

# 2018 Annual Biological Monitoring and Mitigation Compliance Report

Chevron Long Wharf Maintenance and Efficiency Project

Chevron Products Company

January 11, 2019

Prepared for:

Chevron Products Company  
Richmond Refinery  
841 Chevron Way  
Richmond, CA 94801

Prepared by:

AECOM  
300 Lakeside Drive  
Suite 400  
Oakland  
CA 94612  
aecom.com

## Table of Contents

1.	Introduction .....	1
2.	Project Area.....	1
3.	Methods .....	1
3.1	Marine Mammal and Fish Monitoring.....	1
3.1.1	Pre-Project Baseline Biological Survey.....	1
3.1.2	Worker Education Program.....	1
3.1.3	Monitoring During Pile-Driving Activities .....	3
3.1.3.1	Hydroacoustic Monitoring .....	3
4.	Results .....	3
4.1	Marine Mammal and Fish Monitoring.....	3
4.1.1	Marine Mammals Observed.....	6
4.1.2	Pile-Driving Shutdowns .....	8
4.1.3	Hydroacoustic Monitoring.....	8
4.1.3.1	Hydroacoustic Measurements Relative to Fish Thresholds .....	8
4.1.3.2	Hydroacoustic Measurements Relative to Marine Mammal Thresholds .....	9
5.	Discussion.....	11

## Appendices

Appendix A CDFW ITP MMRP Table
Appendix B Site Photographs
Appendix C Marine Mammal Monitoring Daily Field Datasheets
Appendix D Hydroacoustic Monitoring Reports
Appendix E Worker Environmental Awareness Training Brochure
Appendix F Training Attendance Record

## Figures

Figure 1. Project Location .....	2
Figure 2. Vibratory Pile Driving Shutdown Zones .....	4
Figure 3. Impact Pile Driving Shutdown and Monitoring Zones.....	5

## Tables

Table 1. Summary of 2018 Monitored Covered Activities .....	6
Table 2. Predicted Underwater Pile Driving Noise Levels and Distances of Threshold Exceedance with Impact and Vibratory Driver.....	7
Table 3. Observed Level B Take Events .....	7
Table 4. Summary of 2018 Level A and Level B Take Events.....	8
Table 5. Distances (meters) to the NMFS Cumulative SEL Thresholds for Fish (dB re: 1 $\mu$ Pa-sec <sup>2</sup> ) .....	9
Table 6. Underwater Noise Injury and Behavioral Disturbance Thresholds for Marine Mammals .....	10
Table 7. Actual Distances (meters) to the NMFS Harassment Thresholds for Marine Mammals (dB re: 1 $\mu$ Pa-sec <sup>2</sup> ).....	11

## Acronyms and Abbreviations

$\mu\text{Pa-sec}^2$	micropascals per second squared
A.P.E.	American Piledriving Equipment
BO	Biological Opinion
CDFW	California Department of Fish and Wildlife
cSEL	cumulative sound exposure level
dB	decibels
FHWG	Fisheries Hydroacoustic Working Group
ft-lbs	foot per pound
HASE	Harbor seals
ID	identification
IHA	Incidental Harassment Authorization
ITP	Incidental Take Permit
MMMP	Marine Mammal Monitoring Plan
MMOs	marine mammal observers
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
Project	Chevron Long Wharf Maintenance and Efficiency Project
PTS	permanent threshold shift
RMS	root mean square
SEL	sound exposure level

# 1. Introduction

The Chevron Long Wharf Maintenance and Efficiency Project (Project) includes multiple construction components within and above the water to bring the Long Wharf (Berths 1 through 4) into compliance with Marine Oil Terminal Engineering and Maintenance Standards and to improve the overall operational efficiency. Monitored project construction activities (Covered Activities) occurred between June 4 and July 29, 2018. Covered Activities during the 2018 monitoring period occurred at Berth 2 only.

This 2018 Annual Monitoring and Mitigation Compliance Report is being submitted to the California Department of Fish and Wildlife in accordance with Condition #6.8 in the Project Incidental Take Permit (ITP) No. 2081-2016-056-07, and to the National Marine Fisheries Service in accordance with the Project Biological Opinion (BO) issued April 4, 2017 (WCR-2015-1997) and Incidental Harassment Authorization (IHA) issued May 31, 2018.

## 2. Project Area

The Project is located at the Chevron Products Company Richmond Refinery Long Wharf within the City of Richmond, Contra Costa County (Figure 1). The Project Area is approximately 0.75 miles south of the eastern side of the Richmond-San Rafael Bridge.

## 3. Methods

### 3.1 Marine Mammal and Fish Monitoring

Marine mammal and fish monitoring efforts consisted of a pre-project baseline survey, a worker education program, and monitoring during all vibratory and impact pile driving activities.

#### 3.1.1 Pre-Project Baseline Biological Survey

A pre-Project baseline biological survey was conducted by one Project biologist on June 1, 2018, three days prior to the start of work on June 4, 2018. No marine mammals or fish were observed during the baseline survey of the Project Area. The survey was conducted from 0730-1130, and low tide occurred at 0841. Weather conditions were clear. The Project Area was free of visual obstructions, as the Project materials and crane barges had not yet arrived (see Appendix B, Photograph 1). Surrounding work activity at the neighboring berths and Long Wharf in general was minimal.

#### 3.1.2 Worker Education Program

Worker education programs were given on May 14 and May 24, 2018 to all persons employed or otherwise working in the Project Area before performing any work. The Project biologist discussed the biology and general behavior of the Covered Species. Information about the distribution and habitat needs of the Covered Species, sensitivity of the Covered Species to human activities, Covered Species legal protection, recovery efforts, and penalties for violations were also discussed. A brochure containing this information was provided to all site workers (Appendix E). All trained site workers signed a form stating they attended the program and understand all protection measures (Appendix F). The signature forms and a copy of the Permit were kept on-site in a construction monitoring notebook for the duration of construction.



Figure 1. Project Location

### 3.1.3 Monitoring During Pile-Driving Activities

Two qualified, National Marine Fisheries Service (NMFS)-approved marine mammal observers (MMOs) were on-site daily, for a total of 14 days in 2018. In addition to monitoring for marine mammals, MMOs also monitored for any dead or incapacitated fish. In accordance with the Project Marine Mammal Monitoring Plan (MMMP)<sup>1</sup>, monitoring during each pile-driving event started at least 30 minutes prior to pile-driving (or removal) initiation and ended at least 15 minutes after such work was completed for the day, or when there was a pause in the work of two hours or more (Monitoring Period). The MMOs were stationed at fixed monitoring locations that afforded the best view of the Project Area and adjacent waters, and adjusted these locations during barge positioning to ensure unobstructed views (Figures 2 and 3). MMOs used rangefinders to identify shutdown zones and estimate distances using fixed landmarks, and used binoculars to continuously scan the monitoring zone for marine mammals and fish. Cell phones were used to communicate among the MMOs, construction team, and hydroacoustic monitoring team. Data sheets summarizing environmental conditions, pile-driving activities, and observations of Covered Species were prepared daily (Appendix C).

#### 3.1.3.1 Hydroacoustic Monitoring

For all of the monitoring events, three hydrophones were deployed to collect the data needed to calculate the attenuation rate and the distances to the various criteria. One hydrophone was placed approximately 10-15 meters from the pile, a second was placed at 50-60 meters, and a third hydrophone was placed at 260-280 meters. Hydrophones were placed at mid depth in the water column: approximately 7 meters deep for both the 12-15-meter and 50-60-meter locations. The hydrophone at 260-280 meters was placed at a depth of about 1.5 meters due to shallow water conditions further from the wharf<sup>2</sup>. At the location of the piles, water depth was approximately 12 meters.

## 4. Results

### 4.1 Marine Mammal and Fish Monitoring

Conditions during observation periods were variable but generally favorable for marine mammal observations, with no fog present and average wind speeds generally ranging from 1-10 miles per hour. There were a few occurrences of higher winds with associated choppy water conditions.

Harbor seals (HASE) were the only marine mammal species observed during the Monitoring Period. A majority of the seals were observed on the mainland side of the wharf, north-northeast of the Project Area, typically 200-400 feet from the Project Area. Seals were rarely seen on the open Bay side, west of the Wharf surrounding the crane and materials barges. No fish were observed during the monitoring period.

June pile-driving and associated activities were conducted from June 4 through June 6, and from June 8 through June 12, 2018 (Table 1). A total of four 24-inch concrete piles were driven with an impact hammer, and a total of 18 steel H-piles were driven with a vibratory hammer. No pile-driving occurred on June 7, therefore no biological monitoring was conducted that day.

July pile-driving and associated activities were conducted from July 22 through July 29, 2018 (Table 1). A total of four 24-inch concrete piles were driven with an impact hammer, and a total of 18 steel H-piles were driven with a vibratory hammer. No pile-driving occurred on July 24 or July 28, therefore no biological monitoring was conducted on those days.

<sup>1</sup> AECOM (2018). Marine Mammal Monitoring Plan, Chevron Richmond Refinery Long Wharf Maintenance and Efficiency Project. June 2018. 55 pp.

<sup>2</sup> The area surrounding the Long Wharf is periodically dredged to accommodate the ships berthing at the wharf, thus the area at 260-280 meters was shallower than locations closer in.



Figure 2. Vibratory Pile Driving Shutdown Zones

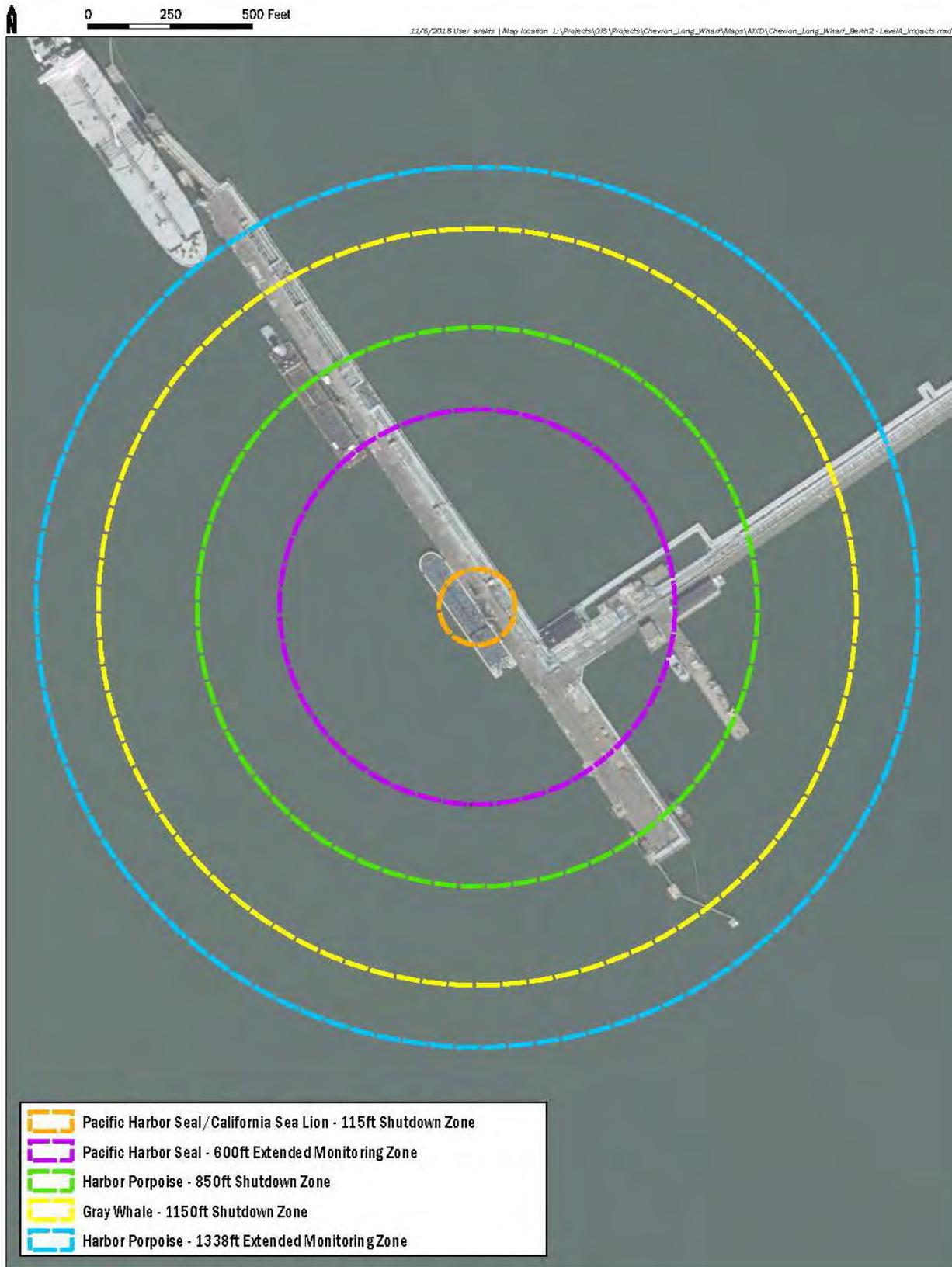


Figure 3. Impact Pile Driving Shutdown and Monitoring Zones

**Table 1. Summary of 2018 Monitored Covered Activities**

Date	Covered Activities
6/4/2018	<ul style="list-style-type: none"> <li>• Mobilized barges into Berth 2</li> <li>• Performed probing of four concrete pile locations to check for obstructions</li> <li>• Installed template and bubble curtain prior to driving the first concrete pile</li> <li>• First concrete pile driven (impact)</li> </ul>
6/5/2018	<ul style="list-style-type: none"> <li>• Installed template and bubble curtain prior to driving the second and third concrete pile</li> <li>• Drove second and third concrete pile (impact)</li> <li>• Removed timber piles (pulled without vibration)</li> </ul>
6/6/2018	<ul style="list-style-type: none"> <li>• Installed template and bubble curtain prior to fourth and final concrete pile</li> <li>• Drove fourth concrete pile (impact)</li> <li>• Performed hydroacoustic monitoring during impact hammer use on concrete pile</li> <li>• Continued removing timber piles (pulled without vibration)</li> </ul>
6/8/2018	<ul style="list-style-type: none"> <li>• Re-tapped the four concrete piles</li> <li>• Mobilized materials barge</li> <li>• Completed removal of timber piles (pulled without vibration)</li> </ul>
6/9/2018	<ul style="list-style-type: none"> <li>• Mobilized crane barge</li> <li>• Performed probing of steel pile locations to check for obstructions</li> <li>• One steel pile driven (vibratory)</li> </ul>
6/10/2018	<ul style="list-style-type: none"> <li>• Four steel piles driven (vibratory)</li> </ul>
6/11/2018	<ul style="list-style-type: none"> <li>• Mobilized crane barge</li> <li>• Performed hydroacoustic monitoring during vibratory hammer use on steel piles</li> <li>• Four steel piles driven (vibratory)</li> </ul>
6/12/2018	<ul style="list-style-type: none"> <li>• Nine steel piles driven (vibratory), completed pile-driving for June 2018 project activity period</li> </ul>
7/22/2018	<ul style="list-style-type: none"> <li>• Installed template and bubble curtain prior to driving</li> <li>• Two concrete piles driven (impact)</li> <li>• Performed hydroacoustic monitoring during impact hammer use</li> </ul>
7/23/2018	<ul style="list-style-type: none"> <li>• Installed template and bubble curtain prior to driving</li> <li>• Two concrete piles driven (impact)</li> <li>• Performed hydroacoustic monitoring during impact hammer use</li> </ul>
7/25/2018	<ul style="list-style-type: none"> <li>• Probed pile locations</li> <li>• Two steel piles driven (vibratory)</li> </ul>
7/26/2018	<ul style="list-style-type: none"> <li>• Four steel piles driven (vibratory)</li> </ul>
7/27/2018	<ul style="list-style-type: none"> <li>• Four steel piles driven (vibratory)</li> </ul>
7/29/2018	<ul style="list-style-type: none"> <li>• Eight steel piles driven (vibratory), completed pile-driving for July 2018 project activity period</li> </ul>

### 4.1.1 Marine Mammals Observed

No animals observed during the Monitoring Period (30 minutes prior to pile-driving, during pile-driving, and a minimum of 15 minutes after pile-driving) demonstrated signs of behavioral changes or distress as a result of pile-driving activities. Each individual animal observed within the predicted Level A or B zones (as reported in the IHA) during the Monitoring Period was treated as a take event. Multiple sightings of an individual animal were recorded as one observation, provided the animal could be tracked or otherwise individually identified. Table 2 provides a summary of the predicted distances of Level A and Level B threshold exceedance, as presented in the IHA.

**Table 2. Predicted Underwater Pile Driving Noise Levels and Distances of Threshold Exceedance with Impact and Vibratory Driver**

Pile Type	Source Levels at 10 meters (dB)		Distance to Threshold 160/120 dB RMS (Level B)* meters (feet)	Distance to Cumulative SEL Threshold for Pinnipeds (Level A) meters (feet)
	Peak	RMS		
<b>Impact Driving</b>				
24-inch square concrete (1-2 per day)	188	176	117 (382)	28 (92)
<b>Vibratory Driving/Extraction</b>				
14-inch steel H pile (4 per day)	180	170	21,544 (70,665)	14 (46)
Notes: dB - decibels RMS - root mean square *160 dB RMS applied to impulse noise such as impact driving and 120 dB RMS applies for continuous noise such as vibratory driving.				

A summary of take recorded by the MMOs during the Monitoring Period is provided in the Table 3 and Table 4. There were no Level A harassments/takes or any other indicators of marine mammal injuries observed during the Monitoring Period. A total of 24 Level B harassments for harbor seal were recorded, less than 1% of the allowed amount. The greatest number of harbor seal Level B harassments occurred on June 12 and July 26, during vibratory pile-driving.

**Table 3. Observed Level B Take Events**

Date	Species	Total Observed	Estimated Distance Range (m)	Pile-Driving (# piles)
6/5/2018	HASE	1	125	Impact (2)
6/6/2018	HASE	1	60	Impact (1)
6/9/2018	HASE	1	125	Vibratory (1)
6/10/2018	HASE	2	60-125	Vibratory (4)
6/11/2018	HASE	2	30	Vibratory (4)
6/12/2018	HASE	6	50-155	Vibratory (9)
7/22/2018	HASE	2	60-185	Impact (2)
7/23/2018	HASE	2	60-305	Impact (2)
7/25/2018	HASE	2	60	Vibratory (2)
7/26/2018	HASE	5	30-125	Vibratory (4)
<b>TOTAL</b>		<b>24</b>		
Notes: HASE - Harbor seals m - meters				

**Table 4. Summary of 2018 Level A and Level B Take Events**

Species	Level A		Level B	
	Authorized	Recorded	Authorized	Recorded
Harbor seal (HASE)	40	0	6,977	25

### 4.1.2 Pile-Driving Shutdowns

No marine mammals were observed within the mandatory shutdown zone for active vibratory or impact pile-driving and other in-water work when such work was occurring, or during the pre- and post-activity monitoring periods. As such, Project work was not postponed or halted for purposes of take avoidance prior to or during pile-driving activities. No fish were observed to be injured or killed during the Monitoring Period.

### 4.1.3 Hydroacoustic Monitoring

Hydroacoustic monitoring of impact driven concrete piles while using a bubble curtain was conducted on June 6, July 22 and July 23. A total of five concrete piles were monitored during this time period. Hydroacoustic monitoring of two vibratory driven 14" steel H piles was conducted on June 11. The results of this monitoring are summarized below, and the full hydroacoustic monitoring reports are provided in Appendix D. Pile behavior and engineering analysis indicates that only soft substrates were encountered, with the pile tip penetrating stiff clay or sand towards the end of driving.

The hydrophone placed at 260-280 meters detected background noise levels of approximately 110 to 120 decibels (dB) root mean square (RMS). For impact driving, the blow count to install each pile was between 70 and 200 blows (details provided in Appendix D) using an American Piledriving Equipment (A.P.E.) D70-52 impact hammer (maximum energy of 114,605 foot per pound [ft-lbs]). For vibratory driving, the total drive time for each pile was 10 minutes or less using a A.P.E. Model 200 vibratory driver.

The attenuation rate measured in the field for both vibratory and impact driving was 20 log, which is greater than the conservative value of 15 log used to predict the distances to the thresholds in the permit applications. This greater attenuation rate causes the distances over which thresholds may be exceeded to shrink considerably, as described in the following subsections.

#### 4.1.3.1 Hydroacoustic Measurements Relative to Fish Thresholds

On July 8, 2008, the Fisheries Hydroacoustic Working Group (FHWG), whose members include NMFS' Southwest and Northwest Divisions; California, Washington, and Oregon departments of transportation; the California Department of Fish and Wildlife (CDFW); and the U.S. Federal Highway Administration issued an agreement for the establishment of interim threshold criteria to determine the effects of high-intensity sound on fish. While these criteria are not formal regulatory standards, they are generally accepted as viable criteria for underwater noise effects on fish. These criteria were established after extensive review of the most recent analysis of the effect of underwater noise on fish. The agreed-upon threshold criteria for impulse-type noise to harm fish have been set at 206 dB peak, 187 dB accumulated sound exposure level (SEL) for fish over 2 grams, and 183 dB for fish less than 2 grams.

Underwater noise levels during impact and vibratory driving did not approach the 206 peak dB criteria, but impact driving exceeded the 183 and 187 dB Cumulative SEL thresholds over short distances. These measured distances are less than the distances over which thresholds were anticipated to have been exceeded in the biological assessment (BA and ITP). Table 5 provides a summary of the actual and predicted distances to the underwater noise thresholds for fish.

**Table 5. Distances (meters) to the NMFS Cumulative SEL Thresholds for Fish (dB re: 1 $\mu$ Pa-sec<sup>2</sup>)**

Day	Installation Method	Pile IDs	Distance to 187 dB Cumulative SEL Actual (Predicted)	Distance to 183 dB Cumulative SEL Actual (Predicted)
6/6	Impact w. Bubble Curtain	24" Concrete Pile #4	Less than 10 meters (11 meters)	Less than 10 meters (21 meters)
6/11	Vibratory Hammer	14" Steel H Pile #6 14" Steel H Pile #7	NA	NA
7/22	Impact w. Bubble Curtain	24" Concrete Pile #1 24" Concrete Pile #2	Less than 10 meters (11 meters)	11 meters (21 meters)
7/23	Impact w. Bubble Curtain	24" Concrete Pile #3 24" Concrete Pile #4	Less than 10 meters (11 meters)	12 meters (21 meters)
$\mu$ Pa-sec <sup>2</sup> = micropascals per second squared dB = decibel ID = identification NA = Cumulative SEL Thresholds are only applicable for impulsive noise (i.e.) impact pile driving. NMFS = National Marine Fisheries Service SEL = Sound exposure level				

#### 4.1.3.2 Hydroacoustic Measurements Relative to Marine Mammal Thresholds

In 2010, NMFS established interim thresholds regarding the exposure of marine mammals to high-intensity noise that may be considered take under the MMPA. Updated National Oceanic and Atmospheric Administration (NOAA) guidance on assessing the effects of underwater noise on marine mammals for agency impact analysis was adopted in 2016<sup>3</sup>. The 2016 guidance includes sound thresholds for slight injury to an animal's hearing, or permanent threshold shift (PTS) (Level A Harassment). The underwater sound pressure threshold for slight injury or PTS (Level A harassment) is a dual metric criterion for impulse noise (e.g., impact pile-driving), including both a peak pressure and cumulative sound exposure level (cSEL) threshold, which is specific to the species hearing group (i.e., high-frequency cetaceans [i.e., harbor porpoise], mid-frequency cetaceans [i.e., bottlenose dolphin], low-frequency cetacean [i.e., gray whale], phocids [i.e., Pacific harbor seal and northern elephant seal], and otariids [i.e., California sea lion and northern fur seal]). For continuous noise (e.g., vibratory pile extraction or driving), the PTS threshold is based on cSEL for each species hearing group.

The 2010 thresholds for Level B behavioral harassment levels are still applicable: 160 dB RMS for impulse sounds and 120 dB for nonimpulsive or continuous sounds. Level B Behavioral harassment is considered to have occurred when marine mammals are exposed to noise of 160 dB RMS or greater for impulse noise and 120 dB RMS for continuous noise. In some instances, ambient noise levels may be used in place of the 120 dB RMS threshold for continuous noise. For continuous noise, RMS levels are based on a time constant of 10 seconds, and those RMS levels should be averaged across the entire event. For impact pile-driving, the overall RMS level should be characterized by integrating sound energy for each acoustic pulse across 90 percent of the acoustic energy in each pulse, and averaging all the RMS levels for all pulses. Harassment thresholds for the various types of underwater noise are shown in Table 6.

<sup>3</sup> 2016 Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing.

**Table 6. Underwater Noise Injury and Behavioral Disturbance Thresholds for Marine Mammals**

Hearing Group and species considered	Underwater Continuous Noise Thresholds (e.g., Vibratory Pile-Driving)		Underwater Impulse Noise Thresholds (e.g., Impact Pile-Driving)		
	Level A cSEL Threshold	Level B RMS Threshold	Level A Peak Threshold <sup>2</sup>	Level A cSEL Threshold <sup>2</sup>	Level B RMS Threshold
Phocids (Pacific harbor seals, northern elephant seals)	201 dB	120 dB	218 dB	185 dB	160 dB
Otariids (California sea lions, northern fur seals)	219 dB	120 dB	232 dB	203 dB	160 dB
Low-Frequency Cetaceans (gray whales)	199 dB	120 dB	219 dB	183 dB	160 dB
Mid-Frequency Cetaceans (bottlenose dolphins)	198 dB	120 dB	230 dB	185 dB	160 dB
High-Frequency Cetaceans (harbor porpoises)	173 dB	120 dB	202 dB	155 dB	160 dB

Notes:  
<sup>1</sup> The airborne disturbance guideline applies to hauled-out pinnipeds.  
<sup>2</sup> Level A threshold for impulse noise is a dual criterion based on peak pressure and cSEL. Thresholds are based on the NMFS 2016 Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing.  
 μPa-sec<sup>2</sup> = micropascals per second squared  
 cSEL = cumulative sound exposure level  
 dB = decibel  
 N/A = Not applicable, no thresholds exist  
 NMFS = National Marine Fisheries Service  
 RMS = root mean square

Underwater peak and RMS are re: 1 μPa; cSEL is re: 1 μPa<sup>2</sup>-sec; Airborne RMS is re: 20 μPa.

The distances to underwater noise thresholds for marine mammals were also calculated using the results of the hydroacoustic monitoring. Table 7 provides a summary of the actual distances over which the Level A and Level B Harassment thresholds for marine mammals were exceeded during pile driving. These distances are much less than those used to generate the take estimates developed for the IHA (Table 2).

**Table 7. Actual Distances (meters) to the NMFS Harassment Thresholds for Marine Mammals (dB re: 1 $\mu$ Pa-sec<sup>2</sup>)**

Day	Installation Method	Pile IDs	Distance to Level B Threshold (Avg/Max)	Distance to Level A cSEL Threshold (meters)*				
				Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
6/6	Impact w. Bubble Curtain	24" Concrete Pile #4	45 meters/ 56 meters	11 meters	1 meter	13 meters	7 meters	1 meter
6/11	Vibratory Hammer	14" Steel H Pile #6 14" Steel H Pile #7	268 meters/ 299 meters	1 meter	< 1 meter	2 meters	1 meter	< 1 meter
7/22	Impact w. Bubble Curtain	24" Concrete Pile #1 24" Concrete Pile #2	45 meters/ 38 meters	13 meters	1 meter	14 meters	8 meters	1 meter
7/23	Impact w. Bubble Curtain	24" Concrete Pile #3 24" Concrete Pile #4	38 meters	14 meters	1 meter	16 meters	9 meters	1 meter

\*As calculated using the highest daily mean SEL value and a 20 log transmission loss.  
 $\mu$ Pa-sec<sup>2</sup> = micropascals per second squared  
cSEL = cumulative sound exposure level  
ID = identification  
SEL = sound exposure level

## 5. Discussion

No stunned or injured fish were observed within the monitoring area during any Covered Activities, and the distances over which underwater noise levels were exceeded was consistently lower than the modeled results presented in the Biological Assessment provided to NMFS and the ITP (Table 5).

Hydroacoustic monitoring found the distances to the harassment thresholds for marine mammals to be significantly smaller than the modeled distances used to estimate take for the IHA. For example, the Level B zone during vibratory driving of the H piles was found to be approximately 300 meters in radius, whereas the distance used in the IHA was approximately 21,500 meters. This was largely due to the measured attenuation rate of 20 log being much higher than the standard, conservative value of 15 log used in the IHA calculations. Additionally, the measured sound levels at 10 meters were consistently lower than the source sound levels estimated in the IHA. The contractor used a bubble curtain attenuation device during impact driving of the concrete piles, whereas no attenuation device was factored into the estimates for concrete piles presented in the IHA.

As presented in the IHA application, harbor seals are the most likely species to occur in the vicinity of the Long Wharf, and were the only species observed during pile driving in 2018. No seals entered the Level A zone during pile driving, and seals that were observed within the Level B zone did not demonstrate signs of disturbance prior to, during, or after vibratory or impact pile-driving.

The current avoidance and minimization measures, as required in permit conditions, have been demonstrated to effectively minimize take of marine mammals and fish. Given that the monitoring results demonstrate that underwater noise from pile driving has been far less impactful than suggested by pre-project modeling, we anticipate that potential impacts from future project activities, such as additional pile-driving, would continue to be mitigated by current avoidance and minimization measures.



# Appendix A CDFW ITP MMRP Table



**Appendix A**  
**Chevron Long Wharf Maintenance and Efficiency Project**  
**CDFW Mitigation Monitoring and Reporting Program**

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
<b>BEFORE DISTURBING SOIL OR VEGETATION</b>					
1	Before starting Covered Activities, Permittee shall designate a representative (Designated Representative) responsible for communications with CDFW and overseeing compliance with the ITP. Permittee shall notify CDFW in writing before starting Covered Activities of the Designated Representative's name, business address, and contact information, and shall notify CDFW in writing if a substitute Designated Representative is selected or identified at any time during the term of the ITP.	ITP Condition #5.1	Before commencing ground- or vegetation-disturbing activities/ Entire Project	Permittee	Chevron provided the information required by this Mitigation Measure (as Transmittal #1) to Mr. Arn Aarreberg via email on July 27, 2017.
2	Permittee shall submit to CDFW in writing the name, qualifications, business address, and contact information of a biological monitor (Designated Biologist) at least 30 days before starting Covered Activities. Permittee shall ensure that the Designated Biologist is knowledgeable and experienced in the biology and natural history of the Covered Species. The Designated Biologist shall be responsible for monitoring Covered Activities to help minimize and fully mitigate or avoid the incidental take of individual Covered Species and to minimize disturbance of Covered Species' habitat. Permittee shall obtain CDFW approval of the Designated Biologist in writing before starting Covered Activities, and shall also obtain approval in advance in writing if the Designated Biologist must be changed.	ITP Condition #5.2	Before commencing ground- or vegetation-disturbing activities	Permittee	Chevron provided the information required by this Mitigation Measure (Transmittal #3) to Mr. Arn Aarreberg via email on October 8, 2017.
3	Permittee shall conduct an education program for all persons employed or otherwise working in the Project Area before performing any work. The program shall consist of a presentation from the Designated Biologist that includes a discussion of the biology and general behavior of the Covered Species, information about the distribution and habitat needs of the Covered Species, sensitivity of the Covered Species to human activities, its status pursuant to CESA including legal protection, recovery efforts, penalties for violations and Project-specific protective measures described in the ITP. Permittee shall provide interpretation for non-English speaking workers, and the same instruction shall be provided for any new workers before their performing work in the Project Area. Permittee shall prepare and distribute wallet-sized cards or a fact sheet handout containing this information for workers to carry in the Project Area. Upon completion of the program, employees shall sign a form stating they attended the program and understand all protection measures.	ITP Condition #5.4	Before commencing ground- or vegetation-disturbing activities / Entire Project	Permittee	The AECOM Designated Biologist conducted two education program sessions on May 14 and 24, 2018. The education sessions were prepared and delivered as required by this Mitigation Measure. Each attendee was given a brochure fact sheet containing the required information.
4	The Designated Biologist shall maintain a construction-monitoring notebook on-site throughout the construction period, which shall include a copy of this ITP with attachments and a list of signatures of all personnel who have successfully completed the education program. Permittee shall ensure a copy of the construction-monitoring notebook is available for review at the Project site upon request by CDFW.	ITP Condition #5.5	Before commencing ground- or vegetation-disturbing activities / Entire Project	Permittee	The Designated Biologist is maintaining a construction-monitoring notebook on-site. The notebook includes a copy of the ITP with attachments and a list of signatures of all personnel who have successfully completed the education program. The construction-monitoring notebook is available for review at the Project site upon request by CDFW.

**Appendix A**  
**Chevron Long Wharf Maintenance and Efficiency Project**  
**CDFW Mitigation Monitoring and Reporting Program**

	<b>Mitigation Measure</b>	<b>Source</b>	<b>Implementation Schedule</b>	<b>Responsible Party</b>	<b>Status / Date / Initials</b>
5	The Designated Representative shall notify CDFW 14 calendar days before starting Covered Activities and shall document compliance with all pre-Project Conditions of Approval before starting Covered Activities.	ITP Condition #6.1	Before commencing ground- or vegetation-disturbing activities / Entire Project	Permittee	The Chevron Designated Representative notified CDFW more than 14 days before the start of Covered Activities and documented compliance with all pre-Project Conditions of Approval before starting Covered Activities. The notice was sent to Mr. Arn Aarreberg (Transmittal #5) via email on January 2, 2018.
6	Permittee shall create a hydroacoustic monitoring plan and provide CDFW with a copy for review prior to the start of Covered Activities	ITP Condition #7.8	Before commencing ground- or vegetation-disturbing activities	Permittee	Chevron (AECOM) provided CDFW with a copy of the hydroacoustic monitoring plan which was sent to Mr. Arn Aarreberg (Transmittal #2) via email on August 1, 2017.
7	Permittee shall purchase 0.11 acres of Covered Species credits from a CDFW-approved mitigation or conservation bank and provide CDFW documentation of the purchase prior to initiating Covered Activities or 30 days after the effective date of this ITP, whichever occurs first i. CDFW has estimated the cost of Covered Species credits as \$16,500 for purchase of 0.11 acres.	ITP Condition #8.1, 8.1.1	Before commencing ground- or vegetation-disturbing activities (or within 18 months of issuance of the ITP if Security is provided)	Permittee	Chevron purchased 0.11 acres of Covered Species credits from Wildlands at a cost of \$16,500. Chevron provided documentation to CDFW which was sent to Mr. Arn Aarreberg (Transmittal #4) via email on December 26, 2017.
<b>DURING CONSTRUCTION</b>					
10	To ensure compliance with the Conditions of Approval of this ITP, the Designated Biologist shall have authority to immediately stop any activity that does not comply with this ITP, and/or to order any reasonable measure to avoid the unauthorized take of an individual of the Covered Species.	ITP Condition #5.3	Entire Project	Permittee	Chevron has communicated to AECOM and the construction contractors that the Designated Biologist has authority to immediately stop any activity that does not comply with the ITP, and/or to order any reasonable measure to avoid the unauthorized take of an individual of the Covered Species.

**Appendix A**  
**Chevron Long Wharf Maintenance and Efficiency Project**  
**CDFW Mitigation Monitoring and Reporting Program**

	<b>Mitigation Measure</b>	<b>Source</b>	<b>Implementation Schedule</b>	<b>Responsible Party</b>	<b>Status / Date / Initials</b>
11	The Designated Biologist shall maintain a construction-monitoring notebook on-site throughout the construction period, which shall include a copy of this ITP with attachments and a list of signatures of all personnel who have successfully completed the education program. Permittee shall ensure a copy of the construction-monitoring notebook is available for review at the Project site upon request by CDFW.	ITP Condition #5.5	Entire Project	Permittee	The Designated Biologist is maintaining a construction-monitoring notebook on-site. The notebook includes a copy of the ITP with attachments and a list of signatures of all personnel who have successfully completed the education program. The construction-monitoring notebook is available for review at the Project site upon request by CDFW.
12	Permittee shall immediately stop and, pursuant to pertinent state and federal statutes and regulations, arrange for repair and clean up by qualified individuals of any fuel or hazardous waste leaks or spills at the time of occurrence, or as soon as it is safe to do so. Permittee shall exclude the storage and handling of hazardous materials from the Project Area and shall properly contain and dispose of any unused or leftover hazardous products off-site.	ITP Condition #5.6	Entire Project	Permittee	Chevron will immediately stop and, pursuant to pertinent state and federal statutes and regulations, arrange for repair and clean up by qualified individuals of any fuel or hazardous waste leaks or spills at the time of occurrence, or as soon as it is safe to do so. Chevron is not storing hazardous materials at the Project Area and is managing the minimum quantities of materials in compliance with applicable U.S. Coast Guard and other agency regulations and will properly contain and dispose of any unused or leftover hazardous products off-site.
13	Permittee shall provide CDFW staff with reasonable access to the Project and shall otherwise fully cooperate with CDFW efforts to verify compliance with or effectiveness of mitigation measures set forth in this ITP.	ITP Condition #5.7	Entire Project	Permittee	Chevron will provide CDFW staff with reasonable access to the Project and will otherwise fully cooperate with CDFW efforts to verify compliance with or effectiveness of mitigation measures set forth in the ITP.
14	The Designated Representative shall immediately notify CDFW in writing if it determines that the Permittee is not in compliance with any Condition of Approval of this ITP, including but not limited to any actual or anticipated failure to implement measures within the time periods indicated in this ITP and/or the MMRP. The Designated Representative shall report any non-compliance with this ITP to CDFW within 24 hours.	ITP Condition #6.2	Entire Project	Permittee	The Chevron Designated Representative will immediately notify CDFW in writing if it determines that the Project is not in compliance with any Condition of Approval of the ITP

**Appendix A**  
**Chevron Long Wharf Maintenance and Efficiency Project**  
**CDFW Mitigation Monitoring and Reporting Program**

	<b>Mitigation Measure</b>	<b>Source</b>	<b>Implementation Schedule</b>	<b>Responsible Party</b>	<b>Status / Date / Initials</b>
15	The Designated Biologist shall be on-site daily when Covered Activities occur. The Designated Biologist shall conduct compliance inspections to (1) minimize incidental take of the Covered Species; (2) prevent unlawful take of species; (3) check for compliance with all measures of this ITP; (4) check all exclusion zones; and (5) ensure that signs, stakes, and fencing are intact, and that Covered Activities are only occurring in the Project Area. The Designated Representative or Designated Biologist shall prepare daily written observation and inspection records summarizing: oversight activities and compliance inspections, observations of Covered Species and their sign, survey results, and monitoring activities required by this ITP. The Designated Biologist shall conduct compliance inspections a minimum of once per quarter during periods of inactivity longer than 90 days.	ITP Condition #6.3	Entire Project	Permittee	The AECOM Designated Biologist has been on-site whenever covered activities have occurred and has prepared written observations and inspection records as specified in this Mitigation Measure.
16	The Designated Representative or Designated Biologist shall compile the observation and inspection records identified in Condition of Approval 6.3 into a Monthly Compliance Report and submit it to CDFW along with a copy of the MMRP table with notes showing the current implementation status of each mitigation measure. Monthly Compliance Reports shall be submitted to the CDFW offices listed in the Notices section of this ITP and via e-mail to CDFW's Regional Representative and Headquarters CESA Program. At the time of this ITP's approval, the CDFW Regional Representative is Arn Aarreberg (Arn.Aarreberg@wildlife.ca.gov) and Headquarters CESA Program email is CESA@wildlife.ca.gov. CDFW may at any time increase the timing and number of compliance inspections and reports required under this provision depending upon the results of previous compliance inspections. If CDFW determines the reporting schedule must be changed, CDFW will notify Permittee in writing of the new reporting schedule.	ITP Condition #6.4	Entire Project	Permittee	The Chevron Designated Representative has compiled the observation and inspection records identified in Condition of Approval 6.3 into Monthly Compliance Reports that were submitted to CDFW along with a copy of this MMRP table showing the current implementation status of each mitigation measure. The AECOM Designated Biologist has the compiled the observation and inspection records and they were included as an attachment to each submitted monthly report.
17	Permittee shall provide CDFW with an Annual Status Report (ASR) no later than January 31 of every year beginning with issuance of this ITP and continuing until CDFW accepts the Final Mitigation Report identified below. Each ASR shall include, at a minimum: (1) a summary of all Monthly Compliance Reports for that year identified in Condition of Approval 6.4; (2) a general description of the status of the Project Area and Covered Activities, including actual or projected completion dates, if known; (3) a copy of the table in the MMRP with notes showing the current implementation status of each mitigation measure; (4) an assessment of the effectiveness of each completed or partially completed mitigation measure in avoiding, minimizing and mitigating Project impacts; (5) all available information about Project-related incidental take of the Covered Species; (6) an accounting of the number of acres subject to both temporary and permanent disturbance, both for the prior calendar year, and a total since ITP issuance; and (7) information about other Project impacts on the Covered Species.	ITP Condition #6.5	Entire Project	Permittee	Chevron will provide CDFW with an Annual Status Report no later than January 31 of every year beginning with issuance of this ITP and continuing until CDFW accepts the Final Mitigation Report.

**Appendix A**  
**Chevron Long Wharf Maintenance and Efficiency Project**  
**CDFW Mitigation Monitoring and Reporting Program**

	<b>Mitigation Measure</b>	<b>Source</b>	<b>Implementation Schedule</b>	<b>Responsible Party</b>	<b>Status / Date / Initials</b>
18	The Designated Biologist shall submit all observations of Covered Species to CDFW's California Natural Diversity Database (CNDDDB) within 60 calendar days of the observation and the Designated Biologist shall include copies of the submitted forms with the next Monthly Compliance Report or ASR, whichever is submitted first relative to the observation.	ITP Condition #6.6	Entire Project	Permittee	The Designated Biologist will submit all observations of Covered Species to CDFW's California Natural Diversity Database (CNDDDB) within 60 calendar days of the observation and will include copies of the submitted forms with the next Monthly Compliance Report or Annual Status Report, whichever is submitted first relative to the observation.
19	Permittee shall immediately notify the Designated Biologist if a Covered Species is taken or injured by a Project-related activity, or if a Covered Species is otherwise found dead or injured within the vicinity of the Project. The Designated Biologist or Designated Representative shall provide initial notification to CDFW by calling the Regional Representative at (707) 576-2889. The initial notification to CDFW shall include information regarding the location, species, and number of animals taken or injured and the ITP Number. Following initial notification, Permittee shall send CDFW a written report within two calendar days. The report shall include the date and time of the finding or incident, location of the animal or carcass, and if possible provide a photograph, explanation as to cause of take or injury, and any other pertinent information.	ITP Condition #6.7	Entire Project	Permittee	Chevron will immediately notify the Designated Biologist if a Covered Species is taken or injured by a Project-related activity, or if a Covered Species is otherwise found dead or injured within the vicinity of the Project. The Designated Biologist or Designated Representative will then provide initial notification to CDFW by calling the Regional Representative at (707) 576-2889. The initial notification to CDFW will include information regarding the location, species, and number of animals taken or injured and the ITP Number. Following initial notification, Chevron will send CDFW a written report within two calendar days. The report shall include the date and time of the finding or incident, location of the animal or carcass, and if possible provide a photograph, explanation as to cause of take or injury, and any other pertinent information.
20	Permittee shall conduct pile installation, removal, and related in-water work between June 1 and November 30 of any year.	ITP Condition #7.1	Entire Project	Permittee	Chevron understands that pile installation, removal, and related in-water work is only permitted between June 1 and November 30 of any year.

**Appendix A**  
**Chevron Long Wharf Maintenance and Efficiency Project**  
**CDFW Mitigation Monitoring and Reporting Program**

	<b>Mitigation Measure</b>	<b>Source</b>	<b>Implementation Schedule</b>	<b>Responsible Party</b>	<b>Status / Date / Initials</b>
21	Work within the Project Area shall be confined to the period of June 1 to November 30. Any extension of the work period will require an amendment to this ITP. The amendment request for a work window extension shall: 1) describe the extent of work already completed; 2) detail the activities that remain to be completed; 3) detail the time required to complete each of the remaining activities; 4) provide photographs of both the current work completed and the proposed site for continued work; and 5) include an assessment of the impacts of the work extension of Covered Species.	ITP Condition #7.2	Entire Project	Permittee	Chevron understands that pile installation, removal, and related in-water work is only permitted between June 1 and November 30 of any year, and that any extension of the work period will require an amendment to the ITP.
22	All piles shall be removed by direct pull or by vibratory methods. Should a pile break or cannot be removed, the pile shall be cut off, at a minimum, 2 feet below the mud line.	ITP Condition #7.3	Entire Project	Permittee	Chevron understands that all piles must be removed by direct pull or by vibratory methods. Should a pile break or cannot be removed, the pile will be cut off, at a minimum, 2 feet below the mud line.
23	Permittee shall install piles with a vibratory pile driver to the maximum extent feasible. Maximum pile diameter to be installed shall be 60 inches.	ITP Condition # 7.4	Entire Project	Permittee	Chevron will install piles with a vibratory pile driver to the maximum extent feasible. Maximum pile diameter to be installed will be 60 inches.
24	Permittee shall employ a “soft start” technique to give aquatic species an opportunity to move out of the area. Maximum pile diameter shall be 60 inches.	ITP Condition #7.5	Entire Project	Permittee	Chevron will employ a “soft start” technique to give aquatic species an opportunity to move out of the area. Maximum pile diameter will be 60 inches.
25	Sound pressure levels (SPLs) have the potential to exceed 206 decibels (dB) peak and the daily 187 dB accumulated sound exposure level (SEL) for many of the piles sizes and materials proposed, even with the addition of a bubble curtain. Should the hydroacoustic monitoring show that SPL values are exceeding, or have exceeded any of the calculated distances to either the peak pressure or accumulated SEL, as specified within the ITP application, the Permittee shall halt pile driving until the sound attenuation system is repaired. The Permittee shall either take measures to increase the effectiveness of the sound attenuation system or obtain an ITP amendment from CDFW.	ITP Condition #7.6	Entire Project	Permittee	If the hydroacoustic monitoring shows that SPL values are exceeding or have exceeded any of the calculated distances to either the peak pressure or accumulated SEL, as specified within the ITP application, Chevron will halt pile driving until the sound attenuation system is repaired. Chevron will then either take measures to increase the effectiveness of the sound attenuation system or obtain an ITP amendment from CDFW.

**Appendix A**  
**Chevron Long Wharf Maintenance and Efficiency Project**  
**CDFW Mitigation Monitoring and Reporting Program**

	<b>Mitigation Measure</b>	<b>Source</b>	<b>Implementation Schedule</b>	<b>Responsible Party</b>	<b>Status / Date / Initials</b>
26	Permittee shall use a bubble curtain during all pile installation of 60" diameter piles using an impact hammer. If feasible, a bubble curtain shall also be deployed on all other piles exceeding 24" when using an impact hammer. Additional attenuation measures such, as a wooden pile cushion, shall be used during all pile installation using an impact hammer.	ITP Condition #7.7	Entire Project	Permittee	Chevron will use a bubble curtain during all pile installation of 60" diameter piles using an impact hammer. If feasible, a bubble curtain will also be deployed on all other piles exceeding 24" when using an impact hammer. Additional attenuation measures such, as a wooden pile cushion, will be used during all pile installation using an impact hammer.
<b>POST CONSTRUCTION</b>					
27	No later than 45 days after completion of all mitigation measures, Permittee shall provide CDFW with a Final Mitigation Report. The Designated Biologist shall prepare the Final Mitigation Report which shall include, at a minimum: (1) a summary of all Monthly Compliance Reports and all ASRs; (2) a copy of the table in the MMRP with notes showing when each of the mitigation measures was implemented; (3) all available information about Project-related incidental take of the Covered Species; (4) information about other Project impacts on the Covered Species; (5) beginning and ending dates of Covered Activities; (6) an assessment of the effectiveness of this ITP's Conditions of Approval in minimizing and fully mitigating Project impacts of the taking on Covered Species; (7) recommendations on how mitigation measures might be changed to more effectively minimize take and mitigate the impacts of future projects on the Covered Species; and (8) any other pertinent information.	ITP Condition #6.8	Post-construction and after completion of mitigation	Permittee	No later than 45 days after completion of all mitigation measures, Chevron will provide CDFW with a Final Mitigation Report as specified by this Mitigation Measure.



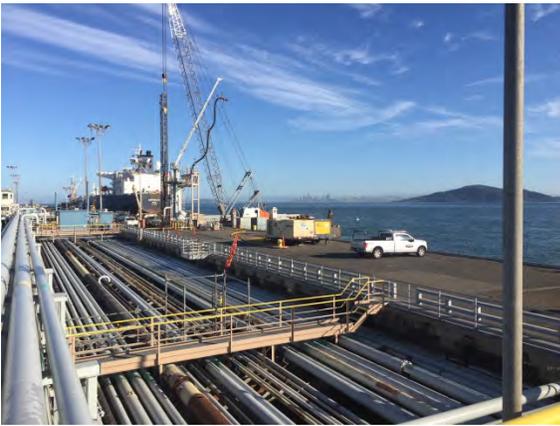
# Appendix B Site Photographs



Appendix B – Site Photographs



Photograph 1. View of Project Area during pre-construction baseline biological survey, June 1, 2018.



Photographs 2 and 3. View of Project Area from elevated monitoring platform, looking southwest and southeast.



Photographs 4 and 5. View of Project Area from elevated monitoring platform, looking east and north.

## Appendix B – Site Photographs



Photographs 6 and 7. Views of Project Area from north wharf monitoring location (looking southeast) and south wharf monitoring location (looking northwest).

# **Appendix C Marine Mammal Monitoring Daily Field Datasheets**

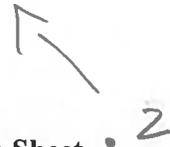




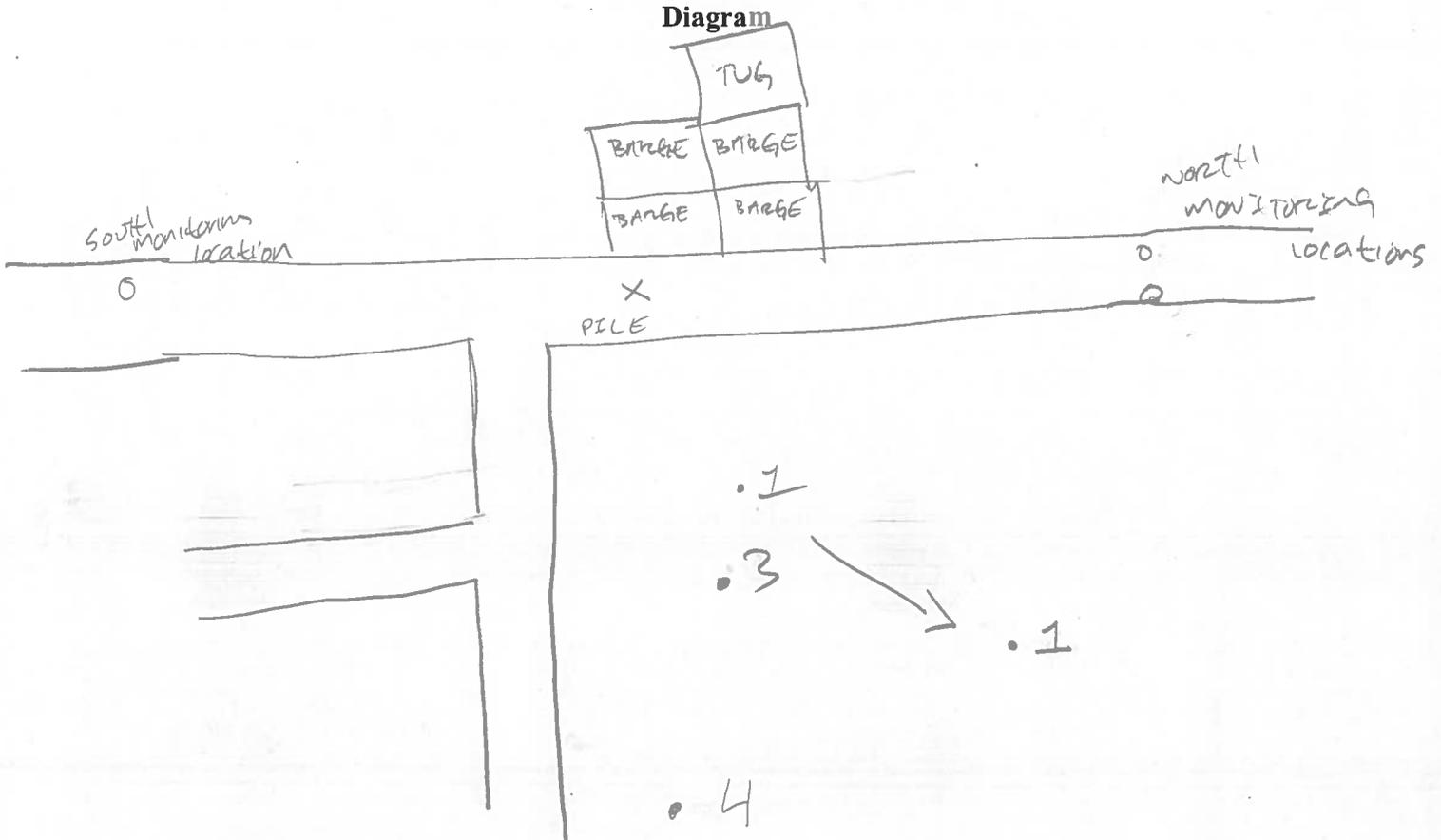


6/4/18  
3 of 3

.2



**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**



Biological Monitor: Diana Edwards Print Name *Diana Edwards*

Signature: 6/4/18

Date: 6/5/2018

Page 1 of 3

**Daily Marine Mammal Monitoring Summary Log**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

Monitor(s):

Edwards, Diana; Bettelheim, Matthew

Weather/visibility observations and sea state, using Beaufort Scale on next page):

Clear blue skies w/ slight haze, sea state = 2 to 3

Tidal Level (start work/end work):

see tide chart LOW @ 1055 (0.3), High @ 1829 (4.7)

General Human Activity in the Area:

Test probing, pile driving, vehicles travel through wharf deck,  
1 row @ Berth 2, 2 crane barges, 2 materials barges @ Berth 2

Monitoring Location (s):

ON WHARF, 2400 FT North d South of pile driving  
South Wharf: 37.921900°N, 122.410154°W North Wharf: 37.923571°N, 122.4113393°W

Pile Type (s):

Concrete

Total Pile Count for the Day 2 Equipment: Impact  Vibratory

Total Minutes of Pile Driving/Total Blows of Impact Driving:

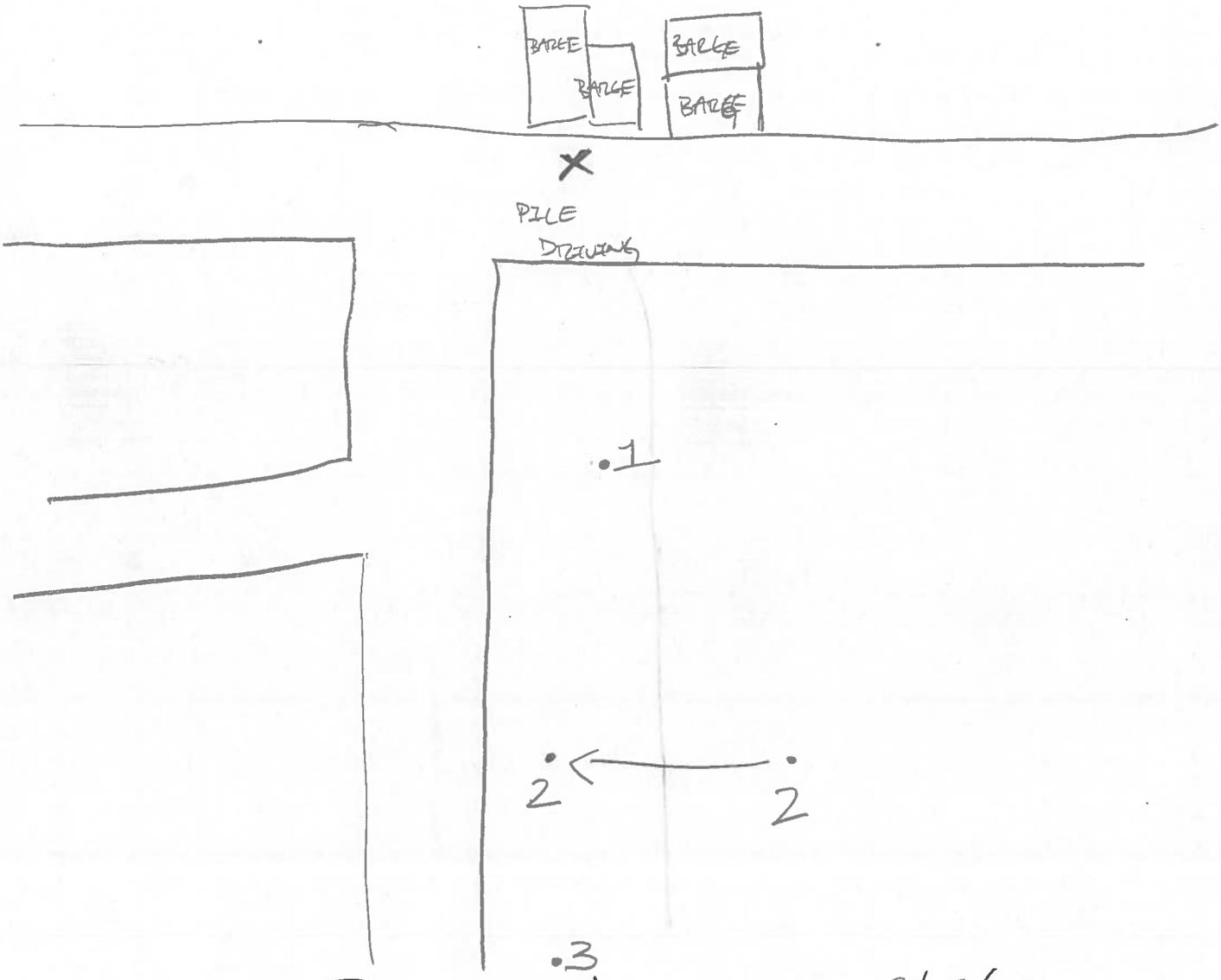
<u>2<sup>04</sup>-2<sup>07</sup></u>	<u>2400 FT start / taps</u>	<u>3<sup>23</sup>-3<sup>24</sup></u>	<u>SOFT Start, TAPS</u>
<u>2<sup>09</sup>-2<sup>11</sup></u>	<u>BLOWS ; 2<sup>16</sup> Final blows</u>	<u>3<sup>25</sup>-3<sup>27</sup></u>	<u>BLOWS</u>
		<u>3<sup>30</sup>-3<sup>37</sup></u>	<u>BLOWS</u>
		<u>3<sup>39</sup></u>	<u>TAPS</u>



6/5/18  
3 of 3

**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Diagram**



Biological Monitor: Dana Edwards Print Name 6/5/18  
Signature: [Handwritten Signature]

Date: 6/6/18

Page 1 of 3

**Daily Marine Mammal Monitoring Summary Log**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Monitor(s):**

Diana F. Clark, MAUDI M. ELOY

**Weather/visibility observations and sea state, using Beaufort Scale on next page):**

@ 8<sup>30</sup> AM : 10% cloud cover, w 5-15 mph, cool ~ 58°, breezy (2-3 Beaufort)

**Tidal Level (start work/end work):**

see tide chart Low @ 1146, high @ 1910

**General Human Activity in the Area:**

Pile driving, vehicle movement on wharf

**Monitoring Location (s):**

~ 400 FT North of South of Pile driving

**Pile Type (s):**

Concrete

**Total Pile Count for the Day** 1 **Equipment:** Impact  Vibratory

**Total Minutes of Pile Driving/Total Blows of Impact Driving:**

soft start @ 1038, last hammer blow @ 1049



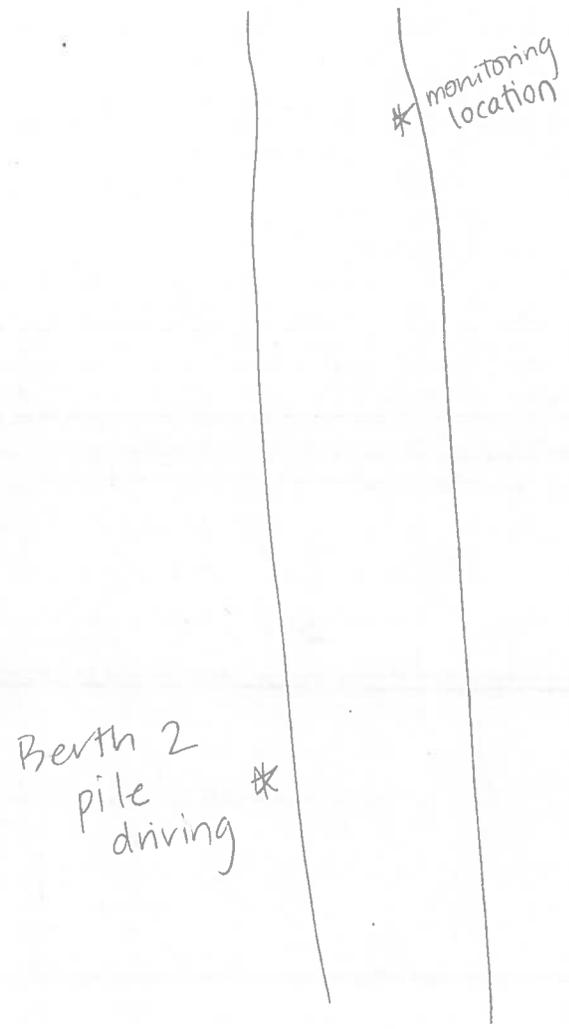
4/6/18  
3 of 3

**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Diagram**

(HASE) 1100  
N ↑ slow swim

(HASE)  
1039



Biological Monitor: M. McElroy Print Name \_\_\_\_\_

Signature:

ext down  
into 23 days  
July 16 -  
1st week of Aug  
mid-late Sept into Oct

1347 hammer being  
positioned  
to re-hammer  
concrete piles.

Date: 6/8/18

Page 1 of 3

**Daily Marine Mammal Monitoring Summary Log**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Monitor(s):**

Mandi McElroy, Matthew Bettelheim

**Weather/visibility observations and sea state, using Beaufort Scale on next page):**

South location = clear - cloud cover  $\emptyset$ . Beaufort = 2. 75°, sunny, wind 1-5 mph from SW (SW)  
North location = " " Beaufort = 1 75°, sunny " " " (NW)

**Tidal Level (start work/end work):**

see tide charts High @ 0745 (3.8), Low @ 1328 (1.1)

**General Human Activity in the Area:**

large tanker left berth 1 ~ 12:30 pm, low activity on LW (Friday)

**Monitoring Location (s):**

Mandi = LW southwest Matthew = LW northeast (elevated)

**Pile Type (s):**

no new piles - re-hammering (4) concrete piles driven earlier this week

**Total Pile Count for the Day**  $\emptyset$  **Equipment:** Impact  Vibratory

**Total Minutes of Pile Driving/Total Blows of Impact Driving:**

< 5 minutes total

1356 (pause) < 1 minute  
1359 (pause) < 1 minute  
1417 < 1 minute  
1433 - 1434 (1 min)  
1500 - 1501 (1 min)

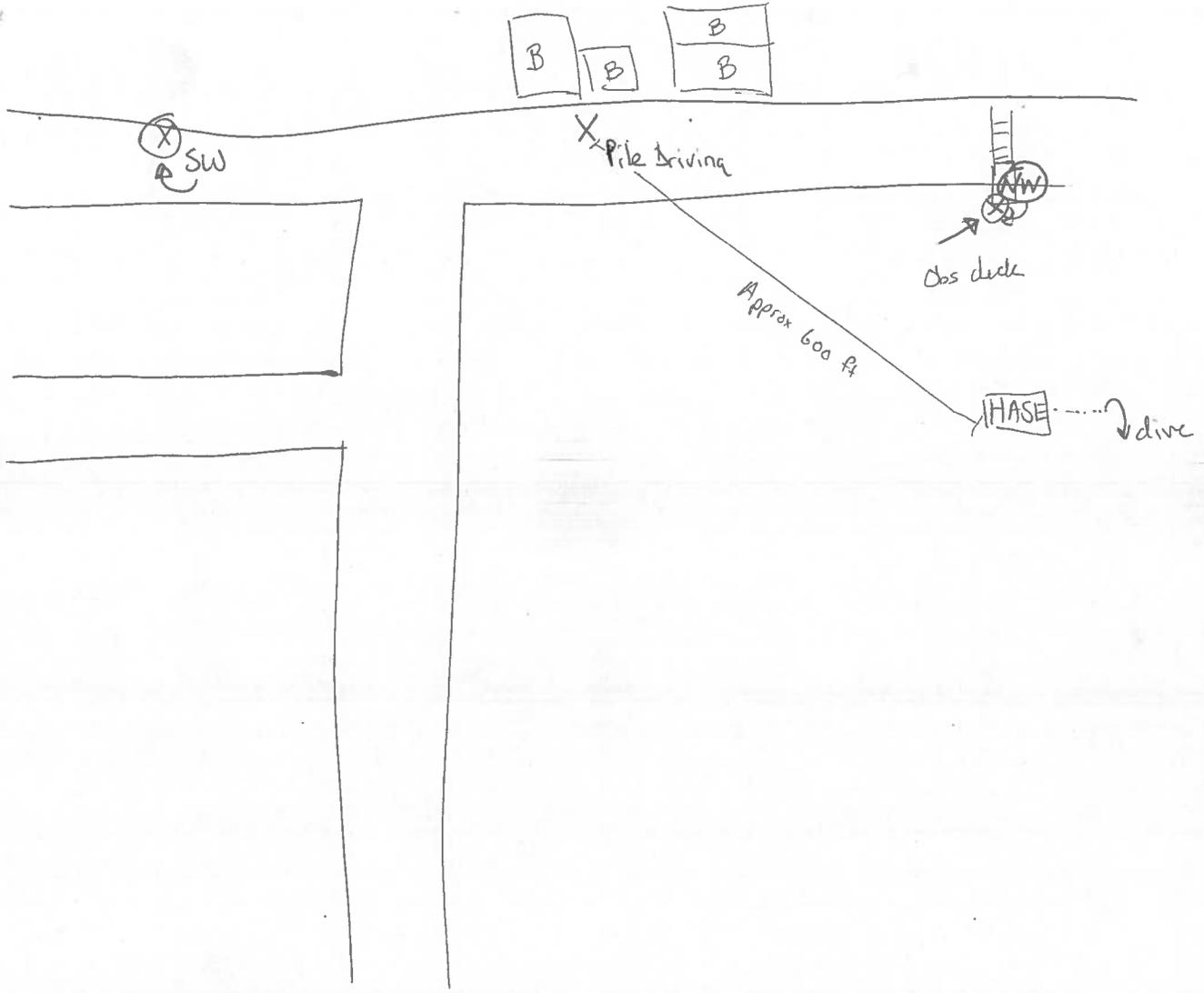
monitoring end 1516



6/8/18  
3 of 3

**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Diagram**



**Biological Monitor:** Matthew Betelheim      **Print Name** Matthew Betelheim

**Signature:** *Matthew Betelheim*

left Oakland - 11:00  
on site @ 12:00

Date: 6/9/18

Page 1 of 3

**Daily Marine Mammal Monitoring Summary Log**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Monitor(s):**

Mandi McElroy, Matthew Bettelheim  
(@ LW South) (@ LW North)

1652 positioning 1st  
pile

**Weather/visibility observations and sea state, using Beaufort Scale on next page):**

South = @ 1700: 67°F overcast, windy 15-20 mph gusts from NW. Beaufort

- earlier  
3-4-5  
later

North = Beaufort 2, smoke in air

**Tidal Level (start work/end work):**

see tide chart High @ 0859 (3.9), Low @ 1416 (1.4)

**General Human Activity in the Area:**

tanker docked @ Berth 1.

**Monitoring Location (s):**

Mandi LW South, Matthew LW North, both ~ 200 ft. from driving location.

**Pile Type (s):**

steel

**Total Pile Count for the Day** 1 **Equipment:** Impact  Vibratory

**Total Minutes of Pile Driving/Total Blows of Impact Driving:**

~ 3 minutes

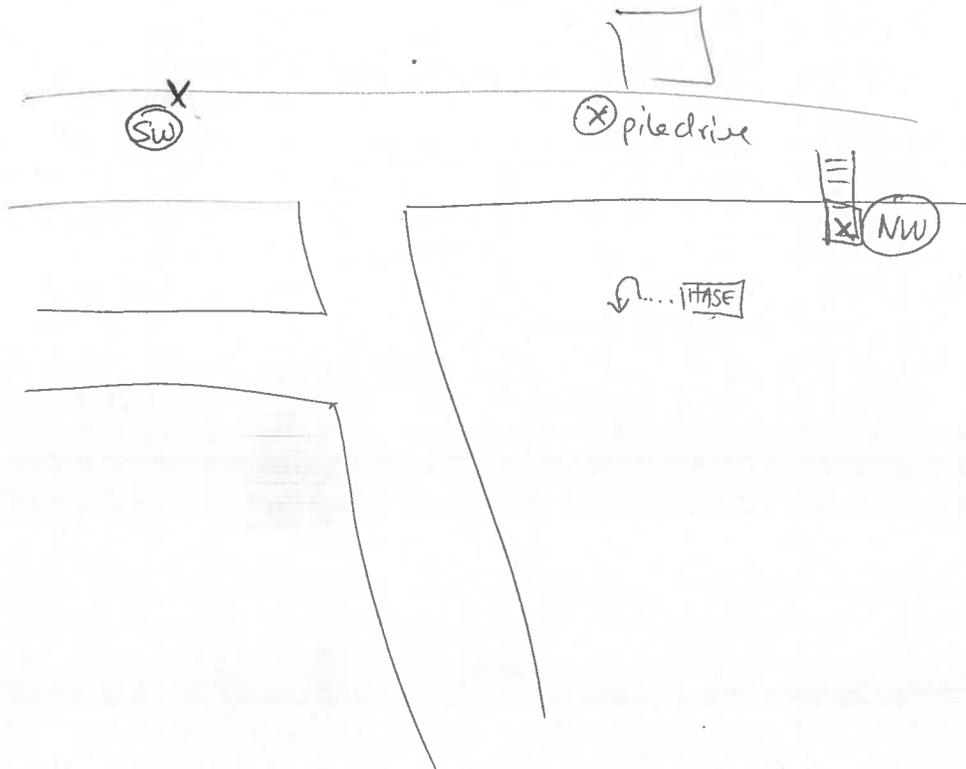
monitoring end @ 1815

1751 - ? 1755? could not  
hear when it stopped  
due to ↑ ambient noise -  
tugboat pulling small crane  
- materials - large + winds.



**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Diagram**



**Biological Monitor:** \_\_\_\_\_ **Print Name** \_\_\_\_\_

**Signature:** \_\_\_\_\_

Date: 6/10/18

Page 1 of 5

**Daily Marine Mammal Monitoring Summary Log**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Monitor(s):**

Mandi M. + Christina K.

① start: 0958  
(short start)

continuous  
1000-1003  
1007-1008  
done @ 1016

**Weather/visibility observations and sea state, using Beaufort Scale on next page):**

clear, 10% cloud cover, Beau fort 2 (on E side), 78° at 1300, 3-5 mph wind from South

② start: 1117 (<1 min)  
1119- (<1 min)  
long pauses  
done ~ 1200

**Tidal Level (start work/end work):**

see tide chart High @ 1006 (4.2), low @ 1504 (1.7)

③ start: 1359  
still driving @ 1500  
w/long pauses.  
stopped @ 1509,  
removed hammer.

**General Human Activity in the Area:**

tankers @ other berths, vehicles moving on wharf

re-trieved @ 1600  
1613, 1634,  
1641, 1702

**Monitoring Location (s):** Mandi: LW south in AM, LW north in PM  
Christina: LW north in AM, LW south in PM

④ start 1813 (<1 min)  
1822  
1827  
1832  
1834  
1855

**Pile Type (s):**

steel h-piles

**Total Pile Count for the Day** 4 **Equipment:** Impact  Vibratory

**Total Minutes of Pile Driving/Total Blows of Impact Driving:**

intermittent from 0958 - 1855, total time = ?

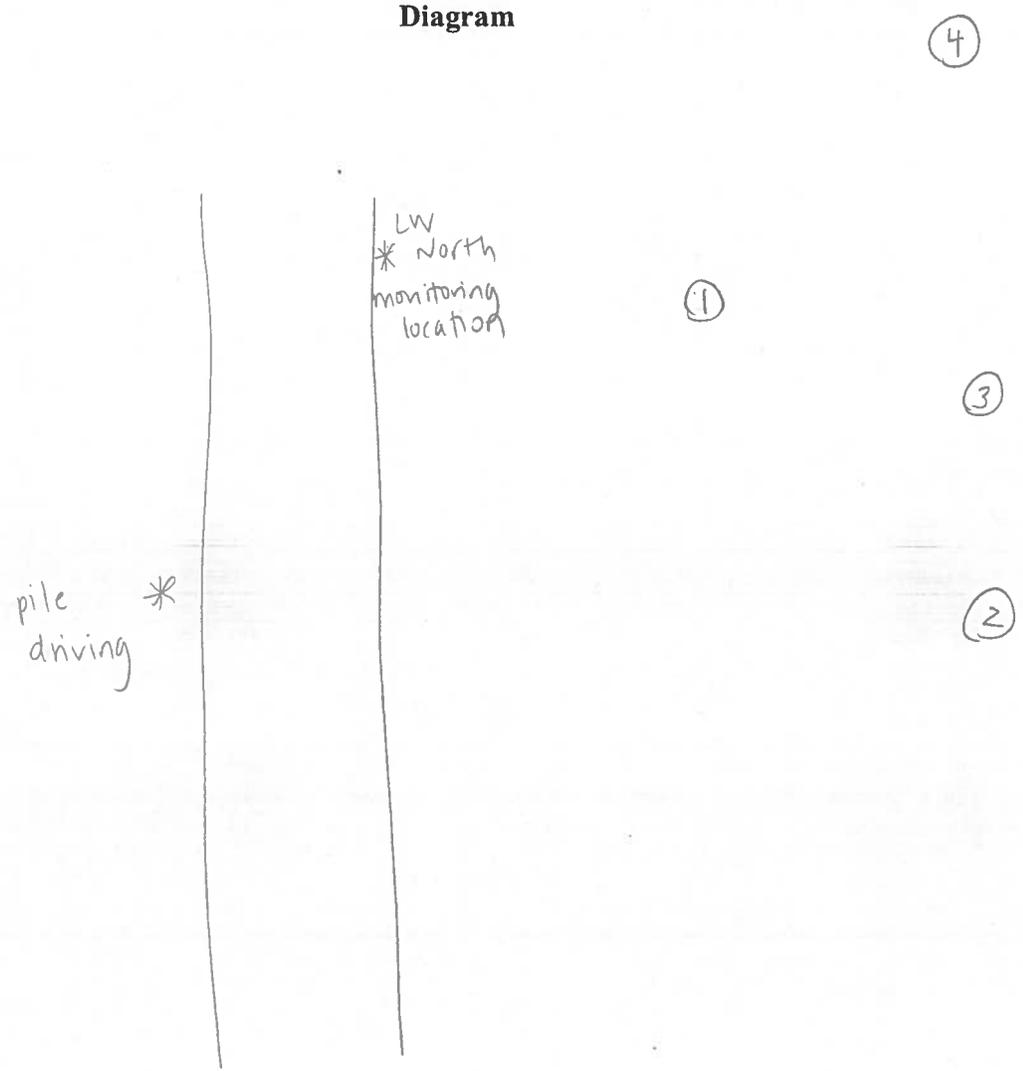




6/10/18  
4 of 5

**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Diagram**



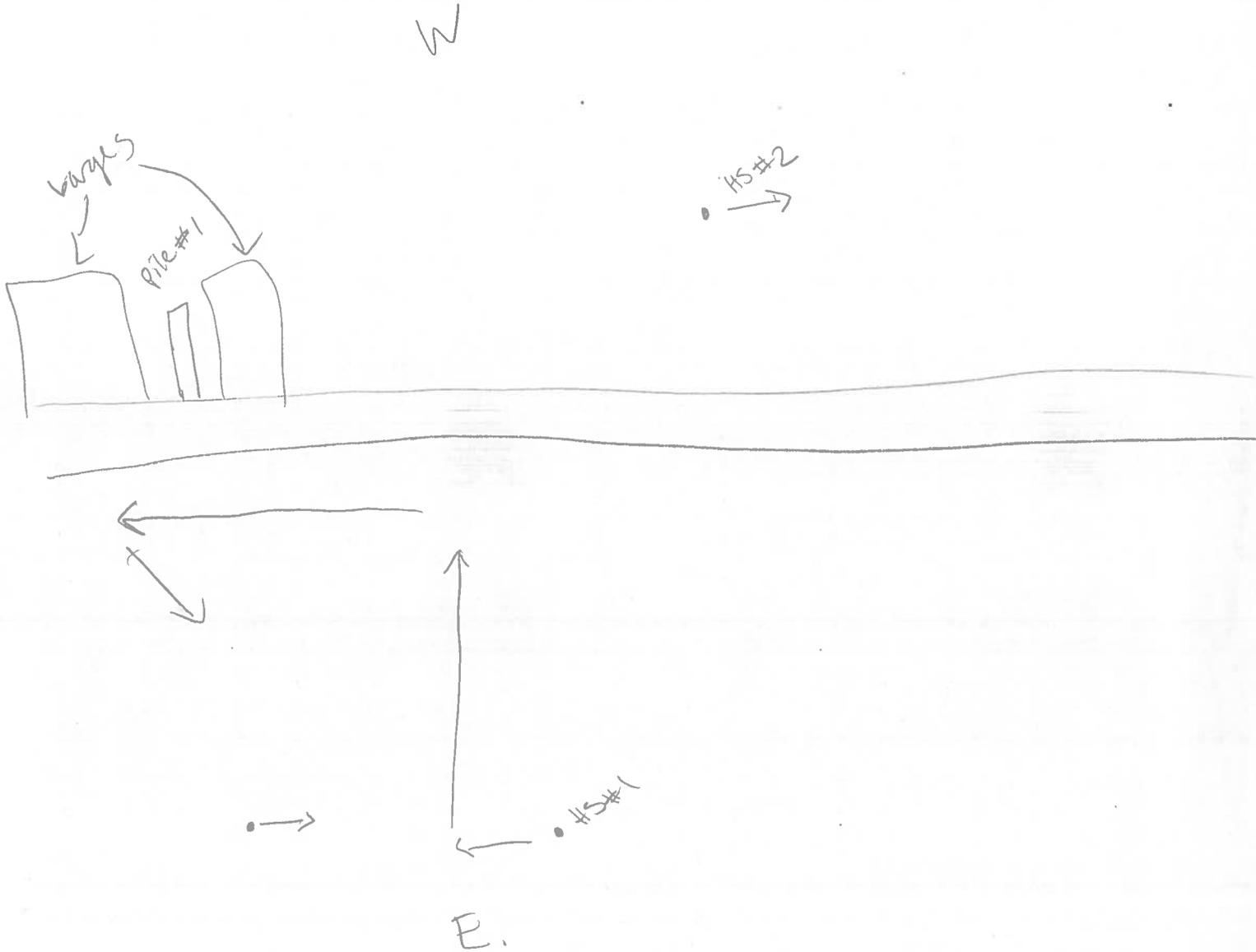
**Biological Monitor:** M. McElroy **Print Name** \_\_\_\_\_

**Signature:** [Handwritten Signature]

6/10/18  
5 of 5

**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Diagram**



Biological Monitor: Kelleher Print Name \_\_\_\_\_

Signature: \_\_\_\_\_

Date: 06/11/18

Page 1 of 3

Daily Marine Mammal Monitoring Summary Log  
Richmond Refinery Long Wharf Maintenance and Efficiency Project

Monitor(s):

Natalie Greer

Weather/visibility observations and sea state, using Beaufort Scale on next page):

Start: Sunny, high visibility <sup>~10 miles</sup>, 0-1 Beaufort,

Stop: Sunny, windy - 8 mile, 3-4 beaufort

Tidal Level (start work/end work):

See tide chart

General Human Activity in the Area:

Caution tape for LEAD WORK, painting

Monitoring Location (s):

Long Wharf South

Pile Type (s):

Steel

Total Pile Count for the Day 4 Equipment: Impact  Vibratory

Total Minutes of Pile Driving/Total Blows of Impact Driving:

~~0~~, 171 min

Present

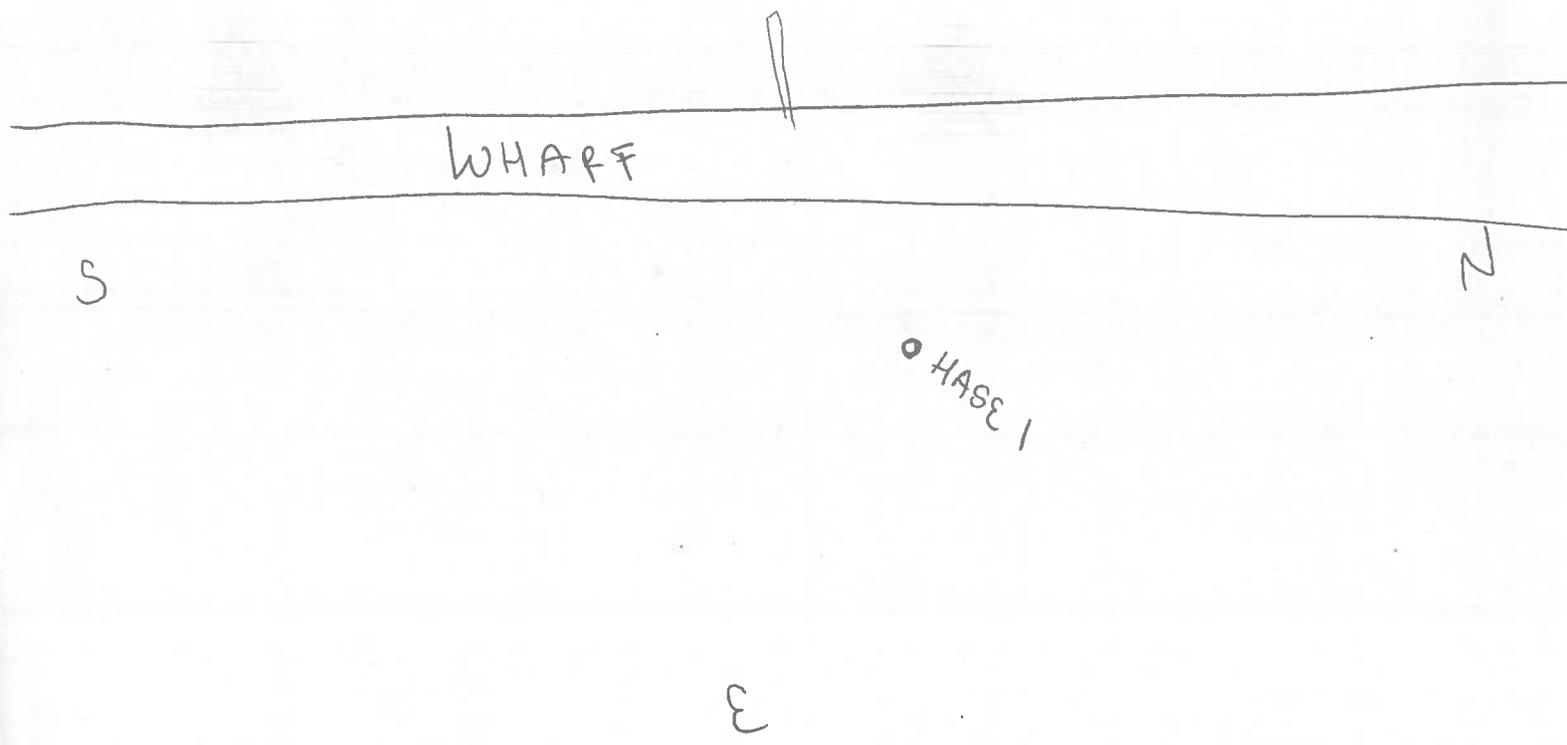


Greer  
6/11/18  
3 of 3

**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Diagram**

W



**Biological Monitor:** Natalie Greer **Print Name** Natalie Greer

**Signature:** ~~Natalie~~ [Handwritten Signature]

Date: 6/11/18

Page 1 of 3

**Daily Marine Mammal Monitoring Summary Log**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Monitor(s):**

Christina Kelleher

**Weather/visibility observations and sea state, using Beaufort Scale on next page):**

Start: Sunny, clear, 0-1 mph wind, 0-1 Beaufort Scale, visibility > 10 miles, 0% clouds

**Tidal Level (start work/end work):**

See tide chart

High @ 1107 (4.4), low @ 1551 (2.0)

**General Human Activity in the Area:**

Crew on site, driving vehicles & machinery, lead work near monitor location N.

**Monitoring Location (s):**

Long Wharf N: 37.9230301, -122.4103586 (8:30-10:50); then S. (10:50-

**Pile Type (s):**

Steel

**Total Pile Count for the Day** 4 **Equipment:** Impact  Vibratory

**Total Minutes of Pile Driving/Total Blows of Impact Driving:**

2 hr. 45 min → on & off

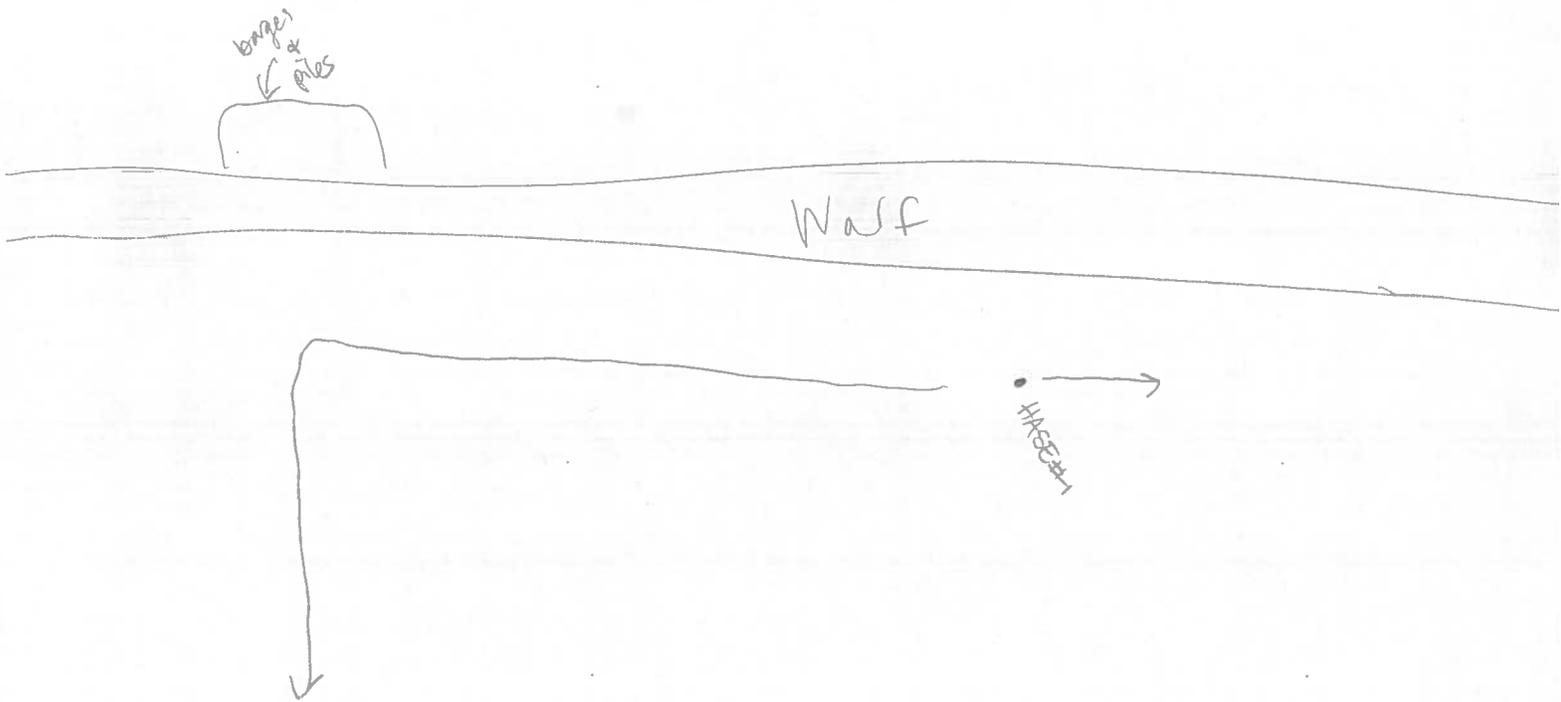


Kelleher  
6/11/18 3 of 3

**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Diagram**

W.



E.

**Biological Monitor:** Kelleher **Print Name** 6/11/18

**Signature:** \_\_\_\_\_

Date: June 14, 2018  
Page 1 of 3

**Daily Marine Mammal Monitoring Summary Log**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Monitor(s):**

Bettelheim, M., Greer, N.

**Weather/visibility observations and sea state, using Beaufort Scale on next page):**

Clear blue skies w/ slight haze Beaufort = #1

**Tidal Level (start work/end work):**

Low @ 0501 (-0.8), High @ 1203 (4.6), Low @ 1638 (2.2)

**General Human Activity in the Area:**

pile driving (vibratory) and ~~sanding~~ prep work, repainting pipes

**Monitoring Location (s):**

NE = Bettelheim, SW = Greer

**Pile Type (s):**

steel I-beam

**Total Pile Count for the Day** 9 **Equipment:** Impact  Vibratory

**Total Minutes of Pile Driving/Total Blows of Impact Driving:**

Pile #1: 8:18 - 8:45; Pile #2: 9:27 - 10:05; Pile #3: 10:40 - 11:03

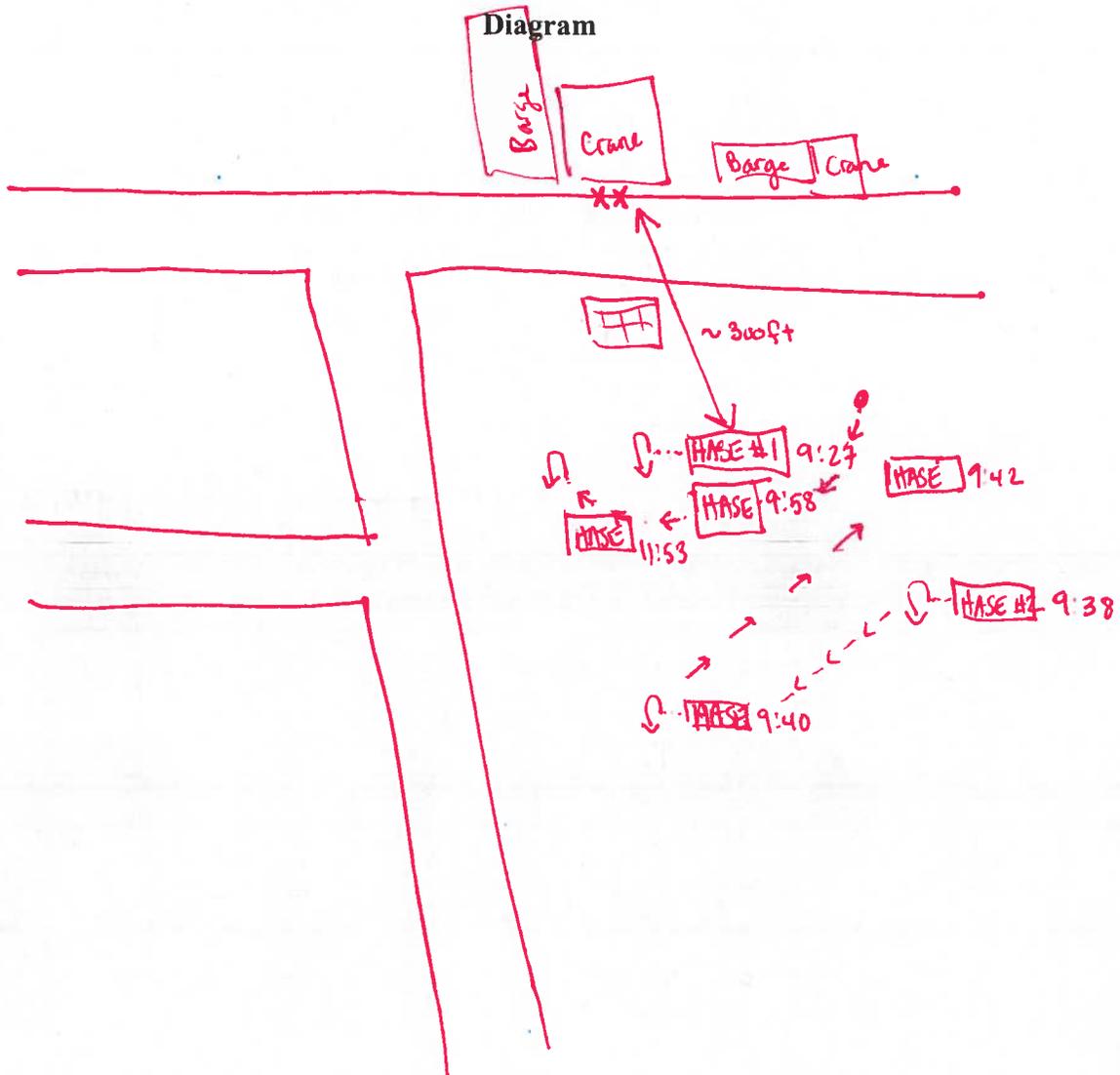
Pile #4: 11:48 - 12:16 Pile #5: Pile #6:

Pile #7: 16:31 - 16:49 Pile #8: 17:54 - 18:06 Pile #9: 17:13 - 19:26



MB 6/12/18  
3 of 3

**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**



Biological Monitor: Bettelheim Print Name \_\_\_\_\_

Signature: \_\_\_\_\_

Date: 06/12/18

Page 1 of 3

**Daily Marine Mammal Monitoring Summary Log**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Monitor(s):**

Natalie Greer

**Weather/visibility observations and sea state, using Beaufort Scale on next page):**

Sunny, hazy Sm. Beaufort: 0-1

**Tidal Level (start work/end work):**

See tide chart

**General Human Activity in the Area:**

LEAD WORK

**Monitoring Location (s):**

Long Wharf N+S

**Pile Type (s):**

Steel pile

**Total Pile Count for the Day** 9 **Equipment:** Impact  Vibratory

**Total Minutes of Pile Driving/Total Blows of Impact Driving:**

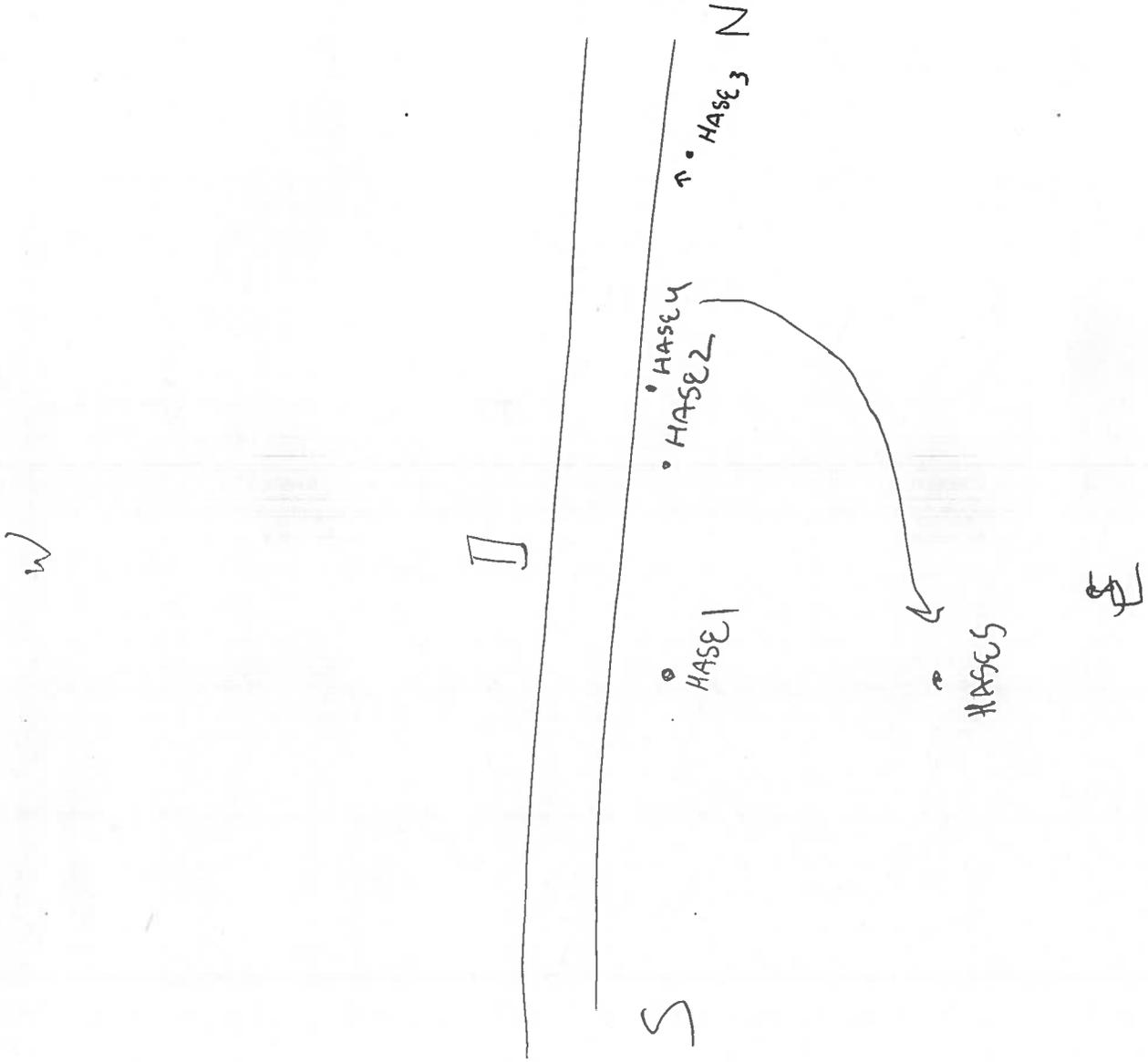
267



Greer  
6/12/18  
3 of 3

**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Diagram**



Biological Monitor: Natalie Greer Print Name Natalie Greer

Signature: ~~Natalie Greer~~

Date: 7/22/18

Page 1 of 3

**Daily Marine Mammal Monitoring Summary Log**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Monitor(s):**

Mandi McElron, Diana Edwards

**Weather/visibility observations and sea state, using Beaufort Scale on next page):**

10% cloud cover, visibility 500 ft+, 72°F, wind 10-15 mph from SW  
Beaufort 1 on (E) side of wharf, Beaufort 3 on (W) side

**Tidal Level (start work/end work):**

high @ 0935 (4.2), low @ 1412 (2.5), high @ 2039 (6.1)

**General Human Activity in the Area:**

wharf operations. ships docked @ Berths 1, 4

**Monitoring Location (s):**

Berth 2 / <sup>①</sup> elevated platform on east side, <sup>②</sup> on wharf near Berth 1, west side

**Pile Type (s):**

concrete

**Total Pile Count for the Day** 2 **Equipment:** Impact  Vibratory

**Total Minutes of Pile Driving/Total Blows of Impact Driving:**

31 minutes (intermittent)

Pile 1:  
22 mins { first tap @ 1406 - low tide  
continuous @ 1410-1411  
strikes @ 1422 (< 1 min)  
taps @ 1426, 1428 (end)

Pile 2:  
9 mins { first tap @ 1529  
second tap @ 1529  
strike @ 1530, 1531-1532  
A-1 continuous  
1537-1538





Date: 07/23/18

Page 1 of 3

Daily Marine Mammal Monitoring Summary Log  
Richmond Refinery Long Wharf Maintenance and Efficiency Project

Monitor(s):

Diana Edwards + Natalie Green

Weather/visibility observations and sea state, using Beaufort Scale on next page):

Sunny, cloudy to west (near SE), some visibility  
Beaufort: 3

Tidal Level (start work/end work):

see tidal chart low @ 1507  
high @ 1037

General Human Activity in the Area:

painting/general maintenance

Monitoring Location (s):

1. top of stairs of wharf house  
2. 300 ft S. of pile driving on wharf

Pile Type (s):

concrete piles

Total Pile Count for the Day \_\_\_\_\_ Equipment: Impact  Vibratory

Total Minutes of Pile Driving/Total Blows of Impact Driving:

3<sup>13</sup> - 3<sup>29</sup> 4<sup>25</sup> - 4<sup>32</sup> 18 minutes

7/23/18 2 of 3

Daily Marine Mammal Monitoring Data Sheet - Richmond Refinery Long Wharf Maintenance and Efficiency Project

Time of Observation	Piling Activity <sup>1</sup>	Species <sup>2</sup>	Age Class <sup>3</sup>	Identifying Marks	Distance from Pile <sup>4</sup>	Direction of Travel	Behavior <sup>5</sup>
First: 7:11 Last: 7:43	B	HASE	HASE	DARK HASE	300 ft	W	Playing + Diving w/ OTHER HASE
First: 8:35 Last: 8:47	B	HASE	HASE	Brownish	1000 ft	N	Swimming + Diving
First: 7:41 Last: 7:43	B	HASE	HASE	Grayish tone	300 ft	W	Playing + Diving w/ OTHER HASE
First: 14:58 Last:	B	HASE	HASE	Light Gray	200 Fw	S	Slow swimming SW
First: 15:02 Last:	B	"	"	"	400 F SW	N	slow swimming N
First: 15:15 Last:	B	"	"	"	300 Fw	W	slow swimming W
First: 16:30 Last:	DA	"	"	Dark gray head	1700 E	E	DAVE
First: 16:33 Last:	A	"	"	"	200 NE	E	slow swim
First: 16:37 Last: 16:47	A	"	"	"	300 NE	N/A	stationary at surface
First: Last:							
<sup>1</sup> Activity: Indicate if observation is: before (B); during (D); or after (A) pile driving.		<sup>2</sup> Species Abbreviations: California Sea Lion = CASL Pacific Harbor Seal = HASE Northern Elephant Seal = NOES Harbor Porpoise = HAPO	<sup>3</sup> Species Age Classes: CASL = juvenile, subadult male, adult male HASE = juvenile, adult HAPO = calf, adult	<sup>4</sup> Distance: Provide an approximate distance from location of pile being driven, just driven, or about to be driven. Indicate unit of measurement (meters, feet, etc.).	<sup>5</sup> Behavior examples: Stationary at surface, swimming (slow or fast), transiting, foraging, resting, looking around. Note if mammal appears to be attentive to project activities, or displays any behavior changes related to project activities, and describe the project activity. Note any human-caused disturbances such as recreational boating or helicopters.  Add a reference number if comments are provided on a separate sheet.		

NO BEHAVIOR OCT THIS TIME

4 SAME STAMP

5 SAME STAMP

15:15 - 15:31  
HAPO: 3:15 - 15:31

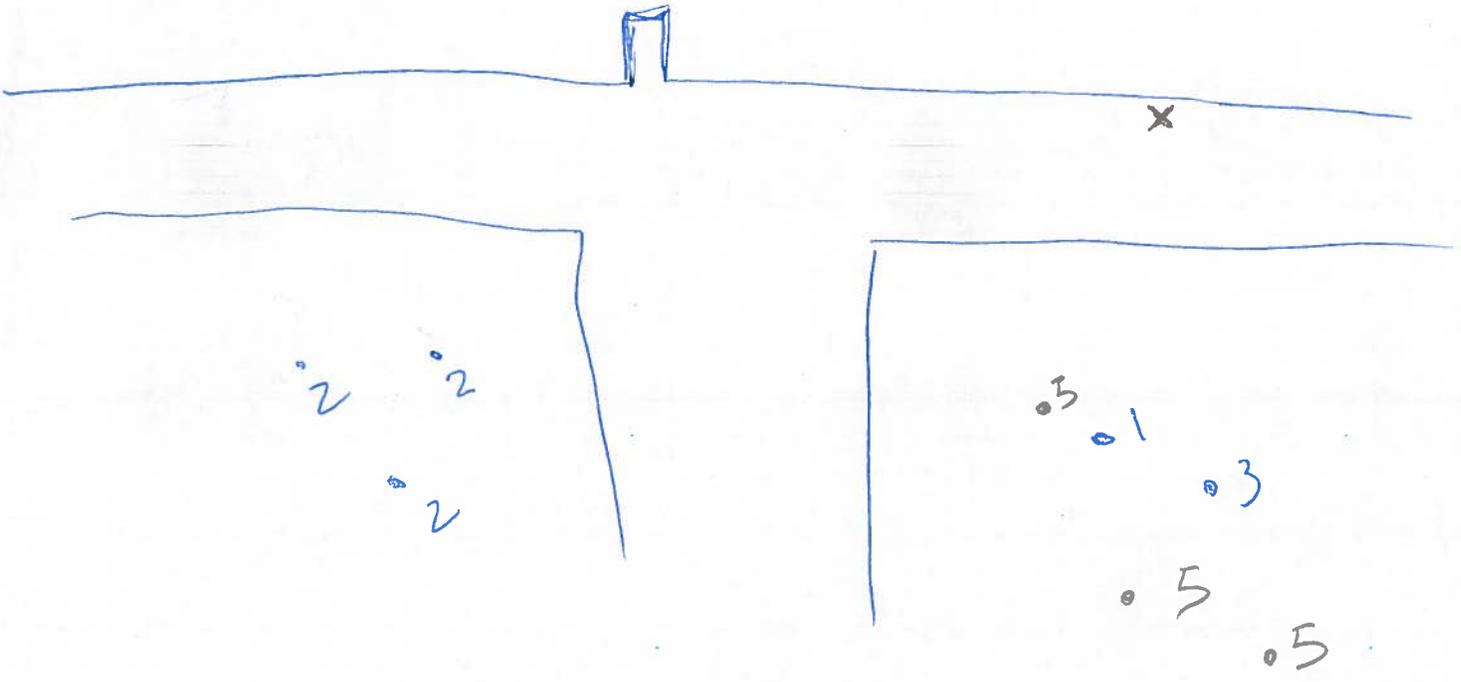
7/23/18  
30r3

4

**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Diagram**

4  
4



Biological Monitor: Natale Greer Print Name Natale Greer

Signature: 

Date: 7/25/18

Page 1 of 4

**Daily Marine Mammal Monitoring Summary Log**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

Monitor(s):

Christina Kelleher & Matthew Bettelheim

Weather/visibility observations and sea state, using Beaufort Scale on next page):

0-1 Beaufort

Tidal Level (start work/end work):

See tide charts

High @ 1210  
Low @ 1040

General Human Activity in the Area:

Construction crew conducting pile driving, Chevron crew doing maintenance, driving, etc.

Monitoring Location (s):

Location A: top of stairs at Control Room Building  
Location B: on road/water wharf SE. of barge & pile driving

Pile Type (s):

Steel piles - vibratory drilling

Total Pile Count for the Day 2 Equipment: Impact  Vibratory

Total Minutes of Pile Driving/Total Blows of Impact Driving:

file #1: 1143-~~1228~~ 1228, #2: 1409-~~1423~~ 1423 stopped to fix hammer ~ 1423 <sup>1730</sup> start ~ ~~1830~~ <sup>1831</sup> ~~1830~~  
(45) + (14) + (61) = 2 hours

Jellyfish observed in water by barge & on NE side of wharf

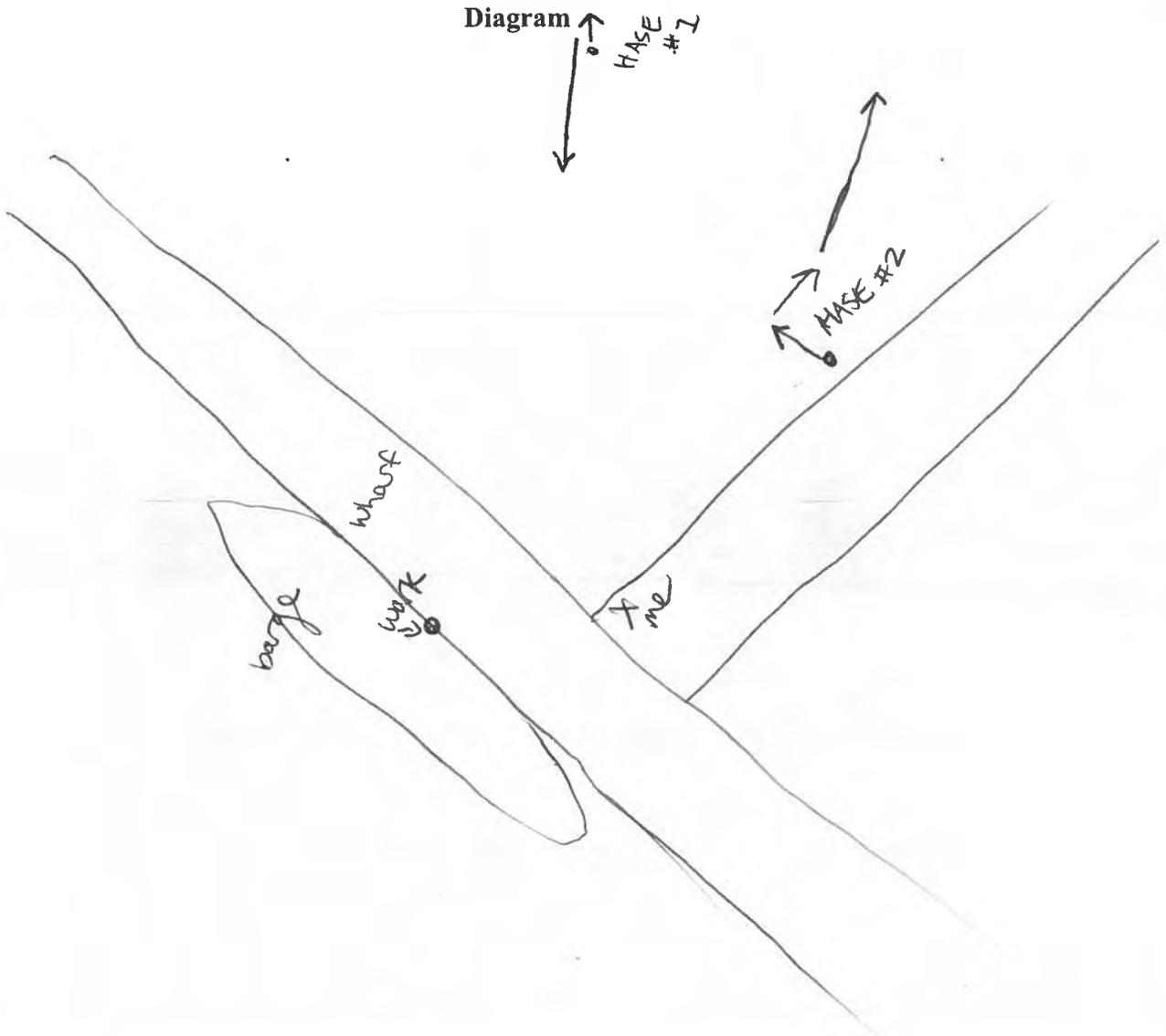
WBU adults + fledglings, OSR, BRPE, jellyfish, RPS, PEG adults + juveniles, BARS



7/25/18

3 of 4

**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**



Biological Monitor: Christina Kelleher Print Name Christina Kelleher

Signature: *Christina Kelleher*



Date: 7/26/18

Page 1 of 5

**Daily Marine Mammal Monitoring Summary Log**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

Monitor(s):

Christina Kelleher + Natalie Greer

Weather/visibility observations and sea state, using Beaufort Scale on next page):

~75°F, 90% clouds (morning), 10 miles+ visibility, Beaufort 0-1

Tidal Level (start work/end work):

See tide chart High @ 1247  
Low @ 1720

General Human Activity in the Area:

Pile driving, driving cars/construction equipment

Monitoring Location (s):

- ① SE of barge/pile driving along ~~the~~ wharf
- ② On stairs outside of control room building

Pile Type (s):

Steel

Total Pile Count for the Day 4 Equipment: Impact  Vibratory

Total Minutes of Pile Driving/Total Blows of Impact Driving:

#1: 0818-0834, 0922-1036, 1302-1307 #2: 1349-1415 #3: 1516-1627  
#4: 1719-1807

$(18) + 74 + 7 + 26 + 71 + 48 = 244$

4 hr 4 min

BRPE, WEGU, OCCO, ROPE, OSRR, BCNH, SNEG

7/26/18

1 #2  
 2 of 5  
 → #2  
 in 0830 - both monitors moved to west position (SE of barg) due to jackhammering making other position have bad air quality

Daily Marine Mammal Monitoring Data Sheet - Richmond Refinery Long Wharf Maintenance and Efficiency Project

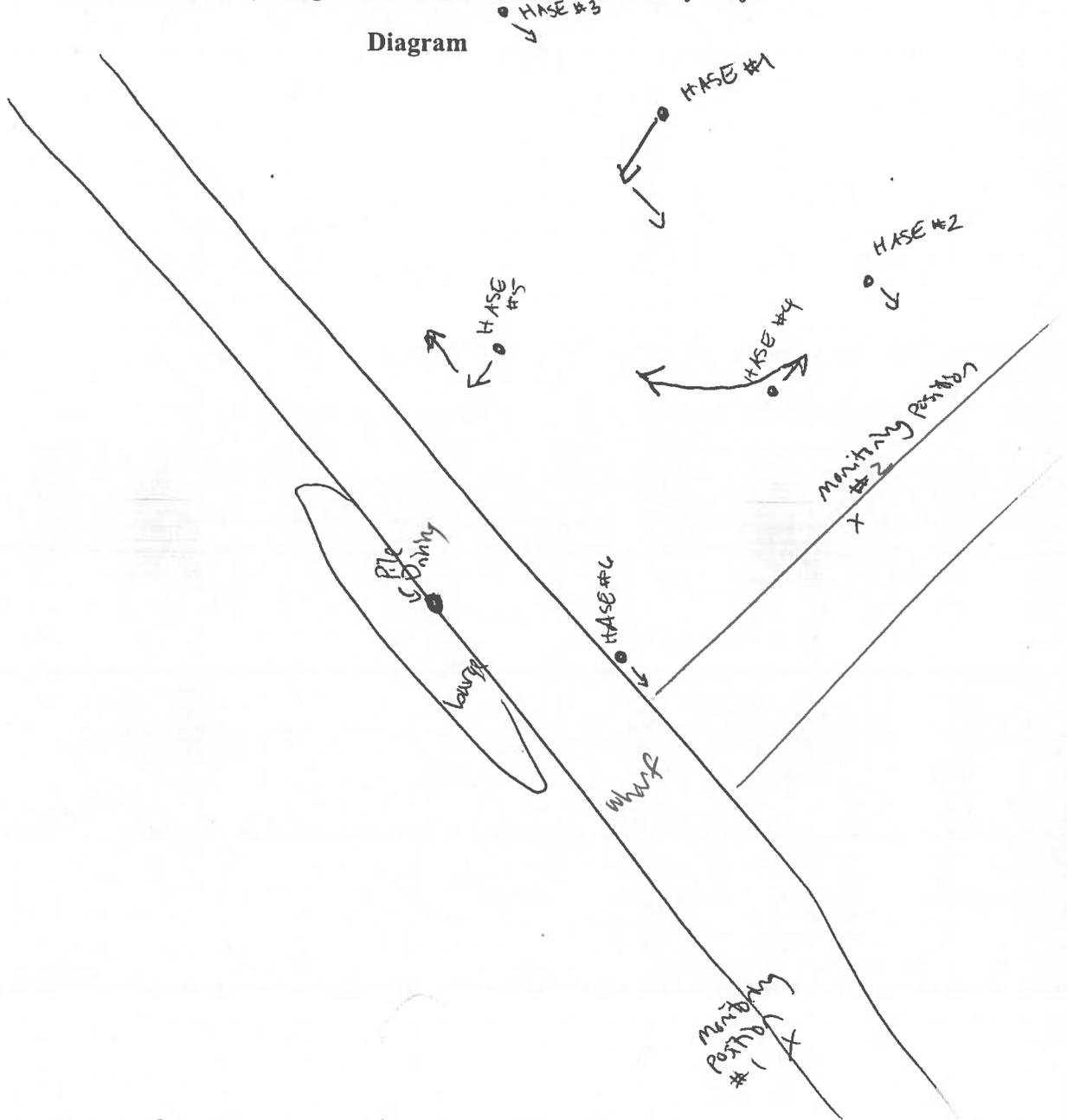
Time of Observation	Piling Activity <sup>1</sup>	Species <sup>2</sup>	Age Class <sup>3</sup>	Identifying Marks	Distance from Pile <sup>4</sup>	Direction of Travel	Behavior <sup>5</sup>
First: 0926 Last: 1031	Vertical down	HASE	unk	too far to tell	~200m East	W.	Swim W., dive under. Resurface 938, 1044, 1031
First: 0932 Last: 0932	" "	HASE	unk	"	~150m East	S.	Swim S., dive
First: 1011 Last: 1011	" "	HASE	unk	"	~225m NE	S.	Swim, dove
First: 1515 Last: 1515	" "	HASE	unk	light brown gray, dark spots	~100m E	E.	float + dive; resurface 1524 close to wharf
First: 1525 Last: 1611	" "	HASE	unk	dark gray	~80m E	W.	Swim W. to wood wharf dive (saw @ same time as #4, so different animal) resurface 1527, 1532, 1547, 1555, 1603, 1611
First: 1614 Last: 1615	" "	HASE	unk	light med brown, no spots on face, dark back of dark spots light gray chest	~50m E	S.	Swim under wharf S. (not toward pile)
First: Last:							
First: Last:							
First: Last:							
First: Last:							
First: Last:							
First: Last:							
Footnote 1:	<sup>1</sup> Activity: Indicate if observation is: before (B); during (D); or after (A) pile driving.						
Footnote 2:	<sup>2</sup> Species Abbreviations: California Sea Lion = CASL; Pacific Harbor Seal = HASE; Northern Elephant Seal = NOES; Harbor Porpoise = HAPO						
Footnote 3:	<sup>3</sup> Species Age Classes: CASL = juvenile, subadult male, adult male; HASE = juvenile, adult; HAPO = calf, adult						
Footnote 4:	<sup>4</sup> Distance: Provide an approximate distance from location of pile being driven, just driven, or about to be driven. Indicate unit of measurement (meters, feet, etc.).						
Footnote 5:	<sup>5</sup> Behavior examples: Stationary at surface, swimming (slow or fast), transiting, foraging, resting, looking around. Note if mammal appears to be attentive to project activities, or displays any behavior changes related to project activities, and describe the project activity. Note any human-caused disturbances such as recreational boating or helicopters.						
Footnote 6:	Add a reference number if comments are provided on a separate sheet.						

position #2

7/26/18  
3 of 5

**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

Diagram



Biological Monitor: Christina Kelleher Print Name \_\_\_\_\_

Signature: 



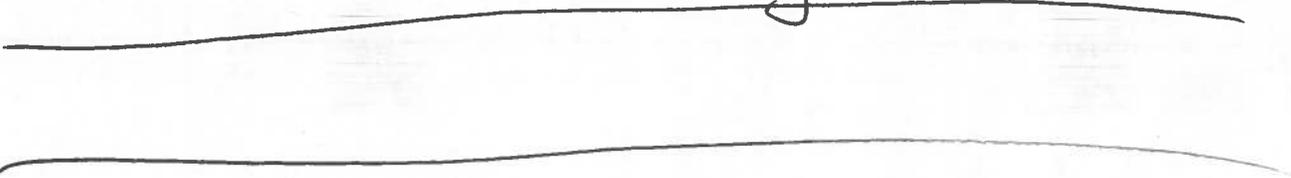
7/26/18  
5 of 5

**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

Diagram



• PICE DRIVING



• MM1

MM

Biological Monitor: Nataie Greer Print Name Nataie Greer

Signature: 

NO MMS OBSERVED

Date: 7/27/18

Page 1 of 1

**Daily Marine Mammal Monitoring Summary Log**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Monitor(s):**

Mandi McElroy, Natalie Greer

**Weather/visibility observations and sea state, using Beaufort Scale on next page):**

Beaufort 1, 56°F @ 0745, 85% cloud cover, wind 0-5 mph  
@ 1200, ↑ to Beaufort 4, clear skies, wind ↑ to ~10 mph, 67°F

**Tidal Level (start work/end work):**

High @ 1320, Low @ 1757

**General Human Activity in the Area:**

wharf operations - Tanker @ Berth 4

**Monitoring Location (s):**

South wharf, north wharf ~ 300 ft.

**Pile Type (s):**

steel h-piles

**Total Pile Count for the Day** 4 **Equipment:** Impact  Vibratory

**Total Minutes of Pile Driving/Total Blows of Impact Driving:**

~70 minutes (divided)

0720 - used hammer < 1 min  
to adjust pile from yesterday  
30 { 0905-0930 pile 1  
0944-0950? finished  
removed hammer @ 0955  
14 1043-1057 pile 2  
15 1201-1206 } pile 3  
1210-1220 } A-1  
10 1746-1756 } pile 4

0750 left Oakland  
on site @ 0815  
started piles @  
0900

NO MM'S OBSERVED

Date: 7/29/18

Page 1 of 1

**Daily Marine Mammal Monitoring Summary Log**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

Monitor(s):

Mandi McElroy

Weather/visibility observations and sea state, using Beaufort Scale on next page):

0815: 55° F, wind 5-10 mph, 100% cloud cover / fog, Beaufort 3  
@ south position

Tidal Level (start work/end work):

low @ 0711 (-0.2), high @ 1419 (4.9)

General Human Activity in the Area:

decreased activity @ Long Wharf (Sunday)

Monitoring Location (s):

South wharf - view of bay / area surrounding crane barge

Pile Type (s):

steel h-piles

Total Pile Count for the Day 8

Equipment: Impact  Vibratory

Total Minutes of Pile Driving/Total Blows of Impact Driving:

~66 min (intermittent)

- ① 0900 - 0906 = 6
- ② 0936 - 0945 = 9
- ③ 1057 - 1102 = 5
- ④ 1137 - 1145 = 8
- ⑤ 1331 - 1338 = 7
- ⑥ 1436 - 1451 = 15
- ⑦ 1520 - 1524 = 6
- ⑧ 1607 - 1617 = 10

total = 66



# Appendix D Hydroacoustic Monitoring Reports



# Memo

To: Bill Martin  
AECOM

From: Torrey Dion

Date: July 31, 2018

Re: Chevron Long Wharf Maintenance and Efficiency Project –Hydroacoustic  
Measurements

Subject: **Preliminary Results of the July 22-23, 2018 Hydroacoustic  
Measurements**

---

The following is a summary of the work completed on July 22, 2018 through July 23, 2018 for the driving of four 24-inch concrete square piles at the Chevron Long Wharf. Table 3 shows the summary of the hydroacoustic measurements. Piles were installed using an impact hammer.

The hydroacoustic monitoring was conducted in accordance with the requirements of the United States Army Corps Engineers (Corps), and the National Marine Fisheries Service (NMFS) Biological Opinion<sup>1</sup>. The hydroacoustic Monitoring Plan required the following:

- Measure the dual metric criteria (Popper et al. 2006) and the accumulated sound exposure level (SEL);
- Establish field locations that will be used to document the extent of the area experiencing 187 decibels (dB) SEL accumulated;
- Describe the methods necessary to continuously assess underwater noise on a real-time basis, including details on the number, location, distance and depth of hydrophones, and associated monitoring equipment;
- Provide a means of recording the time and number of pile strikes, the peak sound energy per strike, and interval between strikes;

Three hydrophones were deployed to establish the needed data to calculate the attenuation rate and the distances to the various criteria. One hydrophone was placed at 12-15 meters from the pile, a second was placed at 60 meters, a third hydrophone was placed at 280 meters. Hydrophones were placed at mid depth in the water at approximately 7 meters deep for both the 12-15-meter and 60-meter locations. The hydrophone at 280 meters was placed at a depth of about 1.5 meter due to shallow water conditions further from the wharf.

---

<sup>1</sup> National Marine Fisheries Service, West Coast Region, Tracking Number WCR-2016-5530, Dated June 20, 2017

The distances to the 187 dB and 183 dB Cumulative SEL thresholds were calculated using a 20 log drop off rate based off field measurements for the two closer positions. Table 1 shows the per pile and daily distances to the two criteria.

**Table 1 – Distances to the NMFS Cumulative SEL Thresholds (dB re: 1 $\mu$ Pa-sec<sup>2</sup>)  
Distances are in Meters**

Day	Pile ID	Distance to 187 dB <sub>Cumulative SEL</sub> (meters)	Distance to 183 dB <sub>Cumulative SEL</sub> (meters)
7/22	24" Square Concrete Pile #1	Less than 10 meters	Less than 10 meters
7/22	24" Square Concrete Pile #2	Less than 10 meters	Less than 10 meters
7/22	All Piles	Less than 10 meters	11 meters
7/23	24" Square Concrete Pile #3	Less than 10 meters	Less than 10 meters
7/23	24" Square Concrete Pile #4	Less than 10 meters	Less than 10 meters
7/23	All Piles	Less than 10 meters	12 meters

The distances to the 190 dB RMS for pinnipeds, 180 dB RMS for cetaceans, 160 dB RMS for marine mammals and 150 dB RMS for fish were established based on the average daily maximum RMS levels measured. The attenuation rate was computed to be about a 20 log drop off in this case. Table 2 shows the various distances.

**Table 2 - Distances are based on an  
Average RMS level of 156 dB re 1 $\mu$ Pa at 60 meters**

Criteria	Distance in Meters
190 dB RMS for pinnipeds	Less than 10 meters
180 dB RMS for cetaceans	Less than 10 meters
160 dB RMS for marine mammals	38 meters
150 dB RMS for fish	120 meters

Tables 3 and 4 show the maximum peak, RMS, and SEL levels and range of RMS and SEL levels measured. The time histories for the 12-15-meter, 60-meter, and 280-meter locations are shown in Figures 1 through 12.

**Table 3 – July 22, 2018 Summary**

	Pile ID	Hammer Type	# Strikes/ Seconds Driving	Hydrophone Distance from Pile/ depth (m)	Water Depth (m)		Peak (dB)		SEL (dB) <sup>1</sup>			RMS (dB) <sup>1</sup>			Notes
					At Pile	At H-phone	Max	Mean	Max	Mean	SEL cumulative	Max	Mean	Duration	
7/22 2:06-2:30pm	1	A.P.E D70-52	128	13 / 7	~12	~12	181	178	157	156	177	170	168	0.035 seconds	Impact hammer with bubble curtain attenuation
7/22 2:06-2:30pm	1	A.P.E D70-52	128	60 / 7	~12	~12	165	160	143	139	<sup>2</sup> -	153	150	0.035 seconds	Impact hammer with bubble curtain attenuation
7/22 2:06-2:30pm	1	A.P.E D70-52	128	280 / 1	~2	~2	142	138	123	116	<sup>2</sup> -	128	126	0.035 seconds	Impact hammer with bubble curtain attenuation
7/22 3:28-3:39pm	2	A.P.E D70-52	107	15 / 7	~12	~12	188	185	161	159	178	173	171	0.035 seconds	Impact hammer with bubble curtain attenuation
7/22 3:28-3:39pm	2	A.P.E D70-52	107	60 / 7	~12	~12	172	170	149	147	<sup>2</sup> -	161	158	0.035 seconds	Impact hammer with bubble curtain attenuation
7/22 3:28-3:39pm	2	A.P.E D70-52	107	280 / 1	~2	~2	147	141	134	126	<sup>2</sup> -	139	131	0.035 seconds	Impact hammer with bubble curtain attenuation

<sup>1</sup> Pulse RMS will be analyzed subsequently. The RMS is based on the 0.035 second impulse detector which is assumed to be a conservative estimate.

<sup>2</sup> This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet).

**Table 4 – July 23, 2018 Summary**

Date and Time	Pile ID	Hammer Type	# Strikes/ Seconds Driving	Hydrophone Distance from Pile/ depth (m)	Water Depth (m)		Peak (dB)		SEL (dB) <sup>1</sup>			RMS (dB) <sup>1</sup>			Notes
					At Pile	At H-phone	Max	Mean	Max	Mean	SEL cumulative	Max	Mean	Duration	
7/23 5:18-5:30pm	3	A.P.E D70-52	92	15 / 7	~12	~12	186	182	160	158	178	172	169	0.035 seconds	Impact hammer with bubble curtain attenuation
7/23 5:18-5:30pm	3	A.P.E D70-52	92	60 / 7	~12	~12	171	168	148	145	<sup>2</sup> -	160	156	0.035 seconds	Impact hammer with bubble curtain attenuation
7/23 5:18-5:30pm	3	A.P.E D70-52	92	280 / 1	~2	~2	141	139	123	119	<sup>2</sup> -	129	126	0.035 seconds	Impact hammer with bubble curtain attenuation
7/23 4:25-4:32pm	4	A.P.E D70-52	71	12 / 7	~12	~12	189	184	162	160	179	174	172	0.035 seconds	Impact hammer with bubble curtain attenuation
7/23 4:25-4:32pm	4	A.P.E D70-52	71	60 / 7	~12	~12	175	170	149	146	<sup>2</sup> -	161	158	0.035 seconds	Impact hammer with bubble curtain attenuation
7/23 4:25-4:32pm	4	A.P.E D70-52	71	280 / 1	~2	~2	142	140	126	121	<sup>2</sup> -	131	127	0.035 seconds	Impact hammer with bubble curtain attenuation

<sup>1</sup> Pulse RMS will be analyzed subsequently. The RMS is based on the 0.035 second impulse detector which is assumed to be a conservative estimate.

<sup>2</sup> This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet).

Figure 1

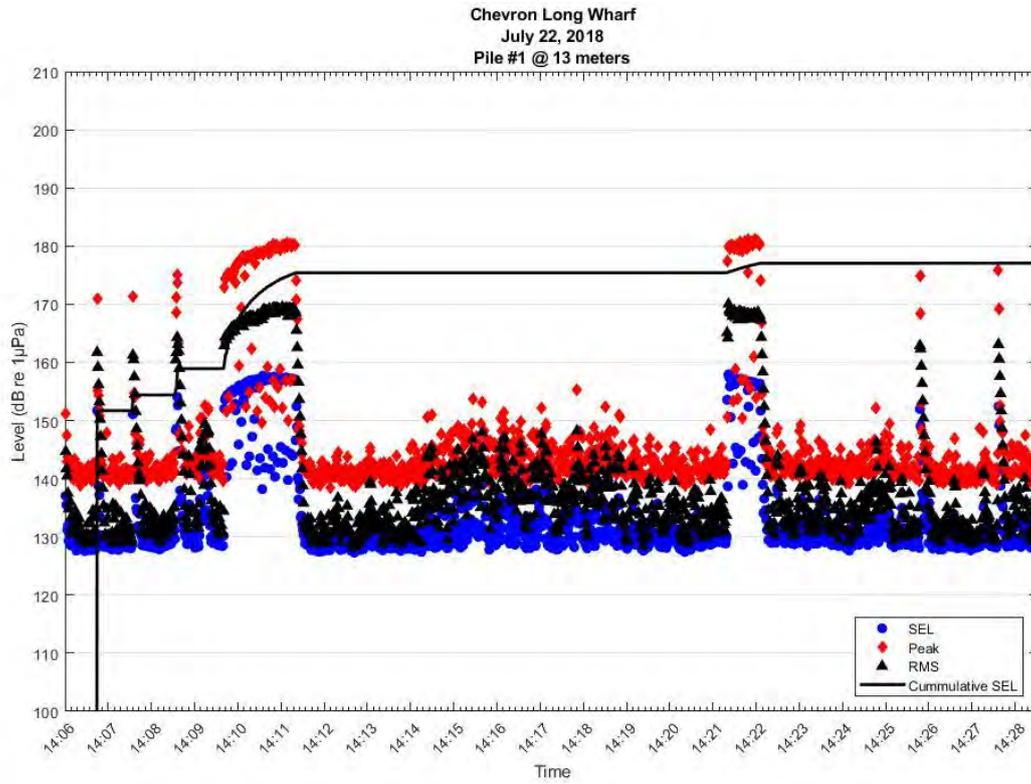


Figure 2

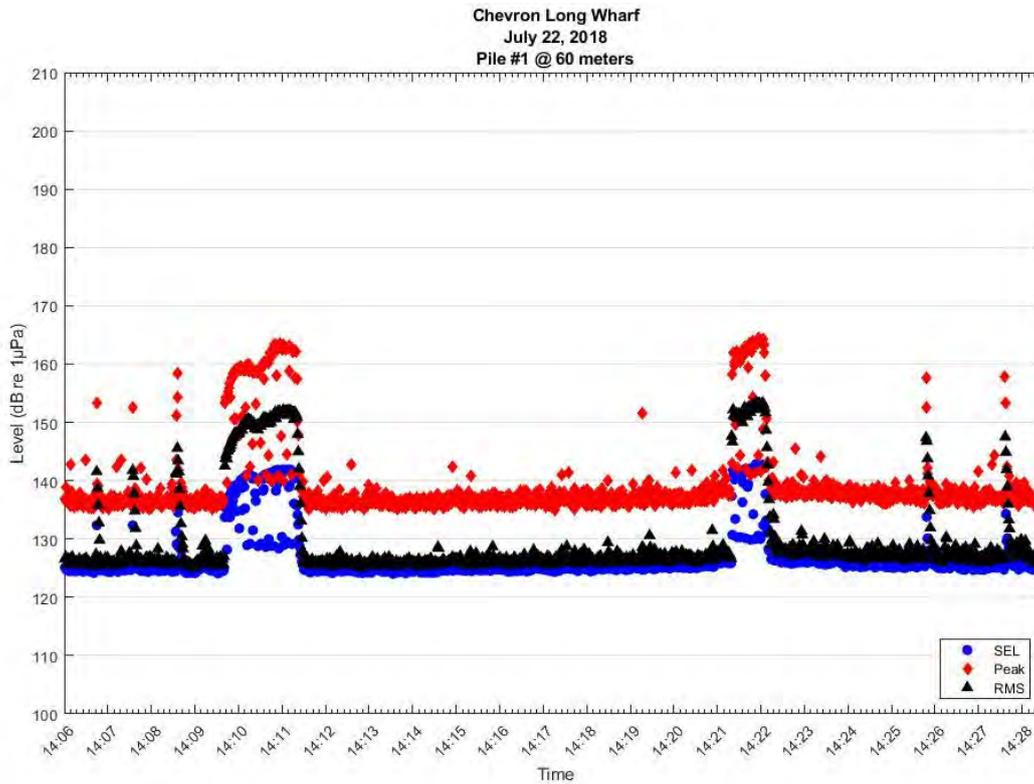


Figure 3

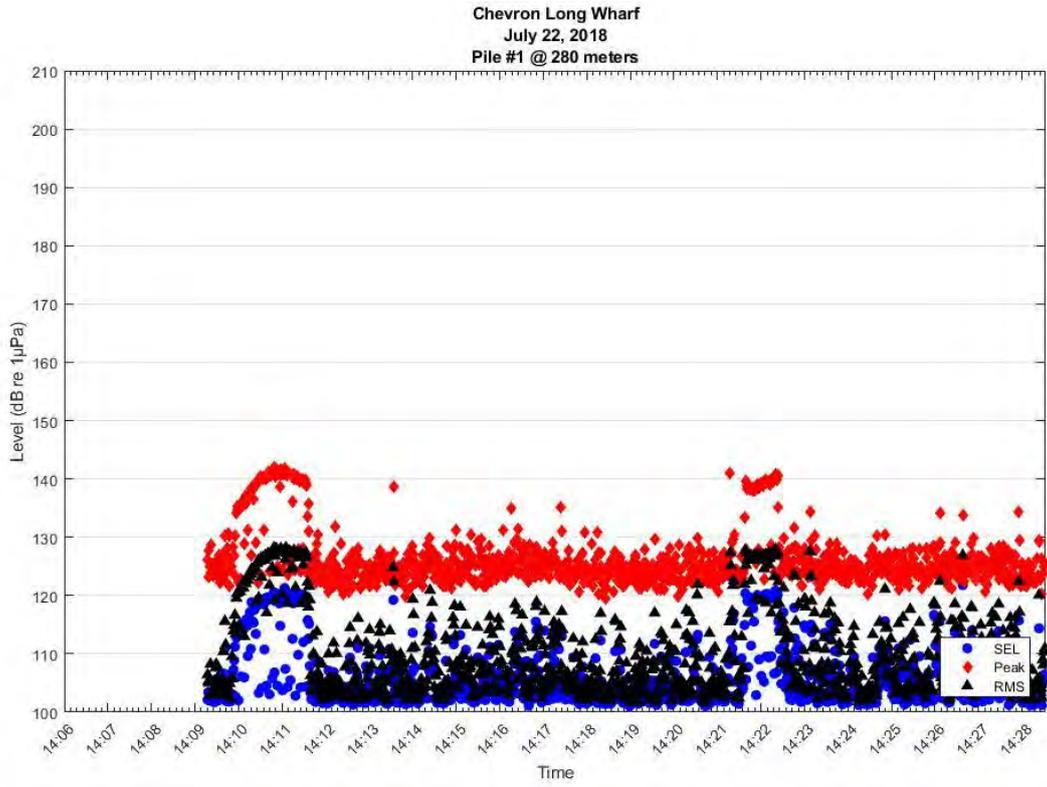


Figure 4

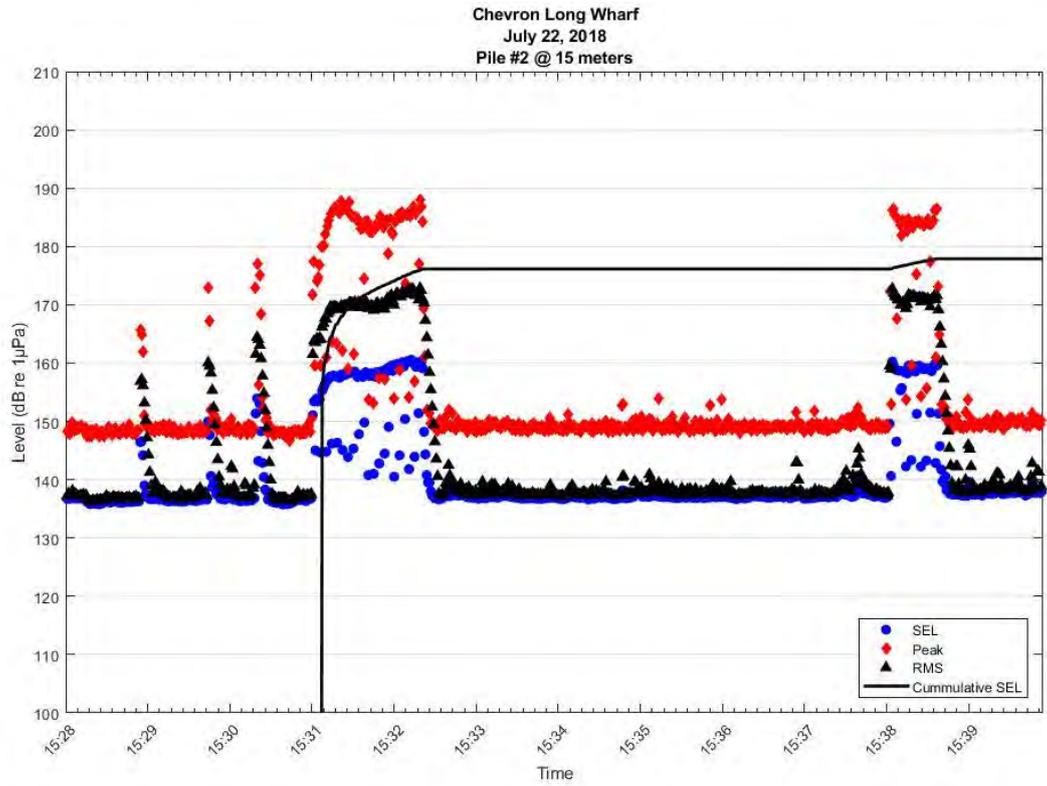


Figure 5

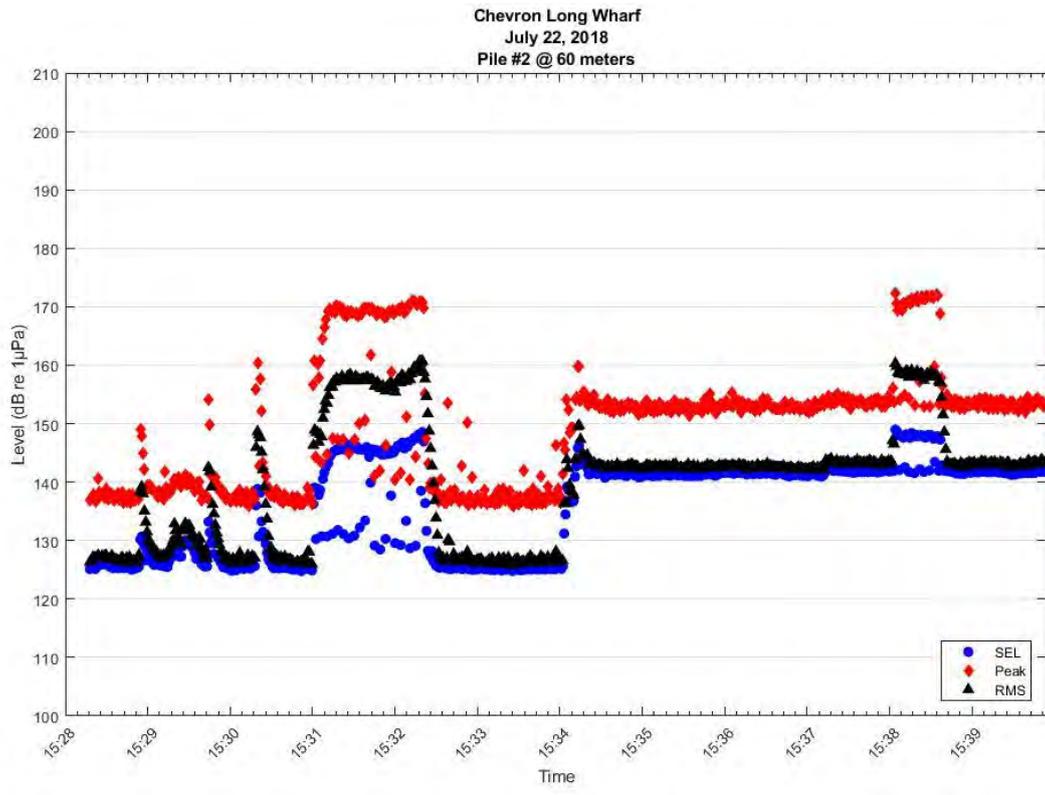


Figure 6

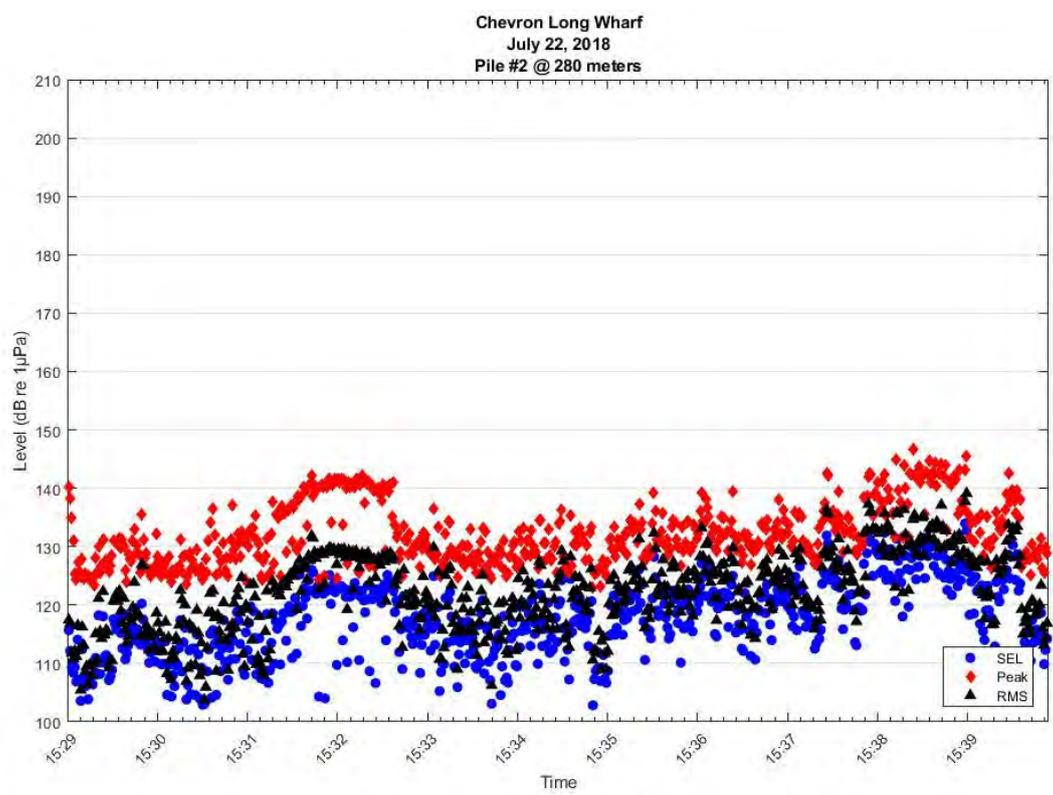


Figure 7

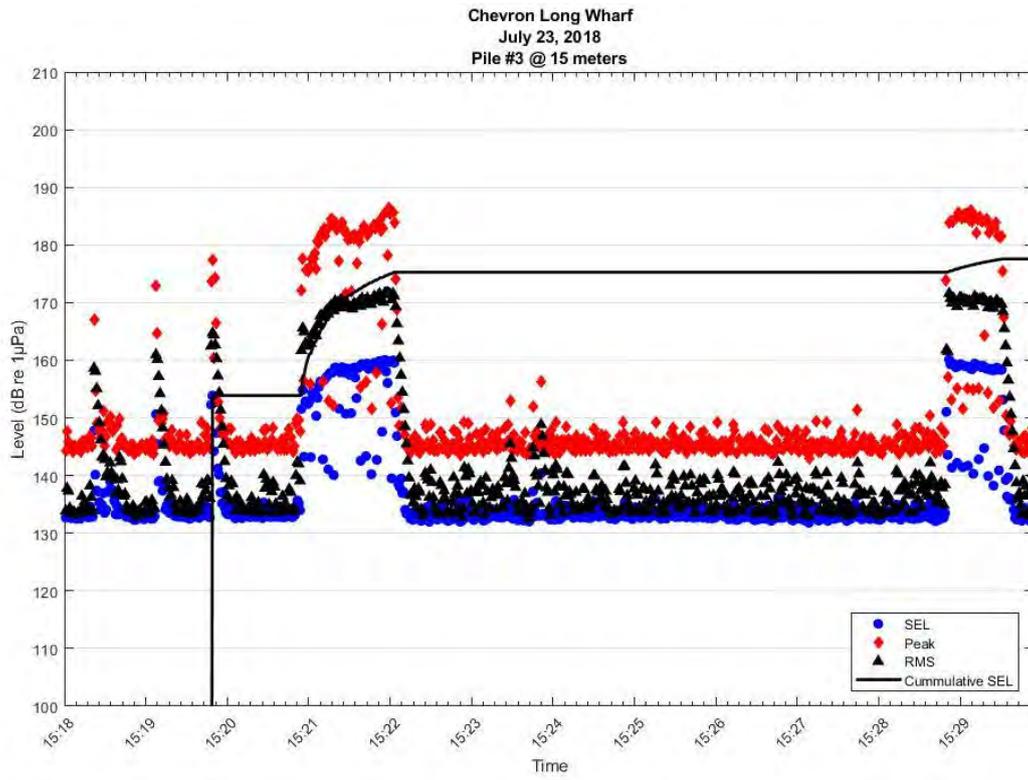


Figure 8

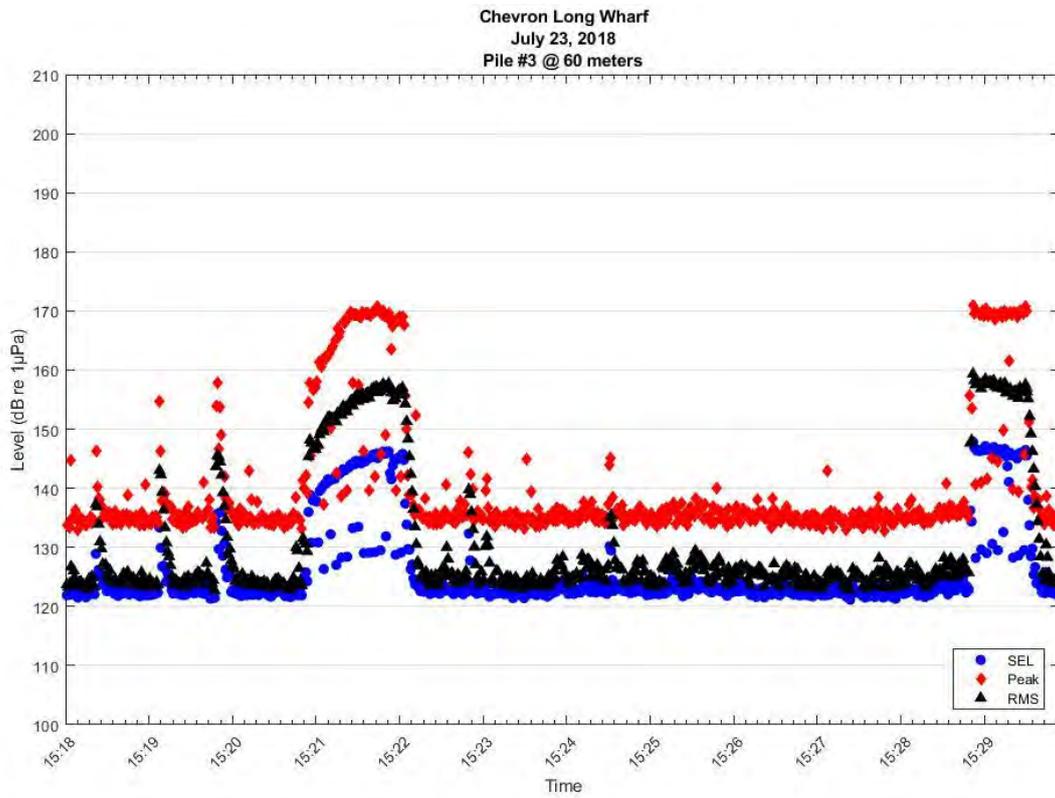


Figure 9

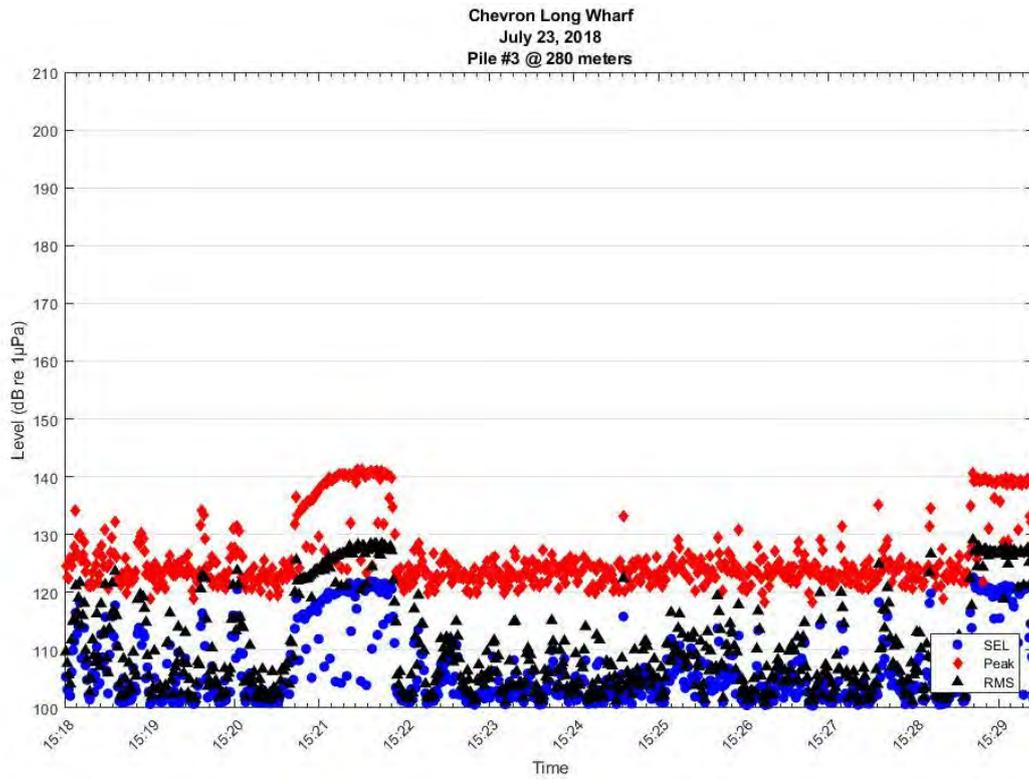


Figure 10

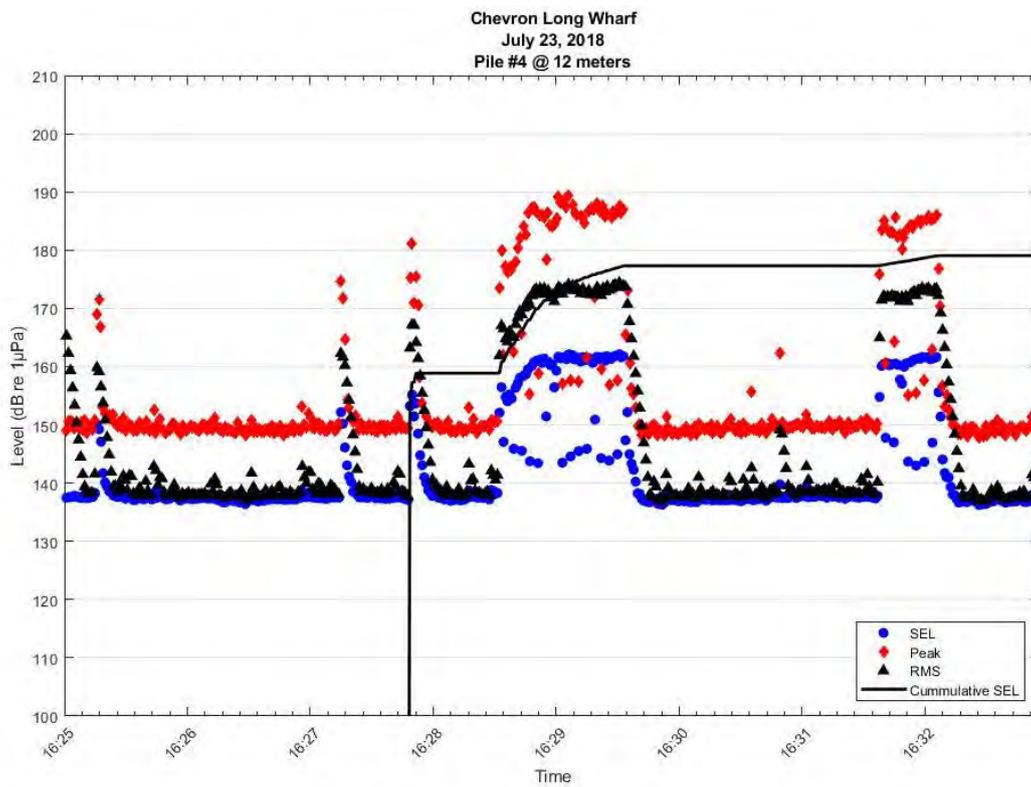


Figure 11

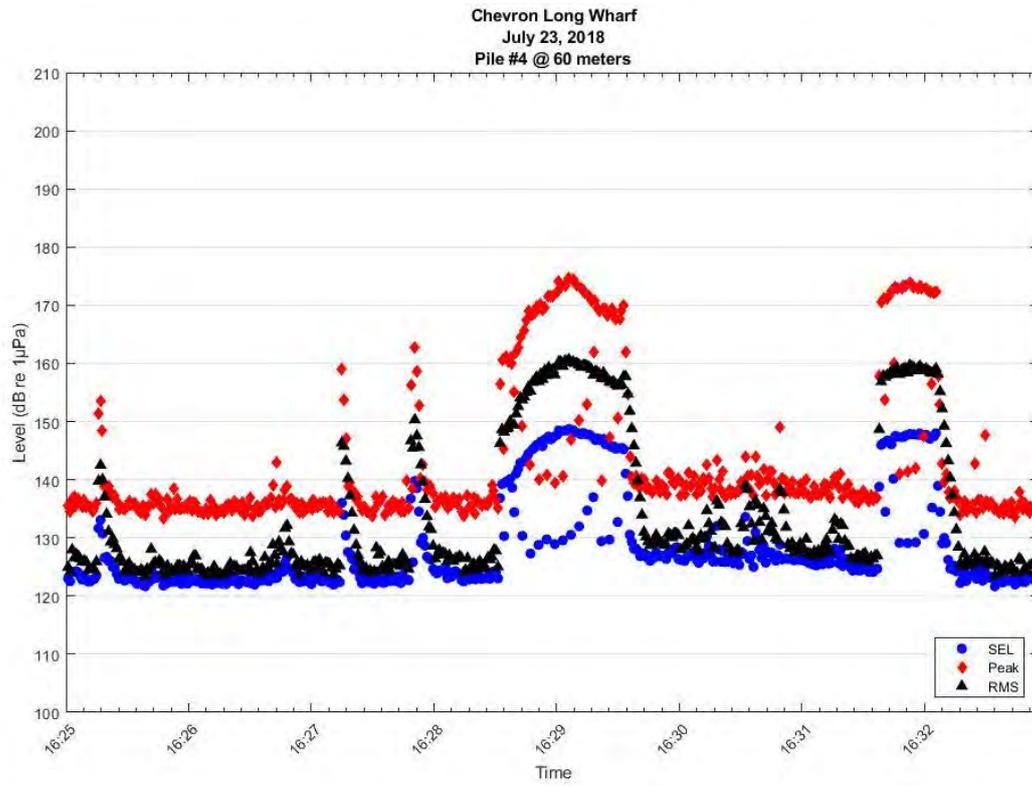
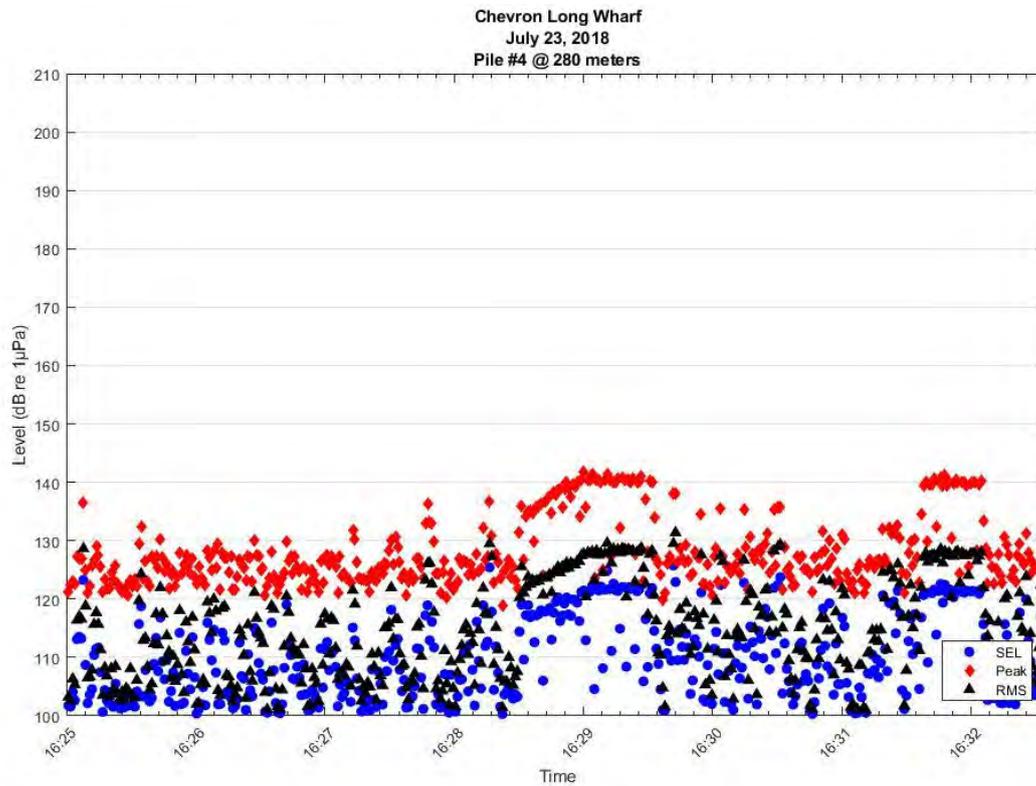


Figure 12



# Memo

To: Bill Martin  
AECOM

From: Torrey Dion

Date: June 7, 2018

Re: Chevron Long Wharf Maintenance and Efficiency Project –Hydroacoustic Measurements

Subject: **Preliminary Results of the June 6, 2018 Hydroacoustic Measurements**

---

The following is a summary of the work completed on June 6, 2018 for the driving of one 24-inch concrete square pile at Chevron Long Wharf. Table 3 shows the summary of the hydroacoustic measurements.

The hydroacoustic monitoring will be conducted in accordance with the requirements of the United States Army Corps Engineers (Corps), and the National Marine Fisheries Service (NMFS) Biological Opinion 1. The monitoring will be done in accordance with the methodology outlined in this Hydroacoustic Monitoring Plan. The monitoring will be conducted based on the following:

- Be based on the dual metric criteria (Popper et al. 2006) and the accumulated sound exposure level (SEL);
- Establish field locations that will be used to document the extent of the area experiencing 187 decibels (dB) SEL accumulated;
- Describe the methods necessary to continuously assess underwater noise on a real-time basis, including details on the number, location, distance and depth of hydrophones, and associated monitoring equipment;
- Provide a means of recording the time and number of pile strikes, the peak sound energy per strike, and interval between strikes;

Three hydrophones were deployed to establish the needed data to calculate the attenuation rate and the distances to the various criteria. One hydrophone was placed at 10 meters, a second was placed at 55 meters, a third hydrophone was placed at 280 meters. Hydrophones were placed at mid depth in the water at approximately 20 feet deep for both the 10-meter and 55-meter locations. The hydrophone at 280 meters was placed at a depth of about 5 feet due to shallow water conditions further from the wharf.

---

<sup>1</sup> National Marine Fisheries Service, West Coast Region, Tracking Number WCR-2016-5530, Dated June 20, 2017

The 55-meter hydrophone did not produce valuable data due to an unknown loose connection after installation. Due to the nature of the installation, underwater levels could not be validated during meter operation. For this reason, subsequent measurements will require a different 55-meter location to ensure valid data is being recorded.

The distances to the 187 dB and 183 dB Cumulative SEL thresholds was calculated using a standard 20 log drop off rate and using the data measured in the field. Table 1 shows the per pile and daily distances to the two criteria.

**Table 1 – Distances to the NMFS Cumulative SEL Thresholds (dB re: 1µPa-sec<sup>2</sup>)  
Distances are in Meters**

Day	Pile ID	Distance to 187 dB Cumulative SEL (meters)	Distance to 183 dB Cumulative SEL (meters)
6/6	4	6 meters	9 meters

The distances to the 190 dB RMS for pinnipeds, 180 dB RMS for cetaceans, 160 dB RMS for marine mammals and 150 dB RMS for fish were established based on the average daily maximum RMS levels measured. The attenuation rate is assumed to be a standard 20 log drop off in this case. Table 2 shows the various distances.

**Table 2 - Distances are based on an Average RMS level of 180 dB re 1µPa at 10 meters**

Criteria	Distance in Meters
190 dB RMS for pinnipeds	Less than 10 meters
180 dB RMS for cetaceans	Less than 10 meters
160 dB RMS for marine mammals	45 meters
150 dB RMS for fish	141 meters

The average number of pile strikes per minute is estimated to be approximately 38 blows per minute or approximately one blow every 1.5 seconds. Table 3 shows the number of blows per pile and the maximum peak, RMS, and SEL levels and range of RMS and SEL levels measured. The time histories for the 10-meter and 280-meter locations are shown in Figures 1 and 2.

**Table 3 – June 6, 2018 Summary**

Pile ID	Time	Distance	Peak	RMS		One-Second SEL		Single Pie Cumulative SEL	Number of pile strikes
			Max	Mean	Range	Mean	Range		
24" Concrete #4	10:38	10	191	173	175-165	161	165-154	182	71
	10:48	55	NA <sup>1</sup>						
		280	146	126	136-113	117	127-106	140	

<sup>1</sup>Data invalid for particular day.

Figure 1

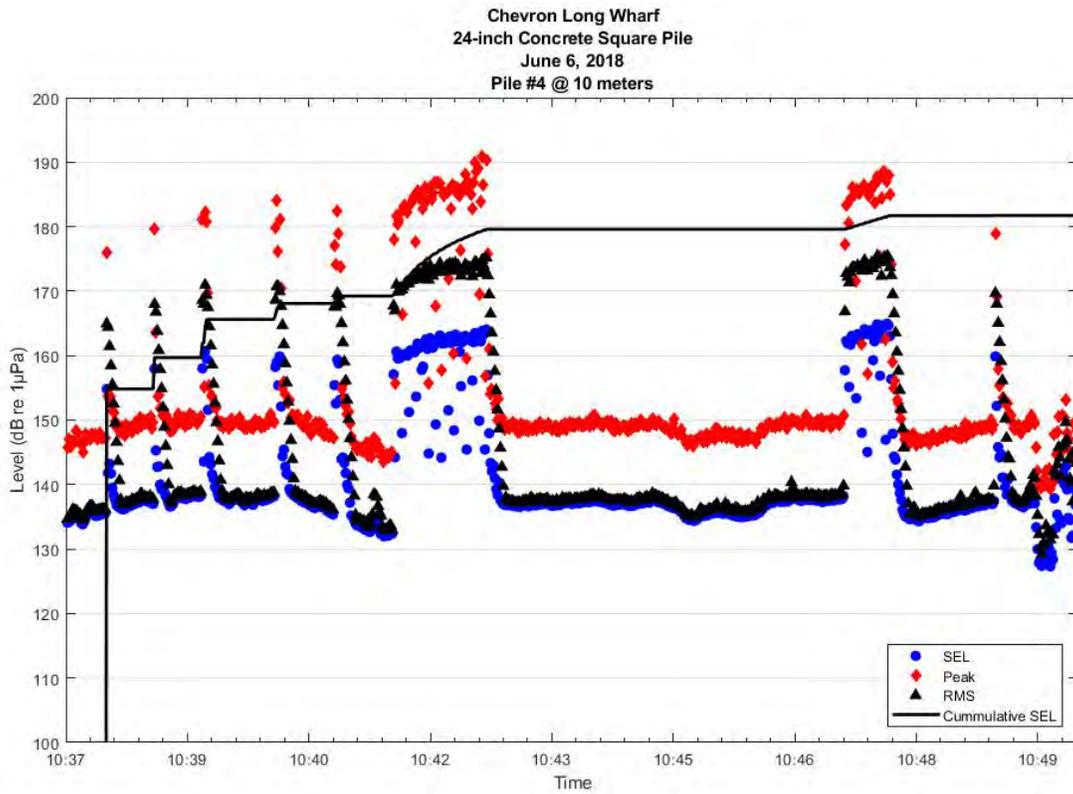
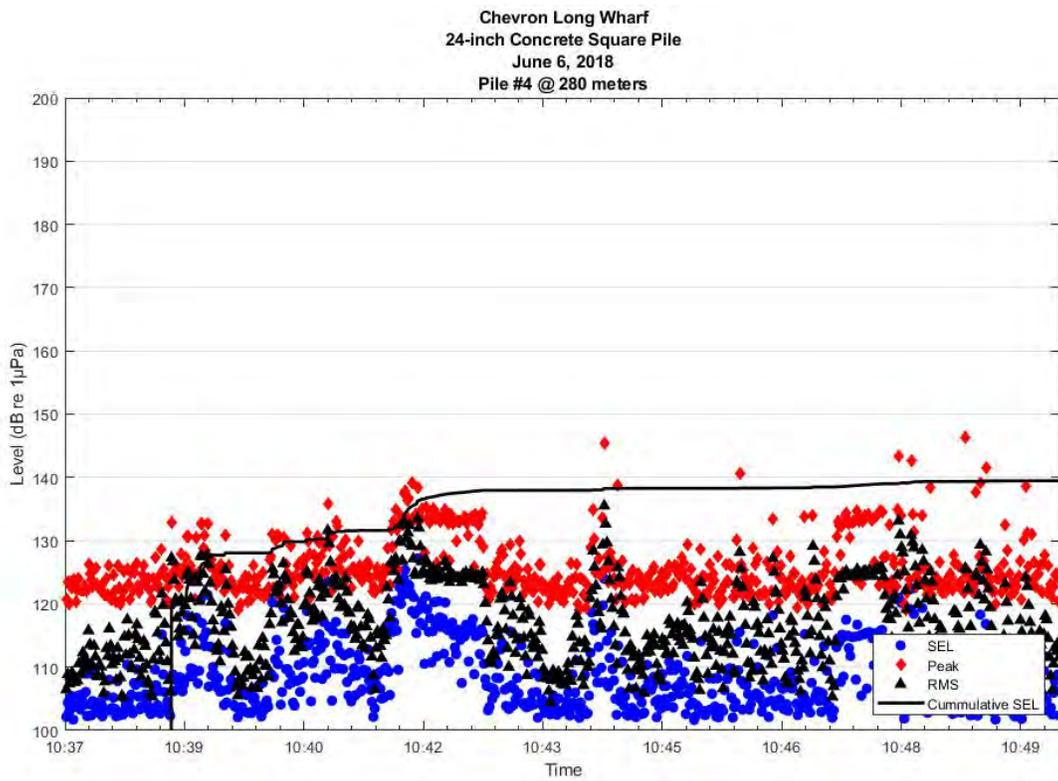


Figure 2





# Memo

To: Bill Martin  
AECOM

From: Torrey Dion

Date: June 13, 2018

Re: Chevron Long Wharf Maintenance and Efficiency Project –Hydroacoustic Measurements

Subject: **Preliminary Results of the June 11, 2018 Hydroacoustic Measurements**

---

The following is a summary of the work completed on June 11, 2018 for the driving of two 14-inch steel H piles at the Chevron Long Wharf. Table 3 shows the summary of the hydroacoustic measurements. Piles were installed using a vibratory hammer.

The hydroacoustic monitoring will be conducted in accordance with the requirements of the United States Army Corps Engineers (Corps), and the National Marine Fisheries Service (NMFS) Biological Opinion 1. The monitoring will be done in accordance with the methodology outlined in this Hydroacoustic Monitoring Plan. The monitoring will be conducted based on the following:

- Be based on the dual metric criteria (Popper et al. 2006) and the accumulated sound exposure level (SEL);
- Establish field locations that will be used to document the extent of the area experiencing 187 decibels (dB) SEL accumulated;
- Describe the methods necessary to continuously assess underwater noise on a real-time basis, including details on the number, location, distance and depth of hydrophones, and associated monitoring equipment;
- Provide a means of recording the time and number of pile strikes, the peak sound energy per strike, and interval between strikes;

Three hydrophones were deployed to establish the needed data to calculate the attenuation rate and the distances to the various criteria. One hydrophone was placed at 10 meters, a second was placed at 55 meters, a third hydrophone was placed at 280 meters. Hydrophones were placed at mid depth in the water at approximately 20 feet deep for both the 10-meter and 55-meter locations. The hydrophone at 280 meters was placed at a depth of about 5 feet due to shallow water conditions further from the wharf.

---

<sup>1</sup> National Marine Fisheries Service, West Coast Region, Tracking Number WCR-2016-5530, Dated June 20, 2017

The 280-meter hydrophone did not record any distinguishable pile driving levels. Levels from the 280-meter hydrophone were representative of water current noise have been included in Figures 3 and 6.

The distances to the 187 dB and 183 dB Cumulative SEL thresholds were calculated using a 21 log drop off rate based off field measurements. Table 1 shows the per pile and daily distances to the two criteria.

**Table 1 – Distances to the NMFS Cumulative SEL Thresholds (dB re: 1µPa-sec<sup>2</sup>)**  
Distances are in Meters

Day	Pile ID	Distance to 187 dB Cumulative SEL (meters)	Distance to 183 dB Cumulative SEL (meters)
6/11	14" Steel H Pile #6	Less than 10 meters	Less than 10 meters
6/11	14" Steel H Pile #7	Less than 10 meters	Less than 10 meters

The distances to the 190 dB RMS for pinnipeds, 180 dB RMS for cetaceans, 160 dB RMS for marine mammals and 150 dB RMS for fish were established based on the average daily maximum RMS levels measured. The attenuation rate is assumed to be a 21 log drop off in this case. Table 2 shows the various distances.

**Table 2 - Distances are based on an Average RMS level of 150 dB re 1µPa at 10 meters**

Criteria	Distance in Meters
190 dB RMS for pinnipeds	Less than 10 meters
180 dB RMS for cetaceans	Less than 10 meters
160 dB RMS for marine mammals	Less than 10 meters
150 dB RMS for fish	10 meters

Table 3 shows the maximum peak, RMS, and SEL levels and range of RMS and SEL levels measured. The time histories for the 10-meter, 55-meter, and 280-meter locations are shown in Figures 1 through 6.

**Table 3 – June 6, 2018 Summary**

Pile ID	Time	Distance	Peak	10-Sec Average RMS		One-Second SEL	
			Max	Mean	Range	Mean	Range
14" Steel #6	8:14 8:30	10	162	150	151-146	147	151-138
		55	156	134	140-128	132	142-126
		280	NA <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>
14" Steel #7	9:18 9:42	10	165	149	151-144	146	151-134
		55	154	132	137-119	130	141-112
		280	NA <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>

<sup>1</sup>Levels not considered due to high water current noise.

Figure 1

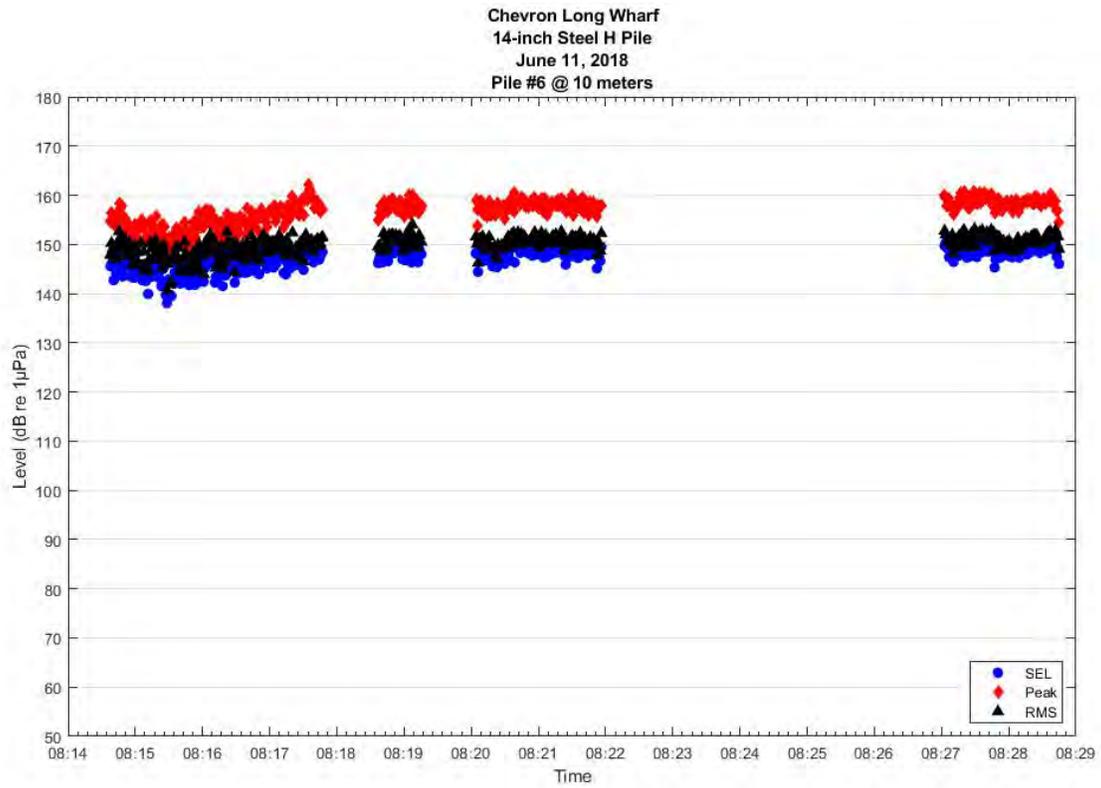


Figure 2

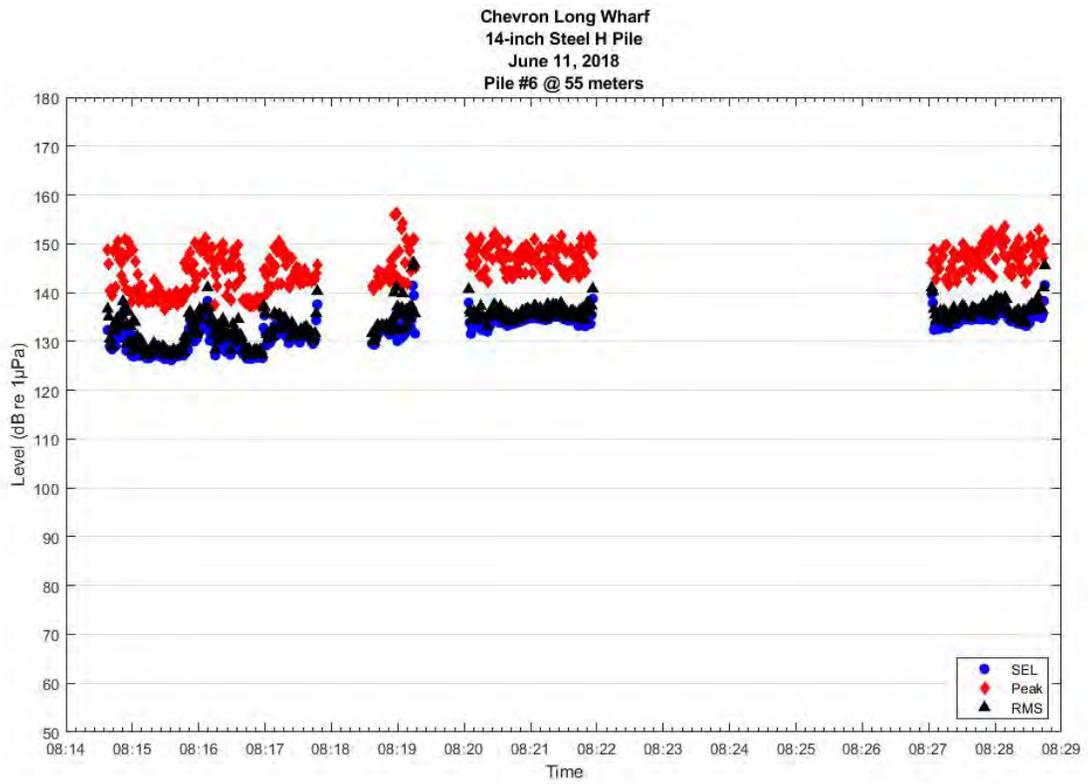


Figure 3

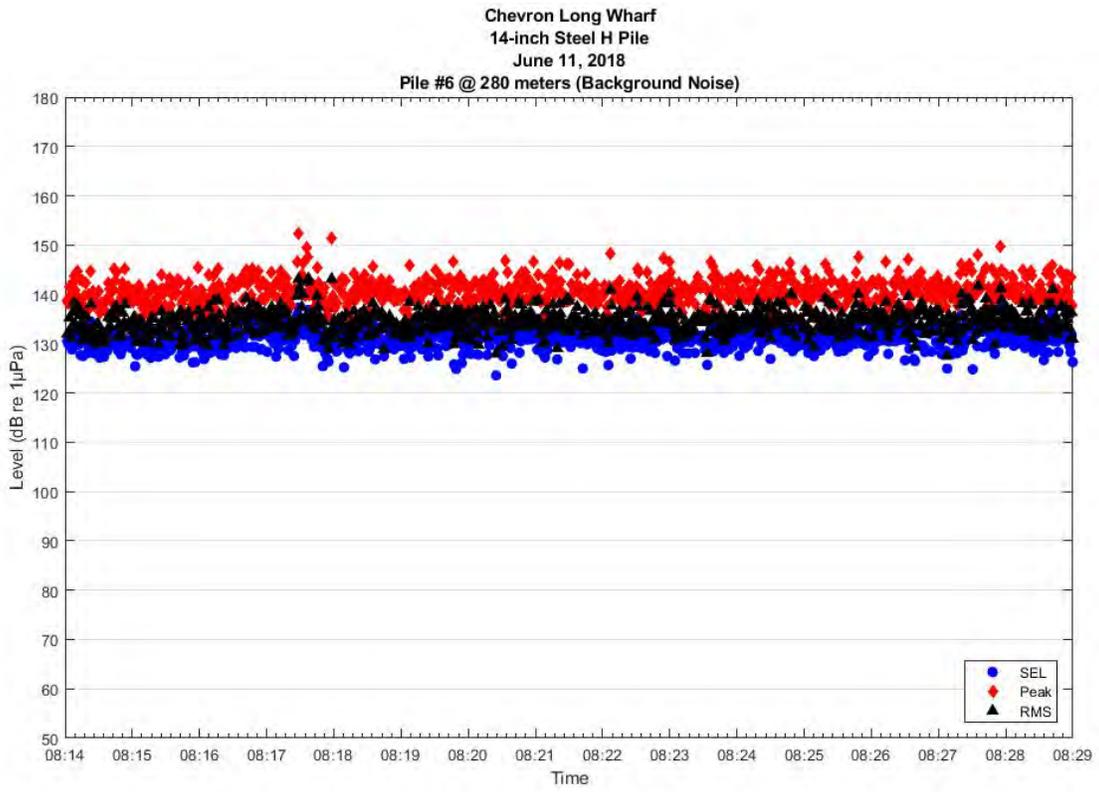


Figure 4

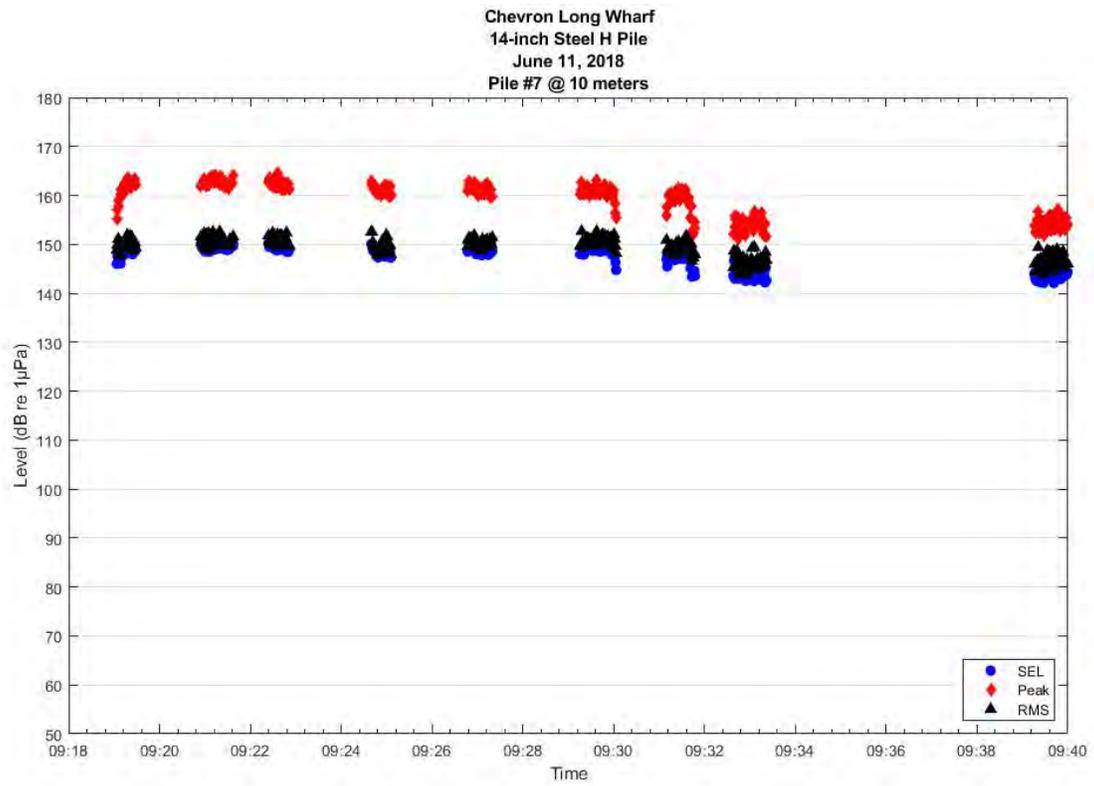


Figure 5

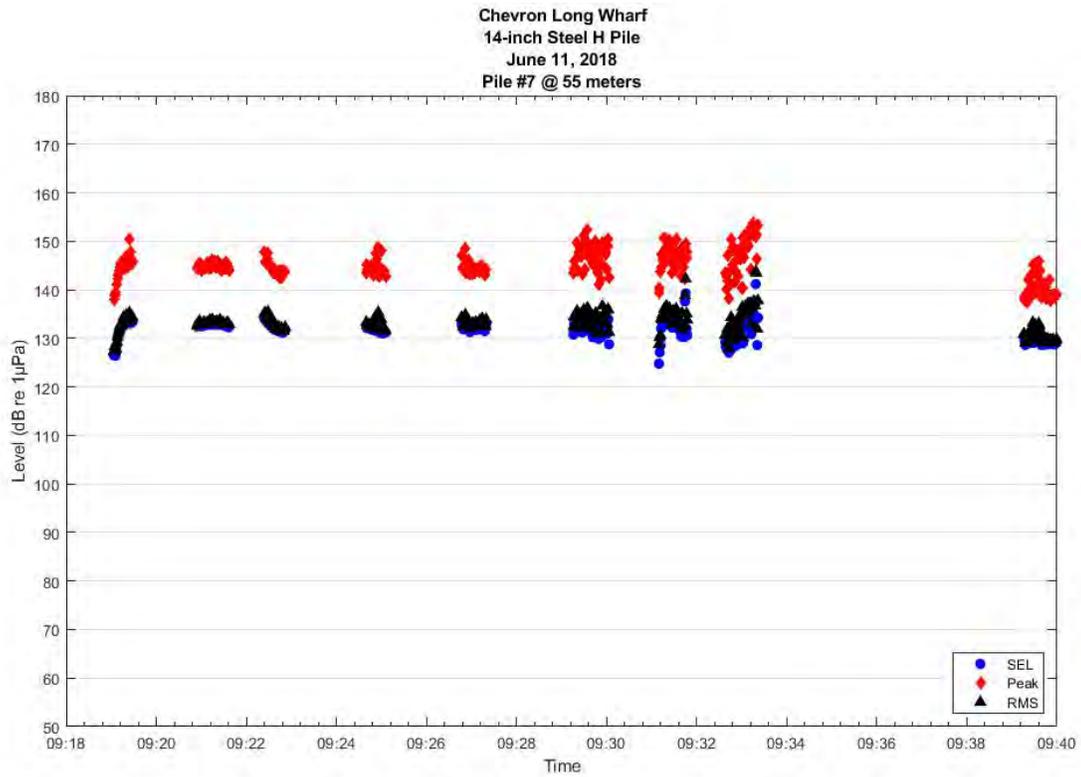
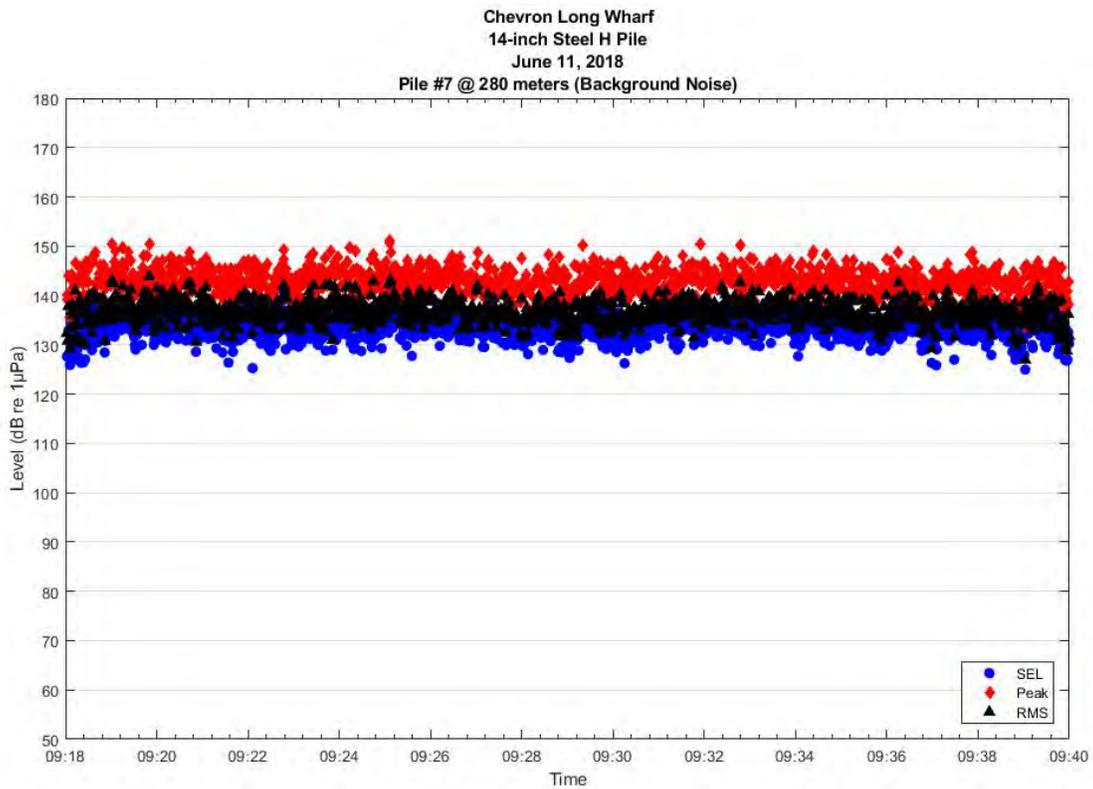


Figure 6





# **Appendix E Worker Environmental Awareness Training Brochure**



## ENVIRONMENTAL LAWS, REGULATIONS AND PENALTIES

- ◆ **Federal Endangered Species Act (ESA)** – enacted to conserve endangered and threatened species in an effort to bring species back to viable population levels.
  - Prohibits the “take” of any listed species. “Take” is defined as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.”
- ◆ **California Endangered Species Act (CESA)** – generally parallels the main provisions of the Federal Act and prohibits the “taking” of state-listed species.
- ◆ **Marine Mammal Protection Act** – protects all marine mammals.
  - Prohibits the “take” of marine mammals. “Take” is defined as “to harass, hunt, capture, or kill, or attempt to engage in any such conduct.”
- ◆ **California Fish and Game Code §3511** – prohibits take of fully protected birds. Take can only be authorized for necessary scientific research. No other take permits can be issued.

***Violation of federal and/or state environmental laws may result in fines and/or jail.***

## PROTECTIVE MEASURES

### Measures to Protect and Monitor All Species

- ◆ **Time Restrictions:** For all in-water pile driving activities, Chevron shall operate only during daylight hours
- ◆ Permittee shall conduct pile installation, removal, and related in-water work between June 1 and November 30
- ◆ All piles shall be removed by direct pull or by vibratory methods. Should a pile break or cannot be removed, the pile shall be cut off, at a minimum, 2 feet below the mudline.
- ◆ Permittee shall install piles with a vibratory pile driver to the maximum extent feasible. Maximum pile diameter to be installed shall be 60 inches.
- ◆ Sound pressure levels should not exceed any of the calculated distances to the peak pressure or accumulated sound exposure level.
- ◆ Permittee shall use a bubble curtain during all pile installation of 60” diameter piles using an impact hammer.

### Measures to Protect Marine Mammals

- ◆ **Establishment of Shutdown Zone:** For all pile driving activities, will establish shutdown zones for marine mammal species.
- ◆ Shutdown zones will be monitored for 30 min prior to the start of driving. Monitor will give the all clear. Also will

notify if a shutdown must occur during driving if animals approach too close.

- ◆ The shutdown zone shall be monitored throughout the time required to install a pile. Pile installation shall be halted before the animal enters the shutdown zone.
- ◆ If any marine mammal species other than those in the IHA, or if a species for which authorization has been granted but the number of authorized takes has been met enters or approaches the ZOI all activities shall be shut down until the animal is seen leaving the ZOI or it has not been seen in the shutdown zone for 30 minutes for cetaceans and 15 minutes for pinnipeds.
- ◆ Use of Ramp Up/ Soft Start.
- ◆ Pile caps or cushions shall be used during all impact pile-driving activities.
- ◆ For in-water heavy machinery work other than pile driving (e.g., standard barges, tug boats, barge-mounted excavators, or clamshell equipment), if a marine mammal comes within 10 meters, operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions.
- ◆ Visual marine mammal monitoring, observation, data collection, and reporting

## YOUR RESPONSIBILITIES

- ◆ All workers should always keep an eye open for these species.
- ◆ If a species is observed, immediately notify your Foreman and Supervisor.

Please contact the Project Compliance Specialist, Mark Piersante, at (510) 912-8667 or Maureen Dunn at 510-210-2483 if species are observed, with any questions, or for a complete description of all protective measures for the Project. Other contacts include Mandi McElroy (designated biologist) at 706-254-8717.

**AECOM**

## Long Wharf Maintenance and Efficiency Project

### WORKER ENVIRONMENTAL AWARENESS TRAINING

#### Protection of



Marine Mammals



Fish



## SENSITIVE SPECIES

### MARINE MAMMALS

- ◆ All marine mammals are protected under the Marine Mammal Protection Act.

#### Pacific Harbor Seal



- ◆ Most common marine mammal species in the Project area.
- ◆ Have spotted coats in a variety of shades from white or silver-gray to dark brown or black. They are true seals, having no external ear flaps. They have small flippers and move on land by flopping along on their bellies.
- ◆ Shutdown Zones: 115 feet-impact/50 feet-vibratory

#### California Sea Lion



- ◆ Second most common marine mammal species in the Project area.
- ◆ Their color ranges from chocolate brown in males to a lighter golden brown in females. They are known for their noisy barking. They are not “true” seals, having external ear flaps and large flippers that they use to “walk” on land.
- ◆ Shutdown Zones: 115 feet-impact/50 feet-vibratory

#### Harbor Porpoise



- ◆ They are small, relative to most dolphins. Backs are very dark gray or dark brown. They have a low triangular dorsal fin located slightly after the center of the body.
- ◆ Shutdown Zones: 850 feet-impact/100 feet-vibratory

#### Gray Whale



- ◆ They can grow to about 50 feet long, with mottled gray body, small eyes above the corners of the mouth, and broad, paddle-shaped, pointed pectoral fins (flippers). They have a dorsal hump instead of a fin, and a series of small bumps between the hump and tail flukes.
- ◆ Shutdown Zones: 1,150 feet-impact/100 feet-vibratory

### FISH

#### Longfin Smelt



- ◆ Size: 3-inches
- ◆ Threatened under CESA

#### Chinook Salmon



- ◆ Size: 36-inches
- ◆ Endangered / Threatened under ESA & CESA

#### Green Sturgeon



- ◆ Size: 4.5-6.5 feet
- ◆ Threatened under ESA

### NESTING AND PROTECTED BIRDS

Most nesting birds are protected under the Migratory Bird Treaty Act except rock dove, European starling and house sparrows. If you see a nest, contact a biologist.

# Appendix F Training Attendance Record



Please scan email to : Leila Zamani LZWK

**Refinery Long Wharf Maintenance & Efficiency Project  
Education and Training Meeting  
Attendee Sign-In Sheet**

**Date: May 14, 2018**

The person completing and signing this Sign-in Sheet acknowledges that they have attend and successfully completed the required training session and understand all protection measures imposed by the LWMEP regulatory conditions of approval and mitigation measures required by the ITP issued by CDFW.

Name	Company	Phone	Email
HANIF AMMAR	Redwood Painting	(925) 432-4500	
Ricard Alvarez	Redwood Painting	(925) 395-8135	<del>1/25/18</del>
John D Evans	Redwood Painting	(510) 965-8642	
Bennett Clegg	P.E.C.	(415) 559-0089	clegg@ PowerEng Construction.com
Kristi Twemmler	P.E.C	(925) 510-3230	notion42@hotmail.com
Tony Castillo	P.E.C	707 338-9014	TonyCastillo AKC@gmail.com
CHON YOUNG	CCE	1-000-000-0001	CHON_420@YAHOO.COM
MUNTE PARDO	HMC	702.812.6524	
James Beucler	Harder		
Daniel Lara	Redwood	-	-

Scott Sanger			
Dawn Taylor			
Erin Post			
Vincenzo Cobisenco			
Jacob Hansen			
TODD BROUSSARD			
Leila Zamani	CTX/CONNEXSYS		
Chad Little			
<del>R.K. Decker</del>			
Rob Brooks			

**Refinery Long Wharf Maintenance & Efficiency Project  
Education and Training Meeting  
Attendee Sign-In Sheet**

**Date: May 14, 2018**

The person completing and signing this Sign-in Sheet acknowledges that they have attend and successfully completed the required training session and understand all protection measures imposed by the LWMEP regulatory conditions of approval and mitigation measures required by the ITP issued by CDFW.

Name	Company	Phone	Email
Jesse Johansen	Power	(510) 631-7550	_____
Enrique Vega	POWER	(707) 477-2920	_____
Jose Saramillo	Power Eng	209-640-7516	_____
Jose Luis Coronel	Power Eng	650-384-3399	coronej73@gmail.com
Steven Sharsub	Power Eng	925 674 2690	_____
Lars Olsen	Power Eng	510-207-4560	lo@powerengconstruction.com
Joe Junior	CCE	(925) 768-3101	JJunior@Emc.Net
MIKE KNUTT	CCE		
Diana Chatmon	CCE		_____
Julio CONTRIL	POWER ENG	(925) 588-1819	
JUAN CARRILLO	power ENG.	(510) 289-7373	
Roberto Alejandro	power eng		
Aaron Tong	Power Eng		





