Female	Adult	Flood	CD	2	moderate
18-Jan-17	9:30:14	Caisson1	Caisson	CSL	1	0	32.70177	-117.22927	HO		P-H-6	Unknown	Juvenile	Flood	CD	2	moderate
18-Jan-17	11:56:19	Caisson1	Pre-/Post-	CSL	0	1	32.69665	-117.23526	RF			Male	Adult	Flood	CD	2	moderate

18-Jan-17	12:33:53	Caisson1	Pre-/Post-	CBD	0	1	32.70007	-117.23800	SW			Unknown	Adult	Flood	CD	2	moderate
25-Jan-17	8:08:45	Caisson1	Caisson	CSL	1	0	32.70621	-117.22619	HO		P-K-5	Unknown	Adult	Ebb	C	1	good
25-Jan-17	8:08:49	Caisson1	Caisson	CSL	3	0	32.69577	-117.23318	HO		P-K-5	Male	Adult	Ebb	C	1	good
25-Jan-17	8:23:48	Caisson1	Caisson	CSL	0	1	32.70158	-117.22977	EX		P-K-5	Male	Adult	Ebb	C	1	good
25-Jan-17	8:35:55	Caisson1	Caisson	CSL	0	3	32.69440	-117.23478	RF		P-K-5	Unknown	Unknown	Ebb	C	1	good
25-Jan-17	8:43:27	Caisson1	Pre-/Post-	CSL	0	1	32.70047	-117.23583	SW			Male	Adult	Ebb	C	1	good
25-Jan-17	9:25:20	Caisson1	Caisson	CSL	0	1	32.69572	-117.23337	EN		P-K-5	Unknown	Adult	Ebb	C	1	good
25-Jan-17	10:34:57	Caisson1	Pre-/Post-	CSL	0	1	32.69854	-117.23076	ML			Unknown	Pup	Ebb	C	1	good
25-Jan-17	11:16:58	Caisson1	Caisson	CSL	0	1	32.70101	-117.23488	SW		P-K-5	Male	Adult	Ebb	C	1	good
26-Jan-17	8:11:36	Caisson1	Caisson	CSL	0	1	32.70126	-117.23270	SW		P-H-6	Male	Adult	Ebb	C	2	good
26-Jan-17	13:35:04	Caisson1	Caisson	GST	0	1	32.70105	-117.23605	SW		P-K-3	Unknown	Unknown	Ebb	C	2	good
27-Jan-17	9:59:31	Caisson1	Caisson	PHS	0	1	32.70001	-117.23634	SW		P-K-3	Unknown	Adult	Ebb	C	4	good
28-Jan-17	12:18:07	Caisson1	Caisson	CSL	0	1	32.70213	-117.23630	SW		P-H-3	Unknown	Adult	Ebb	CD	1	excellent
28-Jan-17	12:57:05	Caisson1	Caisson	CSL	0	1	32.69977	-117.23689	SW		P-H-3	Female	Adult	Ebb	CD	1	excellent
28-Jan-17	13:08:00	Caisson1	Caisson	CSL	0	1	32.69963	-117.23703	SW		P-H-3	Unknown	Adult	Ebb	CD	1	excellent
28-Jan-17	13:12:39	Caisson1	Caisson	CSL	0	1	32.70038	-117.23559	SW		P-H-3	Unknown	Juvenile	Ebb	CD	1	excellent
30-Jan-17	10:08:31	Caisson1	Caisson	CSL	1	0	32.69577	-117.23318	HO		P-H-9	Unknown	Unknown	Flood	C	2	excellent
30-Jan-17	10:08:31	Caisson1	Caisson	PHS	0	1	32.70030	-117.23531	ML		P-H-9	Unknown	Adult	Flood	C	2	excellent
30-Jan-17	10:08:31	Caisson1	Caisson	PGW	0	1	32.68105	-117.22369	SW		P-H-9	Unknown	Unknown	Flood	C	2	excellent
30-Jan-17	10:10:17	Caisson1	Caisson	CBD	0	1	32.69690	-117.23108	SW		P-H-9	Unknown	Adult	Ebb	C	2	excellent
30-Jan-17	10:38:24	Caisson1	Caisson	CSL	0	2	32.69902	-117.23274	SW		P-H-9	Unknown	Juvenile	Ebb	C	2	excellent
30-Jan-17	12:00:59	Caisson1	Caisson	PHS	0	1	32.70149	-117.23676	ML		P-K-7	Unknown	Adult	Ebb	C	2	excellent
30-Jan-17	12:59:23	Caisson1	Caisson	PHS	0	1	32.70120	-117.23047	LO		P-K-7	Unknown	Unknown	Ebb	C	2	excellent
30-Jan-17	13:02:58	Caisson1	Caisson	CSL	0	1	32.69854	-117.23378	SW		P-K-7	Unknown	Unknown	Ebb	C	2	excellent
30-Jan-17	13:56:02	Caisson1	Pre-/Post-	CSL	1	0	32.70246	-117.23649	HO			Male	Adult	Ebb	C	2	excellent
31-Jan-17	7:52:50	Caisson1	Caisson	CSL	2	0	32.70177	-117.22927	HO		P-K-11	Unknown	Unknown	Flood	C	0	excellent
01-Feb-17	10:42:01	P-122	Caisson	CSL	1	0	32.69826	-117.23863	HO		P-K-9	Male	Adult	Flood	HZ	2	moderate
01-Feb-17	11:07:18	BaitBarge	Caisson	CSL	8	0	32.69435	-117.23540	HO		P-K-9	Mixed	Adult	Flood	C	1	excellent
01-Feb-17	11:07:18	BaitBarge	Caisson	CSL	0	1	32.70149	-117.23473	SW		P-K-9	Male	Adult	Flood	C	1	excellent
01-Feb-17	11:17:17	MagSi	Pre-/Post-	CSL	1	0	32.67354	117.23030	HO			Unknown	Juvenile	Flood	F	2	poor
01-Feb-17	11:22:10	BaitBarge	Pre-/Post-	CSL	0	3	32.69564	-117.23436	ML			Unknown	Unknown	Flood	C	1	excellent
01-Feb-17	11:26:57	Sierra	V-PD	CSL	0	1	32.69976	-117.23631	SW		D5-PD(IPP)	Male	Adult	Flood	HZ	1	moderate
01-Feb-17	13:56:19	MagSi	Pre-	CSL	1	0	32.66540	-117.22669	HO			Unknown	Unknown	Ebb	HZ	2	good
01-Feb-17	14:05:57	BaitBarge	Pre-	CSL	0	1	32.69910	-117.23438	ML			Mixed	Adult	Ebb	C	1	excellent
01-Feb-17	14:09:02	November	Pre-	CSL	0	1	32.70144	-117.23684	SW			Male	Adult	Ebb	C	0	moderate
01-Feb-17	14:16:46	BaitBarge	Pre-/Post-	CSL	0	3	32.69440	-117.23376	DV			Unknown	Mixed	Ebb	C	1	excellent
01-Feb-17	14:20:50	November	Pre-/Post-	CSL	0	1	32.70256	-117.23428	SW			Unknown	Juvenile	Ebb	C	0	moderate
01-Feb-17	14:37:42	BaitBarge	Pre-/Post-	CSL	0	1	32.69416	-117.23427	ML			Male	Adult	Ebb	C	1	excellent
01-Feb-17	14:50:19	November	Pre-/Post-	CSL	0	1	32.70159	-117.23679	SW			Male	Adult	Ebb	C	0	moderate
01-Feb-17	14:57:13	MagSi	Shutdown	CSL	0	1	32.67731	-117.23440	PP			Unknown	Subadult	Ebb	PC	2	good
01-Feb-17	14:59:55	MagSi	Pre-/Post-	CSL	0	1	32.67821	-117.23193	SW			Unknown	Unknown	Ebb	PC	2	good
01-Feb-17	15:04:35	MagSi	I-PD	PHS	0	1	32.68731	-117.23453	ML		D5-PD(IPP)	Unknown	Adult	Ebb	PC	2	good

02-Feb-17	8:51:55	Sierra	Pre-	CSL	6	0	32.69435	-117.23540	HO			Unknown	Unknown	Flood	CD	1	good
02-Feb-17	8:59:56	MagSi	Pre-	CSL	1	0	32.67354	117.23030	HO			Unknown	Juvenile	Flood	HZ	2	moderate
02-Feb-17	9:00:12	Sierra	Pre-	CSL	1	0	32.69577	-117.23318	HO			Unknown	Unknown	Flood	CD	1	good
02-Feb-17	9:02:34	Sierra	Pre-	CSL	0	1	32.69557	-117.23433	SW			Mixed	Adult	Flood	CD	1	good
02-Feb-17	9:14:50	BaitBarge	Pre-	CSL	0	1	32.69465	-117.23411	ML			Male	Adult	Flood	C	1	excellent
02-Feb-17	9:43:30	MagSi	Caisson	CSL	1	0	32.67381	-117.22762	HO		P-K-10	Unknown	Adult	Flood	HZ	2	moderate
02-Feb-17	9:51:00	BaitBarge	Caisson	CSL	0	1	32.69469	-117.23483	ML		P-K-10	Male	Adult	Flood	C	1	excellent
02-Feb-17	9:54:28	MagSi	Caisson	CSL	0	1	32.68734	-117.23163	SW		P-K-10	Unknown	Adult	Flood	HZ	2	moderate
02-Feb-17	10:05:43	MagSi	Pre-/Post-	CSL	0	1	32.68697	-117.23310	ML			Unknown	Juvenile	Flood	HZ	2	moderate
02-Feb-17	10:08:06	MagSi	Pre-/Post-	CSL	0	1	32.68718	-117.23291	SW			Unknown	Adult	Flood	HZ	2	moderate
02-Feb-17	10:17:59	MagSi	Caisson	PHS	0	1	32.68711	-117.23265	SH		P-K-10	Unknown	Adult	Flood	HZ	2	moderate
02-Feb-17	10:28:28	MagSi	Caisson	PHS	0	1	32.68582	-117.23263	SW		P-K-10	Unknown	Adult	Flood	HZ	2	moderate
02-Feb-17	10:34:52	P-122	Caisson	PHS	0	1	32.69755	-117.23878	SW		P-K-10	Unknown	Unknown	Flood	PC	2	good
02-Feb-17	10:42:54	MagSi	I-PD	CSL	0	1	32.68896	-117.23254	DV		D8-DB(IPP)	Unknown	Adult	Flood	HZ	2	moderate
02-Feb-17	10:49:53	Sierra	I-PD	CSL	1	0	32.69577	-117.23318	HO		D8-DB(IPP)	Female	Adult	Flood	CD	1	good
02-Feb-17	10:51:56	MagSi	I-PD	CSL	0	1	32.68629	-117.22936	SW		D8-DB(IPP)	Unknown	Adult	Flood	HZ	1	moderate
02-Feb-17	11:02:38	MagSi	Pre-/Post-	CSL	0	1	32.68918	-117.23310	DV			Male	Adult	Flood	HZ	1	moderate
02-Feb-17	11:11:38	P-122	I-PD	CSL	0	1	32.69654	-117.23650	SW		D8-DB(IPP)	Male	Adult	Flood	PC	2	good
02-Feb-17	11:30:46	MagSi	Caisson	PHS	0	1	32.68542	-117.23338	ML		P-K-10	Unknown	Adult	Flood	HZ	1	moderate
02-Feb-17	11:33:17	November	Caisson	CSL	0	1	32.70250	-117.23437	SW		P-K-10	Unknown	Juvenile	Flood	PC	0	good
02-Feb-17	11:33:48	MagSi	Caisson	PHS	0	1	32.68557	-117.23279	SW		P-K-10	Unknown	Adult	Flood	HZ	1	moderate
02-Feb-17	11:38:54	MagSi	Caisson	PHS	0	1	32.68897	-117.23195	ML		P-K-10	Unknown	Adult	Flood	HZ	1	moderate
02-Feb-17	11:41:28	MagSi	Caisson	PHS	0	1	32.68456	-117.23138	ML		P-K-10	Unknown	Adult	Flood	HZ	1	moderate
02-Feb-17	11:44:46	MagSi	Caisson	CSL	0	1	32.68673	-117.23296	SW		P-K-10	Female	Adult	Flood	HZ	1	moderate
02-Feb-17	14:24:46	Caisson1	Caisson	CSL	1	0	32.70246	-117.23649	HO		P-H-9	Male	Adult	Ebb	O	2	good
02-Feb-17	14:58:34	Caisson1	Caisson	CSL	0	1	32.70163	-117.23626	SW		P-H-9	Male	Adult	Ebb	O	2	good
06-Feb-17	8:45:22	BaitBarge	Pre-	CSL	20	0	32.69504	-117.23537	HO			Mixed	Mixed	Ebb	LR	2	moderate
06-Feb-17	8:46:18	MagSi	Pre-	CSL	1	0	32.67354	117.23030	HO			Unknown	Subadult	Ebb	LR	4	moderate
06-Feb-17	8:47:11	BaitBarge	Pre-	CSL	0	2	32.69504	-117.23532	ML			Mixed	Mixed	Ebb	LR	2	moderate
06-Feb-17	8:55:45	BaitBarge	Pre-	CSL	2	0	32.69639	-117.23331	HO			Female	Adult	Ebb	LR	2	moderate
06-Feb-17	9:25:32	BaitBarge	Caisson	CSL	1	0	32.69370	-117.23600	HO		P-K-4	Male	Adult	Ebb	LR	2	moderate
06-Feb-17	10:59:58	Caisson1	Caisson	PHS	0	1	32.70252	-117.23623	SW		P-K-4	Unknown	Adult	Ebb	CD	1	moderate
06-Feb-17	11:11:28	P-122	Caisson	PHS	0	1	32.69850	-117.23847	SW		P-K-4	Unknown	Adult	Flood	CD	2	moderate
06-Feb-17	11:48:22	BaitBarge	Pre-/Post-	CSL	0	1	32.69468	-117.23549	SW			Female	Adult	Flood	O	2	moderate
06-Feb-17	12:12:34	MagSi	ISS-PD	CBD	0	2	32.69287	-117.23116	BR		D8-DB(IPP)	Unknown	Adult	Flood	LR	4	moderate
06-Feb-17	12:15:01	BaitBarge	I-PD	CSL	0	1	32.69477	-117.23533	ML		D8-DB(IPP)	Male	Adult	Flood	O	3	moderate
06-Feb-17	12:17:24	BaitBarge	I-PD	CSL	0	1	32.69631	-117.23304	SW		D8-DB(IPP)	Female	Adult	Flood	O	3	moderate
06-Feb-17	12:41:16	Sierra	Caisson	CSL	0	1	32.69940	-117.23600	SW		P-K-4	Male	Adult	Flood	O	4	moderate

06-Feb-17	13:01:19	BaitBarge	Post-	CSL	2	0	32.69396	-117.23532	HO			Mixed	Mixed	Flood	O	3	moderate
07-Feb-17	9:24:39	Caisson1	Pre-/Post-	CSL	0	1	32.70147	-117.23639	ML			Male	Adult	Ebb	CD	2	moderate
07-Feb-17	9:56:53	Caisson1	Caisson	CSL	0	1	32.70240	-117.23593	SW		P-H-4	Male	Adult	Ebb	CD	2	moderate
15-Feb-17	14:28:41	Clipper	Clipping	CSL	1	0	32.69799	-117.23846	HO		SEC16	Male	Adult	Flood	PC	4	good
16-Feb-17	7:22:39	Clipper	Clipping	CSL	4	0	32.69435	-117.23540	HO		SEC01	Mixed	Mixed	Flood	C	1	moderate
16-Feb-17	7:22:54	Clipper	Clipping	CSL	0	1	32.69524	-117.23491	RF		SEC01	Male	Adult	Flood	HZ	1	moderate
16-Feb-17	8:19:58	Clipper	Pre-/Post-	CSL	0	1	32.69603	-117.23545	SW			Male	Adult	Flood	HZ	1	moderate
16-Feb-17	9:22:03	Clipper	Pre-/Post-	CSL	0	1	32.69902	-117.23730	SW			Male	Adult	Flood	HZ	1	moderate
16-Feb-17	9:28:55	Clipper	Clipping	CSL	0	1	32.69898	-117.23637	SW		SEC08	Male	Adult	Flood	C	1	moderate
16-Feb-17	15:21:39	Clipper	Pre-/Post-	PHS	0	1	32.69939	-117.23816	SW			Unknown	Adult	Ebb	C	1	moderate
18-Feb-17	9:10:00	MagSi	Pre-	CSL	0	1	32.68882	-117.23310	RF			Male	Adult	Ebb	CD	2	moderate
18-Feb-17	9:12:44	MagSi	Pre-	CSL	3	0	32.67354	117.23030	HO			Mixed	Mixed	Ebb	CD	2	moderate
18-Feb-17	9:28:48	BaitBarge	Pre-	CSL	2	0	32.69508	-117.23625	HO			Mixed	Adult	Ebb	CD	2	excellent
18-Feb-17	9:28:59	BaitBarge	Pre-	CSL	1	0	32.69600	-117.23327	HO			Male	Adult	Ebb	CD	2	excellent
18-Feb-17	9:29:06	BaitBarge	Pre-	CSL	14	0	32.69478	-117.23527	HO			Mixed	Mixed	Ebb	CD	2	excellent
18-Feb-17	9:35:15	November	Pre-	CSL	0	1	32.70110	-117.23555	SW			Unknown	Unknown	Ebb	PC	2	good
18-Feb-17	9:37:11	Sierra	Pre-	CSL	0	1	32.69923	-117.23466	SW			Unknown	Adult	Ebb	O	2	moderate
18-Feb-17	9:38:52	BaitBarge	Pre-	CSL	0	1	32.69485	-117.23502	ML			Female	Adult	Ebb	CD	2	excellent
18-Feb-17	9:46:30	BaitBarge	Pre-/Post-	CSL	0	1	32.69741	-117.23335	SW			Female	Adult	Ebb	CD	2	excellent
18-Feb-17	9:52:45	BaitBarge	V-PD	CSL	0	3	32.69472	-117.23501	ML		D6-PD	Mixed	Mixed	Flood	CD	2	excellent
18-Feb-17	10:00:26	November	Pre-/Post-	CSL	0	1	32.70104	-117.23039	SW			Female	Adult	Flood	PC	2	good
18-Feb-17	10:07:25	BaitBarge	Pre-/Post-	CSL	0	1	32.69546	-117.23419	ML			Male	Adult	Flood	CD	2	excellent
18-Feb-17	10:32:49	MagSi	I-PD	CSL	0	1	32.69203	-117.22994	PP		D6-PD	Male	Adult	Flood	CD	3	good
18-Feb-17	10:42:17	BaitBarge	Pre-/Post-	CSL	0	2	32.69332	-117.23465	SW			Unknown	Adult	Flood	CD	2	excellent
18-Feb-17	11:03:14	BaitBarge	Post-	CSL	0	1	32.69541	-117.23419	SW			Female	Adult	Flood	CD	2	excellent
18-Feb-17	11:09:34	MagSi	Post-	CSL	0	1	32.68681	-117.23223	SF			Male	Adult	Flood	CD	3	good
18-Feb-17	11:14:03	BaitBarge	Post-	CSL	0	1	32.69555	-117.23398	SW			Male	Adult	Flood	CD	2	excellent
18-Feb-17	11:16:13	MagSi	Post-	CSL	0	1	32.68598	-117.23233	SW			Male	Adult	Flood	CD	3	good
18-Feb-17	11:20:15	MagSi	Post-	CSL	0	2	32.68764	-117.23324	ML			Mixed	Adult	Flood	CD	3	good
21-Feb-17	8:21:49	November	Clipping	CSL	0	1	32.70135	-117.23522	SW		SWC10	Female	Adult	Ebb	C	2	excellent
21-Feb-17	8:22:30	BaitBarge	Clipping	CSL	0	3	32.69512	-117.23537	ML		SWC10	Male	Adult	Ebb	HZ	0	good
21-Feb-17	8:24:18	BaitBarge	Pre-/Post-	CSL	13	0	32.69435	-117.23540	HO	FL		Mixed	Adult	Ebb	HZ	0	good
21-Feb-17	8:27:13	BaitBarge	Pre-/Post-	CSL	10	0	32.69472	-117.23619	HO			Mixed	Adult	Ebb	HZ	0	good
21-Feb-17	8:28:05	Sierra	Pre-/Post-	CSL	0	1	32.69928	-117.23616	SW			Unknown	Subadult	Ebb	C	1	good
21-Feb-17	8:31:56	BaitBarge	Clipping	CSL	2	0	32.69561	-117.23099	HO		SWC09	Unknown	Adult	Ebb	HZ	0	good
21-Feb-17	8:32:54	November	Pre-/Post-	CSL	0	1	32.70129	-117.23542	SW			Female	Adult	Ebb	C	2	excellent
21-Feb-17	8:40:00	MagSi	Clipping	CSL	1	0	32.68246	-117.22904	HO		SWC08	Male	Adult	Ebb	PC	1	moderate
21-Feb-17	8:40:01	MagSi	Clipping	CSL	1	0	32.68202	-117.23160	HO		SWC08	Male	Adult	Ebb	PC	1	moderate
21-Feb-17	8:44:52	MagSi	Pre-/Post-	CSL	0	2	32.68878	-117.23362	ML			Female	Adult	Ebb	PC	1	moderate
21-Feb-17	8:48:43	MagSi	Pre-/Post-	CSL	0	1	32.68604	-117.23230	SW			Female	Adult	Ebb	PC	1	moderate
21-Feb-17	8:54:49	MagSi	Pre-/Post-	CSL	0	1	32.68688	-117.23261	ML			Unknown	Juvenile	Ebb	PC	1	moderate
21-Feb-17	9:02:04	MagSi	Pre-/Post-	CSL	0	1	32.68553	-117.23117	SW			Male	Adult	Ebb	PC	1	moderate
21-Feb-17	9:09:30	MagSi	Pre-/Post-	CSL	4	0	32.67354	117.23030	HO			Mixed	Mixed	Ebb	PC	1	moderate
21-Feb-17	9:10:10	MagSi	Pre-/Post-	CSL	1	0	32.66505	-117.22912	HO			Male	Adult	Ebb	PC	1	moderate

21-Feb-17	9:12:06	MagSi	Pre-/Post-	CSL	0	1	32.69119	-117.23208	ML			Female	Adult	Ebb	PC	1	moderate
21-Feb-17	9:17:08	MagSi	Pre-/Post-	CSL	0	1	32.68892	-117.23049	ML			Male	Adult	Ebb	PC	1	moderate
21-Feb-17	9:19:00	BaitBarge	V-PD	CSL	0	4	32.69512	-117.23523	ML		D5-PB	Male	Adult	Ebb	HZ	0	good
21-Feb-17	9:36:01	MagSi	V-PD	CSL	0	1	32.68519	-117.22825	SW		D5-PB	Unknown	Adult	Ebb	PC	1	moderate
21-Feb-17	9:37:49	MagSi	V-PD	CSL	0	1	32.68629	-117.23097	SW		D5-PB	Unknown	Adult	Ebb	PC	1	moderate
21-Feb-17	9:42:11	MagSi	Pre-/Post-	CSL	0	1	32.69022	-117.23186	SW			Unknown	Adult	Ebb	PC	1	moderate
21-Feb-17	9:49:23	BaitBarge	Pre-/Post-	CSL	0	1	32.69614	-117.23387	SW			Male	Adult	Ebb	HZ	0	good
21-Feb-17	9:56:14	MagSi	Pre-/Post-	PHS	0	1	32.68674	-117.23265	ML			Unknown	Adult	Ebb	PC	1	moderate
21-Feb-17	10:07:20	Command	Pre-/Post-	CSL	0	1	32.70118	-117.22992	ML			Female	Adult	Ebb	C	1	moderate
21-Feb-17	10:10:10	Command	V-PD	CSL	0	1	32.70118	-117.22992	EN		D6-PD	Female	Adult	Ebb	C	1	moderate
21-Feb-17	10:50:27	MagSi	Pre-/Post-	CSL	0	1	32.68668	-117.23047	SW			Male	Adult	Ebb	PC	1	moderate
21-Feb-17	11:28:25	BaitBarge	Pre-/Post-	CSL	0	1	32.69307	-117.23469	SW			Female	Adult	Ebb	HZ	0	good
21-Feb-17	11:34:30	November	Pre-/Post-	CSL	0	1	32.70135	-117.23522	SW			Female	Pup	Ebb	C	2	excellent
21-Feb-17	11:39:21	November	I-PD	CSL	0	1	32.70165	-117.23664	ML		D6-PD	Female	Adult	Ebb	C	2	excellent
21-Feb-17	12:07:17	BaitBarge	I-PD	CSL	0	1	32.69418	-117.23534	ML		D5-PB	Male	Adult	Ebb	HZ	0	good
21-Feb-17	12:33:13	MagSi	Post-	PHS	0	1	32.68578	-117.23288	SW			Unknown	Adult	Ebb	PC	3	moderate
21-Feb-17	14:21:53	BaitBarge	Pre-	CSL	0	1	32.69498	-117.23338	SW			Female	Adult	Flood	CD	2	good
21-Feb-17	14:30:36	P-122	Pre-	PHS	0	1	32.69825	-117.23836	SW			Unknown	Adult	Flood	PC	3	good
21-Feb-17	15:17:46	MagSi	Pre-	CSL	0	1	32.68539	-117.23301	SW			Female	Adult	Flood	PC	1	moderate
21-Feb-17	15:20:50	MagSi	V-PD	CSL	0	1	32.68607	-117.23240	DV		D7-DB	Male	Adult	Flood	PC	1	moderate
21-Feb-17	15:34:50	MagSi	Pre-/Post-	PHS	0	1	32.68558	-117.23262	LO			Unknown	Adult	Flood	PC	1	moderate
21-Feb-17	15:40:25	BaitBarge	Pre-/Post-	CSL	0	1	32.69409	-117.23532	SW			Female	Adult	Flood	CD	2	good
21-Feb-17	15:43:36	MagSi	Pre-/Post-	CSL	1	0	32.68246	-117.22904	HO			Male	Adult	Flood	PC	1	moderate
21-Feb-17	15:46:07	BaitBarge	Pre-/Post-	CSL	0	1	32.69409	-117.23532	ML			Female	Adult	Flood	CD	2	good
21-Feb-17	15:47:23	P-122	Pre-/Post-	PHS	0	1	32.69824	-117.23818	SW			Unknown	Adult	Flood	PC	3	excellent
22-Feb-17	7:48:16	MagSi	Pre-	CSL	1	0	32.66540	-117.22669	HO			Unknown	Juvenile	Ebb	CD	3	moderate
22-Feb-17	7:50:12	MagSi	Pre-	CSL	1	0	32.67354	117.23030	HO			Unknown	Unknown	Ebb	CD	3	moderate
22-Feb-17	7:55:59	BaitBarge	Pre-	CSL	13	0	32.69435	-117.23540	HO			Mixed	Mixed	Ebb	PC	2	moderate
22-Feb-17	7:56:50	BaitBarge	Pre-	CSL	6	0	32.69472	-117.23619	HO			Mixed	Mixed	Ebb	PC	2	moderate
22-Feb-17	8:08:24	BaitBarge	V-PD	CSL	0	1	32.69454	-117.23542	ML		D8-DA	Female	Adult	Ebb	PC	2	moderate
22-Feb-17	8:24:05	BaitBarge	Pre-/Post-	CSL	1	0	32.69577	-117.23318	HO			Female	Adult	Ebb	PC	2	moderate
22-Feb-17	8:24:57	BaitBarge	Pre-/Post-	CSL	1	0	32.69561	-117.23099	HO			Male	Adult	Ebb	PC	2	moderate
22-Feb-17	8:29:33	November	Pre-/Post-	CSL	0	1	32.70120	-117.23551	SW			Male	Adult	Ebb	CD	3	good
22-Feb-17	8:33:23	BaitBarge	V-PD	CSL	0	8	32.69454	-117.23536	EN	FL	D7-DA	Mixed	Mixed	Ebb	PC	2	moderate
22-Feb-17	10:21:33	BaitBarge	I-PD	CSL	0	1	32.69454	-117.23542	SW		D8-DA	Female	Adult	Ebb	PC	2	moderate
22-Feb-17	10:24:35	BaitBarge	I-PD	CSL	0	1	32.69568	-117.23568	EN		D8-DA	Male	Adult	Ebb	PC	2	moderate
28-Feb-17	14:31:26	BaitBarge	Pre-	CSL	84	0	32.69435	-117.23540	HO			Mixed	Mixed	Ebb	PC	3	good
28-Feb-17	14:35:37	MagSi	Pre-	CSL	1	0	32.67381	-117.22762	HO			Male	Adult	Ebb	PC	3	good
28-Feb-17	14:36:46	MagSi	Pre-	CSL	2	0	32.66540	-117.22669	HO			Mixed	Mixed	Ebb	PC	3	good
28-Feb-17	14:37:40	MagSi	Pre-	CSL	3	0	32.67354	117.23030	HO			Mixed	Mixed	Ebb	PC	3	good
28-Feb-17	15:15:14	MagSi	Pre-/Post-	PHS	0	1	32.68576	-117.23299	SW			Unknown	Adult	Ebb	PC	3	good
28-Feb-17	15:17:46	MagSi	Pre-/Post-	CSL	0	1	32.68641	-117.23231	SW			Female	Adult	Ebb	PC	3	good
28-Feb-17	15:22:00	November	Pre-/Post-	CSL	0	1	32.70148	-117.23607	SW			Male	Adult	Ebb	PC	1	good
28-Feb-17	15:44:43	MagSi	Pre-/Post-	CBD	0	1	32.68110	-117.22881	SW			Unknown	Adult	Ebb	PC	3	good

28-Feb-17	15:50:32	MagSi	Pre-/Post-	CSL	0	1	32.68697	-117.23281	SW			Female	Adult	Ebb	PC	3	good
28-Feb-17	15:55:33	MagSi	Pre-/Post-	CSL	0	1	32.69022	-117.23434	SW			Female	Adult	Ebb	PC	3	good
28-Feb-17	16:31:09	MagSi	Post-	CSL	0	1	32.68676	-117.23245	SW			Male	Adult	Flood	PC	2	good
01-Mar-17	7:31:16	BaitBarge	Pre-	CSL	28	3	32.69447	-117.23548	HO			Mixed	Mixed	Flood	C	1	excellent
01-Mar-17	7:41:43	MagSi	Pre-	CSL	0	1	32.68757	-117.23365	SW			Male	Adult	Flood	HZ	2	good
01-Mar-17	7:44:11	Sierra	Pre-	CSL	0	1	32.69550	-117.23462	EX			Female	Adult	Flood	C	1	good
01-Mar-17	7:44:26	MagSi	Pre-	CSL	0	4	32.68802	-117.23138	SW			Mixed	Adult	Flood	HZ	2	moderate
01-Mar-17	7:52:12	MagSi	Pre-	CSL	0	1	32.68282	-117.22967	SW			Male	Adult	Flood	HZ	2	moderate
01-Mar-17	7:56:05	Sierra	Pre-	CSL	0	1	32.69971	-117.23458	SW			Unknown	Subadult	Flood	C	1	good
01-Mar-17	7:59:18	MagSi	Pre-	CSL	0	1	32.68443	-117.22708	RF			Male	Adult	Flood	HZ	2	moderate
01-Mar-17	8:05:12	MagSi	Pre-	CSL	0	1	32.68799	-117.22758	SW			Male	Adult	Flood	HZ	2	moderate
01-Mar-17	8:16:55	November	Pre-	CSL	1	0	32.69561	-117.23099	HO			Unknown	Subadult	Flood	C	1	good
01-Mar-17	8:18:36	BaitBarge	Pre-	CSL	0	1	32.69526	-117.23479	SW			Male	Adult	Flood	C	1	excellent
01-Mar-17	8:31:39	MagSi	I-PD	CSL	0	3	32.68757	-117.23365	SW		D8-DB-B2	Mixed	Adult	Flood	HZ	2	moderate
01-Mar-17	8:38:49	P-122	I-PD	CSL	0	1	32.69755	-117.23755	ML	AD	D8-DB-B2	Male	Adult	Flood	C	0	good
01-Mar-17	8:41:46	MagSi	Post-	CSL	0	1	32.68664	-117.23276	SW			Female	Adult	Flood	HZ	2	moderate
01-Mar-17	8:43:37	Sierra	Post-	CSL	0	1	32.69558	-117.23435	EX			Unknown	Subadult	Flood	C	1	good
01-Mar-17	8:45:47	MagSi	Post-	CBD	0	3	32.68722	-117.23009	SW			Unknown	Adult	Flood	HZ	2	moderate
01-Mar-17	8:45:55	BaitBarge	Post-	CSL	0	25	32.69447	-117.23548	EN	FL		Mixed	Mixed	Flood	C	1	excellent
01-Mar-17	8:55:28	Sierra	Post-	CSL	0	1	32.70077	-117.22987	SW			Unknown	Subadult	Flood	C	1	good
01-Mar-17	8:58:17	MagSi	Post-	CSL	0	1	32.68640	-117.23236	SW			Female	Adult	Flood	HZ	2	moderate
01-Mar-17	9:05:33	MagSi	Post-	CSL	0	2	32.68352	-117.23036	SW			Unknown	Adult	Flood	HZ	2	moderate
01-Mar-17	12:59:03	MagSi	Pre-/Post-	CSL	0	1	32.68675	-117.23160	SW			Male	Adult	Ebb	HZ	3	moderate
01-Mar-17	13:00:32	BaitBarge	Pre-/Post-	CSL	39	1	32.69447	-117.23548	HO			Mixed	Mixed	Ebb	C	3	excellent
01-Mar-17	13:13:18	MagSi	Pre-/Post-	CSL	0	2	32.68333	-117.23065	SW			Unknown	Adult	Ebb	HZ	3	moderate
01-Mar-17	13:20:40	BaitBarge	V-PD	CSL	0	1	32.69500	-117.23573	EN		D8-DB-B1	Male	Adult	Ebb	C	3	excellent
01-Mar-17	13:31:57	P-122	V-PD	CSL	0	1	32.69790	-117.23789	SW		D8-DB-B1	Male	Adult	Ebb	C	2	excellent
01-Mar-17	14:13:55	P-122	Pre-/Post-	CSL	0	1	32.69689	-117.23785	SW			Male	Adult	Ebb	C	2	excellent
01-Mar-17	14:28:29	MagSi	Post-	CSL	0	1	32.69182	-117.23073	SW			Male	Adult	Ebb	HZ	3	moderate
06-Mar-17	8:48:11	MagSi	Pre-	CSL	1	0	32.68202	-117.23160	HO			Male	Adult	Flood	C	2	good
06-Mar-17	8:49:01	BaitBarge	Pre-	CSL	8	0	32.69435	-117.23540	HO			Mixed	Mixed	Flood	C	3	excellent
06-Mar-17	8:49:38	MagSi	Pre-	CSL	4	0	32.67354	117.23030	HO			Mixed	Unknown	Flood	C	2	good
06-Mar-17	8:52:46	BaitBarge	Pre-	CSL	0	2	32.69430	-117.23551	ML			Female	Juvenile	Flood	C	3	excellent
06-Mar-17	8:53:46	November	Pre-	CSL	1	0	32.70246	-117.23649	HO			Male	Subadult	Flood	C	2	good
06-Mar-17	8:59:44	BaitBarge	Pre-	CSL	1	1	32.69540	-117.23302	ML			Unknown	Juvenile	Flood	C	3	excellent
06-Mar-17	9:11:46	BaitBarge	Pre-	CSL	4	0	32.69435	-117.23540	HO			Mixed	Mixed	Flood	C	3	excellent
06-Mar-17	9:12:59	MagSi	V-PD	CSL	0	1	32.68765	-117.23310	SW		D8-DB-B1	Male	Adult	Flood	C	2	good
06-Mar-17	9:25:37	MagSi	Pre-/Post-	CSL	0	1	32.68610	-117.23184	SW			Male	Adult	Flood	C	2	good
06-Mar-17	9:28:57	November	Pre-/Post-	CSL	1	0	32.70246	-117.23649	HO	FL		Female	Adult	Flood	C	2	good

06-Mar-17	9:31:58	BaitBarge	Pre-/Post-	CSL	0	1	32.69490	-117.23482	SW			Female	Juvenile	Flood	C	3	excellent
06-Mar-17	9:53:28	P-122	Pre-/Post-	PHS	0	1	32.69815	-117.23870	SW			Unknown	Adult	Flood	C	1	moderate
06-Mar-17	9:56:19	BaitBarge	Pre-/Post-	CSL	0	1	32.69377	-117.23550	SW			Unknown	Juvenile	Flood	C	3	excellent
06-Mar-17	10:00:30	P-122	Pre-/Post-	PHS	0	1	32.69809	-117.23883	ML			Unknown	Adult	Flood	C	1	moderate
06-Mar-17	10:09:13	P-122	Pre-/Post-	CSL	0	1	32.69930	-117.23552	SW			Male	Adult	Flood	C	2	moderate
06-Mar-17	10:11:46	P-122	Pre-/Post-	CSL	1	0	32.69826	-117.23863	HO			Male	Adult	Flood	C	2	moderate
06-Mar-17	10:26:00	BaitBarge	Pre-/Post-	CSL	0	1	32.69368	-117.23539	ML			Unknown	Juvenile	Flood	C	3	excellent
06-Mar-17	10:36:16	MagSi	Pre-/Post-	CSL	0	1	32.68807	-117.23273	SW			Male	Adult	Flood	C	2	good
06-Mar-17	10:37:50	BaitBarge	Pre-/Post-	CSL	0	1	32.69517	-117.23488	SW			Female	Adult	Flood	C	3	excellent
06-Mar-17	10:51:36	November	Pre-/Post-	CBD	0	2	32.70071	-117.23204	SW	AD		Unknown	Adult	Flood	C	2	good
06-Mar-17	11:00:19	MagSi	Pre-/Post-	CSL	0	1	32.68720	-117.23157	SW			Female	Adult	Flood	C	2	good
06-Mar-17	11:00:51	BaitBarge	I-PD	CSL	0	1	32.69653	-117.23416	SW		D8-DB-B1	Unknown	Juvenile	Flood	C	3	excellent
06-Mar-17	11:20:15	P-122	Post-	CSL	0	1	32.69942	-117.23816	SW			Male	Adult	Flood	C	3	moderate
06-Mar-17	11:28:07	November	Post-	CSL	1	0	32.70246	-117.23649	HO			Female	Adult	Flood	C	2	good
06-Mar-17	11:46:10	Clipper	Pre-/Post-	PHS	0	1	32.69811	-117.23747	ML			Unknown	Adult	Flood	C	2	excellent
06-Mar-17	14:14:27	November	Pre-	CSL	3	0	32.70246	-117.23649	HO			Mixed	Adult	Flood	C	3	good
06-Mar-17	14:28:33	BaitBarge	Pre-	CSL	40	0	32.69435	-117.23540	HO			Mixed	Mixed	Flood	C	4	excellent
06-Mar-17	14:41:11	MagSi	V-PD	CBD	0	2	32.68282	-117.22967	SW		D7-DB-B2	Unknown	Adult	Flood	C	3	good
06-Mar-17	15:03:40	MagSi	Pre-/Post-	CSL	0	1	32.68495	-117.23282	SW			Male	Adult	Flood	C	3	good
06-Mar-17	15:19:42	BaitBarge	Pre-/Post-	CSL	0	1	32.69249	-117.23302	DV			Unknown	Unknown	Flood	C	5	excellent
06-Mar-17	15:38:27	November	I-PD	CSL	0	1	32.70160	-117.23682	SW		D7-DB-B2	Unknown	Adult	Flood	C	3	excellent
06-Mar-17	16:01:42	November	Post-	CSL	0	1	32.70072	-117.23461	SW			Unknown	Unknown	Flood	C	3	excellent
06-Mar-17	16:08:16	MagSi	Post-	CSL	0	1	32.68645	-117.23205	SW			Male	Adult	Flood	C	3	good
07-Mar-17	9:11:00	BaitBarge	Pre-	CSL	6	0	32.69435	-117.23540	HO			Mixed	Mixed	Ebb	C	1	excellent
07-Mar-17	9:13:58	MagSi	Pre-	CSL	6	0	32.67354	117.23030	HO			Mixed	Mixed	Ebb	HZ	1	moderate
07-Mar-17	9:14:50	November	Pre-	CSL	1	0	32.70621	-117.22619	HO			Unknown	Unknown	Ebb	C	1	good
07-Mar-17	9:15:12	MagSi	Pre-	CSL	2	0	32.66540	-117.22669	HO			Mixed	Adult	Ebb	HZ	1	moderate
07-Mar-17	9:41:45	BaitBarge	Pre-	CSL	0	1	32.69529	-117.23404	PP			Unknown	Subadult	Ebb	C	1	excellent
07-Mar-17	10:04:27	Sierra	Pre-	CSL	0	1	32.70036	-117.23567	SW			Female	Adult	Ebb	C	1	excellent
07-Mar-17	10:05:59	MagSi	Pre-	CSL	1	0	32.68202	-117.23160	HO			Male	Adult	Ebb	HZ	1	moderate
07-Mar-17	10:07:40	BaitBarge	Pre-/Post-	CSL	0	1	32.69491	-117.23532	EN			Male	Adult	Ebb	C	1	excellent
07-Mar-17	10:10:48	BaitBarge	V-PD	CSL	0	1	32.69573	-117.23501	SW		D7-DB-B1	Male	Adult	Ebb	C	1	excellent
07-Mar-17	10:11:23	MagSi	V-PD	CSL	0	1	32.68407	-117.23126	SW		D7-DB-B1	Male	Adult	Ebb	HZ	1	moderate
07-Mar-17	10:13:02	Sierra	V-PD	CSL	0	1	32.69754	-117.23288	ML		D7-DB-B1	Male	Adult	Ebb	C	1	excellent
07-Mar-17	10:32:23	MagSi	Pre-/Post-	PHS	2	0	32.67694	-117.23712	HO			Mixed	Mixed	Ebb	HZ	1	moderate
07-Mar-17	10:34:46	MagSi	Pre-/Post-	PHS	1	0	32.67694	-117.23712	HO			Unknown	Adult	Ebb	HZ	1	moderate
07-Mar-17	10:35:27	MagSi	Pre-/Post-	PHS	1	0	32.67752	-117.23793	HO			Unknown	Adult	Ebb	HZ	1	moderate
07-Mar-17	10:40:11	MagSi	Pre-/Post-	PHS	1	0	32.67025	-117.23644	HO			Unknown	Adult	Ebb	HZ	1	moderate

07-Mar-17	10:42:41	BaitBarge	I-PD	CSL	0	4	32.69492	-117.23540	EN		D7-DB-B1	Mixed	Mixed	Ebb	C	1	excellent
07-Mar-17	10:47:41	MagSi	I-PD	PHS	0	1	32.68665	-117.23303	SW		D7-DB-B1	Unknown	Adult	Ebb	HZ	1	moderate
07-Mar-17	11:13:55	MagSi	Post-	CSL	0	2	32.68594	-117.23155	SW			Mixed	Adult	Ebb	HZ	2	moderate
07-Mar-17	11:16:07	MagSi	Post-	CSL	0	1	32.68536	-117.23009	SW			Male	Adult	Ebb	HZ	2	moderate
07-Mar-17	14:21:24	BaitBarge	Pre-/Post-	CSL	2	0	32.69577	-117.23318	HO			Female	Adult	Flood	C	4	excellent
07-Mar-17	14:22:25	BaitBarge	Clipping	CSL	11	0	32.69435	-117.23540	HO		SWF56	Mixed	Mixed	Flood	C	4	excellent
07-Mar-17	14:30:47	November	Pre-	CSL	1	0	32.70246	-117.23649	HO			Female	Adult	Flood	PC	4	excellent
07-Mar-17	14:34:32	MagSi	Pre-	CSL	3	0	32.66540	-117.22669	HO			Mixed	Unknown	Flood	HZ	4	moderate
07-Mar-17	14:35:20	MagSi	Pre-	CSL	4	0	32.67354	117.23030	HO			Mixed	Unknown	Flood	HZ	4	moderate
07-Mar-17	14:37:33	MagSi	V-PD	PHS	1	0	32.67719	-117.23701	HO		D7-DA-B2	Unknown	Adult	Flood	HZ	4	moderate
07-Mar-17	14:54:34	P-122	Pre-/Post-	CSL	0	1	32.69833	-117.23864	SW			Male	Adult	Flood	C	1	good
07-Mar-17	14:54:41	November	Pre-/Post-	CSL	0	1	32.70200	-117.23624	SW			Unknown	Adult	Flood	PC	3	excellent
07-Mar-17	15:01:55	Sierra	Pre-/Post-	CSL	0	1	32.69848	-117.23478	SW			Female	Adult	Flood	C	3	excellent
07-Mar-17	15:18:19	MagSi	Pre-/Post-	CSL	0	1	32.68666	-117.23190	SW			Male	Adult	Flood	HZ	4	moderate
07-Mar-17	15:51:29	MagSi	Pre-/Post-	CBD	0	1	32.68292	-117.22742	SW			Unknown	Adult	Flood	HZ	4	moderate
08-Mar-17	8:47:15	P-122	Pre-	CSL	0	1	32.69782	-117.23805	SW			Male	Adult	Ebb	PC	1	good
08-Mar-17	8:49:22	MagSi	Pre-	CBD	0	4	32.68644	-117.23243	SW			Unknown	Mixed	Ebb	HZ	1	good
08-Mar-17	8:53:30	BaitBarge	Pre-	CSL	16	0	32.69435	-117.23540	HO			Mixed	Mixed	Ebb	C	1	good
08-Mar-17	8:55:22	November	Pre-	CSL	0	1	32.70126	-117.23536	SW			Male	Adult	Ebb	PC	1	good
08-Mar-17	9:00:10	MagSi	Pre-	PHS	2	0	32.67732	-117.23738	HO			Unknown	Adult	Ebb	HZ	1	good
08-Mar-17	9:06:14	MagSi	Pre-	CSL	4	0	32.67354	117.23030	HO			Mixed	Adult	Ebb	HZ	1	good
08-Mar-17	9:07:27	MagSi	Pre-	CSL	2	0	32.65253	-117.22481	HO			Unknown	Unknown	Ebb	HZ	1	good
08-Mar-17	9:08:18	MagSi	V-PD	CSL	1	0	32.66540	-117.22669	HO		D7-DA-B1	Unknown	Adult	Ebb	HZ	1	good
08-Mar-17	9:09:20	MagSi	V-PD	CSL	1	0	32.67381	-117.22762	HO		D7-DA-B1	Male	Adult	Ebb	HZ	1	good
08-Mar-17	9:11:28	MagSi	Pre-/Post-	CSL	0	1	32.68957	-117.23206	DV			Male	Adult	Ebb	HZ	1	good
08-Mar-17	9:15:05	MagSi	Pre-/Post-	CSL	0	1	32.66827	-117.23124	LO			Male	Adult	Ebb	HZ	1	good
08-Mar-17	9:17:08	BaitBarge	Pre-/Post-	CSL	0	1	32.69571	-117.23526	SW			Female	Adult	Ebb	C	1	good
08-Mar-17	9:23:59	MagSi	Pre-/Post-	PHS	0	2	32.67493	-117.23669	SW			Mixed	Mixed	Ebb	HZ	1	good
08-Mar-17	9:28:42	BaitBarge	Pre-/Post-	CSL	0	1	32.69558	-117.23309	SW			Male	Adult	Ebb	C	1	good
08-Mar-17	9:34:44	BaitBarge	Pre-/Post-	CSL	0	1	32.69547	-117.23467	SW			Male	Adult	Ebb	C	1	good
08-Mar-17	10:01:33	Sierra	Pre-/Post-	CSL	0	1	32.69903	-117.23601	SW			Female	Subadult	Ebb	PC	0	good
08-Mar-17	10:04:04	MagSi	Shutdown	CSL	0	1	32.69114	-117.22830	SW			Male	Adult	Ebb	HZ	1	good
08-Mar-17	10:14:09	BaitBarge	I-PD	CSL	0	2	32.69375	-117.23393	SW		D7-DA-B1	Female	Adult	Ebb	C	1	good
08-Mar-17	10:18:04	MagSi	I-PD	CSL	0	1	32.68668	-117.23047	SW		D7-DA-B1	Male	Adult	Ebb	HZ	2	good
08-Mar-17	10:51:04	MagSi	Post-	PHS	0	1	32.67706	-117.23750	SW			Unknown	Adult	Ebb	HZ	2	good
09-Mar-17	14:18:50	BaitBarge	Pre-	CSL	29	0	32.69435	-117.23540	HO			Mixed	Mixed	Flood	HZ	2	good
09-Mar-17	14:19:29	BaitBarge	Pre-	CSL	1	0	32.69561	-117.23099	HO			Female	Adult	Flood	HZ	2	good
09-Mar-17	14:22:04	MagSi	Pre-	CSL	4	0	32.69577	-117.23318	HO			Mixed	Mixed	Flood	C	2	good

09-Mar-17	14:24:37	November	Pre-	CSL	1	0	32.70246	-117.23649	HO			Male	Adult	Flood	C	3	good
09-Mar-17	14:46:00	P-122	I-PD	CSL	0	1	32.69738	-117.23457	SW		D8-DA-B1	Male	Adult	Flood	C	2	good
09-Mar-17	14:58:52	P-122	Post-	CSL	0	1	32.70002	-117.23239	SW			Male	Adult	Flood	C	2	good
09-Mar-17	14:59:37	Sierra	Post-	PHS	0	1	32.69978	-117.23593	ML			Unknown	Adult	Flood	PC	2	good
09-Mar-17	15:07:05	P-122	Post-	PHS	0	1	32.69828	-117.23789	SW			Unknown	Adult	Flood	C	2	good
10-Mar-17	9:52:02	MagSi	Pre-	CSL	3	0	32.68202	-117.23160	HO			Unknown	Adult	Ebb	HZ	2	moderate
10-Mar-17	9:54:11	MagSi	Pre-	CSL	7	0	32.67354	117.23030	HO			Unknown	Mixed	Ebb	HZ	2	moderate
10-Mar-17	9:55:37	MagSi	Pre-	CSL	4	0	32.68246	-117.22904	HO			Unknown	Mixed	Ebb	HZ	2	moderate
10-Mar-17	10:06:47	BaitBarge	Pre-	CSL	20	0	32.69435	-117.23540	HO			Mixed	Mixed	Ebb	C	3	good
10-Mar-17	10:07:14	MagSi	Pre-	CSL	6	0	32.66505	-117.22912	HO			Unknown	Unknown	Ebb	HZ	2	moderate
10-Mar-17	10:08:44	MagSi	Pre-	CSL	0	1	32.68769	-117.22691	SW			Male	Adult	Ebb	HZ	2	moderate
10-Mar-17	10:13:30	November	Pre-	CSL	0	1	32.70215	-117.23568	SW			Unknown	Adult	Ebb	PC	1	excellent
10-Mar-17	10:15:23	MagSi	Pre-	CSL	1	0	32.69561	-117.23099	HO			Unknown	Unknown	Ebb	HZ	2	moderate
10-Mar-17	10:20:08	MagSi	Pre-	PHS	0	1	32.68752	-117.23086	SW			Unknown	Adult	Ebb	HZ	2	moderate
10-Mar-17	10:49:32	November	Pre-	CSL	0	1	32.70137	-117.23558	SH			Male	Adult	Ebb	PC	2	excellent
10-Mar-17	11:28:58	November	Post-	CSL	0	1	32.70157	-117.23503	SW			Unknown	Juvenile	Ebb	PC	3	excellent
10-Mar-17	11:29:32	BaitBarge	Post-	CSL	0	1	32.69493	-117.23540	ML			Male	Juvenile	Ebb	C	3	good
10-Mar-17	11:49:25	BaitBarge	Pre-/Post-	CSL	0	1	32.69379	-117.23419	SW			Male	Adult	Ebb	C	3	good
11-Mar-17	10:42:44	MagSi	Pre-	CSL	0	1	32.68362	-117.23254	SW			Male	Adult	Ebb	C	2	good
11-Mar-17	10:43:20	MagSi	Pre-	CSL	3	0	32.68202	-117.23160	HO			Mixed	Mixed	Ebb	C	2	good
11-Mar-17	10:45:25	BaitBarge	Pre-	CSL	25	0	32.69435	-117.23540	HO			Mixed	Mixed	Ebb	C	4	good
11-Mar-17	11:15:24	BaitBarge	Pre-/Post-	CSL	1	0	32.69472	-117.23619	HO			Male	Adult	Ebb	C	4	good
11-Mar-17	11:17:46	MagSi	Pre-/Post-	CSL	0	2	32.68711	-117.23265	SW			Unknown	Juvenile	Ebb	C	2	good
11-Mar-17	11:21:21	November	Pre-/Post-	CSL	0	1	32.70118	-117.23539	SW			Unknown	Subadult	Ebb	PC	2	good
11-Mar-17	11:22:02	MagSi	Pre-/Post-	CSL	0	1	32.68629	-117.23230	SW			Male	Adult	Ebb	C	2	good
11-Mar-17	11:44:15	MagSi	I-PD	CSL	0	1	32.68629	-117.23230	SW		D8-DA-B2	Female	Adult	Ebb	C	2	good
11-Mar-17	11:53:58	BaitBarge	I-PD	CSL	0	1	32.69470	-117.23529	ML		D8-DA-B2	Male	Subadult	Ebb	C	4	good
11-Mar-17	12:03:38	BaitBarge	Post-	CSL	1	0	32.69577	-117.23318	HO			Male	Subadult	Ebb	C	4	good
11-Mar-17	12:22:09	MagSi	Post-	CSL	0	1	32.68660	-117.23210	SW			Male	Adult	Ebb	C	2	good
15-Mar-17	10:05:04	November	Pre-	CSL	1	0	32.70177	-117.22927	HO			Unknown	Subadult	Flood	PC	2	moderate
15-Mar-17	10:05:12	P-122	Pre-	CSL	3	0	32.69823	-117.23856	HO			Male	Mixed	Flood	PC	2	good
15-Mar-17	10:08:37	BaitBarge	Pre-	CSL	2	0	32.69561	-117.23099	HO			Unknown	Juvenile	Flood	C	2	good
15-Mar-17	10:10:26	MagSi	Pre-	CSL	1	0	32.67354	117.23030	HO			Male	Adult	Flood	C	2	good
15-Mar-17	10:11:19	MagSi	Pre-	CSL	6	0	32.68202	-117.23160	HO			Mixed	Adult	Flood	C	2	good
15-Mar-17	10:13:17	Sierra	Pre-	CSL	0	1	32.69948	-117.23586	SW			Unknown	Juvenile	Flood	PC	2	moderate
15-Mar-17	10:14:41	BaitBarge	Pre-	CSL	1	0	32.69577	-117.23318	HO			Unknown	Subadult	Flood	C	2	good
15-Mar-17	10:17:35	BaitBarge	Pre-	CSL	12	0	32.69435	-117.23540	HO			Mixed	Mixed	Flood	C	2	good
15-Mar-17	10:25:23	BaitBarge	Pre-	CSL	0	1	32.69430	-117.23462	SW			Male	Adult	Flood	C	2	good
15-Mar-17	10:30:01	MagSi	Pre-	CSL	0	2	32.68433	-117.23177	SW			Male	Adult	Flood	C	2	good
15-Mar-17	10:36:13	MagSi	Pre-	CSL	0	1	32.68752	-117.23242	ML			Male	Subadult	Flood	C	2	good
15-Mar-17	11:25:03	Sierra	Pre-/Post-	CSL	0	1	32.69951	-117.23602	SW			Unknown	Subadult	Flood	PC	2	moderate

15-Mar-17	11:36:11	MagSi	Pre-/Post-	CSL	0	1	32.68683	-117.23134	SW			Male	Adult	Ebb	C	2	good
15-Mar-17	11:39:29	November	Pre-/Post-	CBD	0	2	32.70369	-117.23434	SW			Unknown	Adult	Ebb	PC	2	moderate
15-Mar-17	11:44:39	P-122	Pre-/Post-	CSL	0	2	32.69823	-117.23856	EN			Male	Mixed	Ebb	PC	2	good
15-Mar-17	11:45:33	MagSi	Pre-/Post-	CSL	0	1	32.68472	-117.23203	SW			Male	Adult	Ebb	C	2	good
15-Mar-17	11:48:25	BaitBarge	Pre-/Post-	CSL	1	0	32.69472	-117.23619	HO			Male	Adult	Ebb	C	2	good
15-Mar-17	11:51:44	November	Pre-/Post-	CSL	0	2	32.70489	-117.23255	SW			Male	Subadult	Ebb	PC	2	moderate
15-Mar-17	12:08:54	P-122	Pre-/Post-	CSL	0	1	32.69721	-117.23806	SW			Male	Adult	Ebb	PC	2	good
15-Mar-17	12:14:45	P-122	Pre-/Post-	CSL	0	1	32.69794	-117.23801	SW			Male	Subadult	Ebb	PC	2	good
15-Mar-17	12:19:45	P-122	Pre-/Post-	CSL	0	1	32.69890	-117.23649	SW			Unknown	Juvenile	Ebb	PC	2	good
15-Mar-17	12:31:51	BaitBarge	Pre-/Post-	CSL	0	1	32.69459	-117.23449	ML			Male	Adult	Ebb	C	3	good
15-Mar-17	12:36:12	BaitBarge	I-PD	CSL	0	1	32.69610	-117.23353	SW		D6-PB-B2	Male	Adult	Ebb	C	4	good
15-Mar-17	12:40:52	MagSi	Pre-/Post-	CSL	0	1	32.68842	-117.23219	ML			Female	Adult	Ebb	C	2	good
15-Mar-17	12:52:40	BaitBarge	Pre-/Post-	CSL	0	1	32.69430	-117.23580	SW			Male	Adult	Ebb	C	4	good
15-Mar-17	13:14:10	MagSi	Post-	CSL	0	1	32.68707	-117.23257	SF			Male	Adult	Ebb	C	2	good
16-Mar-17	10:22:00	MagSi	Pre-	CSL	1	0	32.68202	-117.23160	HO			Male	Adult	Flood	HZ	2	moderate
16-Mar-17	10:22:42	MagSi	Pre-	CSL	2	0	32.67354	117.23030	HO			Unknown	Adult	Flood	HZ	2	moderate
16-Mar-17	10:23:18	MagSi	Pre-	CSL	3	0	32.66540	-117.22669	HO			Unknown	Unknown	Flood	HZ	2	moderate
16-Mar-17	10:23:32	P-122	Pre-	CSL	1	4	32.69826	-117.23880	SW			Mixed	Adult	Flood	HZ	3	moderate
16-Mar-17	10:29:54	BaitBarge	Pre-	CSL	15	0	32.69435	-117.23540	HO			Mixed	Mixed	Flood	C	4	moderate
16-Mar-17	10:32:18	November	Pre-	CSL	0	1	32.70069	-117.23307	SW			Unknown	Juvenile	Flood	HZ	1	moderate
16-Mar-17	10:33:37	BaitBarge	Pre-	CSL	2	0	32.69561	-117.23099	HO			Unknown	Mixed	Flood	C	4	moderate
16-Mar-17	10:41:24	BaitBarge	Pre-	CSL	0	1	32.69484	-117.23520	EN			Unknown	Juvenile	Flood	C	4	moderate
16-Mar-17	10:46:21	BaitBarge	V-PD	CSL	0	1	32.69468	-117.23523	EX		D5-PD-B2	N/A	Subadult	Flood	C	4	moderate
16-Mar-17	10:51:06	BaitBarge	V-PD	CSL	0	2	32.69493	-117.23589	SW		D5-PD-B2	Mixed	Mixed	Flood	C	4	moderate
16-Mar-17	10:55:21	BaitBarge	Pre-/Post-	CSL	0	1	32.69547	-117.23424	SW			N/A	Juvenile	Flood	C	4	moderate
16-Mar-17	11:03:28	BaitBarge	Pre-/Post-	CSL	0	1	32.69428	-117.23511	SW			Unknown	Subadult	Flood	C	4	moderate
16-Mar-17	11:05:10	P-122	Pre-/Post-	CSL	0	3	32.69787	-117.23858	ML			Mixed	Mixed	Flood	HZ	2	moderate
16-Mar-17	11:07:06	November	Pre-/Post-	CSL	0	1	32.70281	-117.23381	SW			Unknown	Subadult	Flood	HZ	1	moderate
16-Mar-17	11:17:14	BaitBarge	Pre-/Post-	CSL	0	1	32.69519	-117.23599	EX			Unknown	Subadult	Flood	C	4	moderate
16-Mar-17	11:20:36	November	Pre-/Post-	CSL	0	1	32.70057	-117.23397	SW			Unknown	Unknown	Flood	HZ	1	moderate
16-Mar-17	11:25:53	BaitBarge	Pre-/Post-	CSL	0	3	32.69422	-117.23498	ML			Mixed	Mixed	Flood	C	4	moderate
16-Mar-17	11:30:08	P-122	Pre-/Post-	CSL	0	2	32.69790	-117.23789	SW			Mixed	Adult	Flood	HZ	2	moderate
16-Mar-17	11:33:50	MagSi	I-PD	CSL	0	1	32.68685	-117.23264	SW		D5-PD-B2	Male	Adult	Flood	HZ	2	moderate
16-Mar-17	11:34:29	November	I-PD	CSL	0	1	32.70140	-117.23671	SW		D5-PD-B2	Male	Subadult	Flood	HZ	1	moderate
16-Mar-17	11:34:59	MagSi	I-PD	CSL	0	1	32.69164	-117.23421	PP		D5-PD-B2	Unknown	Juvenile	Flood	HZ	2	moderate
16-Mar-17	11:41:56	MagSi	I-PD	CSL	0	1	32.68863	-117.23210	SW		D5-PD-B2	Unknown	Subadult	Flood	HZ	2	moderate
16-Mar-17	11:42:57	BaitBarge	I-PD	CSL	0	1	32.69402	-117.23475	EX		D5-PD-B2	Male	Subadult	Flood	C	4	moderate
16-Mar-17	11:49:22	BaitBarge	Pre-/Post-	CSL	4	0	32.69472	-117.23619	HO			Mixed	Mixed	Flood	C	4	moderate
16-Mar-17	11:49:46	MagSi	Pre-/Post-	CSL	0	1	32.68626	-117.23246	SW			Unknown	Juvenile	Flood	HZ	2	moderate
16-Mar-17	11:50:14	BaitBarge	Pre-/Post-	CSL	18	0	32.69435	-117.23540	HO			Mixed	Mixed	Flood	C	4	moderate
16-Mar-17	11:55:34	MagSi	Pre-/Post-	CSL	0	1	32.68629	-117.23265	ML			Female	Adult	Flood	HZ	2	moderate
16-Mar-17	12:14:08	BaitBarge	Pre-/Post-	CSL	0	1	32.69517	-117.23613	EN			Male	Adult	Flood	C	4	moderate
16-Mar-17	12:15:48	November	Pre-/Post-	CBD	0	3	32.70231	-117.23467	SW			Mixed	Mixed	Flood	HZ	1	moderate
16-Mar-17	12:25:22	November	Pre-/Post-	CSL	0	1	32.70185	-117.23600	SW			Unknown	Juvenile	Ebb	HZ	1	moderate

16-Mar-17	14:10:34	P-122	Pre-/Post-	CSL	5	3	32.69826	-117.23863	HO			Mixed	Adult	Ebb	HZ	2	good
16-Mar-17	14:10:50	P-122	Pre-/Post-	PHS	0	1	32.69788	-117.23873	ML			Unknown	Adult	Ebb	HZ	2	moderate
16-Mar-17	14:22:30	BaitBarge	Pre-/Post-	CSL	29	0	32.69435	-117.23540	HO			Mixed	Mixed	Ebb	C	4	moderate
16-Mar-17	14:25:48	BaitBarge	Pre-/Post-	CSL	0	2	32.69554	-117.23460	SW			Mixed	Mixed	Ebb	C	4	moderate
16-Mar-17	14:30:31	P-122	Pre-/Post-	CSL	0	2	32.69729	-117.23639	SW			Male	Subadult	Ebb	HZ	2	moderate
16-Mar-17	14:41:25	BaitBarge	Pre-/Post-	CSL	0	1	32.69408	-117.23599	EX			Male	Adult	Ebb	C	4	moderate
16-Mar-17	14:42:30	Sierra	Pre-/Post-	CSL	0	1	32.69974	-117.23656	SW			Female	Subadult	Ebb	HZ	2	poor
16-Mar-17	14:48:32	November	I-PD	CSL	0	2	32.70228	-117.23463	SW		D6-PD-B1	Male	Subadult	Ebb	PC	2	good
16-Mar-17	15:00:38	BaitBarge	I-PD	CSL	0	1	32.69478	-117.23530	EN		D6-PD-B1	Male	Adult	Ebb	C	4	moderate
16-Mar-17	15:04:50	BaitBarge	I-PD	CSL	0	2	32.69388	-117.23651	EX		D6-PD-B1	Male	Mixed	Ebb	C	4	moderate
17-Mar-17	10:50:30	Clipper	Clipping	CSL	5	0	32.69826	-117.23863	HO		Pier56	Mixed	Adult	Flood	F	2	moderate
17-Mar-17	11:17:02	Clipper	Pre-/Post-	CSL	0	1	32.69906	-117.23580	SW			Male	Adult	Flood	F	2	moderate
17-Mar-17	11:20:57	BaitBarge	Pre-	CSL	3	0	32.69577	-117.23318	HO			Female	Adult	Flood	HZ	3	moderate
17-Mar-17	11:22:01	BaitBarge	Pre-	CSL	2	0	32.69561	-117.23099	HO			Male	Adult	Flood	HZ	3	moderate
17-Mar-17	11:23:12	MagSi	Pre-	CSL	2	0	32.67354	117.23030	HO			Mixed	Adult	Flood	HZ	2	moderate
17-Mar-17	11:23:40	P-122	Pre-	CSL	9	0	32.69826	-117.23863	HO			Mixed	Mixed	Flood	C	3	moderate
17-Mar-17	11:24:12	BaitBarge	Pre-	CSL	2	0	32.69472	-117.23619	HO			Unknown	Mixed	Flood	HZ	3	moderate
17-Mar-17	11:26:31	BaitBarge	Pre-	CSL	26	0	32.69435	-117.23540	HO			Mixed	Mixed	Flood	HZ	3	moderate
17-Mar-17	11:43:07	MagSi	Pre-	CSL	0	1	32.68673	-117.23296	DV			Unknown	Unknown	Flood	HZ	2	moderate
17-Mar-17	12:06:41	P-122	Pre-/Post-	CSL	0	1	32.69802	-117.23838	EN			Female	Adult	Flood	CD	4	moderate
17-Mar-17	12:07:07	MagSi	Pre-/Post-	CSL	0	2	32.68551	-117.23179	SW			Male	Adult	Flood	HZ	2	moderate
17-Mar-17	12:08:32	BaitBarge	Pre-/Post-	CSL	0	1	32.69542	-117.23455	SW			Female	Adult	Flood	HZ	3	moderate
17-Mar-17	12:26:01	P-122	I-PD	CSL	0	1	32.69565	-117.23796	SW		D5-PB-B2	Unknown	Adult	Flood	CD	4	moderate
17-Mar-17	12:30:26	BaitBarge	I-PD	CSL	0	1	32.69426	-117.23527	SW		D5-PB-B2	Unknown	Unknown	Flood	HZ	3	moderate
17-Mar-17	12:33:40	P-122	I-PD	CSL	0	1	32.69821	-117.23844	EN		D5-PB-B2	Male	Adult	Flood	CD	4	moderate
17-Mar-17	12:40:56	BaitBarge	I-PD	CSL	0	1	32.69580	-117.23461	SW		D5-PB-B2	Unknown	Juvenile	Flood	HZ	3	moderate
17-Mar-17	12:41:04	MagSi	I-PD	CSL	0	2	32.68312	-117.22663	SW		D5-PB-B2	Male	Adult	Flood	HZ	2	moderate
17-Mar-17	14:51:42	P-122	Pre-	CSL	7	0	32.69826	-117.23863	HO			Mixed	Mixed	Ebb	CD	4	moderate
17-Mar-17	14:52:30	BaitBarge	Pre-	CSL	2	0	32.69577	-117.23318	HO			Female	Adult	Ebb	HZ	3	moderate
17-Mar-17	14:53:19	BaitBarge	Pre-	CSL	5	0	32.69472	-117.23619	HO			Mixed	Mixed	Ebb	HZ	3	moderate
17-Mar-17	14:55:23	BaitBarge	Pre-	CSL	25	0	32.69435	-117.23540	HO			Mixed	Mixed	Ebb	HZ	3	moderate
17-Mar-17	14:57:18	P-122	Pre-	CSL	0	1	32.69824	-117.23838	EN			Female	Adult	Ebb	CD	4	moderate
17-Mar-17	15:58:21	BaitBarge	Pre-	CSL	0	1	32.69644	-117.23409	SW			Unknown	Juvenile	Ebb	HZ	3	moderate
17-Mar-17	16:05:25	MagSi	Pre-	CSL	0	1	32.68606	-117.23207	SW			Female	Adult	Ebb	HZ	2	moderate
17-Mar-17	16:33:40	MagSi	Pre-/Post-	CSL	0	2	32.68668	-117.23244	SW			Unknown	Subadult	Ebb	HZ	2	moderate
17-Mar-17	16:47:45	MagSi	Pre-/Post-	CSL	0	1	32.68778	-117.23246	ML			Male	Adult	Ebb	HZ	2	moderate
17-Mar-17	16:53:57	MagSi	I-PD	CSL	0	1	32.68809	-117.23291	SW		D5-PD-B1	Male	Adult	Ebb	HZ	2	moderate
17-Mar-17	16:58:10	MagSi	I-PD	CSL	0	1	32.68668	-117.23283	SW		D5-PD-B1	Female	Adult	Ebb	HZ	2	moderate
17-Mar-17	16:59:17	P-122	I-PD	CSL	0	1	32.69814	-117.23836	EX		D5-PD-B1	Male	Adult	Ebb	CD	4	moderate
18-Mar-17	10:58:54	BaitBarge	Pre-	CSL	1	0	32.69577	-117.23318	HO			Male	Adult	Flood	F	2	poor
18-Mar-17	10:59:22	MagSi	Pre-	CSL	1	0	32.68202	-117.23160	HO			Unknown	Unknown	Flood	CD	2	poor
18-Mar-17	10:59:58	MagSi	Pre-	CSL	3	0	32.67354	117.23030	HO			Unknown	Unknown	Flood	CD	2	poor
18-Mar-17	11:01:36	BaitBarge	Pre-	CSL	0	1	32.69306	-117.23445	SW			Unknown	Juvenile	Flood	F	2	poor
18-Mar-17	11:04:11	BaitBarge	Pre-	CSL	15	0	32.69472	-117.23619	HO			Mixed	Mixed	Flood	F	2	poor

18-Mar-17	11:05:20	MagSi	Pre-	CSL	0	1	32.68585	-117.23249	SW			Male	Subadult	Flood	CD	2	poor
18-Mar-17	11:06:43	BaitBarge	Pre-	CSL	33	0	32.69435	-117.23540	HO			Mixed	Mixed	Flood	F	2	poor
18-Mar-17	11:07:51	P-122	Pre-	CSL	1	0	32.69826	-117.23863	HO			Male	Adult	Flood	CD	2	moderate
18-Mar-17	11:07:56	BaitBarge	Pre-	CSL	0	1	32.69560	-117.23415	SW			Male	Adult	Flood	F	2	poor
18-Mar-17	11:11:35	MagSi	Pre-	PHS	0	1	32.68673	-117.23273	SW			Unknown	Adult	Flood	CD	2	poor
18-Mar-17	11:54:41	P-122	Pre-	CSL	0	1	32.69636	-117.23598	SW			Male	Adult	Flood	CD	2	moderate
18-Mar-17	12:05:44	BaitBarge	Pre-	CSL	0	1	32.69410	-117.23362	SW			Unknown	Unknown	Flood	HZ	2	moderate
18-Mar-17	12:24:27	November	Pre-/Post-	PHS	0	1	32.70139	-117.23765	ML			Unknown	Adult	Flood	PC	2	good
18-Mar-17	12:24:27	November	Pre-/Post-	PHS	0	1	32.70095	-117.23651	ML			Unknown	Adult	Flood	PC	2	good
18-Mar-17	13:15:01	P-122	Post-	PHS	0	1	32.69817	-117.23879	ML			Unknown	Adult	Flood	CD	2	moderate
20-Mar-17	9:18:43	BaitBarge	Pre-	CSL	0	1	32.69754	-117.23242	SW			Unknown	Adult	Ebb	O	1	good
20-Mar-17	9:19:27	Clipper	Pre-	CSL	1	0	32.69826	-117.23863	HO			Male	Adult	Ebb	CD	0	moderate
20-Mar-17	9:20:33	BaitBarge	Pre-	CSL	0	1	32.69576	-117.23257	RF			Male	Adult	Ebb	O	1	good
20-Mar-17	9:20:52	P-122	Pre-	CSL	1	0	32.69809	-117.23833	HO			Male	Adult	Ebb	O	1	moderate
20-Mar-17	9:21:05	MagSi	Pre-	CSL	2	0	32.69577	-117.23318	HO			Female	Adult	Ebb	O	1	good
20-Mar-17	9:22:06	MagSi	Pre-	CSL	3	0	32.66540	-117.22669	HO			Mixed	Mixed	Ebb	O	1	good
20-Mar-17	9:23:24	MagSi	Pre-	CSL	4	0	32.67354	117.23030	HO			Mixed	Mixed	Ebb	O	1	good
20-Mar-17	9:23:43	BaitBarge	Pre-	CSL	1	0	32.69561	-117.23099	HO			Unknown	Adult	Ebb	O	1	good
20-Mar-17	9:25:31	BaitBarge	Clipping	CSL	2	0	32.69472	-117.23619	HO		SWF55	Mixed	Mixed	Ebb	O	1	good
20-Mar-17	9:26:06	BaitBarge	Pre-	CSL	25	6	32.69435	-117.23540	HO			Mixed	Mixed	Ebb	O	1	good
20-Mar-17	9:26:38	MagSi	Pre-	PHS	3	0	32.67630	-117.23739	HO			Mixed	Adult	Ebb	O	1	good
20-Mar-17	9:33:49	MagSi	Pre-	CSL	0	1	32.69125	-117.23259	DV			Unknown	Adult	Ebb	O	1	good
20-Mar-17	9:39:15	BaitBarge	Pre-	CSL	0	1	32.69068	-117.23449	RF			Unknown	Unknown	Ebb	O	2	good
20-Mar-17	9:45:01	MagSi	Pre-	CSL	0	1	32.68763	-117.23338	DV			Unknown	Juvenile	Ebb	O	1	good
20-Mar-17	9:45:05	MagSi	Pre-	PHS	0	1	32.68787	-117.23310	SW			Unknown	Adult	Ebb	O	1	good
20-Mar-17	10:01:03	MagSi	Pre-/Post-	CBD	0	3	32.69045	-117.22898	SW			Unknown	Adult	Ebb	O	1	good
20-Mar-17	10:19:06	BaitBarge	Pre-/Post-	CSL	0	1	32.69513	-117.23482	SW			Male	Adult	Ebb	O	2	good
20-Mar-17	10:22:09	P-122	Pre-/Post-	CSL	0	1	32.69782	-117.23736	SW			Male	Subadult	Ebb	O	1	moderate
20-Mar-17	10:24:49	P-122	Pre-/Post-	CSL	0	1	32.69798	-117.23811	SW			Male	Adult	Ebb	O	1	good
20-Mar-17	10:37:03	MagSi	Pre-/Post-	CSL	0	1	32.68744	-117.23020	SW			Male	Adult	Ebb	O	1	good
20-Mar-17	11:18:52	November	Post-	CSL	0	1	32.70174	-117.23585	ML			Male	Adult	Flood	CD	2	good
20-Mar-17	11:21:18	P-122	Post-	CSL	0	1	32.69769	-117.23656	SW			Male	Adult	Flood	O	2	good
20-Mar-17	11:23:13	MagSi	Post-	CSL	0	1	32.68649	-117.23044	SW			Male	Adult	Flood	O	2	good
20-Mar-17	11:37:06	MagSi	Post-	CSL	0	1	32.68536	-117.23233	SW			Male	Juvenile	Flood	O	2	good
20-Mar-17	12:48:45	Clipper	Pre-/Post-	CSL	4	0	32.69826	-117.23863	HO			Mixed	Adult	Flood	PC	1	good
20-Mar-17	14:13:45	BaitBarge	Pre-	CSL	4	0	32.69472	-117.23619	HO			Unknown	Mixed	Flood	PC	2	excellent
20-Mar-17	14:14:33	MagSi	Pre-	CSL	2	0	32.68202	-117.23160	HO			Female	Adult	Flood	PC	2	good
20-Mar-17	14:15:25	BaitBarge	Pre-	CSL	17	0	32.69435	-117.23540	HO			Mixed	Mixed	Flood	PC	2	excellent
20-Mar-17	14:19:17	November	Pre-	PHS	0	2	32.70116	-117.23682	ML			Unknown	Mixed	Flood	PC	2	good
20-Mar-17	14:19:35	P-122	Pre-	CSL	1	0	32.69802	-117.23848	HO			Male	Adult	Flood	PC	2	excellent
20-Mar-17	14:44:13	MagSi	Pre-	CSL	0	1	32.68214	-117.22611	SW			Male	Adult	Flood	PC	2	good
20-Mar-17	14:47:28	MagSi	Pre-	CSL	0	1	32.68718	-117.23291	SW			Male	Adult	Flood	PC	2	good
20-Mar-17	15:30:43	MagSi	Pre-/Post-	CSL	0	1	32.68622	-117.23214	DV			Male	Adult	Flood	PC	2	good
20-Mar-17	15:36:57	MagSi	Pre-/Post-	CSL	0	1	32.68658	-117.23237	SW			Female	Adult	Flood	PC	2	good

21-Mar-17	14:58:07	Clipper	Clipping	CSL	16	0	32.69472	-117.23619	HO		Pier54	Mixed	Mixed	Flood	PC	2	good
21-Mar-17	14:58:07	Clipper	Clipping	CSL	5	0	32.69435	-117.23540	HO		Pier54	Mixed	Mixed	Flood	PC	2	good
23-Mar-17	10:46:36	P-122	Pre-	CSL	3	0	32.69826	-117.23863	HO			Mixed	Adult	Ebb	PC	2	good
23-Mar-17	10:46:37	MagSi	Pre-	CSL	2	0	32.68202	-117.23160	HO			Male	Adult	Ebb	CD	2	good
23-Mar-17	10:48:10	MagSi	Pre-	CSL	2	0	32.67354	117.23030	HO			Unknown	Adult	Ebb	CD	2	good
23-Mar-17	10:53:54	November	Pre-	PHS	0	2	32.70285	-117.23556	ML			Mixed	Mixed	Ebb	PC	2	good
23-Mar-17	11:11:04	BaitBarge	Pre-	CSL	26	0	32.69435	-117.23540	HO			Mixed	Mixed	Ebb	C	3	good
23-Mar-17	11:11:54	BaitBarge	Pre-	CSL	2	0	32.69577	-117.23318	HO			Mixed	Adult	Ebb	C	3	good
23-Mar-17	11:12:54	BaitBarge	Pre-	CSL	4	0	32.69472	-117.23619	HO			Mixed	Mixed	Ebb	C	3	good
23-Mar-17	11:25:25	BaitBarge	Pre-	CSL	0	1	32.69590	-117.23519	SW			Male	Subadult	Ebb	C	3	good
23-Mar-17	11:33:26	BaitBarge	Pre-	CSL	0	1	32.69381	-117.23469	SW			Female	Adult	Ebb	C	3	good
23-Mar-17	11:36:30	Sierra	Pre-	PHS	0	1	32.69951	-117.23683	SW			Unknown	Adult	Ebb	PC	3	good
23-Mar-17	11:42:47	MagSi	Pre-	CSL	0	1	32.68698	-117.23142	SW			Unknown	Unknown	Ebb	CD	2	good
23-Mar-17	12:01:27	MagSi	Pre-	PHS	0	2	32.68213	-117.23722	ML			Unknown	Unknown	Ebb	CD	2	good
23-Mar-17	12:04:43	MagSi	Pre-	CSL	0	1	32.68688	-117.23052	SW			Unknown	Adult	Ebb	CD	2	good
23-Mar-17	12:38:50	November	Pre-	CBD	0	2	32.70043	-117.22877	SW			Unknown	Mixed	Ebb	PC	3	good
23-Mar-17	13:14:37	MagSi	Post-	CSL	0	1	32.68609	-117.23179	SW			Unknown	Adult	Ebb	CD	2	good
23-Mar-17	13:15:47	P-122	Post-	PHS	0	3	32.69822	-117.23850	ML			Unknown	Mixed	Ebb	PC	2	good
23-Mar-17	13:16:46	BaitBarge	Post-	CSL	0	1	32.69478	-117.23529	EX			Female	Adult	Ebb	C	3	good
23-Mar-17	13:21:04	MagSi	Post-	PHS	0	1	32.68581	-117.23295	SW			Unknown	Adult	Ebb	CD	2	good
23-Mar-17	15:00:00	P-122	Pre-	CSL	3	0	32.69826	-117.23863	HO	FL		Mixed	Adult	Flood	PC	2	good
23-Mar-17	15:03:41	BaitBarge	Pre-	CSL	27	0	32.69435	-117.23540	HO			Mixed	Mixed	Flood	C	3	good
23-Mar-17	15:06:33	Sierra	Pre-	CSL	0	1	32.69937	-117.23672	SW			Female	Adult	Flood	PC	2	good
23-Mar-17	15:06:44	BaitBarge	Pre-	CSL	3	0	32.69472	-117.23619	HO			Mixed	Mixed	Flood	C	3	good
23-Mar-17	15:30:21	November	Pre-/Post-	CSL	0	2	32.69885	-117.23117	SW			Unknown	Adult	Flood	C	2	good
23-Mar-17	15:31:57	BaitBarge	Post-	CSL	0	1	32.69672	-117.23433	SW			Male	Adult	Flood	C	3	good
23-Mar-17	15:40:56	P-122	Post-	CSL	0	1	32.69826	-117.23836	SW			Male	Adult	Flood	PC	2	good
23-Mar-17	15:43:39	BaitBarge	Post-	CSL	0	1	32.69414	-117.23470	UF			Male	Adult	Flood	C	3	good
23-Mar-17	15:57:51	Sierra	Post-	CSL	0	2	32.69808	-117.23563	SW			Male	Adult	Flood	PC	2	excellent
24-Mar-17	10:39:55	Clipper	Clipping	CSL	18	0	32.69472	-117.23619	HO		Pier52	Mixed	Mixed	Ebb	C	1	moderate
24-Mar-17	10:40:58	Clipper	Clipping	CSL	1	0	32.69435	-117.23540	HO		Pier52	Male	Adult	Ebb	C	1	moderate
24-Mar-17	10:51:43	Clipper	Clipping	CSL	6	0	32.69826	-117.23863	HO		Pier52	Mixed	Mixed	Ebb	C	1	moderate
24-Mar-17	10:55:10	Clipper	Clipping	CSL	0	1	32.69786	-117.23782	ML		Pier52	Female	Adult	Ebb	C	1	moderate
24-Mar-17	11:00:43	Clipper	Clipping	CSL	0	1	32.69951	-117.23654	SW		Pier52	Male	Adult	Ebb	C	1	moderate
24-Mar-17	11:29:23	Clipper	Clipping	CSL	2	0	32.69561	-117.23099	HO		Pier52	Mixed	Mixed	Ebb	C	1	moderate
24-Mar-17	11:30:48	Clipper	Clipping	CSL	1	0	32.69577	-117.23318	HO		Pier52	Unknown	Unknown	Ebb	C	1	moderate
24-Mar-17	11:33:08	Clipper	Clipping	CSL	0	1	32.69944	-117.23435	SW		Pier52	Male	Adult	Ebb	C	1	moderate
24-Mar-17	11:37:10	Clipper	Clipping	CSL	0	1	32.69786	-117.23782	DV		Pier52	Male	Adult	Ebb	C	1	moderate
27-Mar-17	10:09:07	Clipper	Pre-/Post-	PHS	0	2	32.69944	-117.23822	ML			Unknown	Mixed	Ebb	CD	2	moderate
27-Mar-17	11:23:23	Clipper	Pre-/Post-	CSL	0	1	32.69837	-117.23763	SW			Male	Adult	Ebb	CD	2	moderate
27-Mar-17	16:12:04	Clipper	Clipping	CSL	3	0	32.69826	-117.23863	HO		Pier53	Mixed	Mixed	Flood	CD	2	moderate
27-Mar-17	16:12:04	Clipper	Clipping	PHS	1	0	32.69826	-117.23863	HO		Pier53	Unknown	Adult	Flood	CD	2	moderate
27-Mar-17	18:03:48	Command	Jetting	CSL	1	0	32.69577	-117.23318	HO		O-8	Male	Adult	Flood	C	2	moderate
27-Mar-17	18:05:26	Command	Jetting	CSL	3	0	32.69826	-117.23863	HO		O-8	Male	Mixed	Flood	C	2	moderate

27-Mar-17	18:15:10	Command	Jetting	CSL	0	1	32.69825	-117.23590	SW		O-8	Male	Adult	Flood	C	2	moderate
28-Mar-17	9:07:44	Clipper	Clipping	CSL	13	0	32.69472	-117.23619	HO		Pier51	Mixed	Mixed	Flood	HZ	1	moderate
28-Mar-17	9:12:00	Clipper	Clipping	CSL	0	1	32.69653	-117.23718	DV		Pier51	Male	Adult	Flood	HZ	1	moderate
28-Mar-17	9:40:42	Clipper	Pre-/Post-	CSL	0	1	32.69789	-117.23539	DV			Unknown	Unknown	Flood	HZ	2	moderate
28-Mar-17	10:01:48	Clipper	Clipping	PHS	0	2	32.69653	-117.23770	ML		Pier51	Mixed	Mixed	Flood	HZ	1	moderate
28-Mar-17	10:51:36	Clipper	Clipping	CSL	0	1	32.69672	-117.23644	RF		Pier51	Unknown	Unknown	Ebb	HZ	1	moderate
28-Mar-17	10:52:36	Command	Clipping	CSL	0	1	32.69550	-117.23779	SW		Pier51	Unknown	Unknown	Ebb	HZ	2	moderate
28-Mar-17	14:43:05	Command	Jetting	CSL	1	0	32.69826	-117.23863	HO		O-5	Male	Adult	Ebb	HZ	2	moderate
28-Mar-17	15:17:26	Command	Jetting	CSL	2	0	32.69577	-117.23318	HO		O-4	Unknown	Adult	Ebb	HZ	2	moderate
30-Mar-17	7:54:08	Command	Jetting	CSL	2	0	32.69577	-117.23318	HO		O-3	Unknown	Adult	Flood	PC	2	good
30-Mar-17	8:05:15	Command	Jetting	CSL	0	4	32.69886	-117.23300	SW		O-3	Unknown	Mixed	Flood	F	2	poor
30-Mar-17	8:28:14	Command	Pre-/Post-	CSL	0	1	32.70023	-117.23615	SW			Unknown	Subadult	Flood	F	2	bad
30-Mar-17	8:30:10	Command	Pre-/Post-	CSL	0	1	32.70067	-117.23643	SW			Unknown	Juvenile	Flood	F	2	bad
30-Mar-17	9:45:52	Command	Jetting	CSL	0	2	32.69933	-117.23695	SW		O-2	Male	Mixed	Flood	F	2	moderate
30-Mar-17	11:22:22	Command	Pre-/Post-	CSL	0	1	32.69940	-117.23637	SW			Male	Adult	Flood	HZ	4	moderate
31-Mar-17	10:48:05	Clipper	Clipping	CSL	24	0	32.69435	-117.23540	HO		Pier49	Mixed	Mixed	Flood	HZ	1	moderate
31-Mar-17	12:39:00	Clipper	Clipping	PHS	0	2	32.69892	-117.23813	EN		Pier49	Unknown	Mixed	Flood	HZ	1	moderate
03-Apr-17	10:18:10	Clipper	Pre-/Post-	CSL	25	0	32.69435	-117.23540	HO			Mixed	Mixed	Ebb	CD	3	moderate
03-Apr-17	10:39:24	Clipper	Pre-/Post-	CSL	1	0	32.69561	-117.23099	HO			Unknown	Unknown	Flood	CD	3	moderate
03-Apr-17	10:45:25	Clipper	Clipping	CSL	0	1	32.69576	-117.23861	SW		Pier50	Male	Subadult	Flood	CD	3	moderate
03-Apr-17	13:06:00	Sierra	Pre-	CSL	2	0	32.69561	-117.23099	HO			Unknown	Adult	Flood	PC	1	excellent
03-Apr-17	13:13:01	Sierra	Pre-	CSL	17	0	32.69435	-117.23540	HO			Mixed	Mixed	Flood	PC	1	excellent
03-Apr-17	13:20:00	Sierra	Pre-	CBD	0	3	32.69737	-117.23798	SW			Unknown	Mixed	Flood	PC	1	excellent
03-Apr-17	13:32:11	Sierra	Pre-	PHS	0	1	32.70040	-117.23550	SW			Unknown	Adult	Flood	PC	1	excellent
03-Apr-17	13:38:44	P-122	Pre-	PHS	0	1	32.70019	-117.23794	ML			Unknown	Adult	Flood	PC	2	excellent
03-Apr-17	13:42:59	P-122	Pre-	PHS	0	1	32.69844	-117.23869	SW			Unknown	Pup	Flood	PC	2	excellent
03-Apr-17	13:50:02	Clipper	Pre-	CBD	0	3	32.69969	-117.23734	SW			Mixed	Mixed	Flood	CD	3	moderate
03-Apr-17	13:51:00	Sierra	Pre-	CBD	0	3	32.69904	-117.23728	SW			Unknown	Mixed	Flood	PC	1	excellent
03-Apr-17	13:52:09	P-122	Pre-	CBD	0	3	32.69806	-117.23831	SW			Unknown	Mixed	Flood	PC	2	excellent
03-Apr-17	14:00:06	P-122	Pre-	CSL	0	1	32.69870	-117.23885	SW			Male	Adult	Flood	PC	2	excellent
03-Apr-17	14:01:52	Sierra	Pre-	CSL	0	1	32.70018	-117.23544	SW			Female	Adult	Flood	PC	1	excellent
03-Apr-17	14:26:59	Sierra	Pre-	PHS	0	1	32.70026	-117.23580	SW			Unknown	Adult	Flood	PC	1	excellent
03-Apr-17	14:38:50	P-122	I-PD	PHS	0	1	32.69780	-117.23867	ML		O-1	Unknown	Adult	Flood	PC	2	excellent
03-Apr-17	14:49:13	P-122	Post-	CSL	0	1	32.69870	-117.23783	SW			Male	Adult	Flood	PC	2	excellent
03-Apr-17	14:53:28	Command	Post-	CSL	0	1	32.69924	-117.23467	SW			Female	Adult	Flood	CD	3	excellent
03-Apr-17	15:07:54	Sierra	Post-	CSL	0	1	32.69924	-117.23509	SW			Unknown	Adult	Flood	PC	1	excellent
04-Apr-17	7:25:46	Sierra	Pre-	CSL	1	0	32.69577	-117.23318	HO			Unknown	Unknown	Ebb	CD	1	good
04-Apr-17	7:26:22	Sierra	Pre-	CSL	2	0	32.69561	-117.23099	HO			Unknown	Unknown	Ebb	CD	1	good
04-Apr-17	7:30:22	Sierra	Pre-	CSL	15	4	32.69435	-117.23540	HO			Mixed	Mixed	Ebb	CD	1	good
04-Apr-17	7:39:05	P-122	Pre-	CSL	0	1	32.69818	-117.23855	ML			Male	Adult	Ebb	CD	1	excellent
04-Apr-17	7:45:25	P-122	Pre-	CSL	0	12	32.69731	-117.23129	SW			Mixed	Unknown	Ebb	CD	1	excellent
04-Apr-17	7:46:40	Command	Pre-	CSL	0	1	32.70290	-117.23487	SW			Unknown	Unknown	Ebb	CD	2	good
04-Apr-17	7:47:57	P-122	Pre-	CSL	0	1	32.69649	-117.23663	SW			Female	Adult	Ebb	CD	1	excellent
04-Apr-17	7:53:54	Sierra	Pre-	CSL	0	1	32.69974	-117.23492	SW			Male	Subadult	Ebb	CD	1	good

04-Apr-17	7:59:00	Sierra	Pre-	CSL	0	1	32.69670	-117.23407	SW			Male	Subadult	Ebb	CD	1	good
04-Apr-17	8:08:51	Command	Pre-	CSL	0	1	32.69823	-117.23082	SW			Unknown	Unknown	Ebb	CD	2	good
04-Apr-17	8:20:30	Sierra	Pre-/Post-	CSL	0	1	32.69991	-117.23514	SW			Unknown	Unknown	Ebb	CD	1	good
04-Apr-17	8:25:50	Sierra	Pre-/Post-	CSL	0	4	32.69552	-117.23326	RF			Mixed	Unknown	Ebb	CD	1	good
04-Apr-17	8:34:49	Sierra	Pre-/Post-	CSL	0	1	32.70081	-117.23509	SW			Male	Adult	Ebb	CD	1	good
04-Apr-17	8:43:16	Sierra	Pre-/Post-	CSL	0	1	32.69899	-117.23580	SW			Unknown	Unknown	Ebb	HZ	1	excellent
04-Apr-17	8:49:34	Sierra	Pre-/Post-	PHS	0	1	32.70187	-117.23452	SW			Unknown	Unknown	Ebb	HZ	1	excellent
04-Apr-17	8:52:09	Sierra	Pre-/Post-	CSL	0	1	32.69945	-117.23303	SW			Male	Subadult	Ebb	HZ	1	excellent
04-Apr-17	8:57:27	Sierra	Pre-/Post-	CSL	0	4	32.70274	-117.23211	RF			Mixed	Mixed	Ebb	HZ	1	excellent
04-Apr-17	9:00:22	P-122	Pre-/Post-	CSL	0	1	32.69592	-117.23305	SW			Unknown	Adult	Ebb	CD	1	excellent
04-Apr-17	9:03:42	Sierra	Pre-/Post-	CSL	0	1	32.69916	-117.23631	SW			Male	Adult	Ebb	C	1	excellent
04-Apr-17	9:09:15	Sierra	Pre-/Post-	CSL	0	1	32.69955	-117.23141	SW			Male	Subadult	Ebb	C	1	excellent
04-Apr-17	9:22:30	P-122	Pre-/Post-	CSL	0	4	32.69572	-117.23451	SW			Mixed	Mixed	Ebb	CD	1	excellent
04-Apr-17	9:29:26	Sierra	Pre-/Post-	CSL	0	1	32.69924	-117.23571	SW			Male	Adult	Ebb	C	1	excellent
04-Apr-17	9:56:11	P-122	Pre-/Post-	CSL	0	1	32.69853	-117.23797	ML			Female	Adult	Ebb	CD	1	excellent
04-Apr-17	9:58:19	P-122	Pre-/Post-	CSL	0	1	32.69805	-117.23778	SW			Male	Adult	Ebb	CD	1	excellent
04-Apr-17	10:00:15	Sierra	Pre-/Post-	CSL	0	1	32.70229	-117.23172	SW			Male	Adult	Ebb	C	1	excellent
04-Apr-17	10:21:19	Command	I-PD	CSL	0	1	32.70115	-117.23543	SW		O-1	Unknown	Subadult	Ebb	C	3	good
04-Apr-17	10:26:20	Sierra	Pre-/Post-	CSL	0	2	32.70248	-117.23220	SW			Unknown	Unknown	Ebb	C	1	excellent
04-Apr-17	10:29:32	Sierra	Pre-/Post-	CSL	0	1	32.70110	-117.23313	SW			Male	Adult	Ebb	C	1	excellent
04-Apr-17	10:30:42	Command	Pre-/Post-	CSL	0	1	32.69902	-117.23677	SW			Male	Adult	Ebb	C	3	good
04-Apr-17	11:02:21	Sierra	Post-	CSL	0	1	32.69896	-117.23543	SW			Male	Subadult	Ebb	C	1	excellent
05-Apr-17	8:34:54	Sierra	Pre-	CSL	0	3	32.69470	-117.23409	SW			Unknown	Adult	Ebb	C	2	moderate
05-Apr-17	8:38:40	P-122	Pre-	CSL	12	3	32.69580	-117.23518	SW			Mixed	Mixed	Ebb	HZ	1	good
05-Apr-17	8:50:55	Sierra	I-PD	CSL	0	1	32.70030	-117.23303	SW		O-2	Male	Adult	Ebb	C	2	moderate
05-Apr-17	8:55:41	Sierra	Pre-/Post-	CSL	0	1	32.69850	-117.23402	SW			Male	Adult	Ebb	C	2	moderate
05-Apr-17	8:57:31	P-122	Pre-/Post-	CSL	0	1	32.69580	-117.23518	EN			Unknown	Juvenile	Ebb	HZ	1	good
05-Apr-17	9:04:18	P-122	Pre-/Post-	CSL	0	2	32.69580	-117.23518	EX			Male	Adult	Ebb	HZ	1	good
05-Apr-17	9:06:22	Sierra	Pre-/Post-	CSL	0	1	32.69844	-117.23481	SW			Male	Adult	Ebb	C	2	moderate
05-Apr-17	9:12:46	Sierra	Pre-/Post-	CSL	0	2	32.69698	-117.23400	ML			Unknown	Adult	Ebb	C	2	moderate
05-Apr-17	9:40:18	P-122	Pre-/Post-	PHS	0	1	32.69930	-117.23845	SW			Unknown	Adult	Ebb	HZ	1	good
05-Apr-17	9:47:38	P-122	Pre-/Post-	CSL	1	0	32.69561	-117.23099	HO			Unknown	Unknown	Ebb	HZ	1	good
05-Apr-17	9:52:52	Command	Pre-/Post-	PHS	0	1	32.69901	-117.23535	SW			Unknown	Adult	Ebb	HZ	2	moderate
05-Apr-17	10:15:40	P-122	Pre-/Post-	CSL	0	2	32.69486	-117.23543	EN			Unknown	Juvenile	Ebb	HZ	2	good
05-Apr-17	10:34:27	Sierra	Post-	CSL	0	1	32.70005	-117.23406	SW			Male	Adult	Ebb	C	2	moderate
05-Apr-17	10:40:48	P-122	Post-	CSL	0	2	32.69590	-117.23507	EN			Mixed	Mixed	Ebb	HZ	3	good
05-Apr-17	10:48:38	P-122	Post-	CSL	1	0	32.69561	-117.23099	HO			Unknown	Unknown	Ebb	HZ	3	good
05-Apr-17	11:24:20	Sierra	Post-	CSL	0	1	32.69974	-117.23555	SW			Female	Adult	Ebb	C	2	moderate
05-Apr-17	11:25:29	Sierra	Post-	CSL	0	10	32.69564	-117.23418	SW			Unknown	Adult	Ebb	C	2	moderate
05-Apr-17	11:30:35	Sierra	Post-	CSL	0	1	32.69630	-117.23378	ML			Male	Adult	Ebb	C	2	moderate
05-Apr-17	11:33:12	Sierra	Post-	CSL	0	1	32.69748	-117.23458	SW			Male	Adult	Ebb	C	2	moderate
05-Apr-17	12:55:01	P-122	Pre-	CSL	1	0	32.69826	-117.23863	HO			Male	Subadult	Flood	HZ	4	good
05-Apr-17	13:05:41	P-122	Pre-	PHS	0	1	32.69732	-117.23864	SW			Unknown	Adult	Flood	HZ	4	good
05-Apr-17	13:14:05	P-122	Pre-/Post-	CSL	0	1	32.69580	-117.23518	EN			Unknown	Juvenile	Flood	HZ	4	good

05-Apr-17	15:35:48	P-122	I-PD	PHS	0	1	32.69779	-117.23878	EN	FL	O-5	Unknown	Adult	Flood	HZ	1	excellent
05-Apr-17	15:41:12	P-122	Pre-/Post-	CSL	0	1	32.69823	-117.23805	EN			Male	Subadult	Flood	HZ	1	excellent
05-Apr-17	16:14:24	Command	Post-	CSL	0	1	32.69907	-117.23503	SW			Male	Adult	Flood	C	3	good
05-Apr-17	16:14:26	Sierra	Post-	CSL	0	1	32.69787	-117.23485	SW			Male	Adult	Flood	C	2	moderate
06-Apr-17	8:03:52	Clipper	Pre-/Post-	CSL	0	1	32.69849	-117.23450	SW			Male	Adult	Ebb	CD	2	moderate
06-Apr-17	8:11:13	Clipper	Pre-/Post-	CSL	0	1	32.69987	-117.23756	SW			Male	Subadult	Ebb	CD	2	moderate
06-Apr-17	13:17:51	Sierra	Pre-	CSL	2	0	32.69577	-117.23318	HO			Unknown	Mixed	Ebb	PC	2	good
06-Apr-17	13:19:28	P-122	Pre-	PHS	0	1	32.69761	-117.23767	ML			Unknown	Adult	Ebb	PC	4	good
06-Apr-17	13:19:42	Sierra	Pre-	CSL	1	0	32.69561	-117.23099	HO			Male	Adult	Ebb	PC	2	good
06-Apr-17	13:22:23	P-122	Pre-	CSL	8	0	32.69472	-117.23619	HO			Mixed	Mixed	Ebb	PC	4	good
06-Apr-17	13:22:44	Sierra	Pre-	CSL	1	0	32.70621	-117.22619	HO			Unknown	Unknown	Ebb	PC	2	good
06-Apr-17	13:23:35	P-122	Pre-	CSL	12	0	32.69435	-117.23540	HO			Mixed	Mixed	Ebb	PC	4	good
06-Apr-17	13:30:41	P-122	Pre-	CSL	1	0	32.69826	-117.23863	HO			Male	Adult	Flood	PC	3	good
06-Apr-17	13:42:42	P-122	I-PD	CSL	0	1	32.69586	-117.23598	SW		O-4	Unknown	Unknown	Flood	PC	3	good
06-Apr-17	14:28:46	P-122	Pre-/Post-	PHS	0	1	32.69758	-117.23856	ML			Unknown	Adult	Flood	PC	3	good
06-Apr-17	14:48:58	P-122	I-PD	CSL	0	3	32.69735	-117.23584	SW		O-7	Mixed	Mixed	Flood	PC	2	good
06-Apr-17	15:06:18	Sierra	I-PD	CSL	0	1	32.70099	-117.23326	PP		O-7	Unknown	Subadult	Flood	PC	2	good
06-Apr-17	15:28:26	Command	Pre-/Post-	CSL	0	1	32.69884	-117.23595	SW			Female	Adult	Flood	PC	2	good
06-Apr-17	15:55:55	P-122	Pre-/Post-	PHS	0	1	32.69838	-117.23883	EX			Unknown	Adult	Flood	PC	2	good
06-Apr-17	16:10:16	P-122	I-PD	CSL	0	1	32.69856	-117.23873	PP		O-2	Female	Adult	Flood	PC	2	good
06-Apr-17	16:28:40	Sierra	Post-	CSL	0	1	32.69910	-117.23529	DV			Unknown	Unknown	Flood	PC	3	good
10-Apr-17	7:30:16	Clipper	Clipping	CSL	25	0	32.69435	-117.23540	HO		Pier46	Mixed	Mixed	Flood	HZ	2	good
10-Apr-17	7:30:16	Clipper	Clipping	CSL	1	0	32.69826	-117.23863	HO		Pier46	Male	Adult	Flood	HZ	2	good
10-Apr-17	7:30:16	Clipper	Clipping	PHS	0	1	32.69941	-117.23852	ML		Pier46	Unknown	Adult	Flood	HZ	2	good
10-Apr-17	8:28:36	Clipper	Pre-/Post-	CSL	0	1	32.69983	-117.23736	SW			Male	Adult	Flood	HZ	2	good
10-Apr-17	13:03:54	Clipper	Pre-/Post-	CSL	0	1	32.69847	-117.23011	SW			Unknown	Adult	Ebb	C	2	good
11-Apr-17	10:33:17	Command	Pre-/Post-	CSL	0	2	32.69868	-117.23647	SW			Unknown	Subadult	Ebb	C	2	good
11-Apr-17	11:43:09	Clipper	Pre-/Post-	PHS	0	1	32.69968	-117.23740	ML			Unknown	Adult	Ebb	PC	2	good
11-Apr-17	12:56:41	Clipper	Pre-/Post-	CSL	0	1	32.69831	-117.23646	SW			Unknown	Adult	Ebb	PC	2	good
11-Apr-17	13:08:45	Command	Jetting	CSL	8	0	32.69472	-117.23619	HO		I-2	Mixed	Mixed	Ebb	C	3	good
11-Apr-17	13:08:45	Command	Jetting	CSL	10	0	32.69435	-117.23540	HO		I-2	Mixed	Mixed	Ebb	C	3	good
11-Apr-17	13:08:45	Command	Jetting	CSL	3	0	32.69577	-117.23318	HO		I-2	Mixed	Mixed	Ebb	C	2	good
11-Apr-17	13:18:21	Command	Jetting	PHS	1	0	32.69826	-117.23863	HO		I-2	Unknown	Adult	Ebb	C	2	good
11-Apr-17	13:35:38	Command	Jetting	CSL	0	1	32.69887	-117.23870	EN	FL	I-2	Unknown	Unknown	Ebb	C	2	good
11-Apr-17	13:42:50	Command	Jetting	PHS	0	2	32.69887	-117.23870	EX		I-2	Unknown	Adult	Ebb	C	2	good
11-Apr-17	13:52:01	Command	Pre-/Post-	CSL	0	2	32.69942	-117.23717	SW			Male	Adult	Ebb	C	3	good
11-Apr-17	13:56:59	Clipper	Pre-/Post-	CSL	0	1	32.69771	-117.23813	LO			Female	Adult	Ebb	PC	2	good
11-Apr-17	14:03:59	Clipper	Pre-/Post-	CSL	0	4	32.69768	-117.23802	SW			Mixed	Adult	Ebb	PC	2	good
11-Apr-17	15:04:36	Command	Pre-/Post-	CSL	0	1	32.69489	-117.23757	ML			Male	Pup	Ebb	C	3	good
11-Apr-17	15:09:56	Command	Jetting	CSL	0	2	32.69934	-117.23504	ML		I-3	Female	Adult	Ebb	C	3	good
11-Apr-17	15:15:04	Command	Jetting	CSL	0	1	32.70010	-117.23471	SW		I-3	Unknown	Unknown	Ebb	C	3	good
11-Apr-17	15:23:27	Command	Pre-/Post-	CSL	0	1	32.69887	-117.23870	EX			Male	Adult	Ebb	C	3	good
11-Apr-17	15:31:07	Clipper	Jetting	CSL	0	1	32.69916	-117.23696	SW		I-4	Male	Juvenile	Ebb	PC	2	good
11-Apr-17	15:42:57	Command	Jetting	CSL	0	1	32.69953	-117.23538	SW		I-4	Female	Adult	Ebb	C	3	good

11-Apr-17	15:46:15	Clipper	Jetting	UPIN	0	1	32.69980	-117.23713	SW		I-4	Unknown	Unknown	Ebb	PC	2	good
11-Apr-17	15:47:49	Command	Jetting	CSL	0	1	32.69622	-117.23729	SW		I-4	Female	Adult	Ebb	C	2	good
11-Apr-17	16:15:38	Command	Pre-/Post-	PHS	0	1	32.69866	-117.23885	SW			Unknown	Adult	Flood	C	2	good
12-Apr-17	7:33:56	Command	Jetting	CSL	1	0	32.69826	-117.23863	HO	FL	I-5	Female	Adult	Flood	HZ	1	moderate
12-Apr-17	7:35:16	Command	Jetting	CSL	1	0	32.69577	-117.23318	HO		I-5	Unknown	Unknown	Flood	HZ	1	moderate
12-Apr-17	7:36:13	Command	Jetting	CSL	2	0	32.69561	-117.23099	HO		I-5	Mixed	Adult	Flood	HZ	1	moderate
12-Apr-17	7:38:17	Command	Jetting	CSL	2	0	32.70636	-117.22875	HO		I-5	Unknown	Adult	Flood	HZ	1	moderate
12-Apr-17	7:39:57	Command	Jetting	CSL	10	0	32.69435	-117.23540	HO	FL	I-5	Mixed	Mixed	Flood	HZ	1	moderate
12-Apr-17	7:57:02	Clipper	Pre-/Post-	PHS	0	1	32.69912	-117.23817	SW			Unknown	Adult	Flood	HZ	2	good
12-Apr-17	8:34:09	Command	Pre-/Post-	CSL	0	1	32.69810	-117.23515	SW			Male	Adult	Flood	HZ	2	moderate
12-Apr-17	8:57:19	Command	Pre-/Post-	CSL	0	1	32.69944	-117.23461	SW			Male	Subadult	Flood	HZ	2	moderate
12-Apr-17	9:00:51	Command	Pre-/Post-	CSL	0	1	32.70116	-117.23345	SW			Male	Adult	Flood	HZ	2	moderate
12-Apr-17	9:13:33	Command	Pre-/Post-	CSL	0	3	32.69801	-117.23707	SW			Male	Mixed	Flood	HZ	2	moderate
12-Apr-17	13:38:15	Clipper	Pre-/Post-	PHS	1	0	32.69826	-117.23863	HO			Unknown	Adult	Ebb	C	2	good
13-Apr-17	9:03:21	Clipper	Clipping	CSL	7	0	32.69826	-117.23863	HO		Pier42	Mixed	Mixed	Flood	CD	2	moderate
13-Apr-17	9:03:26	Clipper	Clipping	PHS	2	0	32.69826	-117.23863	HO		Pier42	Unknown	Unknown	Flood	CD	2	moderate
13-Apr-17	9:03:33	Clipper	Clipping	CSL	3	0	32.69577	-117.23318	HO		Pier42	Unknown	Unknown	Flood	CD	2	moderate
13-Apr-17	9:03:36	Clipper	Clipping	CSL	25	0	32.69435	-117.23540	HO		Pier42	Mixed	Mixed	Flood	CD	2	moderate
13-Apr-17	9:03:40	Clipper	Clipping	CSL	11	0	32.69472	-117.23619	HO		Pier42	Mixed	Mixed	Flood	CD	2	moderate
13-Apr-17	9:07:02	Clipper	Pre-/Post-	CSL	2	0	32.69561	-117.23099	HO			Unknown	Unknown	Flood	CD	2	moderate
13-Apr-17	10:22:24	P-122	Pre-	CSL	8	0	32.69826	-117.23863	HO			Mixed	Adult	Flood	PC	2	excellent
13-Apr-17	10:28:49	P-122	Pre-	CSL	21	0	32.69435	-117.23540	HO			Mixed	Mixed	Flood	PC	2	excellent
13-Apr-17	10:33:00	P-122	Pre-	CSL	3	0	32.69577	-117.23318	HO			Unknown	Mixed	Flood	PC	2	excellent
13-Apr-17	10:33:03	Sierra	Pre-	CSL	1	0	32.69561	-117.23099	HO			Unknown	Adult	Flood	PC	2	good
13-Apr-17	10:33:03	Sierra	Pre-	CSL	1	0	32.69561	-117.23099	HO			Unknown	Adult	Flood	PC	2	good
13-Apr-17	10:58:17	P-122	Pre-	CSL	0	1	32.69861	-117.23764	SW			Unknown	Adult	Flood	PC	2	excellent
13-Apr-17	12:56:15	Command	Clipping	CSL	0	1	32.69944	-117.23642	LO		Pier43	Female	Adult	Ebb	PC	2	excellent
13-Apr-17	13:00:01	P-122	Pre-/Post-	PHS	1	0	32.69826	-117.23863	HO			Unknown	Adult	Ebb	PC	2	excellent
13-Apr-17	13:01:20	Command	Pre-/Post-	CSL	0	1	32.69788	-117.23393	SW			Unknown	Juvenile	Ebb	PC	2	excellent
13-Apr-17	14:46:27	P-122	Pre-/Post-	PHS	0	1	32.69772	-117.23878	DV			Unknown	Adult	Ebb	PC	2	excellent
14-Apr-17	7:18:14	Sierra	Pre-	CSL	0	2	32.69885	-117.23314	SW			Unknown	Adult	Flood	PC	2	good
14-Apr-17	7:19:14	Sierra	Pre-	CSL	3	0	32.69561	-117.23099	HO			Mixed	Mixed	Flood	PC	2	good
14-Apr-17	7:24:12	Sierra	Pre-	CSL	0	1	32.69957	-117.23568	SW			Female	Adult	Flood	PC	2	good
14-Apr-17	7:26:07	P-122	Pre-	CSL	0	1	32.69785	-117.23553	SW			Unknown	Adult	Flood	CD	2	good
14-Apr-17	7:27:35	Sierra	Pre-	CSL	2	0	32.69577	-117.23318	HO			Unknown	Adult	Flood	PC	2	good
14-Apr-17	7:29:44	P-122	Pre-	CSL	0	1	32.69832	-117.23777	SW			Male	Adult	Flood	CD	2	good
14-Apr-17	7:29:46	Sierra	Pre-	CSL	0	1	32.69857	-117.23495	ML			Female	Adult	Flood	PC	2	good
14-Apr-17	7:33:36	P-122	Shutdown	CSL	0	1	32.69825	-117.23832	EX	FL		Female	Adult	Flood	CD	2	good
14-Apr-17	8:08:34	Sierra	Pre-/Post-	CSL	0	1	32.69786	-117.23389	SW			Male	Adult	Flood	PC	2	good
14-Apr-17	8:36:55	Sierra	Pre-/Post-	CSL	1	0	32.70177	-117.22927	HO			N/A	Adult	Flood	PC	2	good
14-Apr-17	8:48:46	Sierra	Pre-/Post-	CSL	0	1	32.69953	-117.23601	SW			Female	Adult	Flood	PC	2	good
14-Apr-17	9:15:27	Sierra	Pre-/Post-	CSL	0	1	32.69575	-117.23340	ML			Unknown	Subadult	Flood	PC	2	good
14-Apr-17	10:31:00	Clipper	Clipping	CSL	0	1	32.69899	-117.23453	SW		SWF39	Male	Adult	Flood	PC	2	good
14-Apr-17	11:28:44	Sierra	Pre-/Post-	CSL	0	1	32.69926	-117.23702	SW			Male	Adult	Flood	PC	2	good

14-Apr-17	12:03:24	P-122	I-PD	PHS	0	1	32.69809	-117.23838	ML		I-1	Unknown	Adult	Flood	C	2	good
14-Apr-17	12:21:45	P-122	Post-	CSL	0	1	32.69947	-117.23777	SW			Male	Adult	Ebb	HZ	3	good
17-Apr-17	11:39:16	Clipper	Clipping	CSL	13	0	32.69435	-117.23540	HO		Pier40	Mixed	Mixed	Flood	HZ	2	moderate
17-Apr-17	13:30:11	Clipper	Pre-/Post-	CSL	0	1	32.69834	-117.23860	EX			Male	Adult	Flood	HZ	3	moderate
17-Apr-17	13:37:56	Clipper	Pre-/Post-	PHS	0	1	32.69894	-117.23703	ML			Unknown	Adult	Flood	HZ	3	moderate
17-Apr-17	13:49:10	Clipper	Pre-/Post-	PHS	0	1	32.69834	-117.23860	EX			Unknown	Adult	Flood	HZ	3	moderate
17-Apr-17	14:13:08	Clipper	Pre-/Post-	CSL	3	0	32.69577	-117.23318	HO			Unknown	Unknown	Flood	HZ	3	moderate
17-Apr-17	14:18:14	Clipper	Pre-/Post-	CSL	1	0	32.69561	-117.23099	HO			Unknown	Unknown	Flood	HZ	3	moderate
18-Apr-17	13:58:11	Clipper	Clipping	CSL	21	0	32.69435	-117.23540	HO		Pier39	Mixed	Mixed	Flood	PC	3	moderate
18-Apr-17	14:01:07	Clipper	Pre-/Post-	PHS	1	0	32.69826	-117.23863	HO			Unknown	Adult	Flood	PC	3	moderate
18-Apr-17	14:05:29	Clipper	Pre-/Post-	CSL	3	0	32.69577	-117.23318	HO			Mixed	Mixed	Flood	PC	3	moderate
19-Apr-17	9:17:48	Clipper	Clipping	CSL	1	0	32.69826	-117.23863	HO		Pier39	Male	Adult	Ebb	CD	1	good
19-Apr-17	9:27:55	Clipper	Pre-/Post-	CBD	0	6	32.69798	-117.23228	SW			Unknown	Adult	Ebb	CD	1	good
20-Apr-17	11:01:05	Clipper	Pre-/Post-	CSL	1	0	32.69826	-117.23863	HO			Female	Adult	Ebb	C	2	good
20-Apr-17	11:45:23	Clipper	Pre-/Post-	CSL	0	1	32.69773	-117.23788	RF			Male	Adult	Ebb	C	2	good
20-Apr-17	11:46:17	Clipper	Pre-/Post-	PHS	0	1	32.69841	-117.23751	ML			Unknown	Adult	Ebb	C	2	good
21-Apr-17	8:49:29	Clipper	Pre-/Post-	PHS	0	1	32.69951	-117.23752	LO			Unknown	Adult	Ebb	HZ	2	good
27-Apr-17	7:45:53	Clipper	Pre-/Post-	CSL	0	1	32.69843	-117.23716	SW			Male	Adult	Flood	CD	2	moderate

Appendix G: Construction Shutdowns Due to Marine Mammals

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Date	Species Information		Shutdown Information			Delay?	Shutdown?	Notes
	Type	No. of Individuals	Start Time	End Time	Total Time			
27-Oct-2016	California sea lion	1	13:55:19	13:57:21	0:02:02	X		California sea lion approached ZOI from South in-between hammer blows. Went under new pier just outside of the shutdown ZOI. Could not verify if it was outside ZOI after it went under the pier. Observed near saltwater dock at 1357. Green flag raised and PD resumed.
01-Feb-2017	California sea lion	1	14:53:58	14:58:51	0:04:53	X		Male California sea lion sighted by November, passed to P-122. P-122 was unsure of location because it dove, called shutdown to be conservative. Confirmed as outside of ZOI by P-122 and Sierra.
28-Feb-2017	California sea lion	1	15:26:30	15:27:40	0:01:10	X		Adult male California sea lion approached from north. Last observed 20 m (66 ft) from pile during pre/post. Delay called when it dove at 20 m (66 ft) from pile. Last observed approximately 100 m (328 ft) south of crane barge.
06-Mar-2017	Coastal bottlenose dolphin	2	10:52:01	10:56:58	0:04:57	X		2 Coastal bottlenose dolphins swam into ZOI from north during a pre/post. Delayed construction from 1052 until 1057 after they had changed heading 180 degrees to head back north.
08-Mar-2017	California sea lion	1	10:02:13	10:04:55	0:02:42	X		Delay during pre/post. Subadult female California sea lion first observed by Command. Entered the ZOI from south, heading north. Observed at 1004 by Sierra as it left the ZOI heading north.
10-Mar-2017	California sea lion	1	11:31:12	11:35:23	0:04:11	X		Juvenile California sea lion heading south along outside of docked ship during pre-con. Crew just about to start driving. First observed by November, then Sierra, then Command. Kept swimming towards Bait Barges. Green flag at 11:35

Date	Species Information		Shutdown Information			Delay?	Shutdown?	Notes
	Type	No. of Individuals	Start Time	End Time	Total Time			
16-Mar-2017	California sea lion	2	14:33:20	14:36:17	0:02:57	X		2 California sea lions, first observed by P-122 heading north, then by Sierra in-between old pier and new pier. Shutdown called by P-122. Went under the trestle and was observed by November heading north. Dove under P-160c and was not observed again. Confirmed as outside of the ZOI.
16-Mar-2017	California sea lion	1	14:44:03	14:45:46	0:01:43		X	Subadult female CSL heading south. First observed by Sierra in-between old pier and new pier to the south of the trestle. Shutdown called by Sierra. Was likely inside the 150m shutdown ZOI during ISS, but not observed until it was app 70-80 m (230-262 ft) from the pile in-between impact soft start hits. Continued south, and was observed by Command approximately 120 m (394 ft) from the pile. Called clear of the 150 m (492 ft) shutdown ZOI by P-122. It then went to the bait barge but was lost in the animals at the bait barge. Notes from MMOs indicate that there were no observable behavioral changes during the observations.
16-Mar-2017	California sea lion	2	14:50:32	14:54:10	0:03:38		X	2 California sea lions heading south app 100 m (328 ft) east of pier. First observed by November, then Sierra. Shutdown called by Command as the animals entered to shutdown ZOI from the north. Animals continued south and were last observed heading towards the bait barge.
18-Mar-2017	Harbor seal	2	12:27:10	12:47:01	0:19:51	X		2 Harbor seals initially called out by November passing under the trestle traveling South. 1 of the 2 Harbor seal observed by Sierra app 5 m (16 ft) from east side of the old pier, about halfway down the pier, during pre-/post. The individual dove at 1232 and not observed again. 2nd PHS not seen inside the shutdown ZOI. Waited 15 min to 1247 before giving PD green flag. Crew ready to drive at approximately 1245.

Date	Species Information		Shutdown Information			Delay?	Shutdown?	Notes
	Type	No. of Individuals	Start Time	End Time	Total Time			
14-Apr-2017	California sea lion	1	7:30:40	7:46:40	0:16:00	X		Male California sea lion called by P-122 MMO as it entered the shutdown ZOI from the west. Last observed at 0731 as it dove under the barge towards the piles from the west. Did not see it surface outside of ZOI…Waited full 15 until 0746 to give green flag.
	Total	**15**			**01:04:04**	**9**	**2**	

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