

# 2019 Annual Biological Monitoring and Mitigation Compliance Report

Chevron Long Wharf Maintenance and Efficiency Project

Chevron Products Company

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## Acronyms and Abbreviations

°F	degrees Fahrenheit
$\mu\text{Pa}\cdot\text{sec}^2$	micropascals per second squared
CDFW	California Department of Fish and Wildlife
cSEL	cumulative sound exposure level
dB	decibels
IHA	Incidental Harassment Authorization
ITP	Incidental Take Permit
MMMP	Marine Mammal Monitoring Plan
MMO	marine mammal observer
MMPA	Marine Mammal Protection Act
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 1 and November 30, 2019. Covered Activities during the 2019 Monitoring Period occurred at Berth 2 and Berth 4.

This 2019 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 (NMFS) in accordance with the Project Biological Opinion issued April 4, 2017 (WCR-2015-1997) and Incidental Harassment Authorization (IHA) valid from June 1, 2019 through May 31, 2020.

## 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 mile 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 visual 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 two Project biologists on May 29, 2019, eight days prior to the start of work at Berth 2 on June 6, 2019. Two harbor seals were observed during the baseline survey of the Project Area. One individual was seen surfacing and looking around approximately 250 meters northeast of Berth 4 at 10:38 A.M., and another individual was observed approximately 30 meters northeast of Berth 4 at 10:50 A.M. Each seal was seen only once. The survey was conducted from 9:00 A.M. until 1:00 P.M. High tide occurred at 9:12 A.M., and low tide occurred at 3:01 P.M. Weather conditions were clear and sunny, with temperatures increasing from 55 degrees Fahrenheit (°F) in the morning to 65°F in the afternoon. The Project Area was free of visual obstructions. Surrounding work activity at the neighboring berths and Long Wharf in general was minimal.

#### 3.1.2 Worker Education Program

A worker education program was given on May 28, 2019 to all persons that would be working in the Project Area. The Project's Designated Biologist discussed the biology and general behavior of the Covered Species. 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 C). All trained site workers signed a form stating they attended the program and understood all



Figure 1. Project Location

protection measures (Appendix D). The signature forms and a copy of the ITP were kept on-site in a construction monitoring notebook for the duration of construction.

### 3.1.3 Monitoring during Pile-Driving Activities

Two (2) qualified, National Marine Fisheries Service (NMFS)-approved marine mammal observers (MMOs)/fish monitors were on-site daily during in-water work, for a total of 19 days in 2019. No Project in-water activities occurred in July or September. Table 1 provides a summary of the activities monitored in 2019.

**Table 1. Summary of 2019 Monitored Covered Activities**

Date	Covered Activities
6/4/2019	• Performed probing of concrete pile locations to check for obstructions at Berth 2.
	• Installed template frame and bubble curtain prior to driving the first concrete pile at Berth 2.
	• One 24" concrete pile driven with impact hammer at Berth 2.
6/5/2019	• One 24" concrete pile driven with impact hammer at Berth 2.
	• Four piles set in place to be driven 6/6/2019.
6/6/2019	• Four 24" concrete piles driven with impact hammer at Berth 2.
6/8/2019	• Four 24" concrete piles driven with impact hammer at Berth 2.
	• Conducted re-strikes of multiple piles, Berth 2.
6/19/2019	• One 20" steel pipe pile driven with vibratory hammer at Berth 4, South Cap.
6/20/2019	• One 20" steel pipe pile driven with vibratory hammer at Berth 4, South Cap.
6/21/2019	• Six 20" steel pipe piles driven with vibratory hammer (two driven at Berth 4, South Cap and four driven at Berth 4, North Cap).
8/21/2019	• Installed template frame prior to driving at Berth 4.
	• Four 36" steel piles driven (vibratory) at South Cap of Berth 4.
8/22/2019	• Four 36" steel piles driven (vibratory) at North Cap of Berth 4.
8/29/2019	• Conducted re-strikes of three of the 36" steel piles that were placed on August 21–22.
10/3/2019	• Four 24" concrete piles driven with impact hammer at Berth 2.
10/4/2019	• Two 24" concrete piles driven with impact hammer at Berth 2. Re-strikes on three previously driven piles.
10/5/2019	• Four 24" concrete piles driven with impact hammer at Berth 2.
10/6/2019	• Conducted re-strikes of six of the 24" concrete piles that were placed on October 3–5.
10/21/2019	• Three 20" steel piles extracted with vibratory hammer at Berth 4.
10/22/2019	• Five 20" steel piles extracted with vibratory hammer at Berth 4.
11/4/2019	• Four 24" concrete piles driven with impact hammer at Berth 2.
11/5/2019	• Two 24" concrete piles driven with impact hammer at Berth 2.
11/6/2019	• Four 24" concrete piles driven with impact hammer at Berth 2. Re-strikes on all 10 previously driven piles.

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 30 minutes after such work was completed for the day, or when there was a pause in the work of two (2) 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. 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 A).

### 3.1.3.1 Hydroacoustic Monitoring

During hydroacoustic 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 was placed at 150–200 meters. Hydrophones were placed at mid-depth in the water column, approximately 7 meters deep at all monitoring locations. For more information regarding the equipment and methods used, see Appendix B.

## 4. Results

### 4.1 Hydroacoustic Monitoring

Hydroacoustic monitoring of three (3) impact driven concrete piles while using a bubble curtain to mitigate noise impacts was conducted on June 6 and October 3. Hydroacoustic monitoring of vibratory driving of two (2) 20-inch and two (2) 36-inch steel piles was conducted on June 21 and August 22, 2019, respectively. 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. This section briefly summarizes the results of the hydroacoustic monitoring conducted in 2019. The 2019 hydroacoustic monitoring report is provided in Appendix D.

#### 4.1.1 Ambient Noise and Transmission Loss

Measured ambient sound pressure levels were generally between 110-125 RMS and at least 10 dB lower than pile driving sound pressure levels. On October 3, 2019, intermittent drilling occurred at the wharf near the hydrophone positioned at 50 meters, and a vessel releasing water from the hull of the ship in Berth #3 also influenced ambient levels at the hydrophone positioned at 195 meters. These higher ambient levels did not significantly influence reported pulse levels after measurements were processed through the Labview program to filter out ambient noise. See Appendix B for more details regarding recorded ambient noise levels.

The transmission loss calculated from the field monitoring results for vibratory driving was 20.8 to 31.0, much 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. For impact driving, the transmission loss calculated from the field monitoring results for vibratory driving was 13.9 to 15.9, in line with the value of 15 log used to predict the distances to the thresholds in the permit applications.

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

### 4.1.2 Hydroacoustic Measurements Relative to Fish Thresholds

On July 8, 2008, the Fisheries Hydroacoustic Working Group, 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. Since special-status fish under 2 grams in weight were not present in the area during pile driving, only the 187 dB SEL threshold is applicable.

Underwater noise levels during both impact and vibratory driving did not approach the 206 peak dB criteria, but impact driving exceeded the 187 dB cumulative SEL (cSEL) threshold over short distances. These measured distances are less than the distances over which thresholds were anticipated to have been exceeded in the Project Biological Assessment and ITP. Fish exposed to these noise levels for an extended period could experience temporary threshold shifts in hearing, however, since the area is small, it is unlikely that individuals would remain in such close proximity to the pile long enough to experience such effects. Table 2 provides a summary of the actual and predicted distances to the underwater noise thresholds for fish.

**Table 2. Measured Distances (meters) to the NMFS cSEL Thresholds for Fish over 2 grams (dB re: 1µPa-sec<sup>2</sup>)**

Day	Installation Method	Pile IDs	Distance to 187 dB Cumulative SEL Actual (Predicted)
6/5	Impact w. Bubble Curtain	24" Concrete Pile	Less than 10 meters (11 meters)
6/21	Vibratory Hammer	20" Steel Pile #1 20" Steel Pile #2	NA
8/22	Vibratory Hammer	36" Steel Pile #1 36" Steel Pile #2	NA
10/3	Impact w. Bubble Curtain	24" Concrete Pile #1 24" Concrete Pile #2	Less than 7 meters (11 meters)
µPa-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 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 Marine Mammal Protection Act. Updated National Oceanic and Atmospheric Administration guidance on assessing the effects of underwater noise on marine mammals for agency impact analysis was adopted in 2016.<sup>2</sup> The 2016 guidance includes sound thresholds for slight injury to an animal's hearing, or permanent threshold shift (PTS) (Level A

<sup>2</sup> 2016 Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing.

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 cSEL threshold, which is specific to the species hearing group (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 non-impulse or continuous sounds. Level B behavioral harassment is considered to occur 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 levels are 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 3.

**Table 3. 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>1</sup>	Level A cSEL Threshold <sup>1</sup>	Level B RMS Threshold
Phocids (Pacific harbor seal, northern elephant seal)	201 dB	120 dB	218 dB	185 dB	160 dB
Otariids (California sea lion, northern fur seal)	219 dB	120 dB	232 dB	203 dB	160 dB
Low-Frequency Cetaceans (gray whale)	199 dB	120 dB	219 dB	183 dB	160 dB
Mid-Frequency Cetaceans (bottlenose dolphin)	198 dB	120 dB	230 dB	185 dB	160 dB
High-Frequency Cetaceans (harbor porpoise)	173 dB	120 dB	202 dB	155 dB	160 dB

Notes:

<sup>1</sup> Level A threshold for impulse noise is a dual metric 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 = decibels  
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 calculated using the results of the hydroacoustic monitoring. Table 4 provides a summary of the measured distances over which the Level A and Level B harassment thresholds for marine mammals were exceeded during pile driving. On some days where vibratory driving occurred, two to six piles were driven per day (Table 1), which could result in marginally greater Level A zones than presented for the day where hydroacoustic monitoring of vibratory driving occurred and two piles were driven. Even when six piles were installed on a given day, the Level A zones were calculated to be less than 10 meters in radius when the measured hydroacoustic

values were used. In any case, the adjusted distances are much less than those used to generate the take estimates developed for the IHA (see Table 5).

**Table 4. Measured Distances (meters) to the NMFS Harassment Thresholds for Marine Mammals (dB re: 1µPa-sec<sup>2</sup>)**

Month/ Day	Installation Method	Pile Type	Distance to Level B Threshold	Distance to Level A cSEL Threshold (meters)*				
				Low- Frequency Cetaceans	Mid- Frequenc y Cetaceans	High- Frequency Cetaceans	Phocid Pinniped s	Otariid Pinnipeds
6/5	Impact w. Bubble Curtain	24" Concrete Pile	13 meters	<10 meters	<10 meters	<10 meters	<10 meters	<10 meters
6/21	Vibratory Hammer	20" Steel Pile #1 20" Steel Pile #2	207 meters 170 meters	10 meters	<10 meters	<10 meters	<10 meters	<10 meters
8/22	Vibratory Hammer	36" Steel Pile #1 36" Steel Pile #2	491 meters 1,085 meters	<10 meters	<10 meters	<10 meters	<10 meters	<10 meters
10/3	Impact w. Bubble Curtain	24" Concrete Pile #1 24" Concrete Pile #2	17 meters 21 meters	11 meters	<10 meters	14 meters	<10 meters	<10 meters

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

## 4.2 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 1–10 miles per hour. There were a few occurrences of higher winds with associated choppy water conditions, but the MMOs were reliably able to observe the waters within 400 meters of all pile driving activities.

June pile-driving and associated activities were conducted on a total of seven (7) days, from June 4 through June 6, June 8, and from June 19 through June 21, 2019 (Table 1). A total of ten (10) 24-inch concrete piles were driven with an impact hammer at Berth 2, and a total of eight (8) 20-inch steel piles were driven with a vibratory hammer at Berth 4.

August pile-driving and associated activities were conducted on a total of three (3) days: August 21, 22, and 29, 2019 (Table 1). Eight (8) 36-inch steel piles were driven with a vibratory hammer at Berth 4 on August 21–22, and three (3) of those piles were re-tapped on August 29.

October pile-driving and associated activities were conducted over six (6) days, from October 3 through October 6, and October 21–22, 2019. A total of ten (10) 24-inch concrete piles were driven with an impact hammer at Berth 2 from October 3–5. On October 21 and 22, the eight (8) 20-inch steel piles that were driven at Berth 4 in June were extracted using a vibratory hammer.

November pile-driving and associated activities were conducted over three (3) days, from November 4 through November 6, 2019. During this period, a total of ten (10) 24-inch concrete piles were driven with an impact hammer at Berth 2.

No pile-driving was conducted during the months of July and September.

### 4.2.1 Listed Fish Observations and Take

No dead or incapacitated fish were observed during in-water activities and no take of fish species was recorded.

### 4.2.2 Marine Mammal Observations and Take

Harbor seals (HASE) were the only marine mammal species commonly observed during the Monitoring Period. Most of the seals were observed on the mainland side of the wharf, north-northeast of the Project Area, typically 60-120 meters from the Project Area. Seals were rarely seen on the open Bay side, west of the Wharf surrounding the crane and materials barges. One harbor porpoise was observed swimming approximately 200 meters southwest of the pile driving location shortly before pile driving commenced and was conservatively recorded as a Level B take. Additionally, on two pile driving days, a small group (4 to 6) of California sea lions were observed hauling out on a buoy, located approximately 500 meters southeast of the pile driving location. These observations occurred on days when impact driving of concrete piles was occurring and the Level B zone did not approach the buoy, thus no take of those individuals was recorded. In August, one California sea lion hauled out on the stern of an active tugboat during construction activities. Pile driving had just ceased, so no active driving was occurring at the time the sea lion entered the area and hauled out on the tugboat, however this was conservatively counted as a Level B take. There was no interaction with the sea lion, and it left the tug on its own.

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 5 provides a summary of the predicted distances of Level A and Level B threshold exceedance, as presented in the IHA. Note that Table 5 only provides the predicted distances for the Level A thresholds of species for which Level A take was authorized for 2019.

**Table 5. Predicted Underwater Pile Driving Noise Levels and Distances of Threshold Exceedance**

Pile Type	Source Levels at 10 meters (dB)		Distance to Threshold 160/120 dB RMS (Level B)* meters	Distance to cSEL Threshold for Harbor Seal (Level A) meters	Distance to cSEL Threshold for Harbor Porpoise (Level A) meters
	Peak	RMS/SEL			
<b>Impact Driving</b>					
24" square concrete (1-2 per day)	191	173 RMS/ 161 SEL	45	12	22
36" steel pile (proofing)	208	190 RMS/ 180 SEL	1,000	52	115
<b>Vibratory Driving/Extraction</b>					
20" steel pipe pile (4 per day)	180	163 RMS	7,360	4	10
36" steel pipe pile (4 per day)	180	170 RMS	21,545	13	31
Notes: dB = decibels cSEL = cumulative sound exposure level RMS = root mean square SEL = sound exposure level *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 Table 6. There were no Level A harassments/takes or any other indicators of marine mammal injuries observed during

the Monitoring Period. A total of 48 Level B harassments for harbor seal were recorded in the observable portion of the Level B zone. For impact driving, some takes were recorded for animals observed just outside of the measured Level B zone; since these animals may have briefly entered the Level B zone while underwater, they are still counted as takes for reporting purposes.

**Table 6. Observed Level B Take Events**

Date	Species	Total Observed during Monitoring Period	Estimated Distance Range (m)	Pile-Driving (# piles)
6/4/2019	HASE	4	100-200	Impact (1)
6/6/2019	HASE	3	45-150	Impact (4)
6/8/2019	HASE	5	40-200	Impact (4)
6/20/2019	HASE	1	250	Vibratory (2)
6/21/2019	HAPO	1	150-215	Vibratory (6)
6/21/2019	HASE	6	45-150	Vibratory (6)
8/21/2019	HASE	2	60-85	Vibratory (4)
8/22/2019	HASE	4	75-180	Vibratory (4)
8/29/2019	HASE	2	50-300	Impact (3)
8/29/2019	CASL	1	0-50	Impact (3)
10/3/2019	HASE	4	150-300	Impact (4)
10/21/2019	HASE	4	120-305	Vibratory (3)
10/22/2019	HASE	5	25-200	Vibratory (5)
11/6/2019	HASE	8	10-250	Impact (4)
<b>TOTAL</b>		<b>CASL=1, HAPO=1, HASE=48</b>		
Notes: CASL = California sea lion HAPO = Harbor porpoise HASE = Harbor seal m = meters				

As required by the IHA, potential takes of marine mammals that occurred outside of the reliably observable portion of the Level B zone have been extrapolated. This is done by taking the daily occupancy of the observable monitoring zone multiplied by the unobservable portion of the Level B zone. The daily occupancy was developed by taking the total number of animals observed on all monitoring days divided by the observable area of the Level B zone and then dividing that by the total number of monitoring days. The observations used to generate the daily occupancy includes all members of that species observed regardless of their position in relation to any active harassment zones. The observed daily occupancy for harbor seals is as follows:

$$(48 \text{ total harbor seals observed} / (\pi \times 0.4 \text{ km}^2)) / 19 \text{ monitoring days} = 5.03 \text{ harbor seals/km}^2 \text{ observed per day.}$$

For harbor porpoise, the observed daily occupancy is as follows:

$$(1 \text{ total harbor porpoise observed} / (\pi \times 0.4 \text{ km}^2)) / 19 \text{ monitoring days} = 0.105 \text{ harbor seals/km}^2 \text{ observed per day.}$$

To extrapolate daily take, the observed daily occupancy is then multiplied by the unobservable portion of the Level B zone. This value is 3.01 square kilometers for vibratory driving of the 36-inch steel shell piles, as calculated from the distance of threshold exceedance measured during hydroacoustic monitoring (Table 4); and 2.64 square kilometers for impact proofing of 36-inch steel shell piles, as calculated from

the distance of threshold exceedance as provided in the IHA modeling (Table 5). Note that land areas are excluded from the area of the unobservable Level B zone.

For impact pile driving of the 24-inch concrete piles and vibratory driving of the 20-inch steel pipe piles, the entirety of the measured Level B zone was visually observable, so this extrapolation was only applied to vibratory pile driving and proofing of the 36-inch steel shell piles. Table 7 provides a summary of the observed and extrapolated takes for 2019. Extrapolation is only needed for animals that were observed in the water during pile driving, in this case harbor seal and harbor porpoise.

**Table 7. Summary of 2019 Level A and Level B Take Events**

Species	Level A - Authorized	Level A - Recorded	Level B - Authorized	Level B - Recorded	Level B - Extrapolated
Harbor porpoise (HAPO)	4	0	509	1	0.28 (Impact Proofing) 0.63 (Vibratory driving)
<b>Total HAPO Takes 2019</b>				<b>2 Total</b>	
California sea lion (CASL)	0	0	479	1	NA
Harbor seal (HASE)	513	0	6,572	26 (Impact driving) 22 (Vibratory driving)	13.27 (Impact proofing) 30.26 (Vibratory driving)
<b>Total HASE Takes 2019</b>				<b>92 Total</b>	

NA = not applicable

### 4.2.3 Pile-Driving Shutdowns

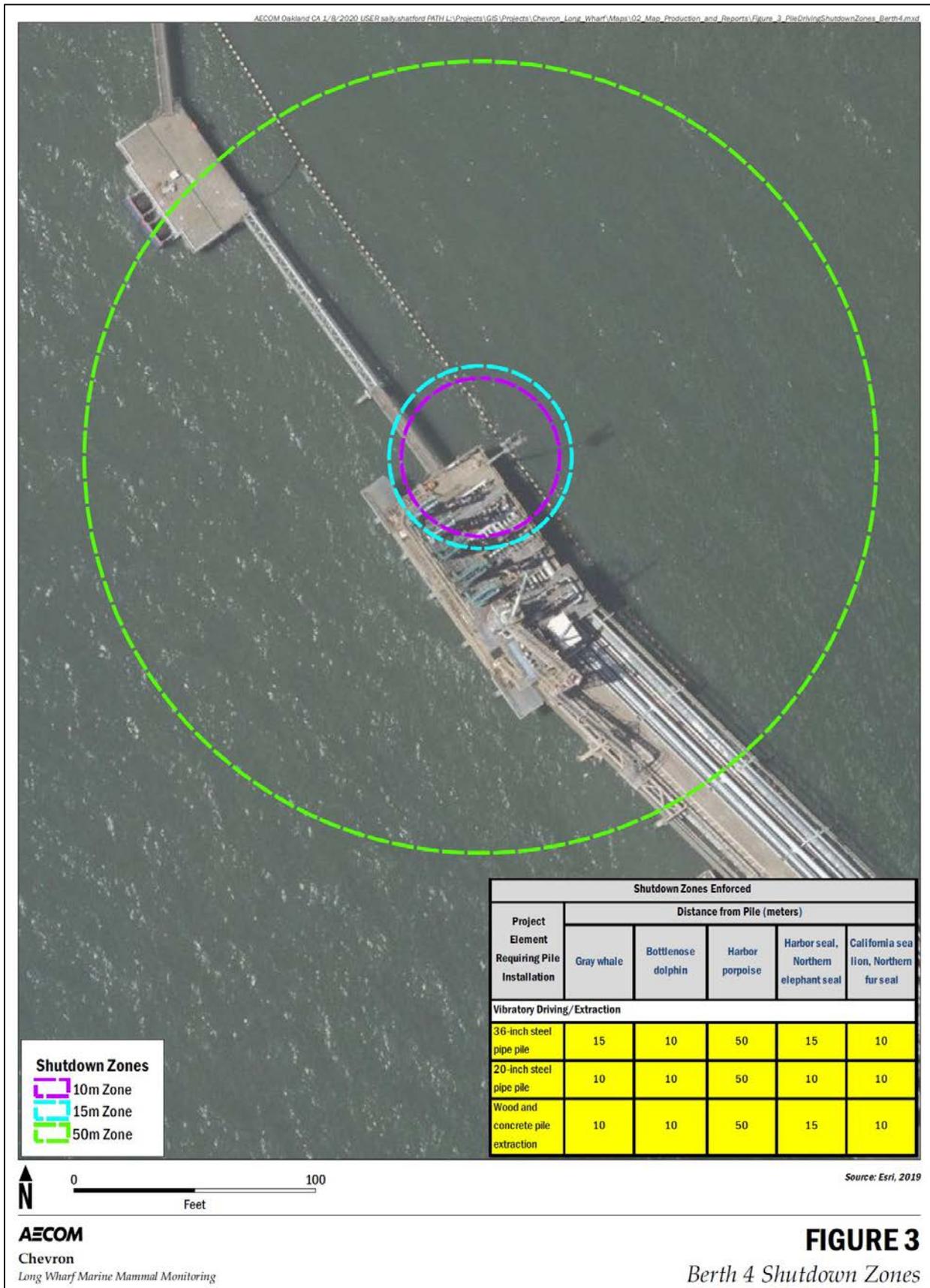
On two (2) occasions during the monitoring period, Project work was postponed or halted for purposes of take avoidance prior to or during pile-driving activities. On August 29, the MMOs called a stop-work at 9:53 A.M. when a California sea lion was seen approaching the shutdown zone approximately three minutes after driving had ceased. At this time, the hammer was not in use and crew members were working from a skiff with hand tools. The sea lion quickly approached the skiff within the shutdown zone, submerged, and surfaced again along the west edge of the pile driving barge, continuing to swim flush along the edge of the barge. Almost two minutes after the sea lion was seen and the stop work was called, the sea lion hauled out on the stern of an idling tugboat and began basking. For safety reasons, the tugboat needed to slowly move away from the barge while the sea lion continued to bask on the deck. At 10:16 A.M., with the tugboat and sea lion over 500 meters from the pile, the impact hammer was struck for less than one (1) minute. The sea lion remained on the tugboat until 11:18 A.M., when it was seen entering the water. While the sea lion was on board, it displayed typical basking behavior and no signs of stress.

On June 6, impact driving of a 24-inch concrete pile was held until the MMOs confirmed that a harbor seal was outside of the shutdown zone. The shutdown zones implemented at Berths 2 and 4 are shown in Figures 2 and 3.

Figure 2. Pile Driving Shutdown Zones at Berth 2



**Figure 3. Pile Driving Shutdown Zones at Berth 4**



## 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 were consistently lower than the modeled results presented in the Biological Assessment for fish provided to NMFS and the ITP (Table 2).

Hydroacoustic monitoring found the distances to the some of 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 20- and 36-inch steel piles was found to be 170 to 1,085 meters in radius, whereas the distance used in the IHA was 7,360 and 21,545 meters, respectively. This was largely due to the measured attenuation rates of 20 to 30 log being much higher than the standard, conservative value of 15 log used in the IHA calculations.

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 most common species observed during pile driving in 2019. One sea lion entered the Level A zone following impact pile driving on August 29, and it did not demonstrate any signs of disturbance. None of marine mammals that were observed within the Level B zone demonstrated 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 Marine Mammal Monitoring Daily Field Datasheets



Date: 6/4/19

Page 1 of 5

**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):

70°F, 0% clouds, sunny, great visibility, 0-1 Beaufort  
~~less visibility of~~ less visibility of shut down zone due to shadow, less light starting @ 1950  
& it continuously gets worse as sun sets

Tidal Level (start work/end work): Monitoring start 1430-1528 (construction delays)

See tide charts

General Human Activity in the Area:

Cars & construction equipment moving in area, crew on site

Monitoring Location(s):

(A) 37.9226130, -122.4104311 (same as last year @ starwell)

(B) 37.9237085, -122.4117772 (NW of pile driving)

Berth(s): 2

Pile Type (s):

~~Vibratory~~ Concrete

Total Pile Count for the Day: 1

Equipment: Impact Vibratory

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

14 minutes Driving

Date: 6/4/19

Page 2 of 5

The Beaufort scale

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face
3	7-10	8-12	Gentle breeze	Large wavelets; Crests not breaking	Small twigs in constant motion;
4	11-16	13-18	Moderate wind	Numerous whitecaps Waves 1-4ft high	Light flags extended
5	17-21	19-24	Fresh wind	Many whitecaps, some spray; Waves 4-8 ft high	Dust, leaves and loose paper raised. Small branches move.
6	22-27	25-31	Strong wind	Whitecaps everywhere; Larger waves 6-13 ft high	Small trees sway
7	28-33	32-38	V. strong wind	White foam from waves is blown in streaks; waves 13-20ft high	Large branches move; Difficult to use umbrellas
8	34-40	39-46	Gale	Edges of wave crests break into spindrift	Whole trees in motion
9	41-47	47-54	Severe gale	High waves; sea begins to roll Spray reduce visibility; 20ft waves	Twigs break off trees; Difficult to walk
10	48-55	55-63	Storm	V. high waves 20-30 ft; blowing foam gives sea white appearance	Chimney pots and slates removed
11	56-63	64-72	Severe storm	Exceptionally high waves; 30-45 ft high	Trees uprooted
12	63	73	Hurricane	Air filled with foam; visibility reduced	Structural damage
				White sea; waves over 45ft high	Widespread damage, rare

Monitoring Start: 14:50 - 1:20 (stopped) at monitoring location (A) at monitoring location (B)  
 Start again: 17:49 - 20:

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

Time of Observation	Observer Initials	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	Bearing	Behavior <sup>5</sup>
First: 1501 Last: 1501	CK	Piling	HASE	unk	Not seen	~75m	NW toward pile	240	Swim & dive heading toward pile/barge
First: 1501 Last: 1503	CK	Piling	2 HASE	unk	Not seen	~65m	NE toward pile	240	Resurfacing & diving several times near same location
First: 1809 Last: 1917	CK	"	1 HASE	unk	"	~150m	SE toward pile	200	Swim slowly toward pile & dive
First: 1917 Last: 1917	CK	"	1 HASE	unk	"	~100m	S	180	near float (swimming) stationary at surface, look around, dive
First: 1915 Last: 1950	CK	Piling	HASE	unk	unk - act seen	~200m	S toward pile	300	Swim toward pile ~20 sec then dove, resurfaced right behind barge
First: 2010 Last: 2022	CK	Piling	HASE	unk	unk - act seen				
First: Last:									
First: Last:									
First: Last:									
First: Last:									
First: Last:									
First: Last:									
First: Last:									

Pile #1 Piling during start: 1945-1959

\*They did not drive Pile #2 due to sunset / poor visibility

<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.

<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>3</sup>Species Age Classes:  
 CASL = juvenile, subadult male, adult male  
 HASE = juvenile, adult  
 HAPO = calf, adult

<sup>2</sup>Species Abbreviations:  
 California Sea Lion = CASL  
 Pacific Harbor Seal = HASE  
 Northern Elephant Seal = NOES  
 Harbor Porpoise = HAPO

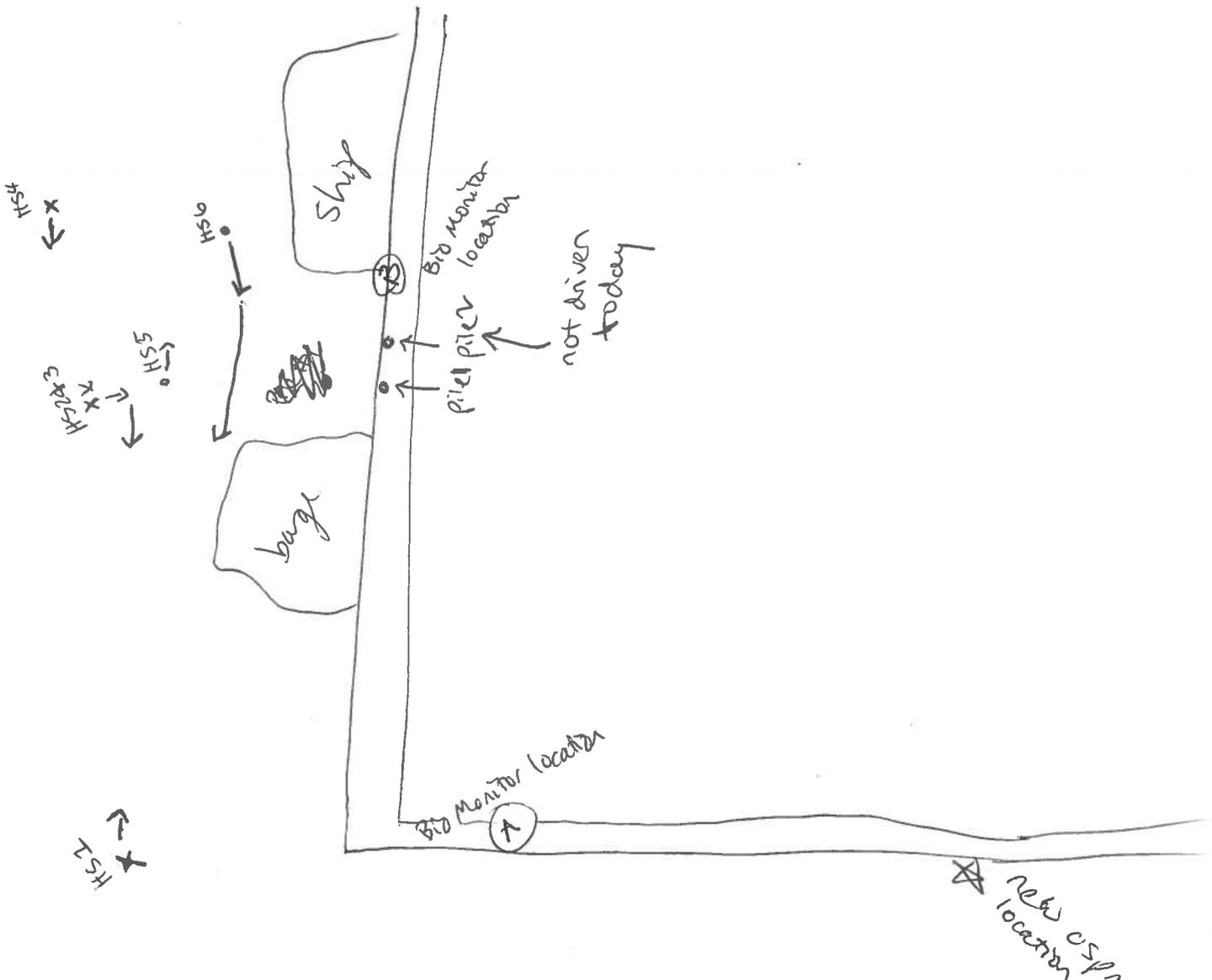
<sup>1</sup>Activity: Indicate if observation is:  
 before (B); during (D); or after (A) piling driving

6/4/19  
3 of 5



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

#### Diagram



Biological Monitor: Christina Kelleher Date 6/4/19  
Print Name

Signature: *Christina Kelleher*

Date: 06/04/19

Page 1 of 5

**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 ~ 2 miles out

**Tidal Level (start work/end work):** → pile driving or day?

**General Human Activity in the Area:**

Divers, general work on wharf, work on pipes

**Monitoring Location(s):**

Stairwell & N of pile on wharf (near Berth 3)  
→ switched back & forth from stairwell to S of piles on wharf  
↳ other datasheet has the lat/long locam

**Berth(s):** Berth 2

**Pile Type (s):**

24-in sq concrete piles

**Total Pile Count for the Day:** 1

**Equipment:** Impact Vibratory

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

7:45 - 7:59

Before Piledriving: Monitoring start: 2:50 - 3:35 PM (came in due to slow activity) → near B3  
Monitoring start: 1748 - 2025

→ at stairwell. Have view of N + E but strong glare @ West end

ended monitoring due to sunset @ 0820

*The Beaufort scale*

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle, wind felt on face
3	7-10	8-12	Gentle breeze	Large wavelets; Crests not breaking	Small twigs in constant motion; Light flags extended
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10	48-55	55-63	Storm	V. high waves 20-30 ft; blowing foam gives sea white appearance	Trees uprooted
11	56-63	64-72	Severe storm	Exceptionally high waves; 30-45 ft high	Structural damage Widespread damage
12	63	73	Hurricane	Air filled with foam; visibility reduced White sea; waves over 45ft high	Widespread damage; rare





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

6/4/19

5 of 5

**Diagram**

**Biological Monitor:** Natalie Grew **Print Name** Natalie Grew

**Signature:** 

Date: 6/5/19

Page 1 of 5

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

**Monitor(s):**

Mandi McElroy + Diana Edwards

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

10% cloud cover, Beaufort 1

**Tidal Level (start work/end work):** very low @ start

0811 = -1.42 ft      1526 = 4.84 ft      2001 = 2.76 ft

**General Human Activity in the Area:**

tankers @ Berths 1 and 3; usual wharf activity

**Monitoring Location(s):**

Berth 2 south (Mandi): 37.922638, -122.410806  
Berth 2 north (Diana): 37.9236577, -122.4110201

**Berth(s):**

2

**Pile Type (s):**

24" concrete

**Total Pile Count for the Day:**

1

**Equipment:** Impact

Vibratory

\*first pile was set last night

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

= 13 min total (1 pile)

pile 1 start: 0942 1<sup>st</sup> blow

0944 tap

0945 2<sup>nd</sup> blow → steady to 0947

0950 - 0951

0954 - 0954 (< 1 min)

12 mm total

Chevron Richmond Refinery

Long Wharf Maintenance and Efficiency Project Marine Mammal Monitoring Plan

re-hammered 1112 - 1113

(1 min) end @ 1113

A-1

The Beaufort scale

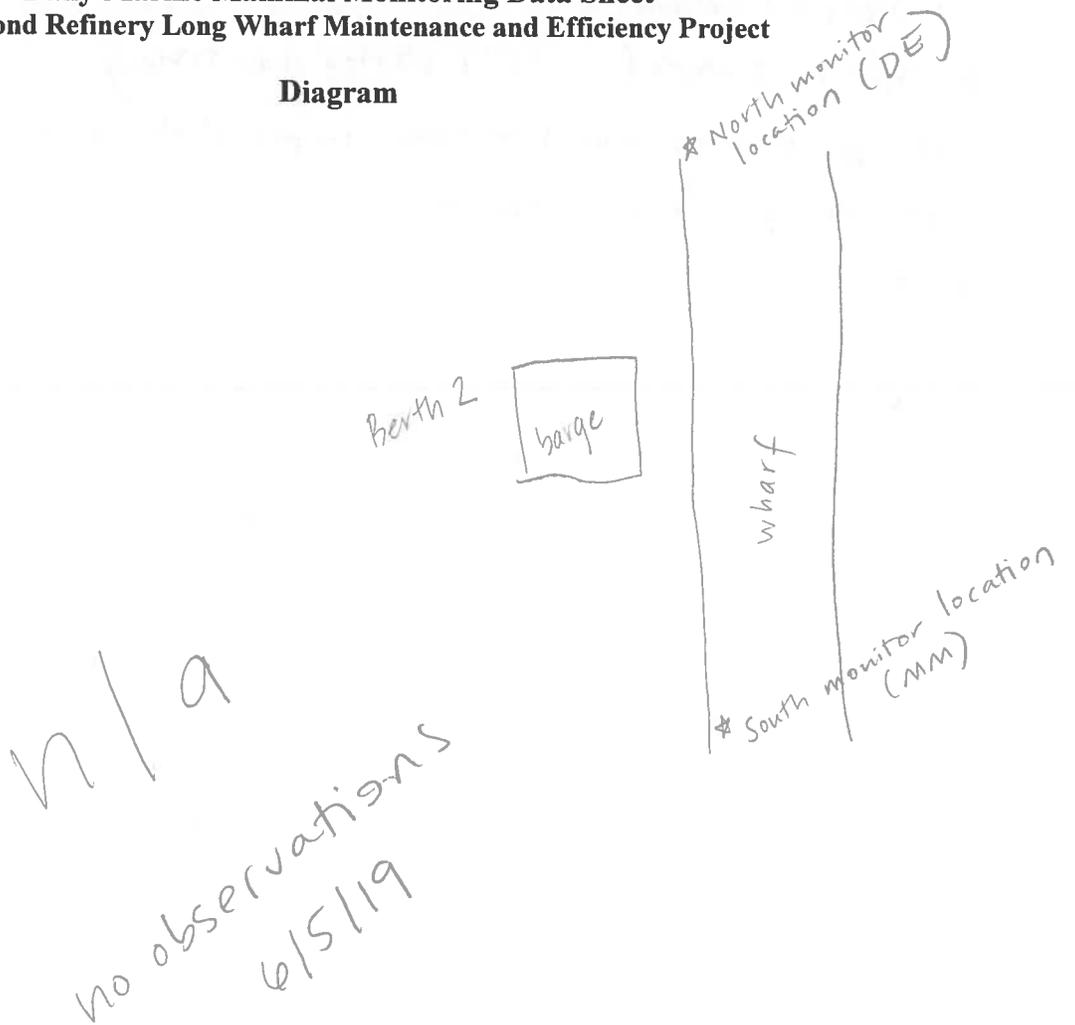
No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face
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12	63	73	Hurricane	Air filled with foam; visibility reduced	Structural damage
				White sea; waves over 45ft high	Widespread damage



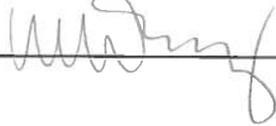


**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Diagram**



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

**Signature:** 

Date: 06/06/19

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

**Monitor(s):**

Christina Kelleher & Diana Edwards

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

~65°F, sunny/clear, ~150% cloud cover, good visibility, ~~0~~ 1-2

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

See tide charts

**General Human Activity in the Area:**

Moving cars & construction equipment & boats, simultaneous construction at other barges

**Monitoring Location(s):**

Ⓐ 37.9238868, -122.4119666 (NW of piles ~250 ft away)

Ⓑ 37.9235186, -122.4116283

**Berth(s):** 2

**Pile Type (s):**

concrete 24" w/ bubble curtain

**Total Pile Count for the Day:** 4

**Equipment:** Impact Vibratory

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

Minutes: 72

Total Blows: ~729

Date: 6/6/19

Page 2 of 5

*The Beaufort scale*

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face
3	7-10	8-12	Gentle breeze	Large wavelets; crests not breaking	Small twigs in constant motion;
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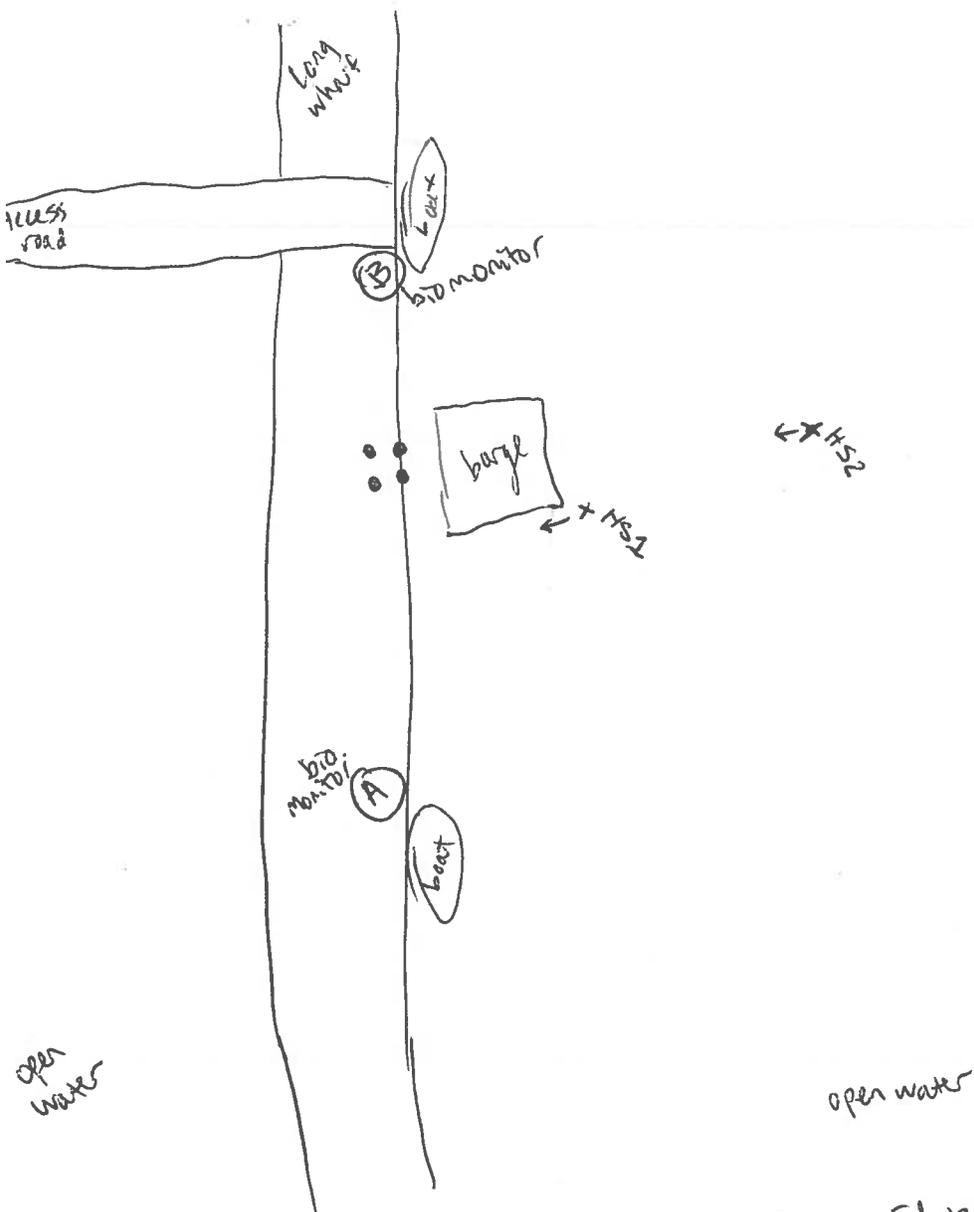




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### Daily Marine Mammal Monitoring Data Sheet Richmond Refinery Long Wharf Maintenance and Efficiency Project

#### Diagram



Biological Monitor: Christina Kelleher & Diana Edwards Print Name 06/06/19  
Date

Signature: *[Handwritten Signature]*

Date: 6/8/19

Page 1 of 6

**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):**

Beaufort 1, clear day ~25% cloud cover, no fog

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

3:34 AM high (5.78'), 10:40 AM low (-0.80'), 5:59 PM high (5.24')

**General Human Activity in the Area:**

typical wharf activity, some construction. Tankers @ Berths 3 and 4.

**Monitoring Location(s):**

Berth 2 north (moving between E+W sides of wharf)

**Berth(s):** 2

**Pile Type (s):**

concrete, 24" square

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

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

New piles (4) = 71 minutes total      // see blow counts on Erik's field report  
Restrikes = 44 minutes

Date: 6/8/19

Page 2 of 6

The Beaufort scale

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face
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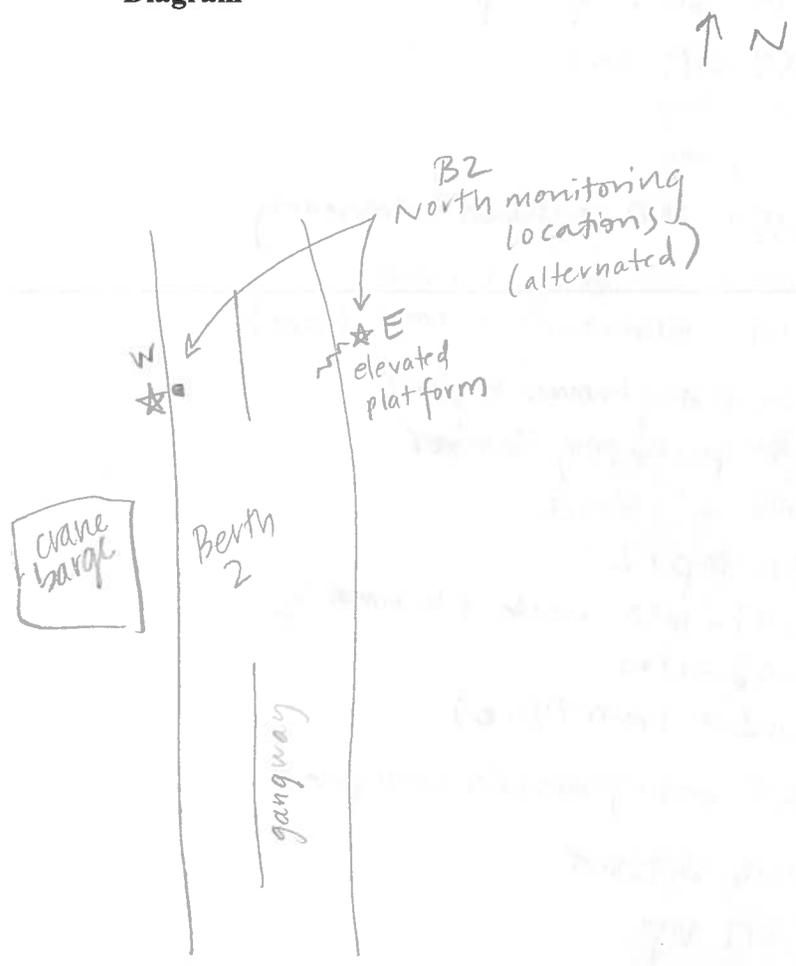


6/18/19  
5 of 6

6/18/19  
5 of 6

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

#### Diagram



Biological Monitor: Mandi McElroy Print Name \_\_\_\_\_

Signature: *Mandi McElroy*

P11110  
4702

6/8/19  
6 of 6

on site @ 0800

0920 - working on hammer. 4 piles were placed yesterday, but not driven.

0945 - starting to position hammer on 1st pile (southernmost pile)

Pile 1  
19 min

- 0952 soft start
- 0955 tap
- 0956 tap
- 0957 - 1000 consistent hammering
- 1005 - hammering, < 1 min
- 1011 - hammering < 1 min (done)

Pile 2  
18 min

- 1026 moving hammer to pile 2
- 1044 positioning hammer
- 1045 soft start
- 1046 tap x 2
- 1047 - 1050 consistent hammering
- 1058 - 1100
- 1103 < 1 min (done)
- 1205 moving hammer onto pile 3

Pile 3  
14 min

- 1216 soft start
- 1217 tap
- 1218 tap
- 1219 - 1221 hammering
- 1229 - 1230 "

Pile 4  
20 min

- 1250 positioning hammer on pile #4
- 1258 soft start
- 1259 - 1301 hammering
- 1318 - < 1 min hammering (stop)

WEGR  
DCCO  
MALL  
WEGU  
PIGU  
OSPR  
BRPE  
ROPE

Restrikes:

- ① 1546 soft start  
1548 tap  
1550 tap x 2
- ② 1557 tap
- ③ 1607 tap
- ④ 1614
- ⑤ 1623
- ⑥ 1630

Date: 06/08/19  
~~06/08/19~~

Page 1 of 6



**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):

CA super clear & 5mi visibility; Beaufort scale = 1  
High of 85°

Tidal Level (start work/end work):

\_\_\_\_\_

General Human Activity in the Area:

some trucks, mostly pile driving, concrete grinding

Monitoring Location(s):

Berth 2 → south

Berth(s): Berth 2

Pile Type (s):

24-in concrete piles

Total Pile Count for the Day: 1111

Equipment: Impact Vibratory

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

PILE 1	PILE 2	PILE 3
PRE: 9:10 - start of 30 min Got to record start time 09:57 POST: 1319 - 1349 1004 - 1036 111 - 1013 0957 - 1013 total	START: 1045 - 1050 1058 - 1059 end: 1163 1045 - 1103 total	1215 - 1221 1229 - 1230 1223 A-1 1215 - 1223 total

PILE 4  
1258 - 1302  
1319  
→ Bob can't talk to me 30 or 40 min

Chevron Richmond Refinery  
Long Wharf Maintenance and Efficiency Project Marine Mammal Monitoring Plan



Date: 6/8/19

Page 2 of 6

*The Beaufort scale*

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face
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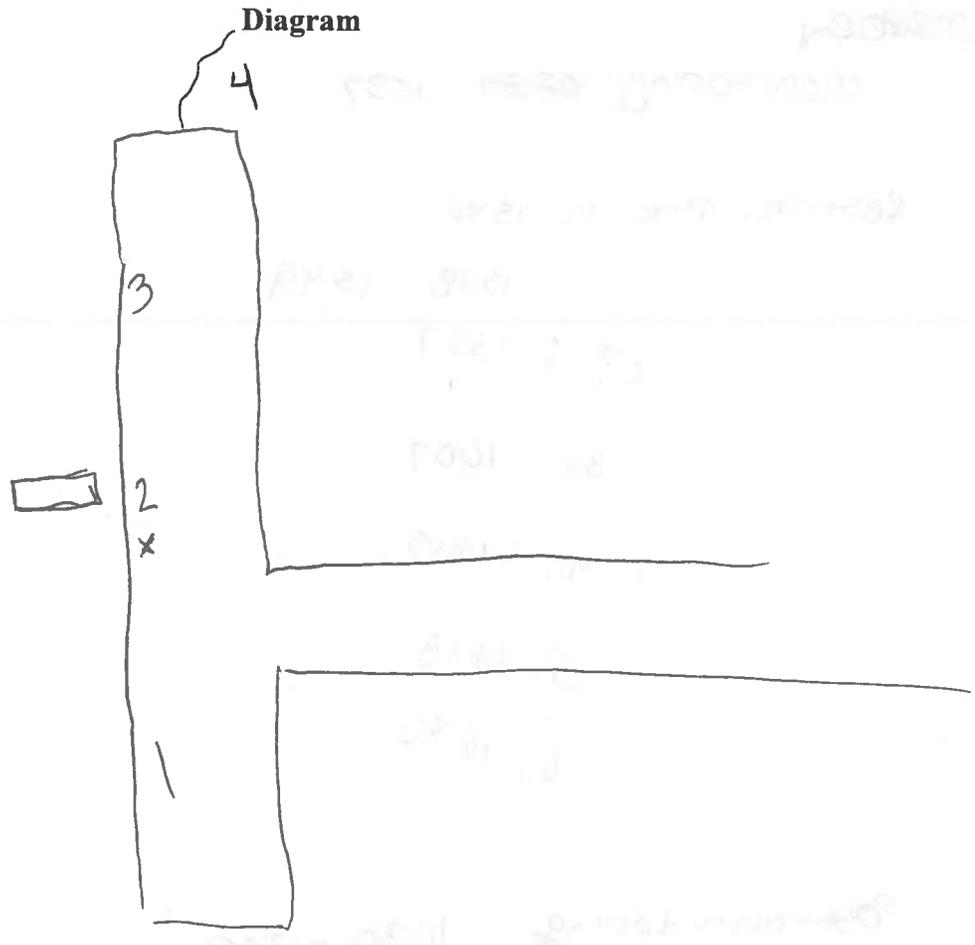




6/8/19  
5 of 6

**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: 09/20/19

Page 1 of 5

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

**Monitor(s):**

Laura Duffy, Mandi McElroy <sup>MM used</sup> - separate data sheet

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

<sup>(0800)</sup> partly cloudy - no fog; BF ~ 2-3 / <sup>(0930)</sup> BF ~ 1-2

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

<sup>(0800)</sup> outgoing (low @ 0855) / <sup>(0930)</sup> incoming (high @ 1619)

**General Human Activity in the Area:**

scaffold work; pile crew on barge; spill prevention team on boat; dredging

**Monitoring Location(s):**

Berth 4 - (37.9267W, -122.414585)

**Berth(s):** 4

**Pile Type (s):**

20" Steel-vibratory

**Total Pile Count for the Day:** 11 2 **Equipment:** Impact Vibratory

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

7 min vibratory hammer

Date: 6/20/19

Page 2 of 5

The Beaufort scale

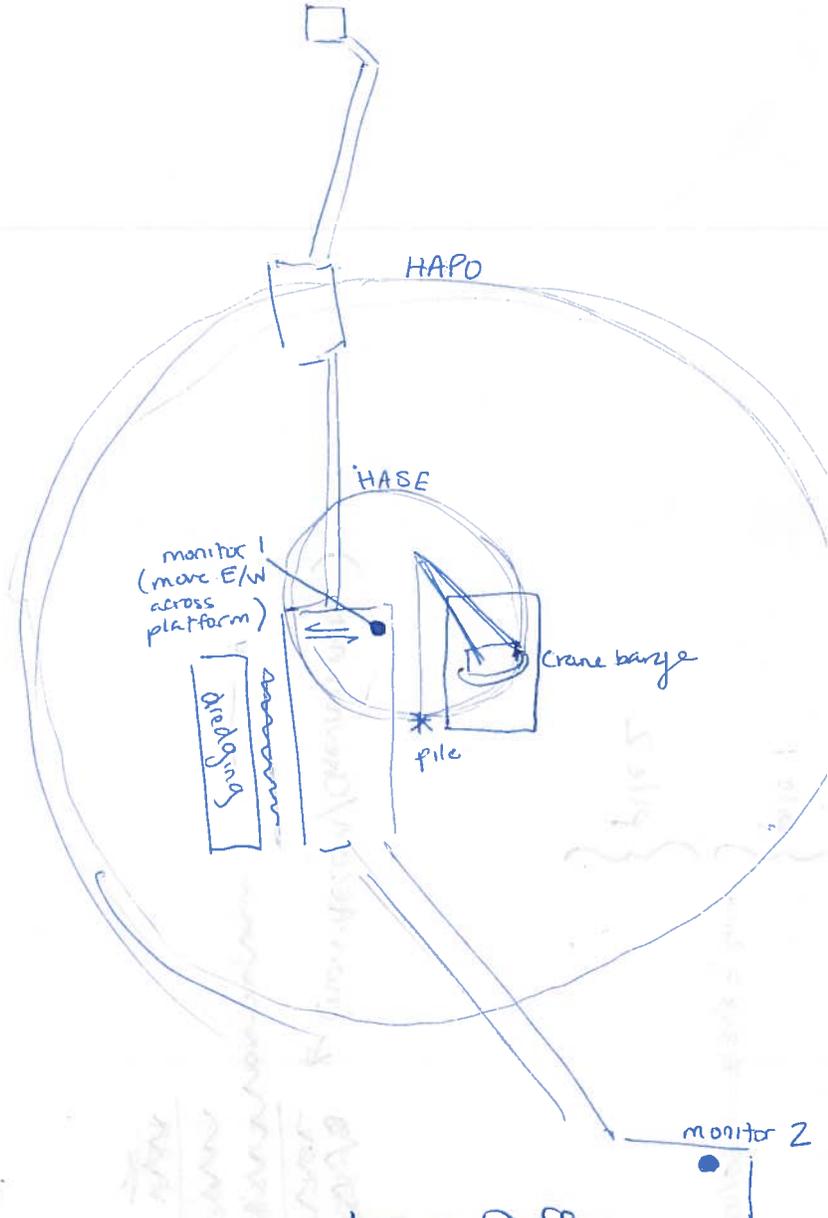
No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face
3	7-10	8-12	Gentle breeze	Large wavelets; Crests not breaking	Small twigs in constant motion; Light flags extended
4	11-16	13-18	Moderate wind	Numerous whitecaps Waves 1-4ft high	Dust, leaves and loose paper raised. Small branches move.
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6	22-27	25-31	Strong wind	Whitecaps everywhere; Larger waves 6-13 ft high	Large branches move; Difficult to use umbrellas
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9	41-47	47-54	Severe gale	High waves; sea begins to roll Spray reduce visibility; 20ft waves	Chimney pots and slates removed
10	48-55	55-63	Storm	V. high waves 20-30 ft; blowing foam gives sea white appearance	Trees uprooted
11	56-63	64-72	Severe storm	Exceptionally high waves; 30-45 ft high	Structural damage Widespread damage
12	63	73	Hurricane	Air filled with foam; visibility reduced White sea; waves over 45ft high	Widespread damage; rare





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

**Diagram**



Biological Monitor: \_\_\_\_\_

Print Name Laura Duffy

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

Date: 6/20/19

Page 1 of 4

**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):**

clear/sunny + windy. Beaufort 2 @ start, increased to 4

**Tidal Level (start work/end work):** low/incoming tide during pile driving window

low tide @ 0855 (-0.79 ft), high tide @ 0143 (5.97) and 1619 (4.97)

**General Human Activity in the Area:**

additional construction @ Berth 4; dredging on west side of Berth 4

**Monitoring Location(s):**

Berth 4 south of pile-driving location, on elevated platform

**Berth(s):** 4

**Pile Type (s):**

24" steel

**Total Pile Count for the Day:** 2

**Equipment:** Impact Vibratory

**Total Minutes of Pile Driving/Total Blows of Impact Driving:** 6 min total

Pile 1: 0929-0937 (3 min) | Pile 2: 1105-1106 (3 min)  
and 0933-0934 and 1107-1109

Stopped early due to high winds

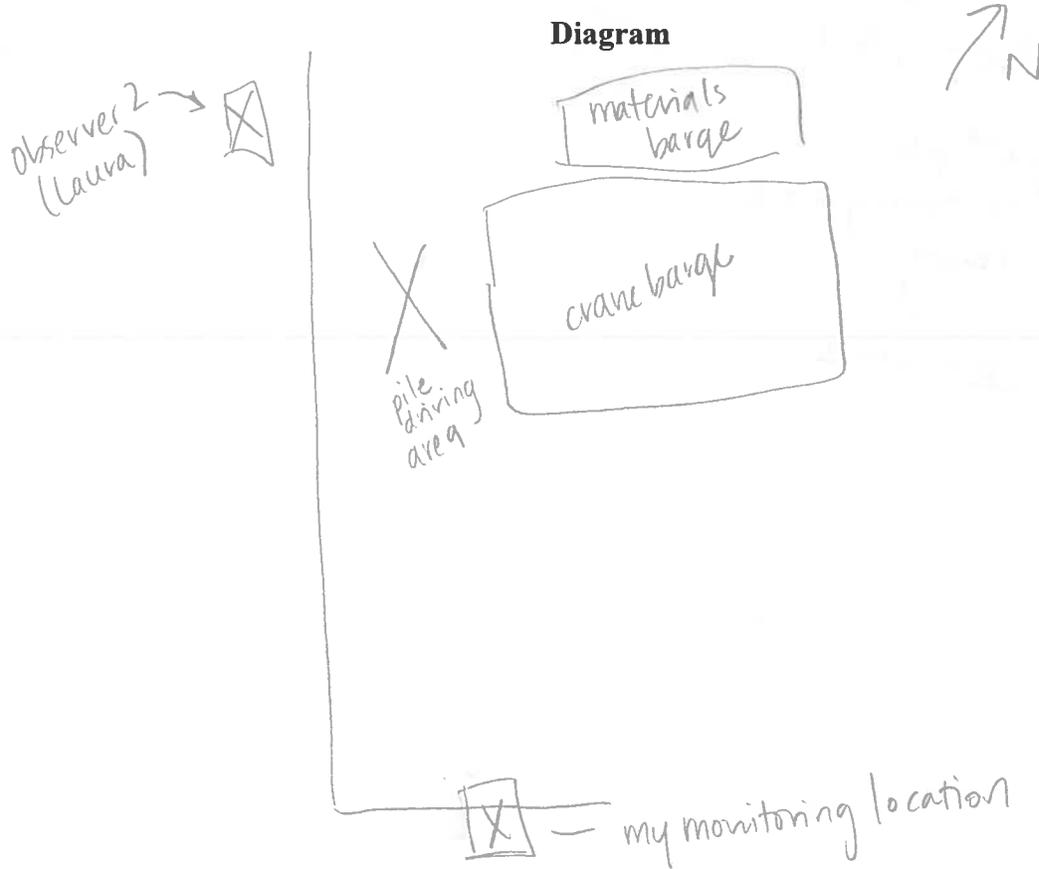
The Beaufort scale

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face
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12	63	73	Hurricane	Air filled with foam; visibility reduced White sea; waves over 45ft high	Widespread damage; rare





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



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

**Signature:**

6/20/19  
6 of 6

0806 monitoring start time, placing pile

0825 using vib. hammer to re-position pile

0908 still positioning first pile.

0929-0931 } 3 min / pile 1  
0933-0934 }

1004 loading 2nd pile

1018 lifting / positioning pile 2

1048 still positioning

1105-1106 } 3 min / pile 2  
1107-1109 }

add to list: 30 days badges deactivate  
chin strap / hard hat

- PPE / PFD req'd at B4

"the finger" - use designated walkways

- active construction

- can drive to B4 - park there, if room

- porta potty

Date: 6/21/19

Page 1 of 5  
A-1 - A-5

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

**Monitor(s):**

Christina Kelleher & Diana Edwards

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

30% cloud cover, sunny, wind 5 mph, Beaufort scale 1-3

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

See tide charts

**General Human Activity in the Area:**

Driving cars / construction equipment, crew walking through site  
Dredging on W. side of Berth 4

**Monitoring Location(s):**

Ⓐ 37.9262784, -122.4138207

Ⓑ 37.9268718, -122.4146757

**Berth(s):** 4

**Pile Type (s):**

Steel vibratory, 20"

**Total Pile Count for the Day:** 6

**Equipment:** Impact Vibratory

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

15 minutes

The Beaufort scale

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face
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12	63	73	Hurricane	Air filled with foam; visibility reduced White sea, waves over 45ft high	Widespread damage; rare

6/21/19  
3 of 5

Monitoring start 07:40-12:20 lunch break  
Monitoring start 13:00-16:19 end

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

Time of Observation	Observer Initials	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	Bearing	Behavior <sup>5</sup>
First: 1023 Last: 1027	CK	Set-up #2	HASE	mk	too far to see	~500 ft SW	SW	240	swimming
First: 1311 Last: 1315	DE	Set-up #1 #4	HASE	UNK	"	~150 ft W	SW	270	Swims dive
First: 1331 Last: 1408	CK	Set-up #4	HASE	mk	too far to see	~250 m. NW	E	15	floods, dive, swam south, resurfaced next to piles at 13:45 when no pile driving occur
First: 1419 Last: 1420	DEA CK	Set-up #5	HASE	mk	light gray/brown	~200 m SE	W	100	W/M shutdown zone, looked around at dove; resurfaced @ 15:57 400 ft. NW of pile
First: 1424 Last: 1429	CK	Set-up #5	HASE	mk	too far to see	~500 m NE	SE	0	→ 2 HASE first a dive heading W first a dive heading SE
First: 1604 Last:	CK	Post-driving	HASE	mk	dark gray w/ light underbelly + spots	~150 m NE	E	75	Surfaced, looked around at barge/activity, at dove
First: Last:									
First: Last:									
First: Last:									
First: Last:									
First: Last:									

<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.).  
 Pile #1: ~~07:32-09:34~~ (2)  
 Pile #2: 10:32-10:33, ~~10:34-10:36~~ (2)  
 Pile #3: 11:45-11:47, 11:48-11:49, 11:50-11:51 (4)  
 Pile #4: 13:36-13:37, 13:38-13:38 (2)  
 Pile #5: 14:42-14:44 (2)  
 Pile #6: 15:47-15:49 (2)

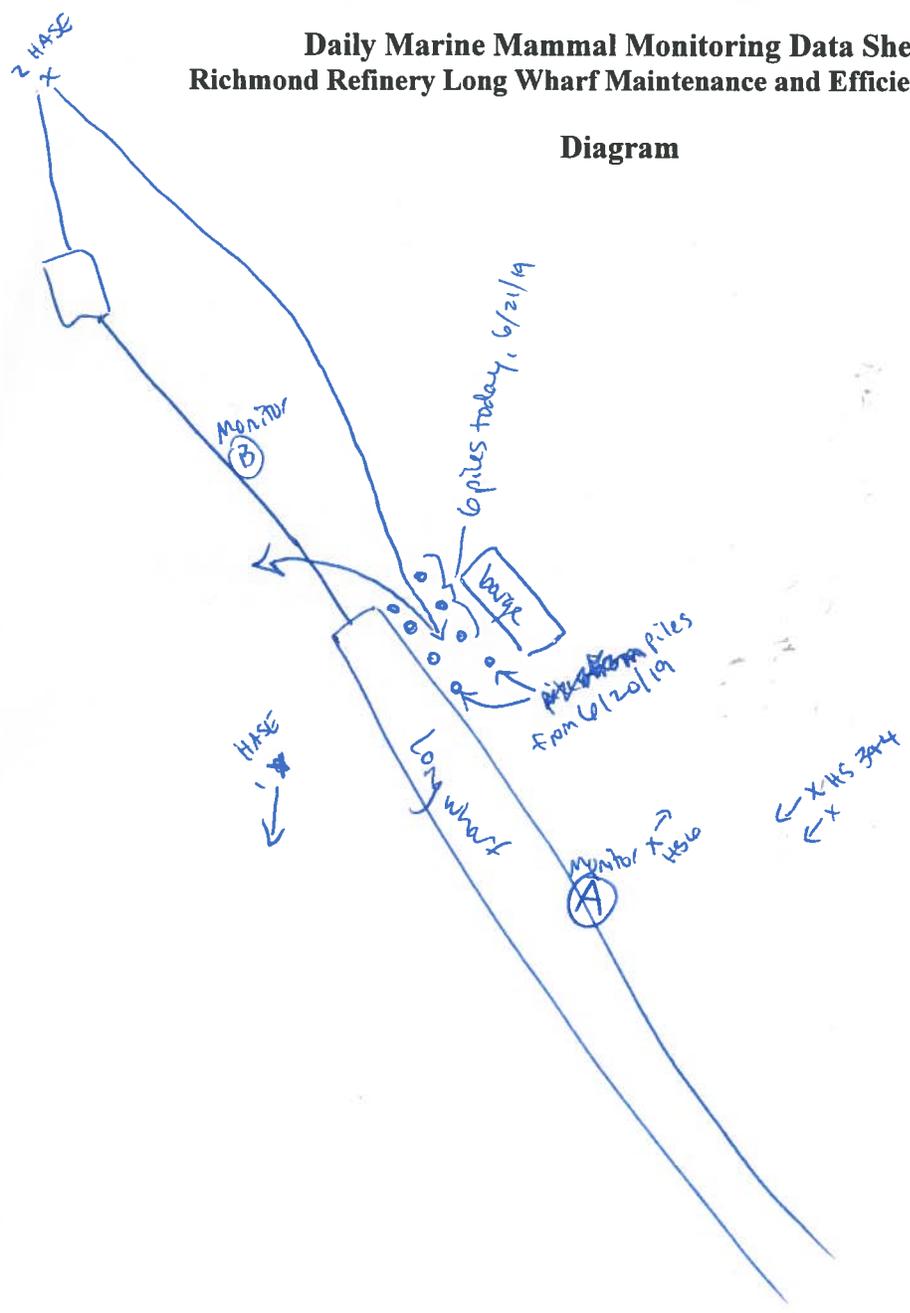
Chevron Richmond Refinery  
 Long Wharf Maintenance and Efficiency Project Marine Mammal Monitoring Plan Incidental Species: SNEG, WEGU, OSPR, DCCO, BRPE, BCNH A-3  
 - many HASE hauled out on rocks under bridge, ~0.25-0.5 mile from work area (20mase)  
 BARS, HOES, AMCE



X  
HS 5

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

#### Diagram



X  
HASE

Biological Monitor: Chazma Kellner <sup>♀</sup> Print Name Diana Edwards

Signature: *[Handwritten Signature]*

Date: 8/21/14

Page 1 of 5

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

**Monitor(s):**

Diana Edwards

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

27<sup>o</sup>, 20% cloud cover, Beaufort 2

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

01:59 - 1.61 FT ; 16:38 - 5.54 FT

**General Human Activity in the Area:**

Craning, Barging, trucks on wharf

**Monitoring Location(s):**

(37.9268446, -122.4146418)

**Berth(s):** 4

**Pile Type (s):** STEEL / VIBRATORY

**Total Pile Count for the Day:** 4

**Equipment:** Impact

Vibratory

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

61 min

The Beaufort scale

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face
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12	63	73	Hurricane	Air filled with foam; visibility reduced White sea; waves over 45ft high	Widespread damage; rare

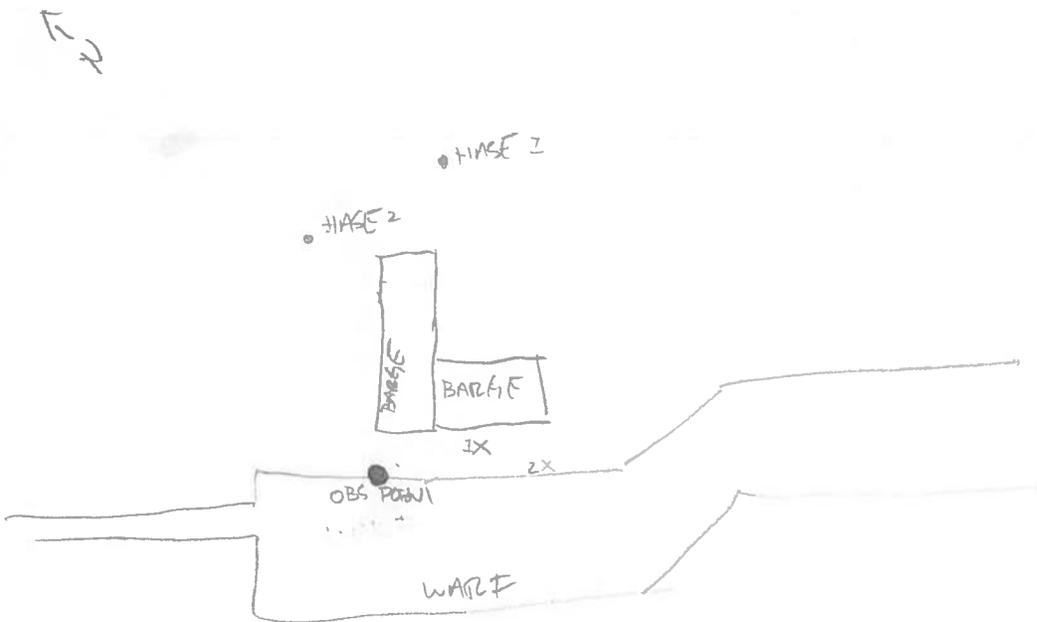




8/21/19  
5 of 5

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

**Diagram**



Biological Monitor: Diana Edwards

Print Name: Diana Edwards

Signature: [Handwritten Signature]

Date: 8/21/2019

Page 1 of 5

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

Monitor(s):

Bettelheim, M.

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

clear blue skies, slight haze, sea state 1 to 2 BS

Tidal Level (start work/end work):

09:59 1.61 FT - 16:30 - 5.54 FT

Spec Obs. Cormorants, seagull, osprey

General Human Activity in the Area:

Pile driving set-up + driving activity

Monitoring Location(s):

see figure bottom right 37.9263051, -122.4137038

Berth(s): 4

Pile Type (s):

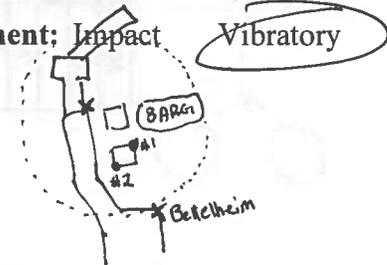
steel/vibratory

Total Pile Count for the Day: 4

Equipment: Impact Vibratory

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

61



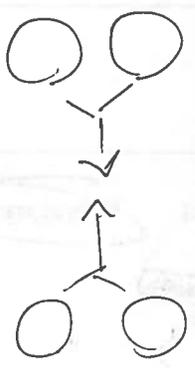
[Pile #1] 13:00 start → 13:30 stop (20 min) [Pile #3] 15:40 start → 15:48 stop (8 min)  
[Pile #2] 13:39 start → 14:01 stop (22 min) [Pile #4] 15:55 start → 16:06 stop (11 min)



6-  
11/11

Date: 8/24/19

Page 2 of 5



- Reminders to share in AM
- Purchase of sized PFD for work
- Used cardboard chip to prevent leaning gear on catwalk
- Used neck gaiter & handkerchief to protect against sun exposure

The Beaufort scale

No.	Knots	Mph	Description	Effects at sea	Effects on land
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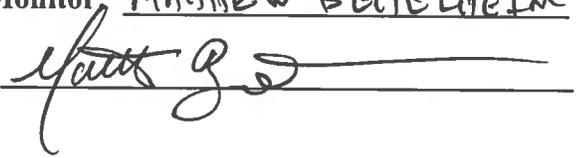
8/21/19  
5 of 5

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

**Diagram**

see page 1

Biological Monitor: MATTHEW BETTELHEIM Print Name MATTHEW BETTELHEIM

Signature: 

Date: 8/22/19

Page 1 of 5

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

Monitor(s):

Diana Edwards

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

@ 08:45 ~ 68° F, 74% CL, Beaufort 3 ; @ 10:00, ~ 72°, 20% CL, Beaufort 2

Tidal Level (start work/end work):

05:09 = 4.18 FT ; 10:40 = 2.09 FT ; 17:19 = 5.64 FT

General Human Activity in the Area:

Monitoring Location(s):

(37.9268345, -122.4148192)

Berth(s): 4

Pile Type (s):

STEEL

Total Pile Count for the Day: 4

Equipment: Impact

Vibratory

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

29

29/13/16

Date: 8/22/19

Page 2 of 5

**The Beaufort scale**

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
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12	63	73	Hurricane	Air filled with foam; visibility reduced White sea; waves over 45ft high	Widespread damage; rare





8/22/19  
5 of 5

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

**Diagram**

**Biological Monitor:** Diana Edwards **Print Name** 8/22/19  
**Signature:** 

Date: 8/22/2019

Page 1 of 5

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

Monitor(s):

Bettelheim, Matthew

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

63° fog, low lying, moderate visibility; 1-2 BS

Tidal Level (start work/end work):

General Human Activity in the Area:

Pre-pile driving and pile driving activity

Monitoring Location(s):

37.9261617; -122.4137671

Berth(s): Berth 4

Pile Type (s):

Steel pile

Total Pile Count for the Day: 4

Equipment: Impact Vibratory

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



[Pile #1] 0913 start → 0925 stop (12m)

[Pile #3] 1149 start → 1155 stop (6m)

[Pile #2] 0957 start → 1004 stop (4m)

[Pile #4] 1202 start → 1209 stop (7m)

Date: 8/22/19

Page 2 of 5

The Beaufort scale

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
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HAS 8/22  
22/22  
Obs vis.   
Fog

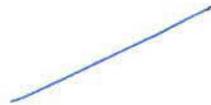




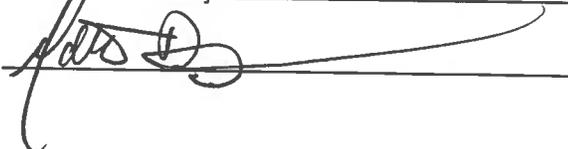
8/22/19  
p 5 of 5

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

**Diagram**



Biological Monitor: MATTHEW BECTELHEIM Print Name MATTHEW BECTELHEIM

Signature: 

Date: 8/29/19

Page 1 of 6

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

Monitor(s):

Laura Duffy; Matthew Bettelheim

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

0730 heavy clouds, haze, low <sup>from WNW</sup> - no wind BF = 1  
cloud breaks @ 0948

Tidal Level (start work/end work):

General Human Activity in the Area:

crews set; 1 skiff; ferry across bay; tugboat; oil tanker; small craft

Monitoring Location(s):

B4 (39.927201, -122.414998)

Berth(s):

Pile Type (s):

Steel

Total Pile Count for the Day: 111

Equipment: Impact Vibratory

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

10 min (pile #1 ~ 8 min; pile #2 ~ 1 min; pile #3 ~ 1 min)

Date: 8/29/19

Page 2 of 6

*The Beaufort scale*

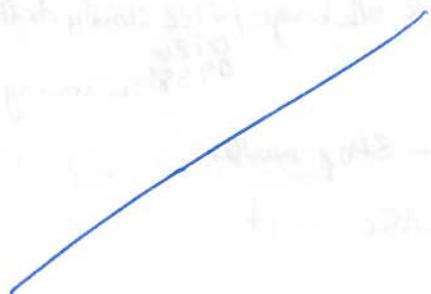
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12	63	73	Hurricane	Air filled with foam, visibility reduced White sea; waves over 45ft high	Widespread damage; rare





8/29/19  
p 5 of 6

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



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

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

soft start

Engines on @ 0800 -- placing gear

1st strike - 1 HASE react: look around, go into H<sub>2</sub>O  
other HASE look around, remain hauled out

~~stake~~ ~~stake~~

0802 - ~~0807~~ 0810 off 1st pile @ 0820

4 HASE @ red buoy; under Richmond bridge surface, look toward activity

0816 1 HASE midway to 4th pier bridge from end of B4; bob then under - again @ 0908 light gray lg. splotches in head  
0825 1 CASL on red channel marker in line w/ G6B/Raccoon Straight - light coat  
1st pile = 8 min (no rxn to hammer strikes)

set gear @ 2nd pile 0827

0828 1 CASL surface @ BAS @ B4 platform

soft start @ 0841

stakes start @ 0841 - 0842 2nd pile = 1 min

post monitoring 0845 - 0915

- tidal front form 0853 on N side B4

- gear off 0858

gear @ 0905 ~~soft start 0914~~

0913 1 HASE lobbing, spy hopping ~ 200yd E of work barges / 0922 slowly drifting NE w/ current

- oil tanker 0916

stakes start 0946 - 0950

silver, very light color little to no spots

0926  
0938 swimming S

0951 1 CASL within 10m buffer - stop work

1015 move tug outside buffer w/ CASL on it

stakes 1016 - (1 min)

post monitor 1015 - 1045

1118 move barge - CASL move off tug stern

Date: 8/29/19

Page 1 of 5

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

Monitor(s):

Bettelheim, Matthew

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

Overcast, warm, 66° 0 to 1 BS

7:40 AM → 8:46

Tidal Level (start work/end work):

General Human Activity in the Area:

Barge/Pier work, prepositioning for pile driving

Monitoring Location(s):

37.9261498; -122.4137758

Berth(s):

B4

Pile Type (s):

steel

Total Pile Count for the Day:

3

Equipment:

Impact

Vibratory

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

Seal in on tug: 9:55

tug moved: 10:13

The Beaufort scale

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face
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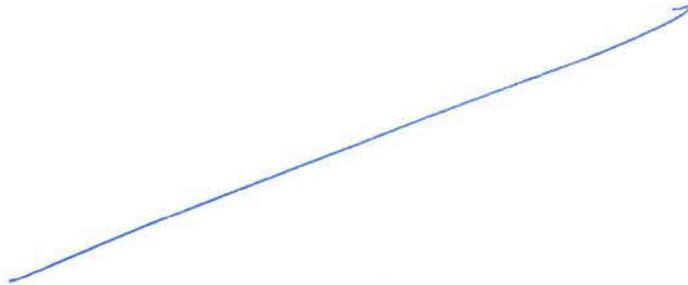




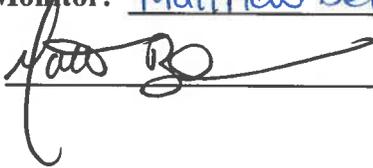
8/29/19  
p 5 of 5

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

**Diagram**



**Biological Monitor:** Matthew Bettelheim **Print Name** MATTHEW BETTELHEIM

**Signature:** 

**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):**

~70°F, sunny, 0% clouds, 10 mile visibility, 0-1

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

2.41 ft (0952am) to 6.11 ft (~~0953~~ 1553pm)

**General Human Activity in the Area:**

Construction, equipment moving, driving, boats at other berths

**Monitoring Location(s):**

Stairs at control room building: 37.9225670, -122.4103979

**Berth(s):** 2

**Pile Type (s):**

24" concrete

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

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

Minutes: ~~40~~ 51 minutes

For blows, see geologist's report/notes

The Beaufort scale

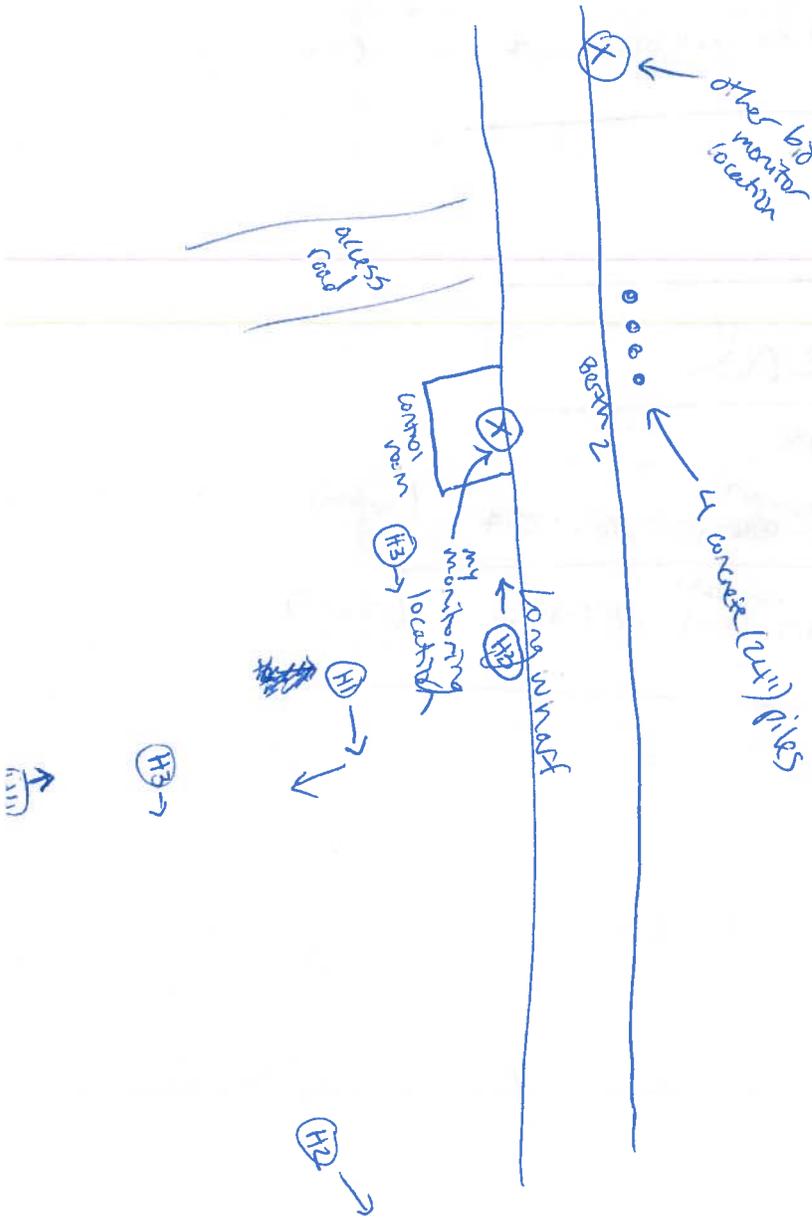
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**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Diagram**



**Biological Monitor:** Christina Kelleher

**Signature:** [Handwritten Signature]

Monitoring start time: 0945

Date: 10/3/19

Page #: 6/6

Pile # 1 Drilling from: 1103 (soft start) - 1113, 1116 - 1117 (11 min)  
#11 n410 blows + 27 = n437 blows

---

Pile # 2 Drilling from: 1141 (soft start) - 1151, 1156 - 1157, 1219 - 1219  
n Blows not counted, see geologist's report (12 min)

---

~~Monitoring start time: 1249~~

Monitoring end time: 1249

---

## Lunch Break

---

Monitoring start time: ~~1430~~ 1430

---

Pile # 3 Drilling from: 1500<sup>(soft start)</sup> - ~~1510~~ 1515, 1516 - 1517 (16 min)

---

Pile # 4 Drilling from: 1510<sup>(soft start)</sup> - 1551, 1552 - 1553 (12 min)

---

Monitoring end time: 1623

Date: 10/3/19

Page 1 of 5

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

Monitor(s):

Diana Edwards

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

@ 10:30 ~ 65° 0% CC ; Beaufort 4  
10-15 mph

Tidal Level (start work/end work):

LOW 01:44 2.48 FT ; HIGH 15:46 6.16 FT

General Human Activity in the Area:

Barge, crucks on wharf, TUG Boat, Tanker traffic

Monitoring Location(s):

37° 21' 9.54" N, - 122° 41' 01.950" W

Berth(s): 2

Pile Type (s):

24" concrete

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

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

1 - 11:03 SOFT START 4-15:35 END  
ed

The Beaufort scale

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face
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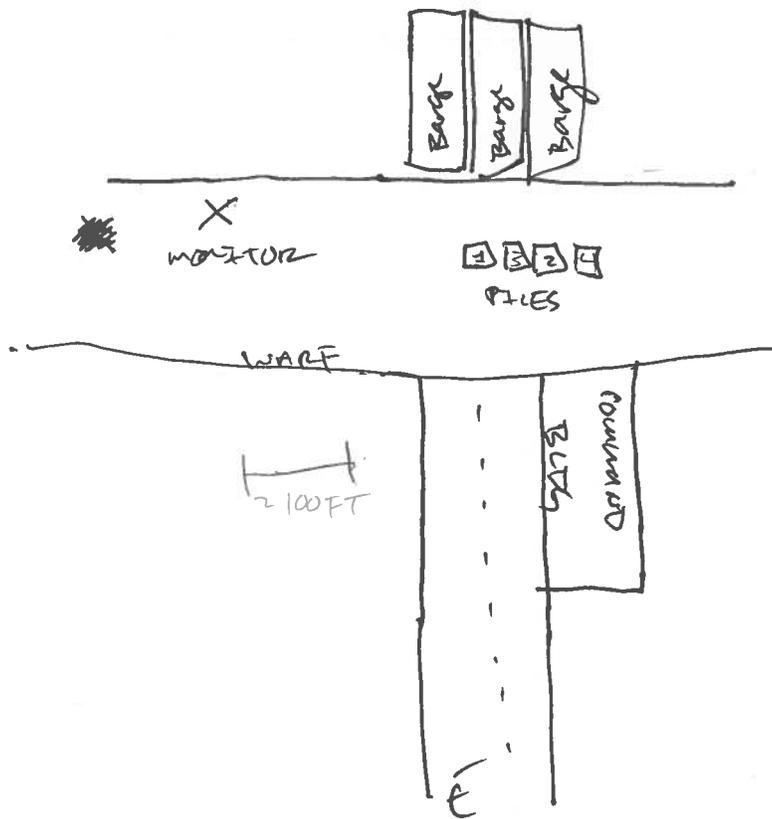




Daily Marine Mammal Monitoring Data Sheet  
Richmond Refinery Long Wharf Maintenance and Efficiency Project

Diagram

W



Biological Monitor:

*Diana Edwards*

Signature:

*[Handwritten signature]*

Date: 10/4/19

Page 1 of 6

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

Monitor(s):

LAURA DUFFY

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

clear - no fog, little haze, BF = 2, wind 3-5 kts

Tidal Level (start work/end work):

1030 - outgoing (low @ 1057) <sup>-2.9 ft @ Richmond Pier</sup> 1453 - flood (high @ 1648 - 5.8 ft @ Richmond Pier)

General Human Activity in the Area:

2 tankers docked N/S of Berth 2 on wharf; sailboats/small craft/ferries in the Bay  
large ship in channel, just outside HAPD buffer @ 1438

Monitoring Location(s):

Ship cleat platform between Berth 2/Berth 1 (37.92209-122.41024)

Berth(s): 2

Pile Type (s):

concrete 24 inch

Total Pile Count for the Day: 2 + retaps on 2 from 10/3 Equipment: Impact Vibratory

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

42 min. total (pile 1 = 14 min; pile 2 = 16 min; retaps of 10/3 piles = 12)

## The Beaufort scale

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
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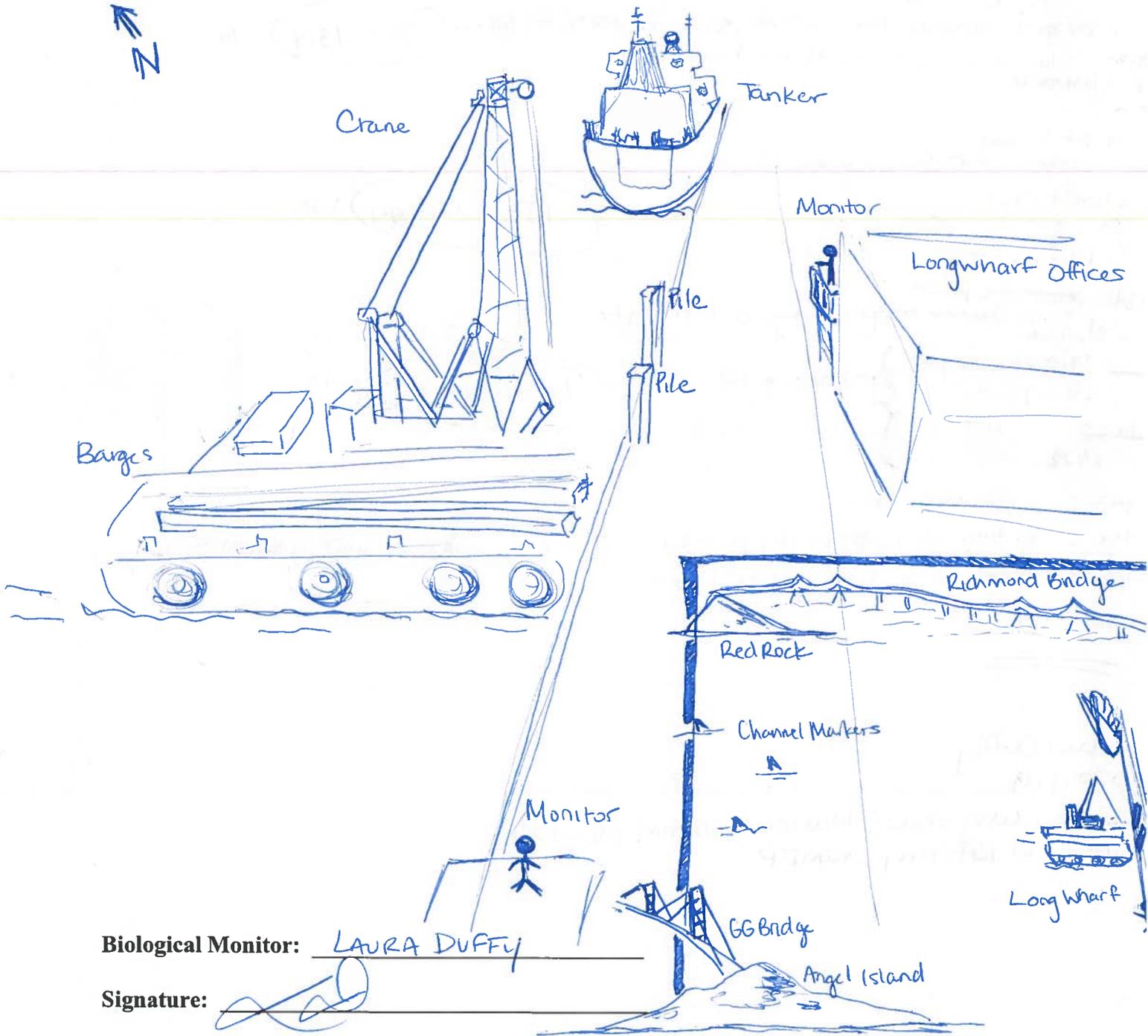
**Daily Marine Mammal Monitoring Data Sheet  
Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**PHOTO LOG**

Comment Reference Number	Photo Number	Photo Taken Before (B), During (D), or After (A) Pile Driving	Description
	1	B	monitoring location perspective
	2	B	CASL w/catch (video)
	3	B	piler getting set
	4	B	Heerman's Gulls - lots of gull activity during hammering
	5	D	hammer driving
	6	D	"Ocean Highway" ship passing beyond buffer area
	7	A	Ship @ Berth 1, S of buffer area

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

**Diagram**



pre monitoring start @ 1030  
hammer up @ 1036, maintenance

- 1 CASL on green channel marker
- 2 CASL on red channel marker

1110 - 1 CASL, solid dark coat catch 1 gulf fish or small shark at Barge/Ship @ Berth 1  
1119

133 move the River Cat around the barges  
136 ship @ B.4 empty ballast H<sub>2</sub>O; 2 tugs waiting  
142 remove barge holding remaining 4 piles  
155 break for lunch  
1253 set hammer

- 3 CASL gm channel marker
- 3 CASL red channel marker

1300 soft start - hammer III • IHH HHH HHH HHH HHH IHH HHH HHH HHH... 1300-1314 = 14  
~~1312~~ - lots of gull activity during hammering  
1314 last stake

324 set hammer  
- glare on H<sub>2</sub>O (outside buffer area to the west)

1327 soft start  
1328 1st stake III • 1328 - 1344 = 16  
1329 <sup>(soft)</sup> 1st real stake

1340 ~~1st stake~~ pause  
1341 ~~start / last stake~~ pause again last stake  
again

1410 start again } restake a 10/3 pile 1410 - 1422 = 12  
1412 pause  
1415  
1422

pause for hammer maint.

1438 "Ocean Highway" large ship passes by work area just outside HAPD buffer area

1440 crew moves to set hammer down

1453 end obs.

Laura Duffy  
10/04/19

Chevron Longwharf Marine Mammal Monitoring  
Richmond Refinery LWMEP

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

Monitor(s):

Diana Edwards

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

@ 10:30 ~ 65°F; 0% CC; 0-5 MPH; Beaufort = 2

Tidal Level (start work/end work):

10:57 LOW; 16:48 High
2.9 FT; 5.8 FT

General Human Activity in the Area:

Barge, Tug on Bay; General Construction on Wharf

Monitoring Location(s):

37.9226543, -122.411483

Berth(s): 2

Pile Type (s):

Concrete 24-INCH

Total Pile Count for the Day: 2 NEW + RESTRIKE Equipment: Impact Vibratory

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

NEW
1-13:00 - 13:11
2-13:28 - 13:44
RESTRIKE 3-14:11 - 14:12
4-14:15 - 14:16
5-14:20 - 14:22

*The Beaufort scale*

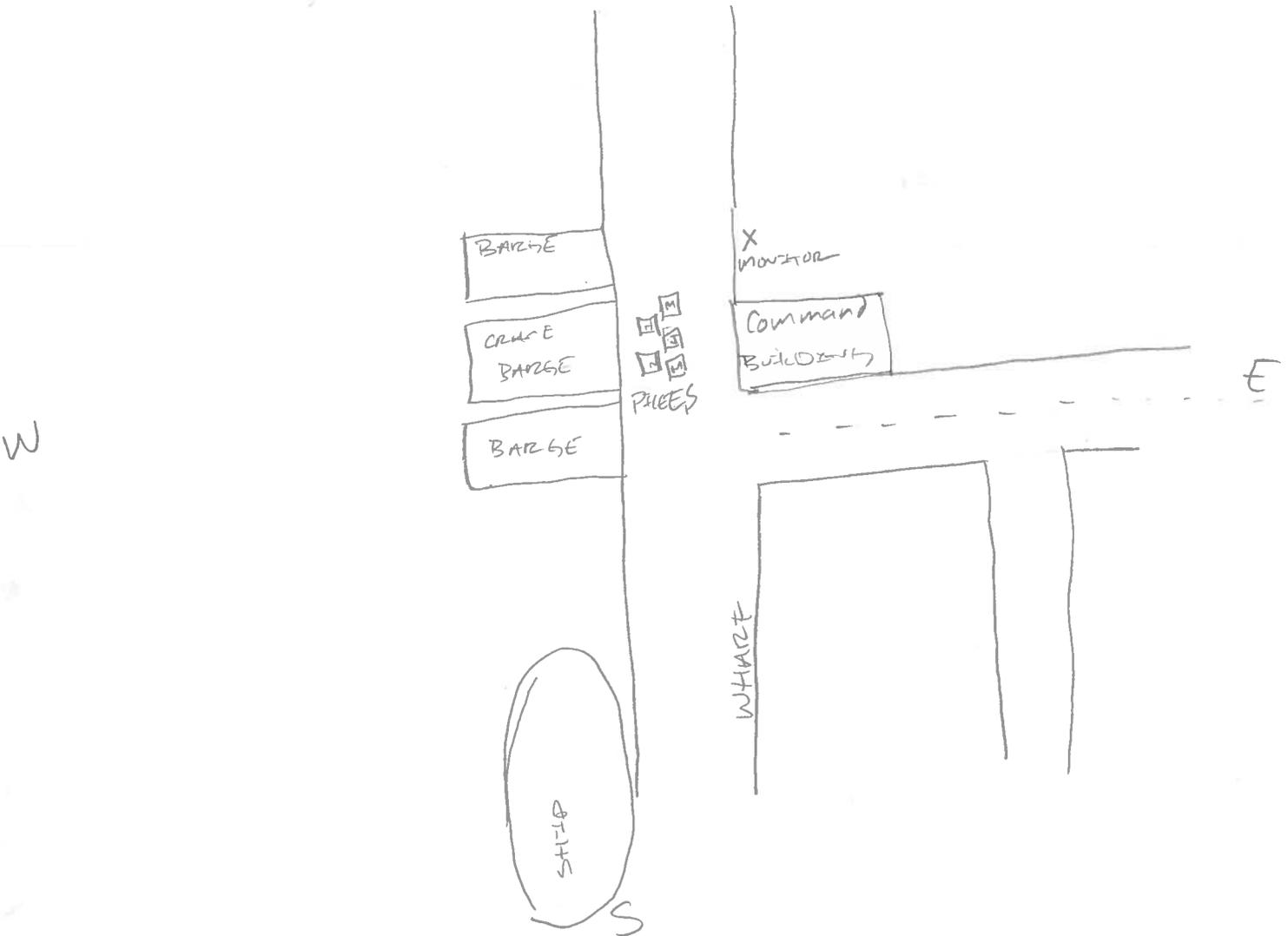
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12	63	73	Hurricane	Air filled with foam; visibility reduced White sea; waves over 45ft high	Widespread damage; rare





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

N  
Diagram



Biological Monitor: Diana Edwards

2150 F

Signature: [Handwritten Signature]

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

Monitor(s):

Diana Edwards

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

~70°; 0% cloud cover; Beaufort 1

Tidal Level (start work/end work):

12:16 low 3.1 FT ; 17:53 high 5.5 FT

General Human Activity in the Area:

Ship @ Berth 1, Trucks driving on wharf

Monitoring Location(s):

37.9219071 ; -122.4101464

Berth(s):

2

Pile Type (s):

24-INCH CONCRETE

Total Pile Count for the Day:

4

Equipment: Impact Vibratory

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

1-14:39-14:52

2-15:07-15:16

3-15:53-16:06

4-16:38-16:50

The Beaufort scale

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
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Daily Marine Mammal Monitoring Data Sheet  
Richmond Refinery Long Wharf Maintenance and Efficiency Project

WEST  
Diagram



Biological Monitor: Diana Edwards

Signature: [Handwritten Signature]

**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):**

@1300 : clear, 70°, no cloud cover. Beaufort 0-1, increased to 1-2 by 1500

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

low @ 1216, 3.1'      high @ 1753, 5.5'

**General Human Activity in the Area:**

ship @ Berth 1, low level wharf activity

**Monitoring Location(s):**

- ① east side of wharf on elevated platform. view of northeast zone <sup>to Castro Rocks</sup> and exclusion zone <sup>north side of</sup>
- ② west side of wharf facing west/north, south of pile-driving location.

**Berth(s):** 2

**Pile Type (s):**

concrete

**Total Pile Count for the Day:** 4      **Equipment:** Impact Vibratory  
the 4 piles were placed last night / this morning + driven this afternoon

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

37 minutes

## The Beaufort scale

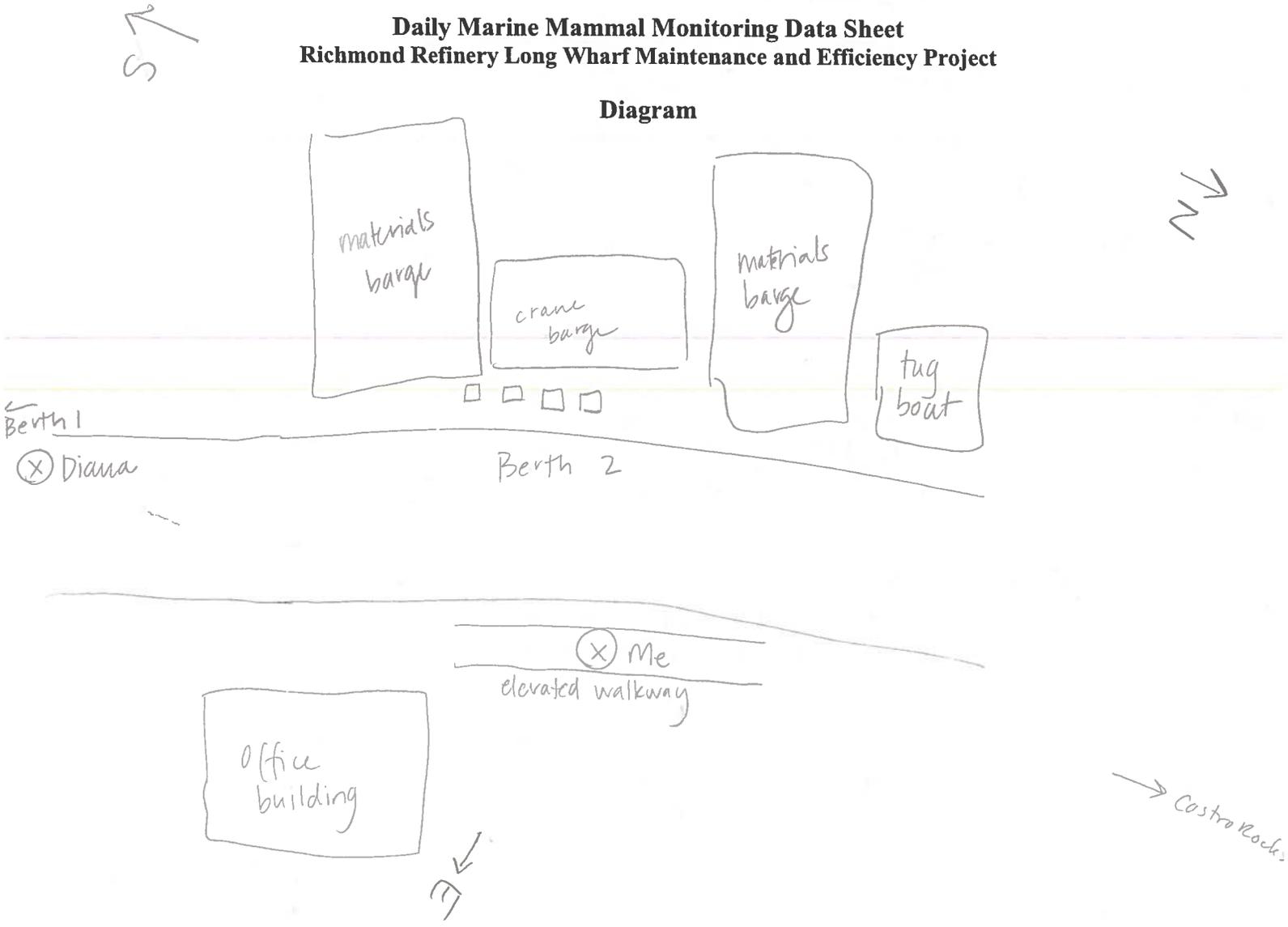
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**Daily Marine Mammal Monitoring Data Sheet**  
**Richmond Refinery Long Wharf Maintenance and Efficiency Project**

**Diagram**



**Biological Monitor:** \_\_\_\_\_

*mcelroy*

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

*[Handwritten signature]*

arrived on-site @ 1155  
starting to pickup hammer @ 1400

pile 1 soft start @ 1440

1442-1450 consistent hammering (8 min) } first pile  
1452-1453 (1 min) } 9 min

pile 2 soft start @ 1508

1508-1516 (8 min) } second pile  
1517-1517 (1 min) } 9 min

pile 3 soft start @ 1554

1558-1604 (8 min) } third pile  
1606-1606 (1 min) } 9 min

pile 4 soft start @ 1639

1640-1649 (9 min) } fourth pile  
1651-1651 (1 min) } 10 min

1721 - monitoring end time

Date: 10/6/19

Page 1 of 5

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

Monitor(s):

Diana Edwards

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

@ 08:45 ~ 65% j-5% cloud cover; Beaufort 2-3

Tidal Level (start work/end work):

08:31 HIGH 4.9 FT; 13:36 LOW 3.0 FT

General Human Activity in the Area:

Ships in BERTH 1, BERTH 3, BERTH 4. General construction activity on wharf.

Monitoring Location(s):

37.9219193, -122.4100988

Berth(s): 2

Pile Type (s):

24-INCH CONCRETE

Total Pile Count for the Day: 7

Equipment: Impact Vibratory

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

1 - 09:01 - 09:06      5 - 09:30 - 09:37  
2 - 09:11 - 09:12      6 - 09:34 - 09:36  
3 - 09:16 - 09:17      7 - 09:40 - 09:42  
4 - 09:20 - 09:23

The Beaufort scale

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-5	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face
3	7-10	8-12	Gentle breeze	Large wavelets; Crests not breaking	Small twigs in constant motion; Light flags extended
4	11-16	13-18	Moderate wind	Numerous whitecaps Waves 1-4ft high	Dust, leaves and loose paper raised. Small branches move.
5	17-21	19-24	Fresh wind	Many whitecaps, some spray; Waves 4-8 ft high	Small trees sway
6	22-27	25-31	Strong wind	Whitecaps everywhere; Larger waves 8-13 ft high	Large branches move. Difficult to use umbrellas
7	28-33	32-38	V. strong wind	White foam from waves is blown in streaks; waves 13-20ft high	Whole trees in motion
8	34-40	39-46	Gale	Edges of wave crests break into spindrift	Twigs break off trees; Difficult to walk
9	41-47	47-54	Severe gale	High waves; sea begins to roll Spray reduce visibility; 20ft waves	Chimney pots and slates removed
10	48-55	55-63	Storm	V. high waves 20-30 ft; blowing foam gives sea white appearance	Trees uprooted
11	56-63	64-72	Severe storm	Exceptionally high waves; 30-45 ft high	Structural damage
12	63	73	Hurricane	Air filled with foam; visibility reduced White sea; waves over 45ft high	Widespread damage; rare



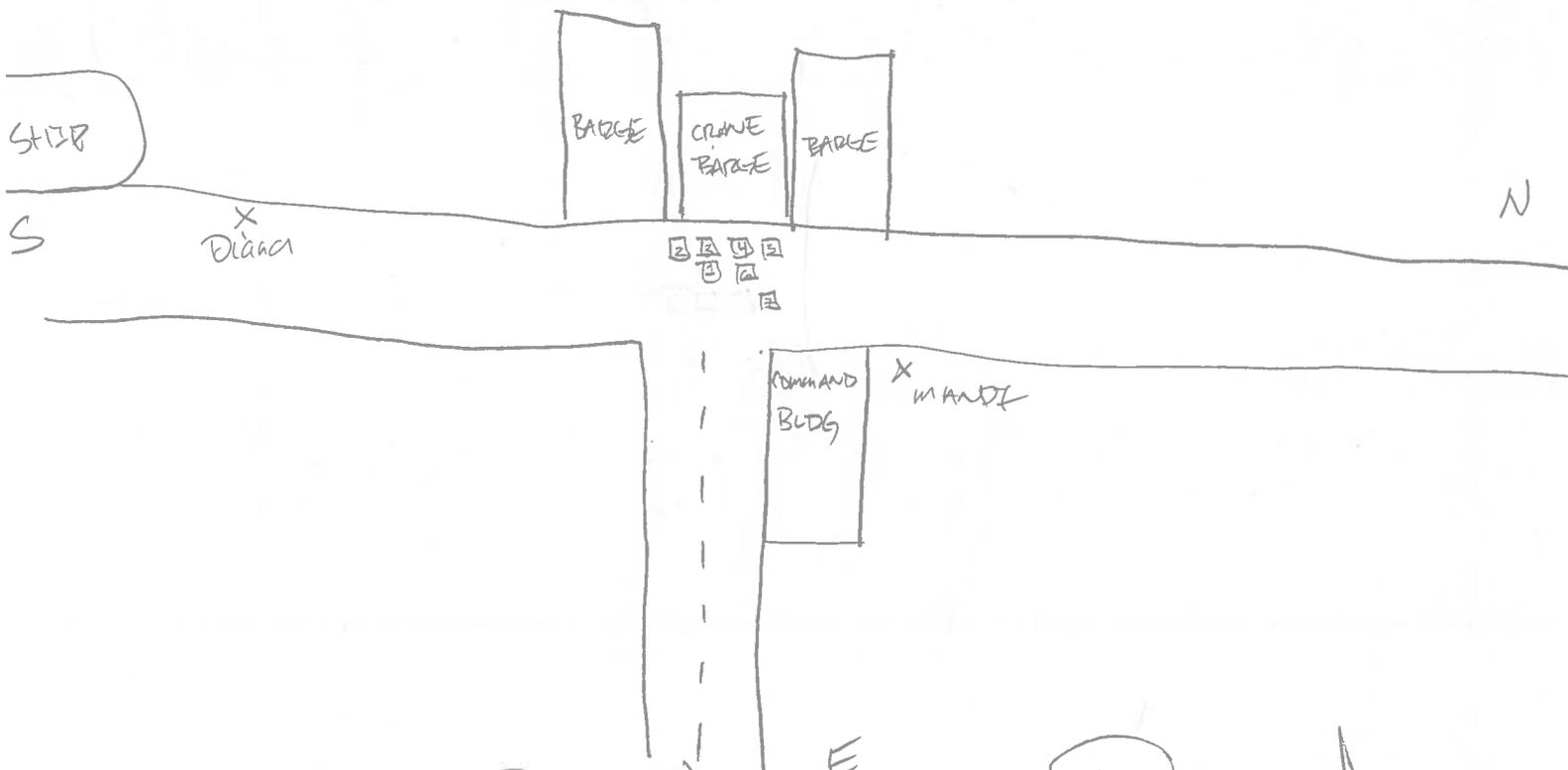


10/6/14

5 OF 5

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

W **Diagram**



**Biological Monitor:** Diana Edwards **Print Name** Diana Edwards

**Signature:** [Handwritten Signature]

Date: 10/6/19

Page 1 of 6

**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):**

@ 0830: 60°F light wind ~5 mph from west, clear sky Beaufort 1

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

high @ 0830 (4.9'), low @ 1337 (3.0')

**General Human Activity in the Area:**

ship @ Berth 1, general wharf maintenance ops

**Monitoring Location(s):**

- ① elevated platform on east side of wharf, directly across (east of) <sup>from</sup> pile location
- ② on west side of wharf, south of pile location

**Berth(s):** 2

**Pile Type (s):**

24" concrete

**Total Pile Count for the Day:** re-strikes only - 6 piles **Equipment:** Impact Vibratory  
no new piles

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

17 minutes

Date: 10/6/19

Page 2 of 5

The Beaufort scale

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle, wind felt on face
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10	48-55	55-63	Storm	V. high waves 20-30 ft; blowing foam gives sea white appearance	Trees uprooted
11	56-63	64-72	Severe storm	Exceptionally high waves; 30-45 ft high	Structural damage Widespread damage
12	63	73	Hurricane	Air filled with foam; visibility reduced White sea, waves over 45ft high	Widespread damage; rare





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

**Diagram**



Biological Monitor: Wandi McElroy Print Name \_\_\_\_\_

Signature: *Wandi McElroy*

10/6/19  
6 of 6

Re-strikes arrived @ 0825

pile 1:	0903 - 0907 (intermittent)	= 4 min
pile 2:	0912 - 0918 "	= 6 min
pile 3:	0928 - 0929	= 1 min
pile 4:	0931 - 0933	= 2 min
pile 5:	0935 - 0937	= 2 min
pile 6:	0941 - 0943	= 2 min

17 total

end observations @ 1013



Date: 10/21/19

Page 2 of 5

*The Beaufort scale*

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
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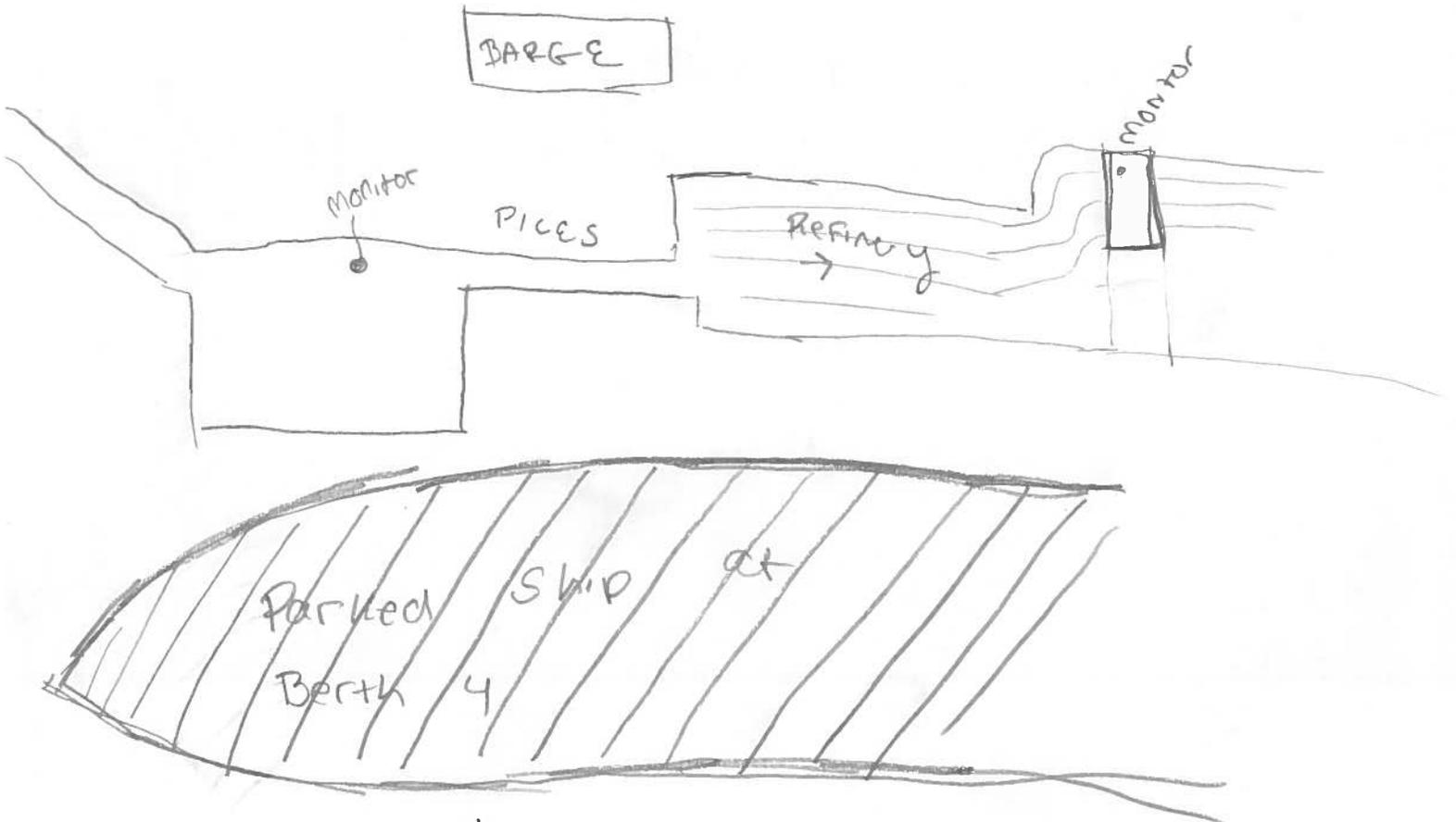




10/21/19  
5 of 5

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

**Diagram**



Biological Monitor: Natalie Greer Print Name Natalie Greer

Signature: 

See NG's notes  
from 10/21/19

Date: 10/21/19

Page 1 of 5

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

**Monitor(s):**

Matthew Betteheim

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

\_\_\_\_\_

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

\_\_\_\_\_

**General Human Activity in the Area:**

\_\_\_\_\_

**Monitoring Location(s):**

\_\_\_\_\_

**Berth(s):** \_\_\_\_\_

**Pile Type (s):** \_\_\_\_\_

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

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

\_\_\_\_\_

The Beaufort scale

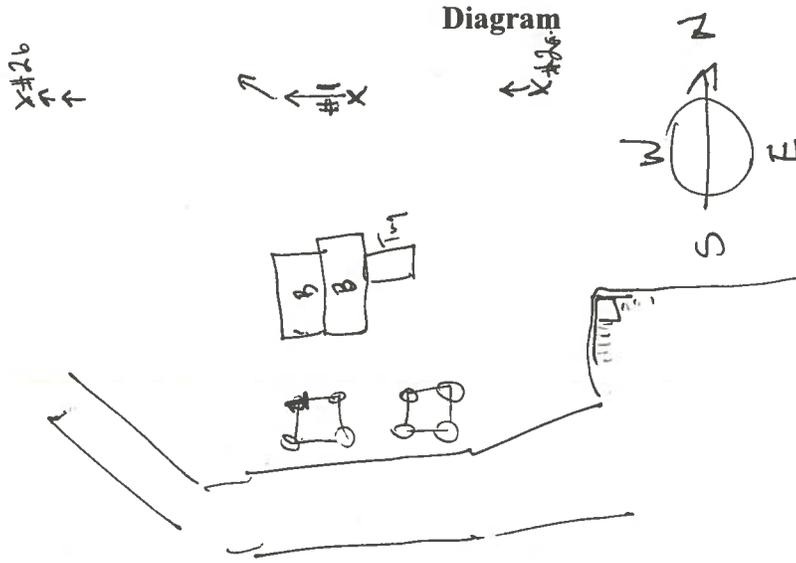
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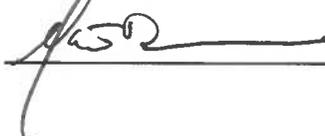


10/21/19  
5 of 5

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



Biological Monitor: Matthew Bettelheim Print Name MATTHEW BETTELHEIM

Signature: 

Date: Oct 22 2019

Page 1 of 5

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

**Monitor(s):**

Bettelheim, Matthew + Duffy, Laura

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

1 (in AM) to 2 (in PM); clear skies, high visibility

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

receding tide throughout monitoring period

**General Human Activity in the Area:**

Standard wharf activity

**Monitoring Location(s):**

observation ladder platform E. of work site @ B4

**Berth(s):**

B4

**Pile Type (s):**

Steel pile

**Total Pile Count for the Day:**

5 piles removed

**Equipment:** Impact

Vibratory

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

\_\_\_\_\_

Date: 10/22/19

Page 2 of 5

The Beaufort scale

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
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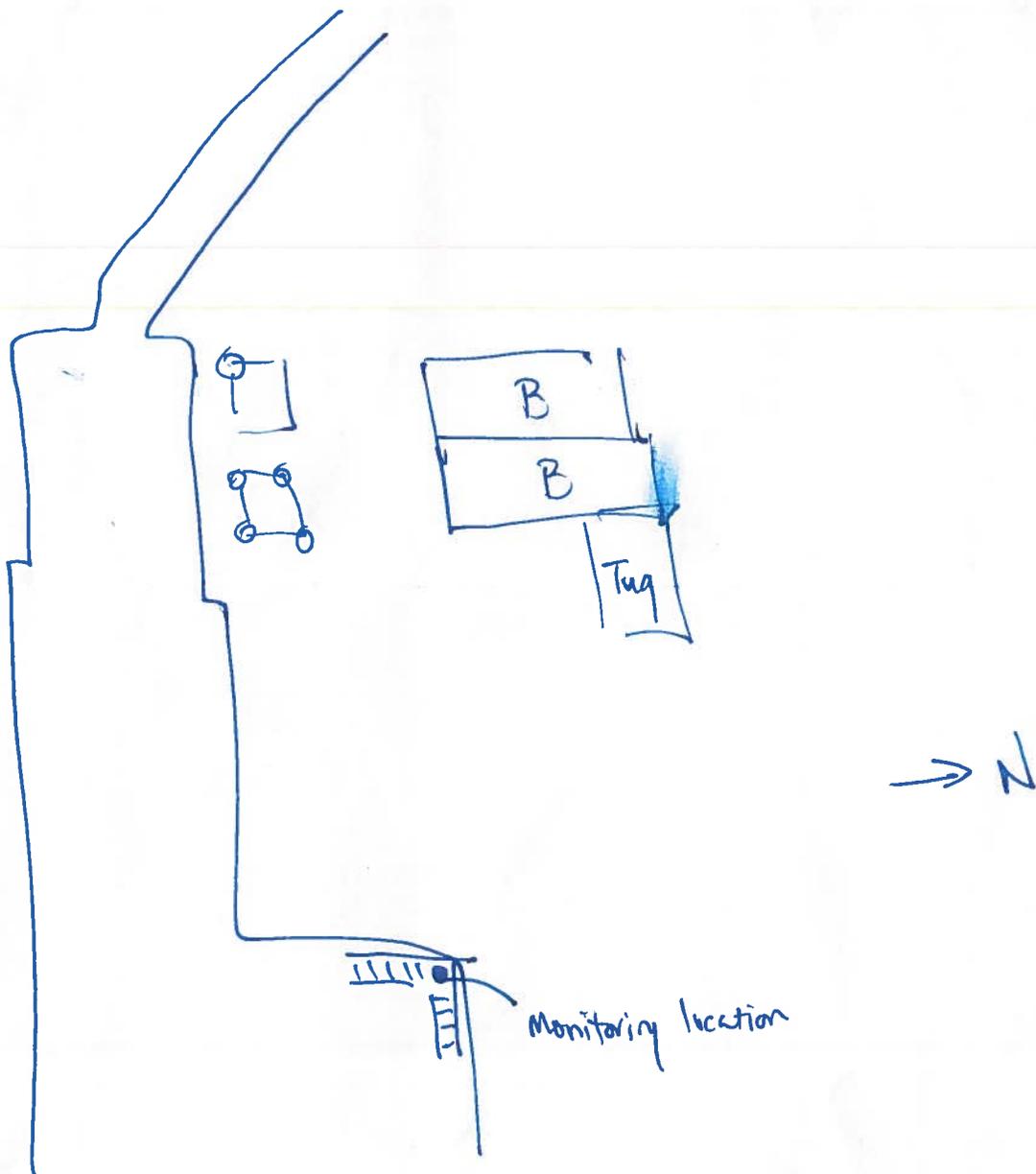




10/22/19  
5 of 5

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

**Diagram**



Biological Monitor: Matthew Bettelheim Print Name Matthew Bettelheim

Signature: 

Date: 10/22/19

Page 1 of 6

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

**Monitor(s):**

Laura Duffy

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

clear/minimal haze; 64°F; BF ~ 2

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

@ 0730 - flood; high tide @ 0840 = 5ft / Richmond Pier Buoy

**General Human Activity in the Area:**

skiff/crew @ pile; Rivercat on NW side B4; small craft in channel; traffic on bridges

**Monitoring Location(s):**

\_\_\_\_\_

**Berth(s):** B4

**Pile Type (s):**

Steel

**Total Pile Count for the Day:** 5

**Equipment:** Impact Vibratory

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

25 min

The Beaufort scale

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face
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12	63	73	Hurricane	Air filled with foam; visibility reduced White sea; waves over 45ft high	Widespread damage; rare

10/22/19  
page 3 of 6

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

Time of Observation	Observer Initials	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	Bearing	Behavior <sup>5</sup>
First: 0730 Last: 0900	LMD	B/D	HASE	1 ad.	gray head/dark speckles	>500m	NA		hauled out on rocks under Richmond bridge
First: 0730 Last: 0730	LMD	B	HASE	1 ad	gray/speckles	>500m	W		swimming around rocks under bridge
First: 0730 Last: 0730	LMD	B	CASL	4 ad.	NA	>500m	NA		hauled out on channel markers
First: 0832 Last: 0832	LMD	A	HASE	1 ad	dark mottled gray/brown	200m	SSW		slow swim / travel
First: 1017 Last: 1017	LMD	B	HASE	1 ad	dark gray w/ black mottle	130m	N		float/rest, facing Richmond Bridge
First: 1036 Last: 1036	LMD	A	HASE	1 juv.	solid black, small	40m	N		slow swim / travel
First: 1051 Last: 1051	LMD	D	HASE	1 ad	light silver w/ gray mottle	>500m	NA		hauled out, rocks under bridge
First: 1130 Last: 1225	LMD	B/D	HASE	3 ad 1 juv	NA	>500m	NA		hauled out, rocks under bridge
First: 1212 Last: 1225	LMD	A	HASE	12 ad/ 1 juv	NA	>500m	NA		hauled out, rocks under bridge
First: 1218 Last: 1220	LMD	A	HASE	2 ad	silvery/solid coats	25m	N		slow swim / travel
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.).

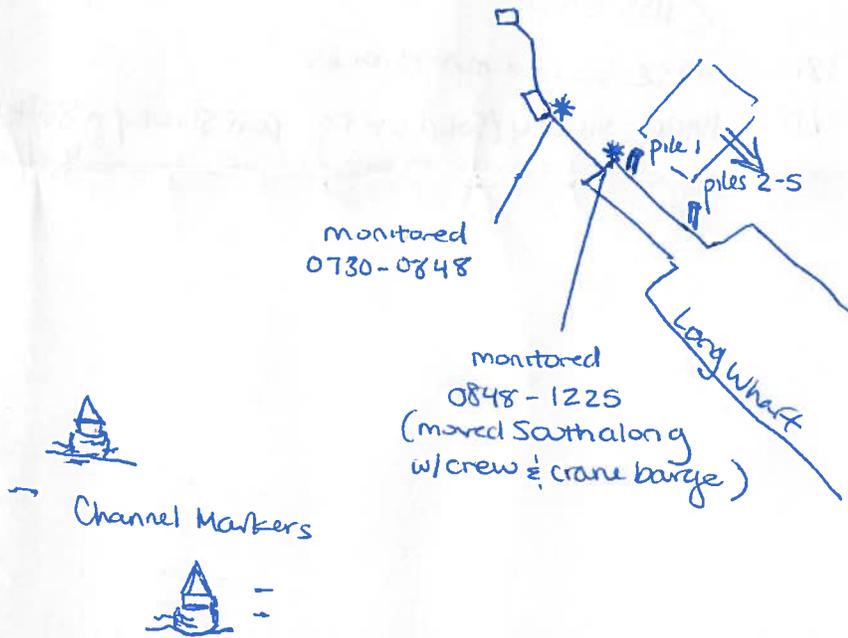
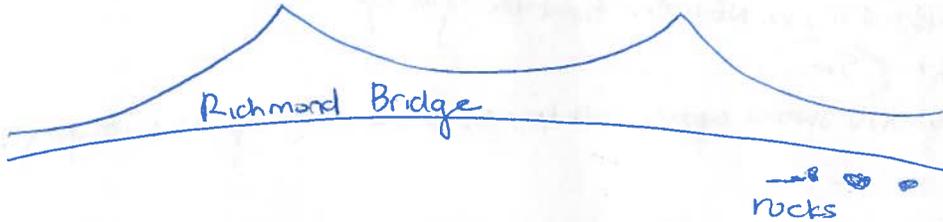
<sup>5</sup>Behavior examples: Stationary at surface, swimming (slow or fast), transiting, foraging, resting, looking around. Note if mammal appears to be attentive to project activities, or displays any behavior changes related to project activities, and describe the project activity. Note any human-caused disturbances such as recreational boating or helicopters.

Add a reference number if comments are provided on a separate sheet.



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

**Diagram**



Biological Monitor: Laura Duffy Print Name \_\_\_\_\_

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

6 of 6  
10/22/19

730 - 1 HASE gray head/dark speckles swim near rocks under bridge; 1 HASE hauled out (high tide - many rocks submerged)

- 4 CASL on channel markers

753 - vib. hammer start } vibratory pile # 1 = steel  
755 - " " stop }  
803 - start / 8804 stop } 5 min

1032 - HASE - dark mottled gray/brown - slow swim SSW - crew/Rivercat moving barge

898 barge move south; max monitoring station South

919 vib. hammer start / 0923 stop 4 min

017 HASE - dk gray w/black mottle - @ end of LW, NE corner - float-facing bridge

018 vib hammer start / 1023 stop 5 min

1036 HASE - mostly black, small - swim N surface approx 50ft from NE corner of barge - crew laying pile down

1051 start / 1052 stop

1051 light silver w/gray mottle hauled out on rocks under bridge

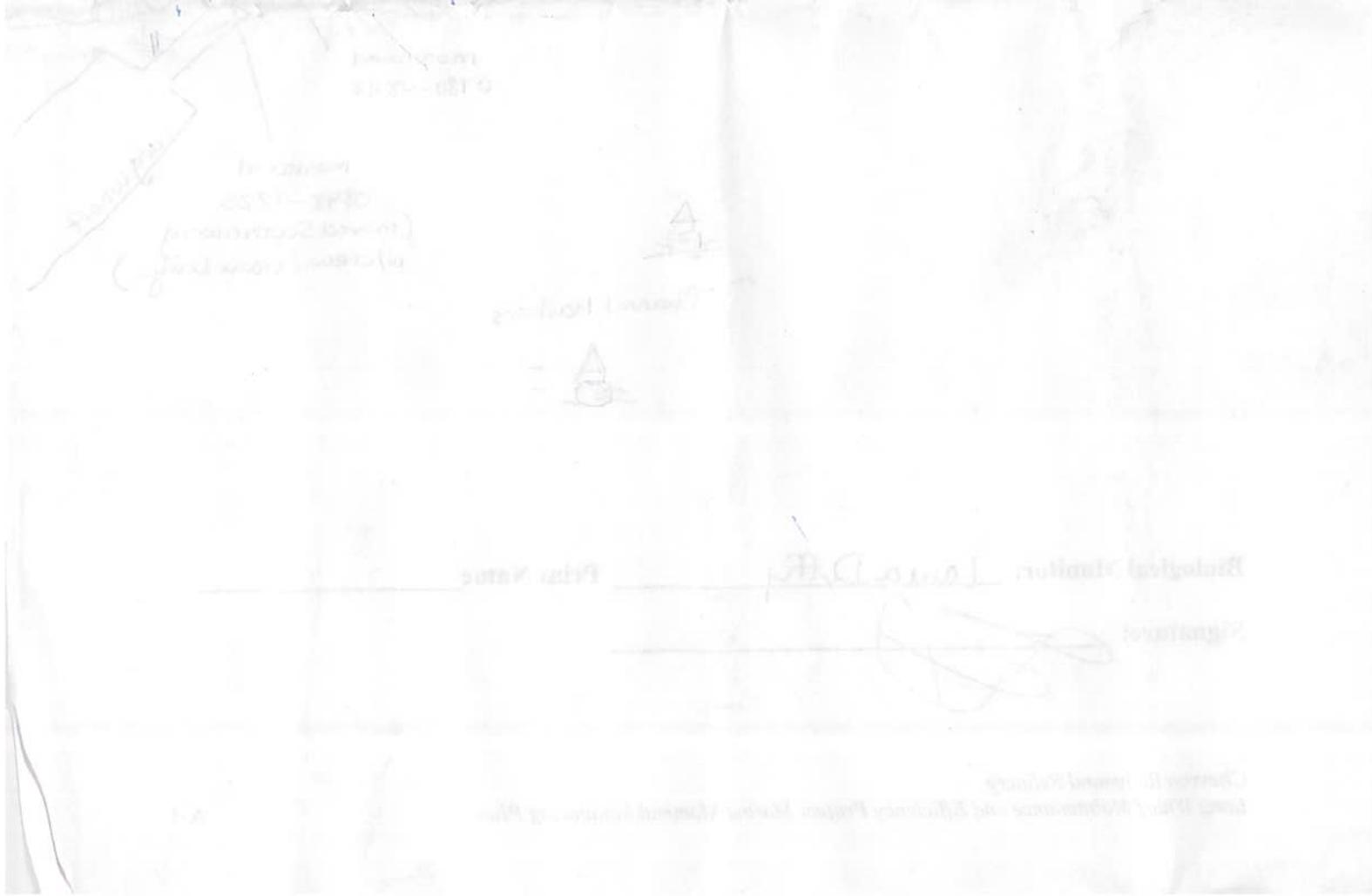
1055 start / 1058 stop 6 min

1130 3 HASE ad / 1 subad (dark small) hauled out near bridge

1155 stop

1212 12 HASE hauled out @ rocks

1218 2 HASE - silvery/solid coats - pass slowly ~80ft E of barge, travel N - crew laying pile down



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

**Monitor:**

Mandi McElroy

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

@0700: clear, Beaufort 1, light wind, 52°

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

high 5.1 ft @ 6:54 am, low (3.1 ft) @ 12:17 pm, high (4.9 ft) @ 5:22 pm

**General Human Activity in the Area:**

typical wharf activities - trucks moving around, ship @ Berth 3

**Monitoring Location(s):**

south side of pile-driving area (between Berths 1+2)

**Berth(s):**

2

**Pile Type (s):**

24" concrete

**Total Pile Count for the Day:**

4

**Equipment:** Impact Vibratory

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

12 minutes (3 per pile)

Date: 11/4/19

Monitor Initials: MM

*The Beaufort scale*

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face
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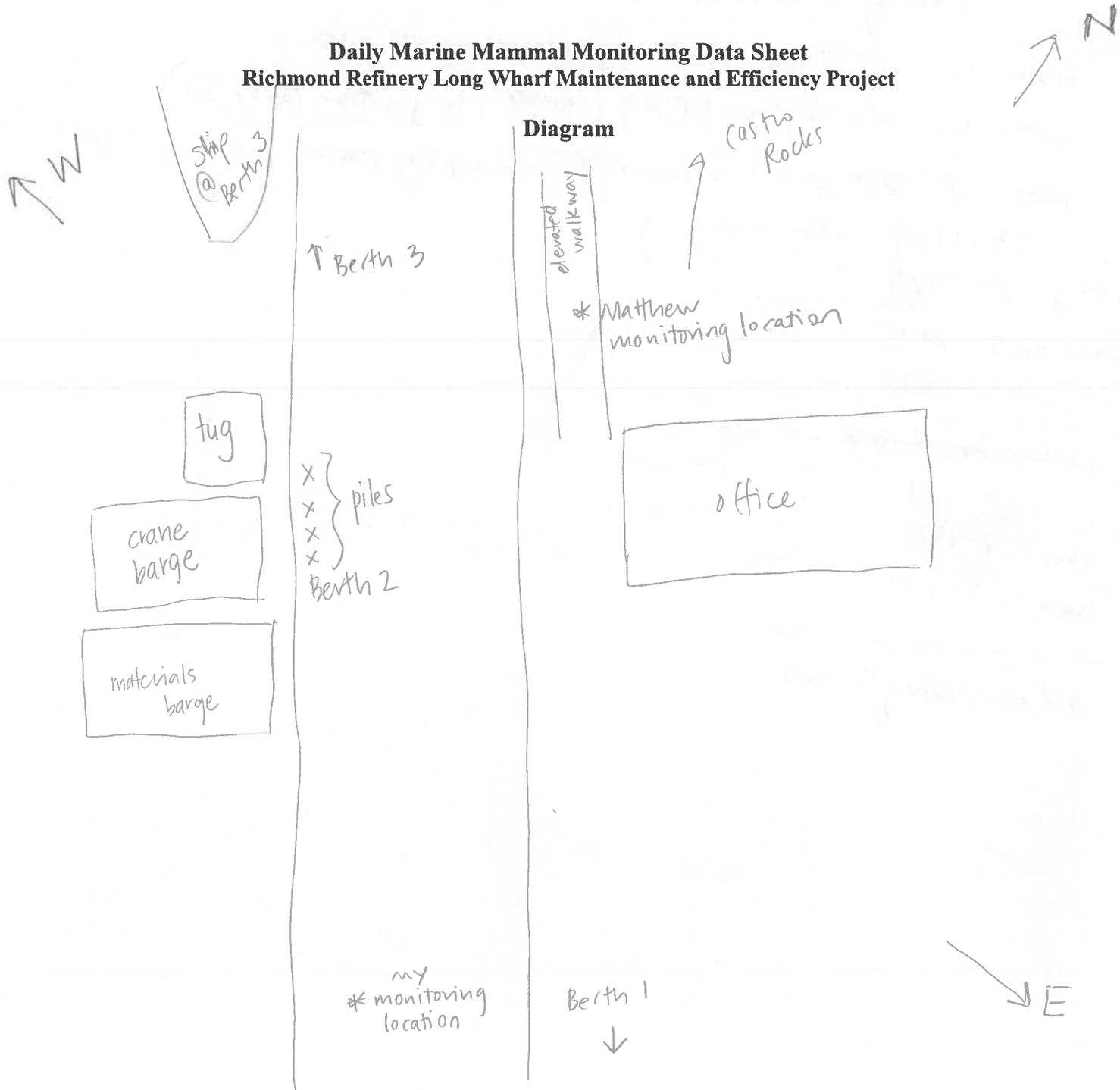


Date: 11/4/19

Page 5 of 6

Monitor Initials: MM

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



Biological Monitor: Mandi McElroy

Signature: [Handwritten Signature]

S ↙

11/4/19  
pg. 6 of 6  
mm

0700 - two piles in position, will be positioning 2 more (n=4) before starting to drive w/hammer

1030 - third pile placed, awaiting placement of 4th pile

1250 - fourth pile in place, lifting hammer (in position @ 1250)

1401 - soft start, pile 1 - followed by hammer adjustment, a few light taps

pile 1 2min 1423 - 1425 steady hammering  
1min 1428 - 1429 " "

pile 2 2min 1443 - 1445 " "  
1min 1447 - 1448 " "

~~moving bubble curtain~~ not needed

pile 3 2min 1459 - 1501  
1min 1502 - 1503

pile 4 3min 1512 - 1515  
end monitoring @ 1545



Date: 11/11/19

Page 2 of 5

Monitor Initials: MB

*The Beaufort scale*

No.	Knots	Mph	Description	Effects at sea	Effects on land
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12	63	73	Hurricane	Air filled with foam; visibility reduced White sea, waves over 45ft high	Widespread damage; rare





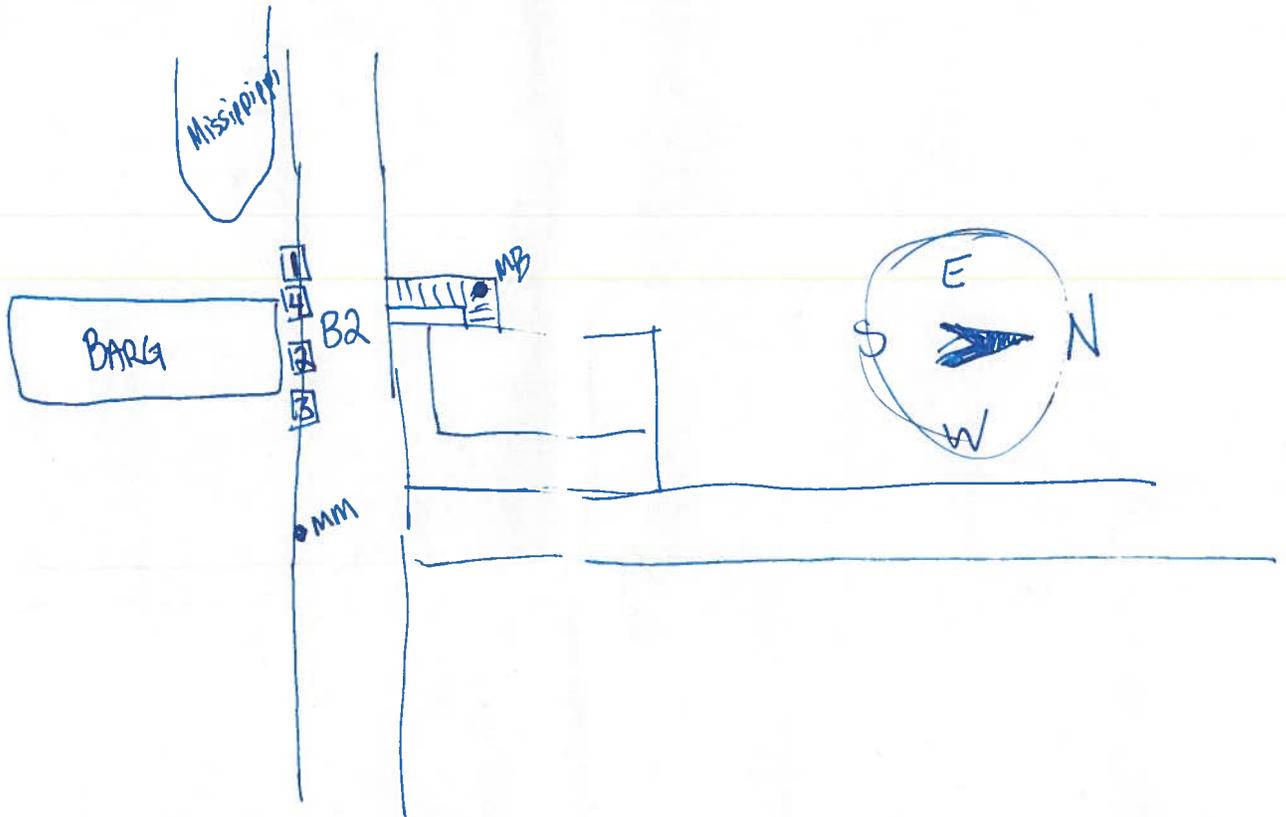
Date: 11/4/19

Page 5 of 5

Monitor Initials: MB

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

**Diagram**



Biological Monitor: BETHEL HEIM

Signature: [Handwritten Signature]

Date: 11/5/19

Page 1 of 6

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

**Monitor:**

Christina Kelleher

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

Clear, 0% clouds, good visibility, ~700F, 0-1 Beaufort

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

start ~ 5.2ft, end 2.61ft.

**General Human Activity in the Area:**

Cars driving, construction equipment moving, work at barge, boats

**Monitoring Location(s):**

stairs of control room, NE of piles, at: 37.9226575, -122.4103788

**Berth(s):** 2

**Pile Type (s):**

Concrete 24"

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

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

7 min, see geotech report for total blows

Date: 11/5/19

Monitor Initials: CK

The Beaufort scale

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face
3	7-10	8-12	Gentle breeze	Large wavelets; Crests not breaking	Small twigs in constant motion; Light flags extended
4	11-16	13-18	Moderate wind	Numerous whitecaps Waves 1-4ft high	Dust, leaves and loose paper raised. Small branches move.
5	17-21	19-24	Fresh wind	Many whitecaps, some spray; Waves 4-8 ft high	Small trees sway
6	22-27	25-31	Strong wind	Whitecaps everywhere; Larger waves 8-13 ft high	Large branches move; Difficult to use umbrellas
7	28-33	32-38	V. strong wind	White foam from waves is blown in streaks; waves 13-20ft high	Whole trees in motion
8	34-40	39-46	Gale	Edges of wave crests break into spindrift	Twigs break off trees; Difficult to walk
9	41-47	47-54	Severe gale	High waves; sea begins to roll Spray reduce visibility; 20ft waves	Chimney pots and slates removed
10	48-55	55-63	Storm	V. high waves 20-30 ft; blowing foam gives sea white appearance	Trees uprooted
11	56-63	64-72	Severe storm	Exceptionally high waves; 30-45 ft high	Structural damage
12	63	73	Hurricane	Air filled with foam; visibility reduced White sea; waves over 45ft high	Widespread damage; rare





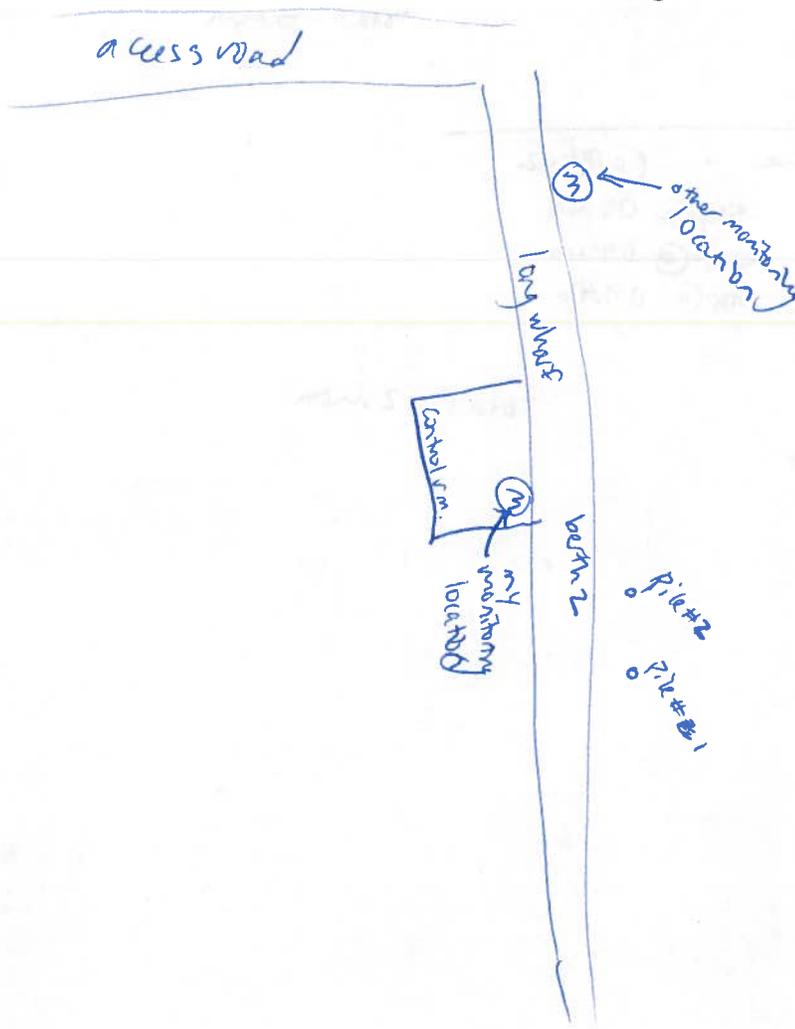
Date: 11/5/19

Page 5 of 6

Monitor Initials: CK

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

**Diagram**



Biological Monitor: Christina Kelleher

Signature: [Handwritten Signature]

Date: 11/5/19

Monitor initials: CK

Monitoring start time: 08:55

---

Pile #1 start time: soft start @ 09:25 ~~09:29~~  
stop @ 09:29  
start @ 09:30  
end stop @ 09:31

total = 5 min

---

Pile #2 start time - @ 09:42  
stop @ 09:43  
start @ 09:45  
end stop @ 09:46

total = 2 min

Date: 11/5/19

Page 1 of 5

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

**Monitor:**

Diana Edwards

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

@ 0830 - 60°; 0% cloud cover; Beaufort 1

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

07:36 High 5.20 FT; 13:22 Low 2.61 FT

**General Human Activity in the Area:**

Venicular movement, tugboat traffic

**Monitoring Location(s):**

37.9219058, -122.4101290

**Berth(s):** 2

**Pile Type (s):**

24" Concrete

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

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

0925 START - 0946 END

Date: 11/5/19

Monitor Initials: OE

The Beaufort scale

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face
3	7-10	8-12	Gentle breeze	Large wavelets; Crests not breaking	Small twigs in constant motion; Light flags extended
4	11-16	13-18	Moderate wind	Numerous whitecaps Waves 1-4ft high	Dust, leaves and loose paper raised. Small branches move.
5	17-21	19-24	Fresh wind	Many whitecaps, some spray; Waves 4-8 ft high	Small trees sway
6	22-27	25-31	Strong wind	Whitecaps everywhere; Larger waves 6-13 ft high	Large branches move; Difficult to use umbrellas
7	28-33	32-38	V. strong wind	White foam from waves is blown in streaks; waves 13-20ft high	Whole trees in motion
8	34-40	39-46	Gale	Edges of wave crests break into spindrift	Twigs break off trees; Difficult to walk
9	41-47	47-54	Severe gale	High waves; sea begins to roll Spray reduce visibility; 20ft waves	Chimney pots and slates removed
10	48-55	55-63	Storm	V. high waves 20-30 ft; blowing foam gives sea white appearance	Trees uprooted
11	56-63	64-72	Severe storm	Exceptionally high waves; 30-45 ft high	Structural damage
12	63	73	Hurricane	Air filled with foam; visibility reduced White sea; waves over 45ft high	Widespread damage; rare





Date: \_\_\_\_\_

Page 5 of 5

Monitor Initials: DE

11/15/19

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

**Diagram**

W

S



Biological Monitor:

Diana Edwards E

Signature:

[Handwritten Signature]

Date: 11/6/19

Page 1 of 6

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

**Monitor:**

Christina Kelleher

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

clear & sunny, 50% cloud cover, ~65-70°F, 0-1 Beaufort

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

start ~4ft, end ~3ft

**General Human Activity in the Area:**

Driving/parking cars, moving construction equipment, boats/barges

**Monitoring Location(s):**

SE of pile driving on long wharf at: 37.9222605, -122.4104106

**Berth(s):** 2

**Pile Type (s):**

Concrete 24"

**Total Pile Count for the Day:** 4, a re-strikes of all 10

**Equipment:** Impact Vibratory

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

14 minutes for 4 piles; 18 mins for re-striking of 10 piles; see geotech report for # blows

Date: 11/6/19

Monitor Initials: SK

*The Beaufort scale*

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face
3	7-10	8-12	Gentle breeze	Large wavelets; Crests not breaking	Small twigs in constant motion;
4	11-16	13-18	Moderate wind	Numerous whitecaps Waves 1-4ft high	Light flags extended
5	17-21	19-24	Fresh wind	Many whitecaps, some spray; Waves 4-8 ft high	Dust, leaves and loose paper raised. Small branches move.
6	22-27	25-31	Strong wind	Whitecaps everywhere; Larger waves 8-13 ft high	Small trees sway
7	28-33	32-38	V. strong wind	White foam from waves is blown in streaks; waves 13-20ft high	Large branches move; Difficult to use umbrellas
8	34-40	39-46	Gale	Edges of wave crests break into spindrift	Whole trees in motion
9	41-47	47-54	Severe gale	High waves; sea begins to roll Spray reduce visibility, 20ft waves	Twigs break off trees; Difficult to walk
10	48-55	55-63	Storm	V. high waves 20-30 ft; blowing foam gives sea white appearance	Chimney pots and slates removed
11	56-63	64-72	Severe storm	Exceptionally high waves; 30-45 ft high	Trees uprooted
12	63	73	Hurricane	Air filled with foam; visibility reduced White sea; waves over 45ft high	Structural damage Widespread damage
					Widespread damage; rare

Monitor Initials: CK

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

Time of Observation	Observer Initials	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	Bearing	Behavior <sup>5</sup>
First: 1125-1200 Last: 1125-1200	CK	B, D, A	HASE	unk	unk - too far to tell, moved closer: light brown	~0.5-1 mile	N	170	float & dive swim N, float, moving toward piles & looking at it, moved far away swim N, dive
First: 1157 Last: 1212	CK	A, B, D	HASE	unk	unk - too far to tell, looks dark	~0.75 mile	N	60	float on back, dive, when diving started looked at drifting then turned away & dove swimming away, repped up further away
First: 1225, 1228 Last: 1233, 1238	CK	B, D, A	HASE	unk	brown/med brown	~0.50 mile	S	100	swim E, dive
First: 1241 Last: 1346		Same as above				~0.30 mile	E	40	float
First: 1248 Last: 1255	CK	A	HASE	unk	dark, probably HZ	~0.5 mile	W	130	float on back S, dive, more closer to pile
First: 1408 Last: 1417, 1420	CK	B	HASE	unk	too far	70.5 mile	S	70	popped up by large, looked at me, swam toward pile, swim under wharf to the E side
First: 1420 Last: 1424, 1429	CK	A	HASE	unk	dark, probably HZ	near 10 M.	NE		out of sight down zone, crew did not start until we gave the clear
First: 1548 Last: 1554, 1626	CK	B	HASE	maybe juv	light gray, small, black spots				
First: 1627 Last:	CK				SEE MATTHEW BERTHELMANN'S NOTES FOR OBS. ON E. SIDE OF WHARF				
First: Last:									
First: Last:									
First: Last:									
1 <sup>Activity</sup> : Indicate if observation is: before (B); during (D); or after (A) pile driving		2 <sup>Species</sup> Abbreviations: California Sea Lion = CASL Pacific Harbor Seal = HASE Northern Elephant Seal = NOES Harbor Porpoise = HAPO	3 <sup>Species Age Classes</sup> : CASL = juvenile, subadult male, adult male HASE = juvenile, adult HAPO = calf, adult	4 <sup>Distance</sup> : Provide an approximate distance from location of pile being driven, just driven, or about to be driven. Indicate unit of measurement (meters, feet, etc.).	5 <sup>Behavior examples</sup> : 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.				

Incidental species observed: BRPE, WEGU, PLCO, LATE, ROES  
Noted many BRPE strikes near pile driving around 1350-1400 at ~50-150m away



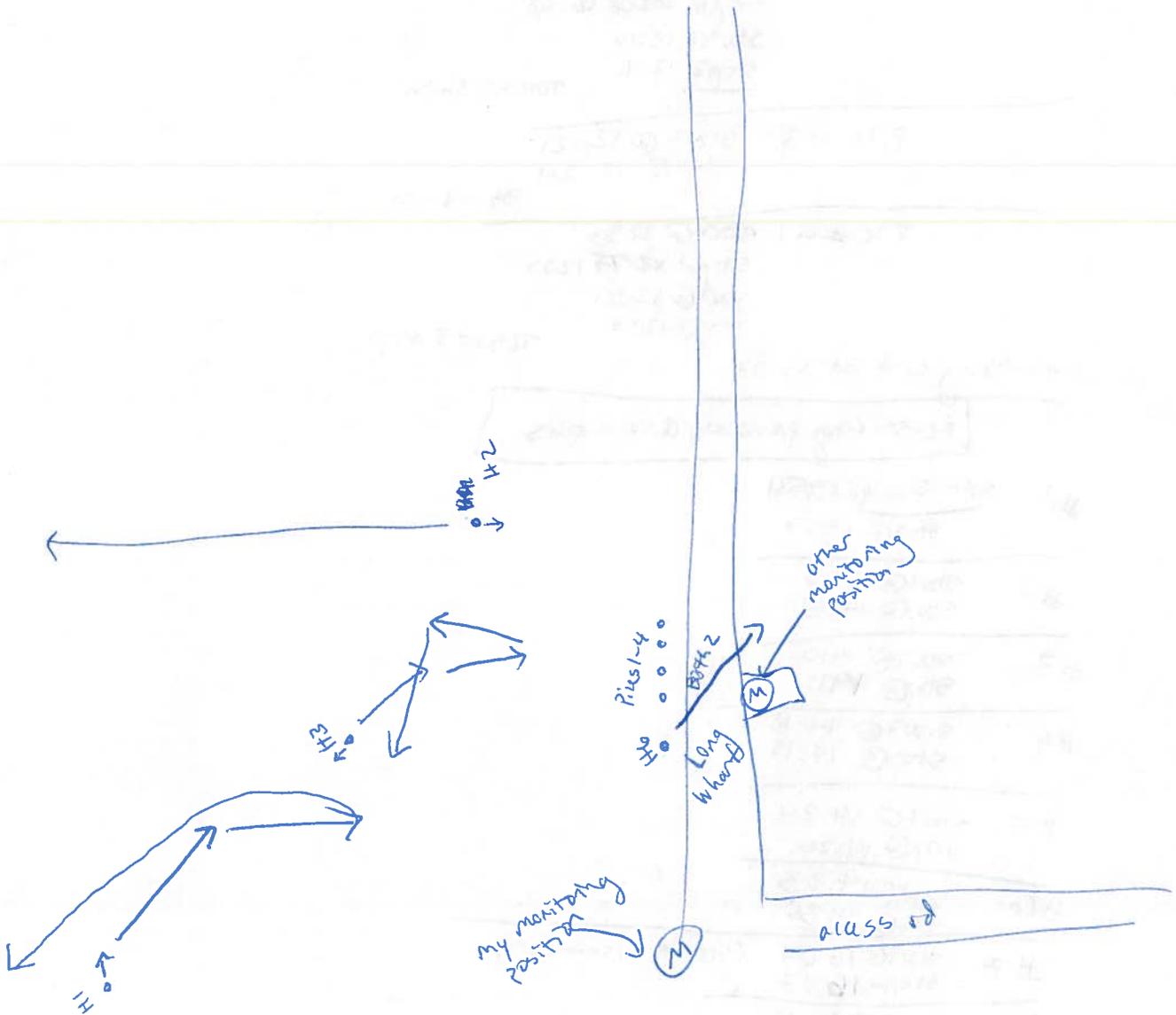
Date: 11/6/19

Page 5 of 6

Monitor Initials: CK

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

**Diagram**



Biological Monitor: Christina Kelleher

Signature: *Christina Kelleher*

date: 11/6/19

Monitor initials: CK

Monitoring start: 11:05

File #1: start w/ soft start @ 11:49

stop @ 11:53

start @ 11:54

stop @ 11:55

Total = 5 min

File #2: start @ 12:06

stop @ ~~12:08~~ 12:08

start @ 12:10

stop @ 12:11

Total = 3 min

File #3: start @ 12:21

stop @ 12:24

Total = 3 min

File #4: start @ 12:33

stop @ ~~12:35~~ 12:35

start @ 12:36

stop @ 12:37

Total = 3 min

Monitoring end at 13:07

Re-striking previously driven files

#1 soft start @ 13:54  
stop @ 13:57

#2 start @ 14:03  
stop @ 14:05

#3 start @ 14:10  
stop @ ~~14:11~~

#4 start @ 14:18  
stop @ 14:19

#5 start @ 14:24  
stop @ 14:26

#6 start @ 14:33  
stop @ 14:35

#7 start @ 16:04 (started w/ soft start)  
stop @ ~~16:07~~

#8 start @ 16:12  
stop @ 16:13

#9 start @ 16:20  
stop @ 16:21

#10 start @ 16:26  
stop @ 16:27  
start @ 16:27  
stop @ 16:28

monitoring end @ 16:58

Total mins re-strike:

$3 + 2 + 1 + 1 + 2 + 2 + 3 + 1 + 1 + 2 = 18 \text{ mins}$

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

Monitor:

BETTELHEIM, MATTHEW

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

2-3 BS, clear blue w/ slight haze

Tidal Level (start work/end work):

\_\_\_\_\_

General Human Activity in the Area:

typical longwharf activities

Monitoring Location(s):

See Figure

Berth(s):

B2

Pile Type (s):

Concrete

Total Pile Count for the Day: \_\_\_\_\_

Equipment: Impact Vibratory

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

<u>Strike</u>		<u>Restrike</u>
#1: 11:48 → 11:57 (9min)		#5: 13:54 → 13:57 (3min)
#2: 12:06 → 12:11 (5min)		#6: 14:03 → 14:05 (2min)
#3: 12:20 → 12:24 (4min)		#7: 14:09 → 14:11 (2min)
#4: 12:32 → 12:37 (5min)		#8: 14:17 → 14:19 (2min)
		#9: 14:24 → 14:26 (2min)
		#10: 14:34 → 14:35 (1min)

Chevron Richmond Refinery  
 Long Wharf Maintenance and Efficiency Project Marine Mammal Monitoring Plan

#1: 16:03 → 16:07 (4min)  
 #4: 16:12 → 16:13 (1min)  
 #2: 16:19 → 16:21 (2min)

Date: 11/6/19  
 Monitor Initials: MB

*The Beaufort scale*

No.	Knots	Mph	Description	Effects at sea	Effects on land
0	0	0	Calm	Sea like a mirror	Smoke rises vertically
1	1-3	1-3	Light air	Ripples but no foam crests	Smoke drifts in wind
2	4-6	4-7	Light breeze	Small wavelets	Leaves rustle; wind felt on face Small twigs in constant motion;
3	7-10	8-12	Gentle breeze	Large wavelets; Crests not breaking	Light flags extended
4	11-16	13-18	Moderate wind	Numerous whitecaps Waves 1-4ft high	Dust, leaves and loose paper raised. Small branches move.
5	17-21	19-24	Fresh wind	Many whitecaps, some spray; Waves 4-8 ft high	Small trees sway
6	22-27	25-31	Strong wind	Whitecaps everywhere; Larger waves 8-13 ft high	Large branches move; Difficult to use umbrellas
7	28-33	32-38	V. strong wind	White foam from waves is blown in streaks; waves 13-20ft high Edges of wave crests break into spindrift	Whole trees in motion
8	34-40	39-46	Gale		Twigs break off trees; Difficult to walk
9	41-47	47-54	Severe gale	High waves; sea begins to roll Spray reduce visibility, 20ft waves	Chimney pots and slates removed
10	48-55	55-63	Storm	V. high waves 20-30 ft; blowing foam gives sea white appearance	Trees uprooted
11	56-63	64-72	Severe storm	Exceptionally high waves; 30-45 ft high	Structural damage Widespread damage
12	63	73	Hurricane	Air filled with foam; visibility reduced White sea; waves over 45ft high	Widespread damage; rare





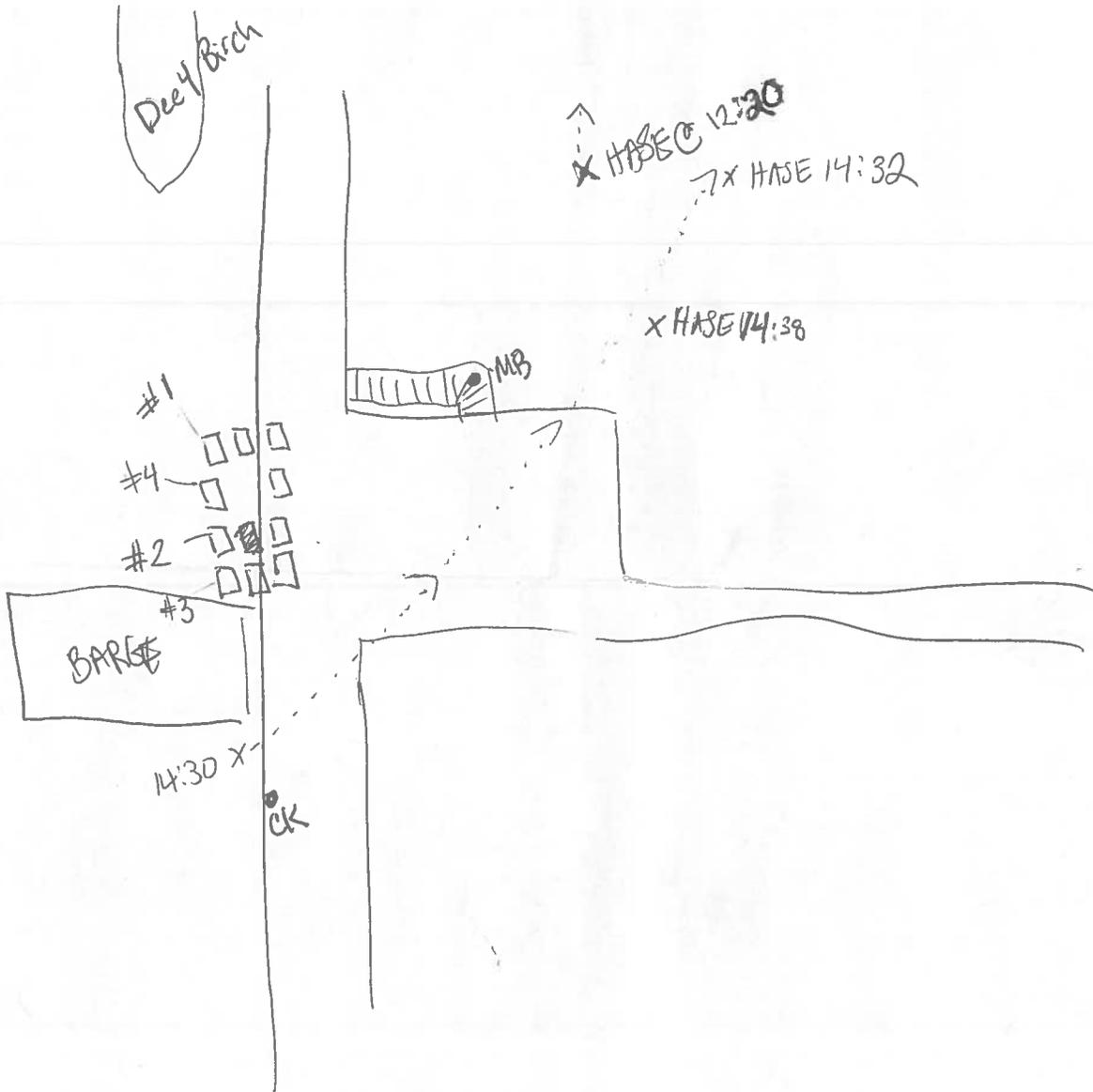
Date: 11/6/19

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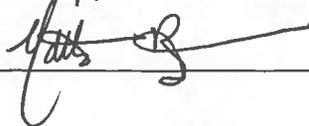
Monitor Initials: MB

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

**Diagram**



Biological Monitor: MATTHEW BETTELHEIM

Signature: 



# Appendix B Hydroacoustic Monitoring Reports



*2019 Annual Report*

# Pile Driving Noise Measurements for Chevron Long Wharf Maintenance and Efficiency Project

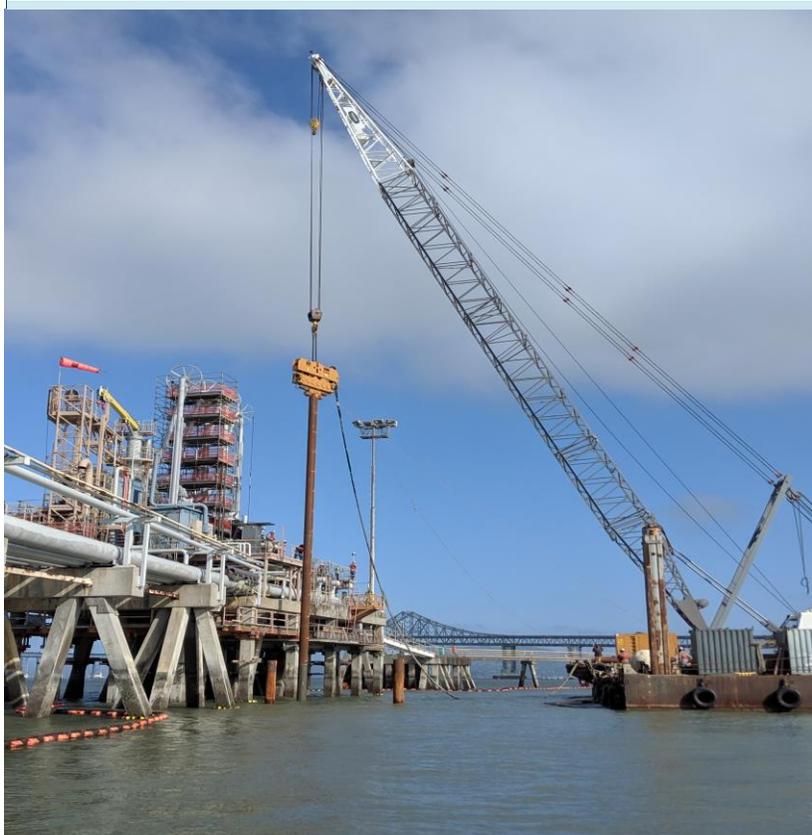
**Submitted to:**

*Bill Martin  
Senior Project Manager  
AECOM  
300 Lakeside Drive, Suite 400  
Oakland, California 94612*

**Prepared by:**

**ILLINGWORTH & RODKIN, INC.**  
Acoustics • Air Quality

*Illingworth & Rodkin  
429 E. Cotati Ave  
Cotati, CA 94931*



January 2020

# 1. Introduction

This report presents the results of hydroacoustic monitoring conducted for the Chevron Long Wharf Maintenance and Efficiency Project (LWMEP) in Richmond, California during the 2019 calendar year. Monitoring was conducted on 24-inch concrete piles installed at Berth #2 and 20-inch and 36-inch steel piles installed at Berth #4.

Hydroacoustic data was collected and reported for the peak sound pressure level, root mean square (RMS) sound pressure level (SPL), sound equivalent level (SEL), and cumulative sound equivalent level (cSEL). The peak sound pressure level is presented in dB re 1  $\mu$ Pa as the maximum sound pressure level over the pulse duration. The RMS sound pressure level is presented in dB re 1  $\mu$ Pa and is averaged over 125 milliseconds for vibratory pile driving or the pulse duration for impact pile driving. The SEL sound pressure level is presented in dB re 1  $\mu$ Pa<sup>2</sup> and summarized where the SEL is greater than 150 dB to compute the cSEL. Generally, the majority of the acoustic energy of pile driving is confined to frequencies between 20 and 20,000 Hertz (Hz), and therefore sound levels were processed within this frequency range.

Each of these data are summarized as the maximum, mean, and median for each pile. If impact pile driving took place, recorded measurements were played through a Labview pulse detection program to identify the peak, RMS, pulse duration, and SEL for each pulse. These data were then used to estimate distances to exceedance thresholds for fish and marine mammals. Cumulative Distribution Function (CDF) plots of the RMS are shown for the driving of each pile as well as for background levels.

## 2. Monitoring Equipment and Methodology

### 2.1 Underwater System Equipment

Measurements were made by a live system and a stationary hydrophone recording system. For the live system, a Reson Model TC-4033 hydrophone was fed through an in-line charge amplifier into a Larson Davis Model 831 Precision Sound Level Meters (LDL 831 SLM) where measurements were observed in real-time. For the stationary hydrophone recording system, a Reson Model TC-4013 hydrophone was fed through a PCB Multi Gain Signal Conditioner (Model 480M122) and into a Roland Model R-05 Solid State Recorder. This unit was deployed via an anchor and buoy or off the construction barge. Following measurements, the recorded files from the stationary hydrophone unit's recorder were played through a calibrated LDL 831 SLM to analyze sound pressure levels.

All field notes were recorded in water-resistant field notebooks. Notebook entries include calibration notes, measurement positions (i.e., distance from source, depth of sensor), measurement conditions (e.g., currents, sea conditions, etc.), system gain settings, and the equipment used to make each measurement. Notebook entries were copied after each measurement day and filed for safekeeping. Digital recordings were also copied and stored for subsequent analysis, if needed.

## 2.2 Underwater System Acoustic Calibration

The measurement systems were calibrated prior to use in the field with a G.R.A.S. Type 42AA pistonphone and hydrophone coupler. The pistonphone, when used with the hydrophone coupler, produces a continuous 136.4 dB re 1  $\mu$ Pa tone for the TC-4033 hydrophones and 145.3 dB re 1  $\mu$ Pa tone for the TC-4013 hydrophones at 250 Hertz (Hz). The tone measured by the SLM was recorded at the beginning of the recordings. The system calibration status was checked at the beginning of each measurement day by measuring both the calibration tone and recording the tone on the solid-state digital data recorder. The pistonphones were certified at an independent facility.

## 2.3 Placement of Hydrophones

Measurements were made at three fixed positions on each day of monitoring in order to compute distances to fish and marine mammal thresholds. The first position was approximately 10 meters from the piles (or as close as possible given site conditions), the second measurement position was between 50 and 100 meters, and the third position was generally around 200 meters. Hydrophones at all positions were placed at approximately mid-depth in the water column. Water depth on the west side of the wharf, where hydrophones were positioned to measure piles driven at Berth #2, was relatively constant at approximately 14 to 15 meters at all hydrophone positions. Water depth on the east side of the wharf, where hydrophones were positioned to measure piles driven at Berth #4, was also relatively constant at approximately 6 meters at all hydrophone positions.

## 2.4 Background/Ambient Sound Data

Current speeds were generally less than 1.0 meter/second but were influenced by tidal shifts. Ambient levels were measured prior to and following pile-driving events at each of the measurement locations. Cumulative Distribution Function (CDF) plots of background measurements are shown in Appendix A. Ambient levels were generally higher to the west of the wharf due to greater current speeds, larger waves, and closer proximity to the shipping channel and vessels docked at nearby berths. Ambient sound pressure levels were generally between 110-125 RMS and at least 10 dB lower than pile driving sound pressure levels. On October 3<sup>rd</sup>, 2019, intermittent drilling occurred at the wharf near the hydrophone positioned at 50 meters. A vessel releasing water from the hull of the ship in Berth #3 also influenced ambient levels at the hydrophone positioned at 195 meters. These higher ambient levels affected impulse measurements but did not significantly influence pulse levels after measurements were processed through the Labview program.

## 3. Measurement Results and Analysis

Table 1 summarizes the monitoring results for the installation of 24-inch concrete piles at Berth #2 on June 5<sup>th</sup>, 2019 and October 3<sup>rd</sup>, 2019. A bubble curtain was used during the installation of all piles driven with a diesel impact hammer. On June 5<sup>th</sup> only, the hydrophone positioned at 66 meters did not capture the final 19 strikes of pile driving. Sound pressure levels were not detected above background noise at the hydrophone positioned at 150 meters due to a vessel docked at

Berth #1. Since the distances to the fish and marine mammal thresholds were measured to be between the hydrophone positions at 10 meters and 66 meters, the drop-off rate between these hydrophones was computed and used to estimate the distance to applicable thresholds. Data collected with the hydrophone at 150 meters was not analyzed further.

Table 2 summarizes the monitoring results for the installation of steel piles at Berth #4 on June 21st, 2019 and August 22nd, 2019. Piles installed on August 22nd, 2019 had a diameter of 36 inches and overall sound pressure levels were significantly higher compared to 20-inch piles installed on June 21st, 2019.

Table 3 summarizes the distances to exceedance thresholds for fish. Note that the injury thresholds were not exceeded at the nearest hydrophone position for all dates monitored. The calculation of the cSEL for fish criteria assumes that strikes below 150 dB SEL are effective quiet and are not included in the calculation. Table 4 summarizes the distances to exceedance thresholds for marine mammals based on drop-off rates calculated from sound pressure levels measured at all positions. Drop-off rates for vibratory pile driving were calculated using the median RMS impulse values and drop-off rates for impact pile driving were calculated using the median RMS pulse values. Permanent Threshold Shift (PTS) isopleth distances were calculated using the NOAA Marine Mammal Calculation Guide<sup>1</sup>. Distances to PTS thresholds for impact pile driving are reported as the largest isopleth distance of either the Peak or cSEL. If more than one pile was driven over a 24-hour period, distances to PTS thresholds were calculated based on the measurements of all piles driven within that 24-hour period. To compute daily PTS thresholds for impact driving, drop-off rates, the median single strike SEL, and measurement distances of the single strike SEL for each pile were averaged for all piles driven within a 24-hour period. The cSEL and total number of strikes were summed over the 24-hour period. To compute daily PTS thresholds for vibratory driving, drop-off rates, the median RMS, and measurement distances of the RMS for each pile were averaged for all piles driven within a 24-hour period. The duration of sound production was summed over the 24-hour period.

Samples of the median 1/3 octave band spectra for pile installation are included in Appendix B. For piles installed with a vibratory hammer, the one-second  $LZ_{eq}$  of each octave band was recorded, and for piles installed with a diesel impact hammer, the LZI of each octave band was recorded. The median value for each octave band was then calculated over a duration of one minute for piles driven with a vibratory hammer or eight strikes for piles driven with a diesel impact hammer. Cumulative Distribution Function plots of the RMS values and Time History plots of all piles are included in Appendices C and D, respectively. Note that time history plots shown for 24-inch concrete piles driven with a diesel impact hammer are based on impulse values since pulse detection is not linked with real time history.

---

<sup>1</sup> NMFS. 2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts (Version 2.0).

**Table 1. Summary Statistics for the Installation of 24-inch Concrete Piles with a Diesel Impact Hammer at Berth #2**

Date	Pile #	# of Strikes	Water Depth at Pile (m)	Msmt Distance from Pile (m)	Water Depth at Msmt (m)	Hydrophone Depth (m)	Peak (dB)			RMS – 90% pulse (dB)				SEL (dB)			cSEL <sup>c</sup>
							Max	Mean	Median	Max	Mean	Median	Pulse Duration	Max	Mean	Median	
6/5	1	181	13	10	14	8	195	175	175	177	163	163	0.126	165	155	155	176
				66 <sup>a</sup>	14	8	159	151	150	148	139	139	0.172	138	132	132	NA
				150 <sup>b</sup>	14	8	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
10/3	1	439	13	7	13	6	185	177	177	172	166	166	0.067	161	155	155	182
				52	14	8	171	164	164	157	152	152	0.177	149	145	145	NA
				195	14	6	164	157	156	154	144	143	0.225	144	137	137	NA
	2	437	13	7	13	6	197	179	179	180	167	167	0.068	167	156	156	185
				50	13	8	171	168	167	158	155	155	0.158	150	147	147	NA
				195	13	6	168	159	159	160	147	147	0.194	148	140	140	NA

<sup>a</sup>The hydrophone at this position missed the final 19 strikes.

<sup>b</sup>The hydrophone at this position only captured the final 19 strikes. This data is not representative of the driving event and is not reported.

<sup>c</sup>The cSEL is summed for all piles driven over a 24-hour duration. Strikes below 150 dB are assumed to be effective quiet and aren't included in the calculation.

**Table 2. Summary Statistics for the Installation of Steel Piles with a Vibratory Hammer at Berth #4**

Date	Pile Type	Pile #	Duration (seconds)	Water Depth at Pile (m)	Hydrophone Distance from Pile (m)	Water Depth at Hydrophone (m)	Hydrophone Depth (m)	Peak (dB)			RMS – 1 sec (dB)		
								Max	Mean	Median	Max	Mean	Median
6/21	20-inch Steel	1	115	6	22	6	3	171	163	164	158	150	150
					75	6	3	165	151	152	146	134	135
					220	6	3	150	133	133	127	119	120
		2	185	6	18	6	3	174	159	154	154	147	146
					75	6	3	168	145	141	146	131	130
					220	6	3	155	136	130	136	121	117
8/22	36-inch Steel	1	684	6	10	7	3	196	172	169	176	158	155
					85	6	3	179	155	151	159	140	138
					228	6	3	168	144	142	149	129	126
		2	218	6	15	7	3	192	175	183	174	160	167
					79	6	3	180	157	168	161	149	151
					222	6	3	166	143	155	147	134	137

**Table 3. Distances to Fish Criteria for Piles Driven with a Diesel Impact Hammer**

Date	Pile #	206 dB Peak	150 dB RMS	187 dB cSEL <sup>a</sup>
5-Jun	1	< 10	28	< 10
3-Oct	1	< 7	73	< 7
	2	< 7	112	< 7

<sup>a</sup>The cSEL is summed over 24-hour period. Strikes below 150 dB are assumed to be effective quiet for fish and aren't included in the calculation.

**Table 4. Distances to Marine Mammal Criteria**

Date	Pile #	PTS Threshold <sup>a</sup> (m)					Behavioral Harassment Threshold (m)		Calculated Drop-Off Rates	
		LF	MF	HF	PW	OW	120 dB RMS	160 dB RMS	Median RMS	Median SEL <sup>c</sup>
5-Jun	1	< 10	< 10	< 10	< 10	< 10	--	13	NR	NR
21-Jun	1	< 10	< 10	< 10	< 10	< 10	207	--	31.0	--
	2	< 10	< 10	< 10	< 10	< 10	170	--	27.1	--
	Daily	< 10	< 10	< 10	< 10	< 10	--	--	28.9 <sup>b</sup>	--
22-Aug	1	< 10	< 10	< 10	< 10	< 10	491	--	20.8	--
	2	< 10	< 10	< 10	< 10	< 10	1,085	--	25.0	--
	Daily	< 10	< 10	< 10	< 10	< 10	--	--	22.9 <sup>b</sup>	--
3-Oct	1	< 10	< 10	< 10	< 10	< 10	--	17	15.9	12.4
	2	< 10	< 10	< 10	< 10	< 10	--	21	13.9	11.0
	Daily	11	< 10	14	< 10	< 10	--	--	--	11.7 <sup>b</sup>

<sup>a</sup>Calculated using the dual metric threshold where the largest isopleth of the peak or cSEL is reported.

<sup>b</sup>Calculated as the average drop-off rate of all piles driven within 24-hour period

<sup>c</sup>Same as the RMS for vibratory driving

LF = Low-Frequency Cetaceans, MF = Mid-Frequency, HF = High-Frequency Cetaceans, PW = Phocid Pinnipeds in Water, and OW = Otariid Pinnipeds in water.





A

Ambient/Background  
Sound Pressure Levels



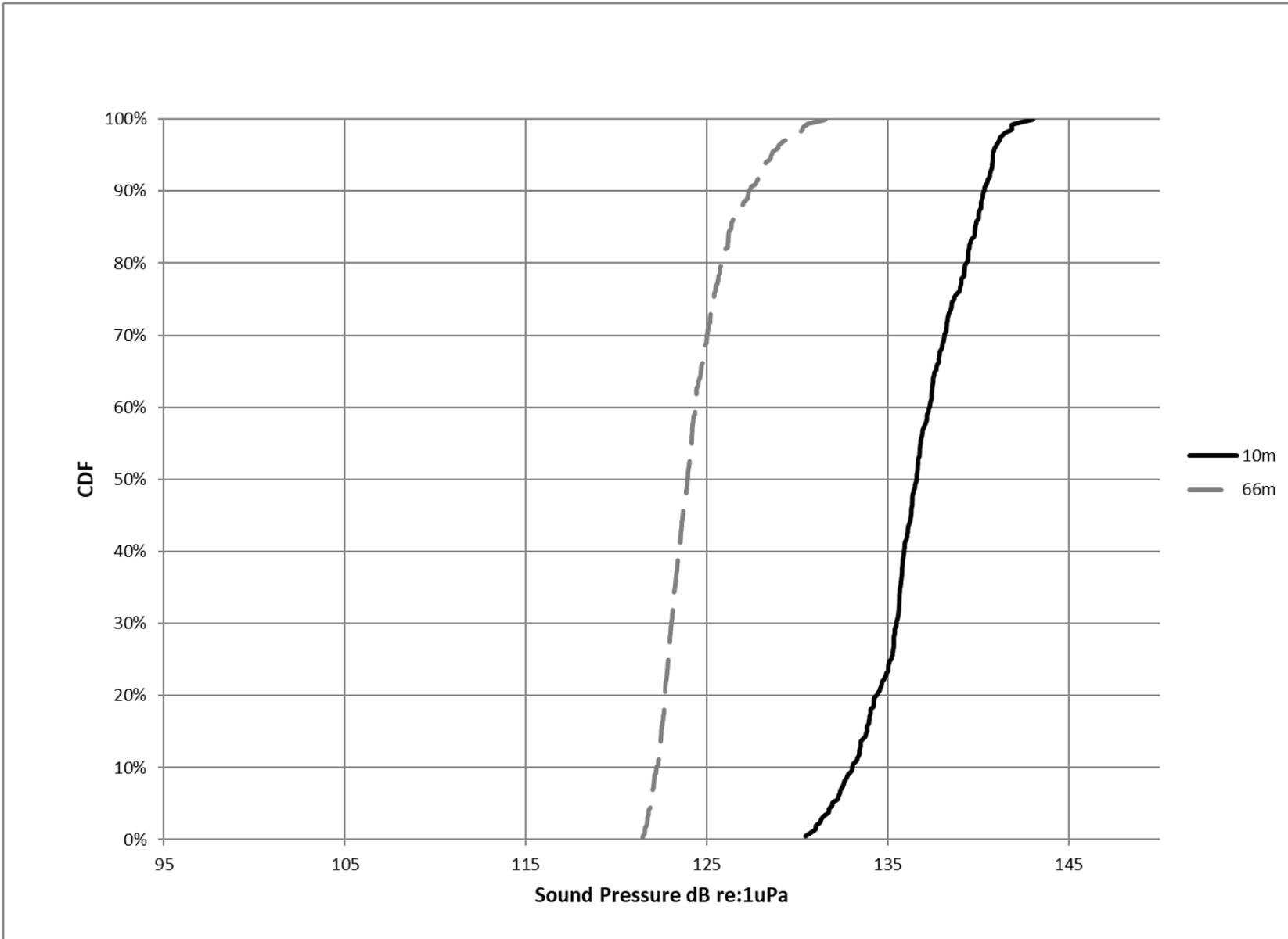


Figure A-1. CDF of Background/Ambient RMS SPL at Hydrophone Positions on June 5<sup>th</sup>, 2019

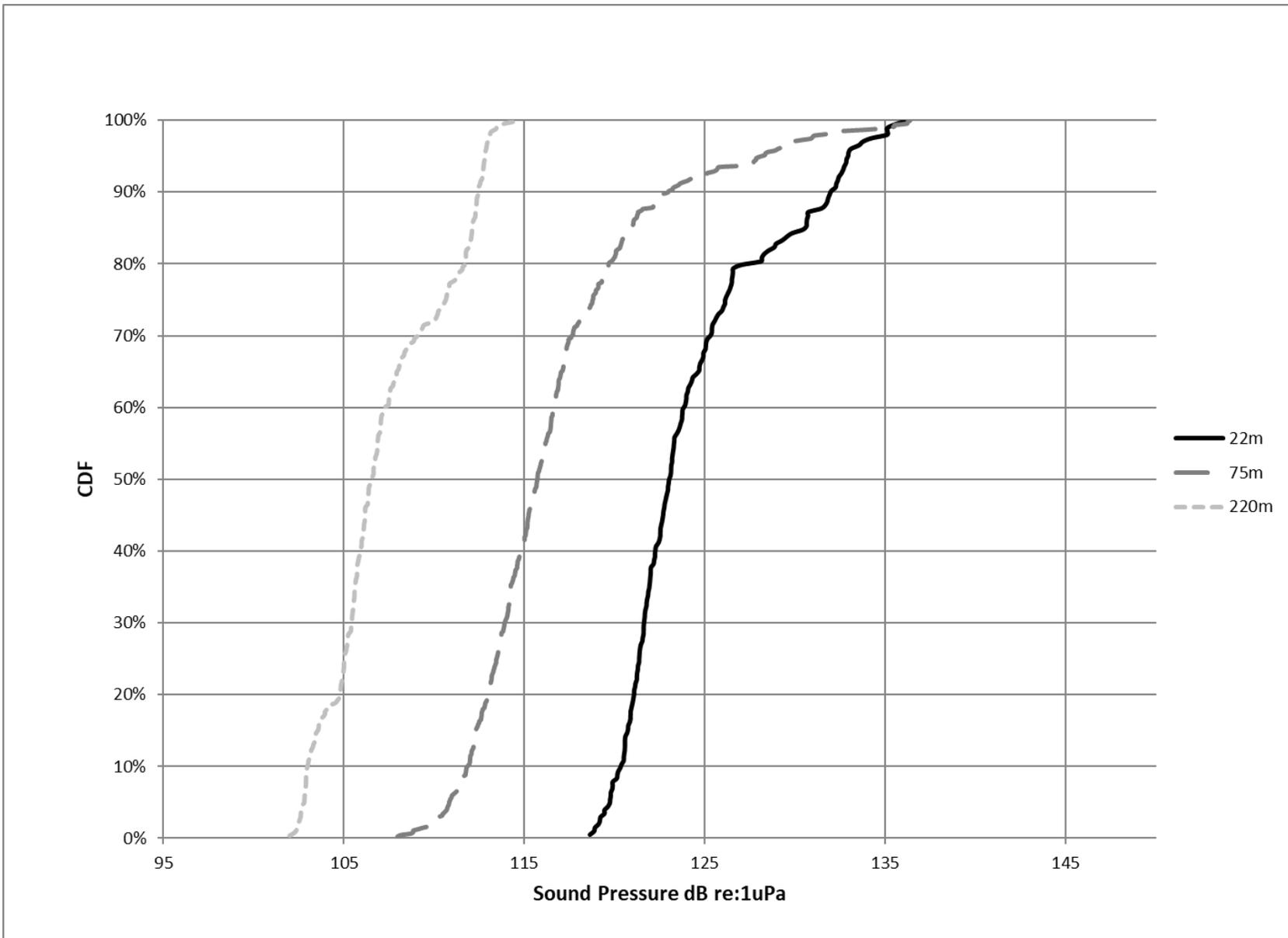


Figure A-2. CDF of Background/Ambient RMS SPL at Hydrophone Positions on June 21<sup>st</sup>, 2019

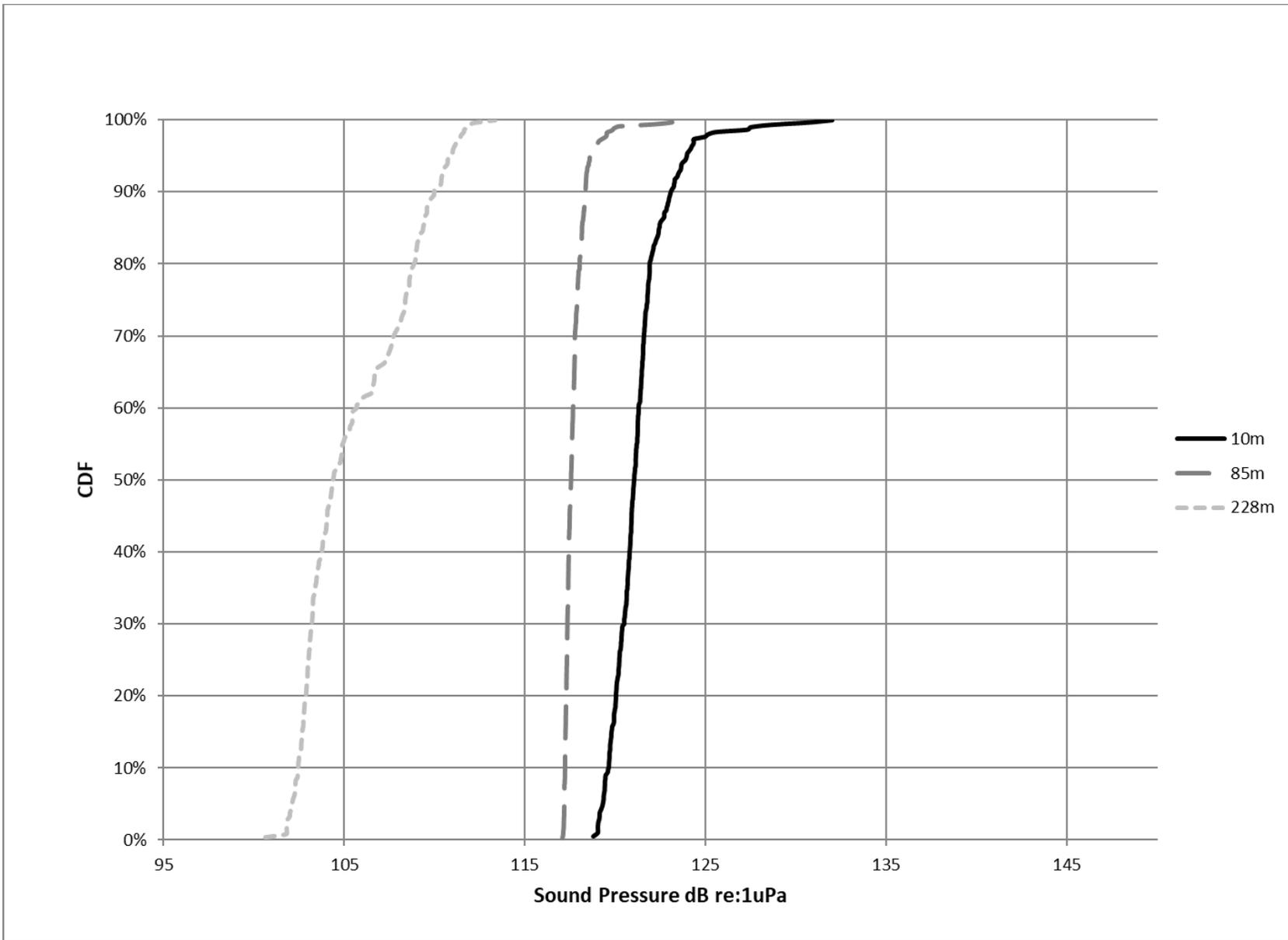


Figure A-3. CDF of Background/Ambient RMS SPL at Hydrophone Positions on August 22<sup>nd</sup>, 2019

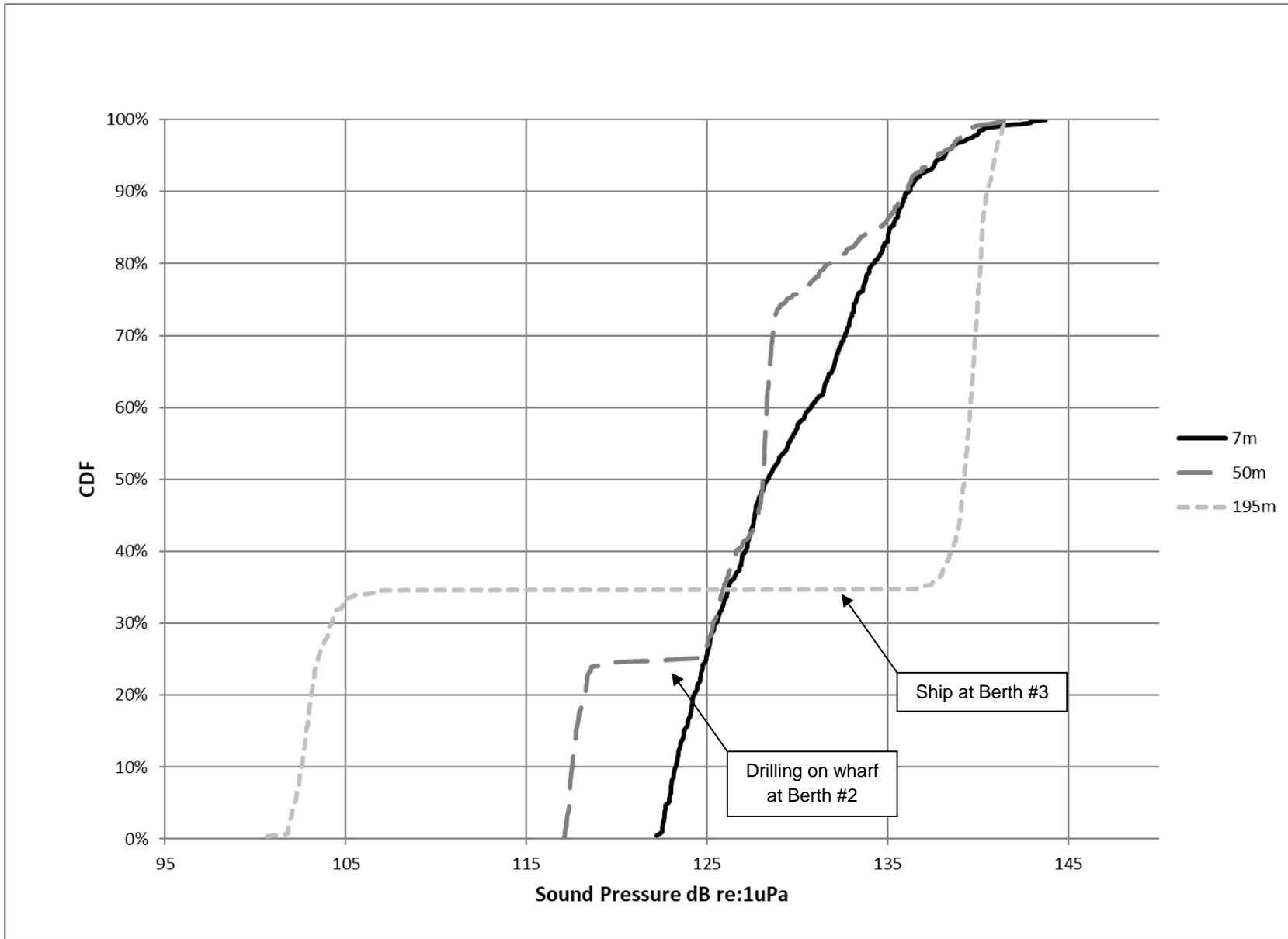


Figure A-4. CDF of Background/Ambient RMS SPL at Hydrophone Positions on October 3<sup>rd</sup>, 2019





# B

1/3 Octave Band  
Spectrum Plots



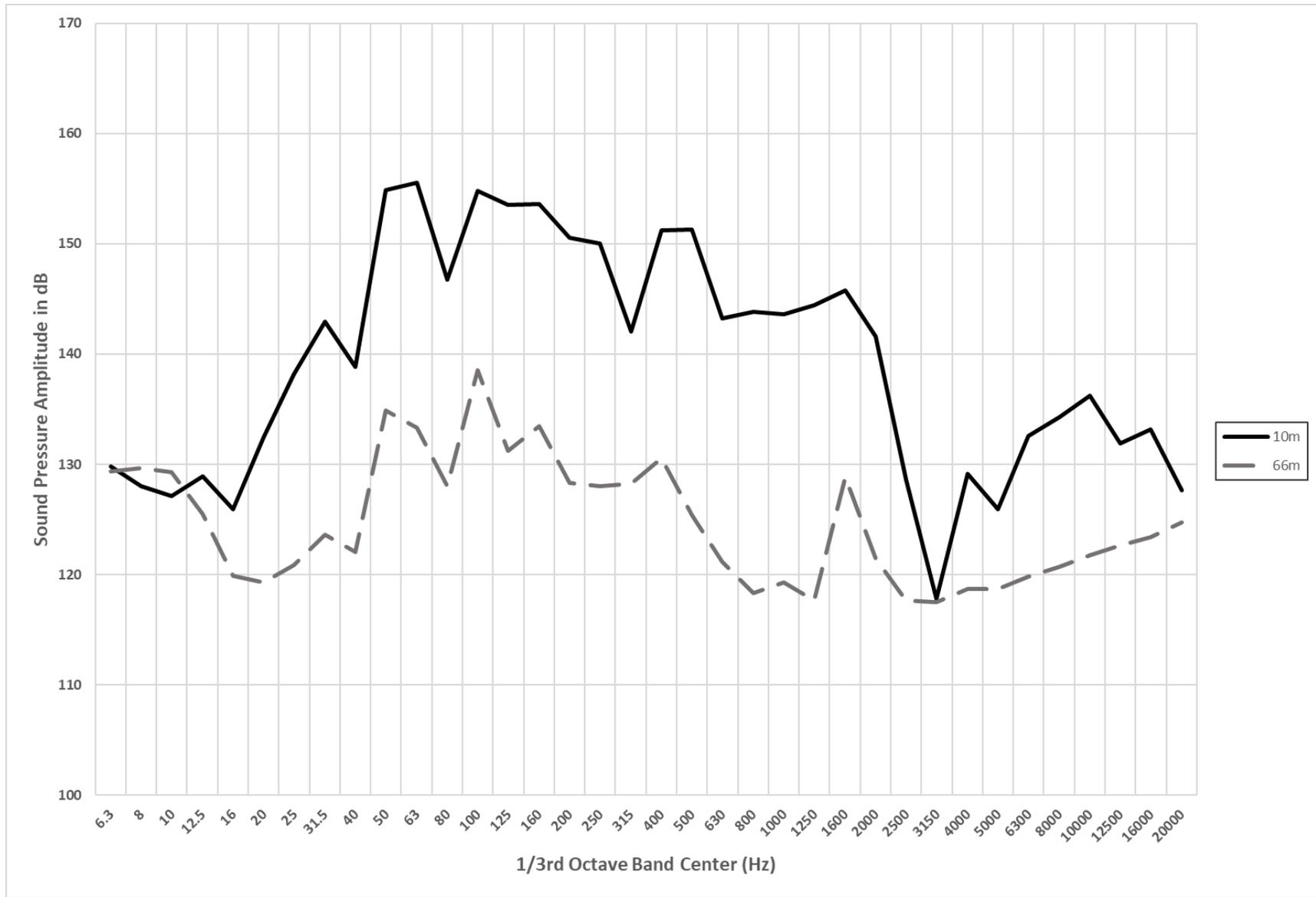


Figure B-1. 1/3 Octave Band Plot of Median LZI over Eight Pile Strikes During the Installation of a 24-inch Concrete Pile with a Diesel Impact Hammer on June 5<sup>th</sup>, 2019



Figure B-2. 1/3 Octave Band Plot of Median LZeQ over One Minute During the Installation of 20-inch Steel Pile #1 with a Vibratory Hammer on June 21<sup>st</sup>, 2019



Figure B-3. 1/3 Octave Band Plot of Median LZeq over One Minute During the Installation of 20-inch Steel Pile #2 with a Vibratory Hammer on June 21<sup>st</sup>, 2019

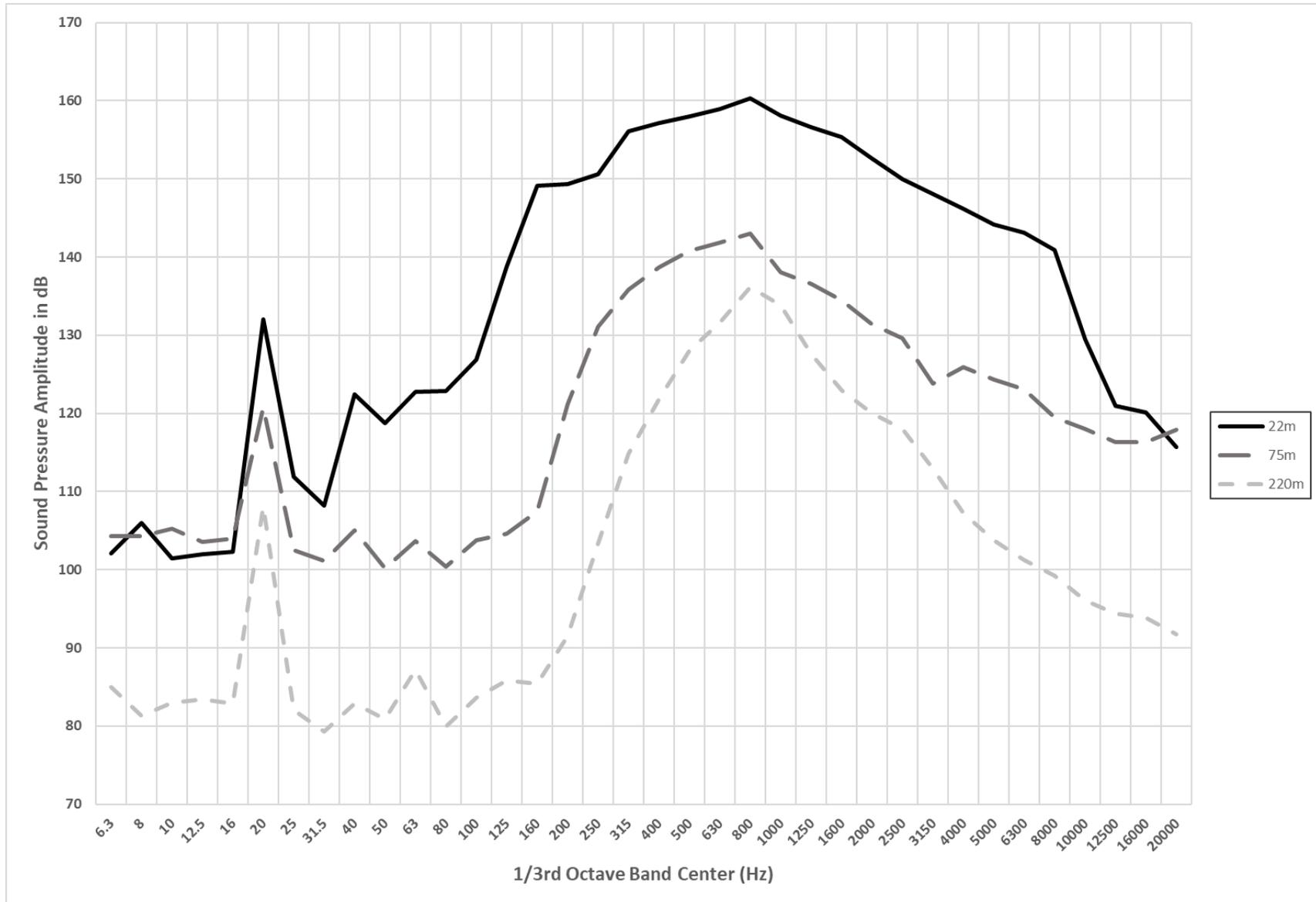


Figure B-4. 1/3 Octave Band Plot of Median LZeq over One Minute During the Installation of 36-inch Steel Pile #1 with a Vibratory Hammer on August 22<sup>nd</sup>, 2019



Figure B-5. 1/3 Octave Band Plot of Median LZeq over One Minute During the Installation of 36-inch Steel Pile #2 with a Vibratory Hammer on August 22<sup>nd</sup>, 2019



Figure B-6. 1/3 Octave Band Plot of Median LZI over Eight Pile Strikes During the Installation of 20-inch Concrete Pile #1 with a Diesel Impact Hammer on October 3<sup>rd</sup>, 2019



Figure B-7. 1/3 Octave Band Plot of Median LZI over Eight Pile Strikes During the Installation of 20-inch Concrete Pile #2 with a Diesel Impact Hammer on October 3<sup>rd</sup>, 2019



C

RMS Cumulative  
Distribution Function Plots



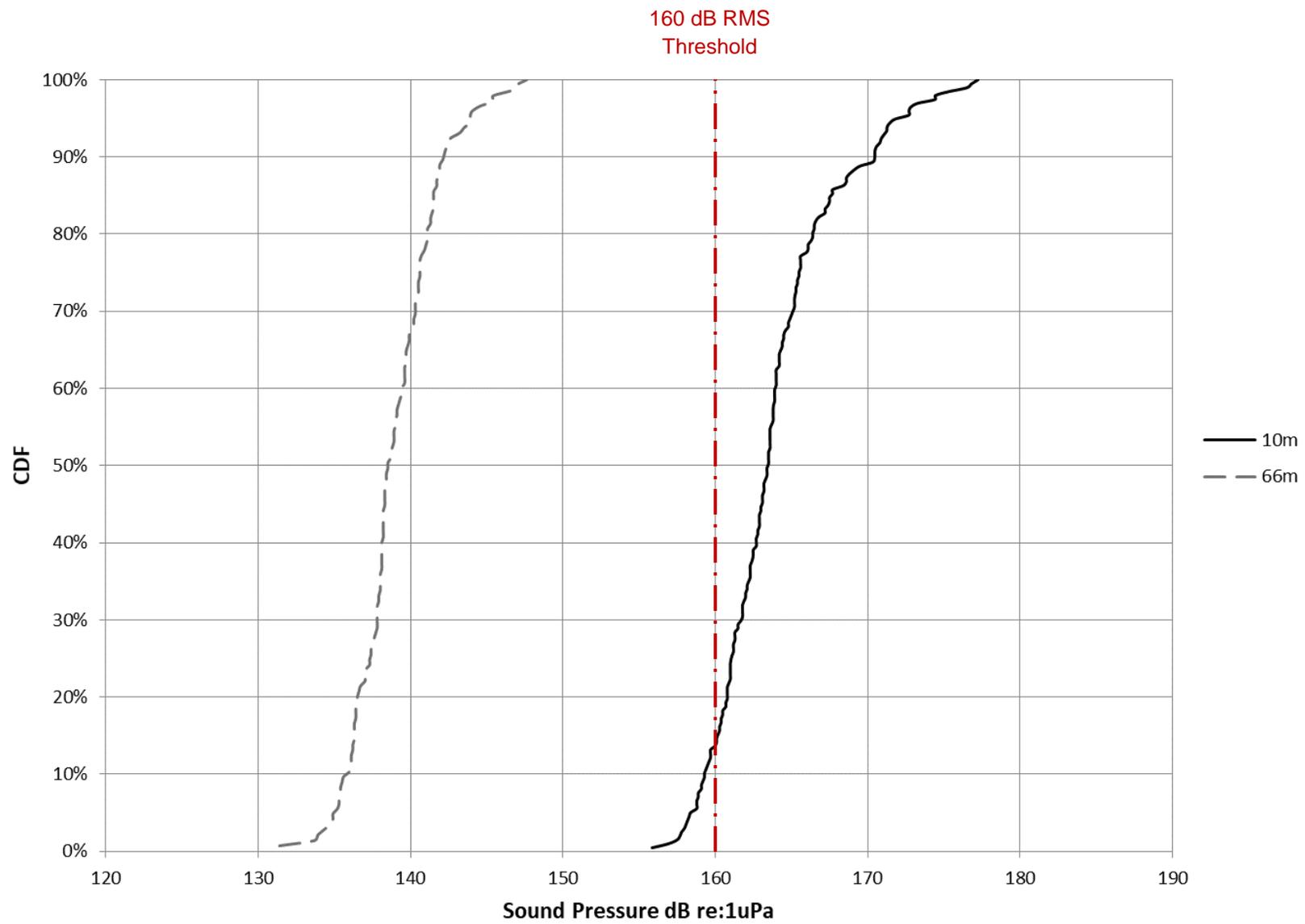


Figure C-1. CDF (RMS values) of the Installation of a 24-inch Concrete Pile with a Diesel Impact Hammer on June 5<sup>th</sup>, 2019

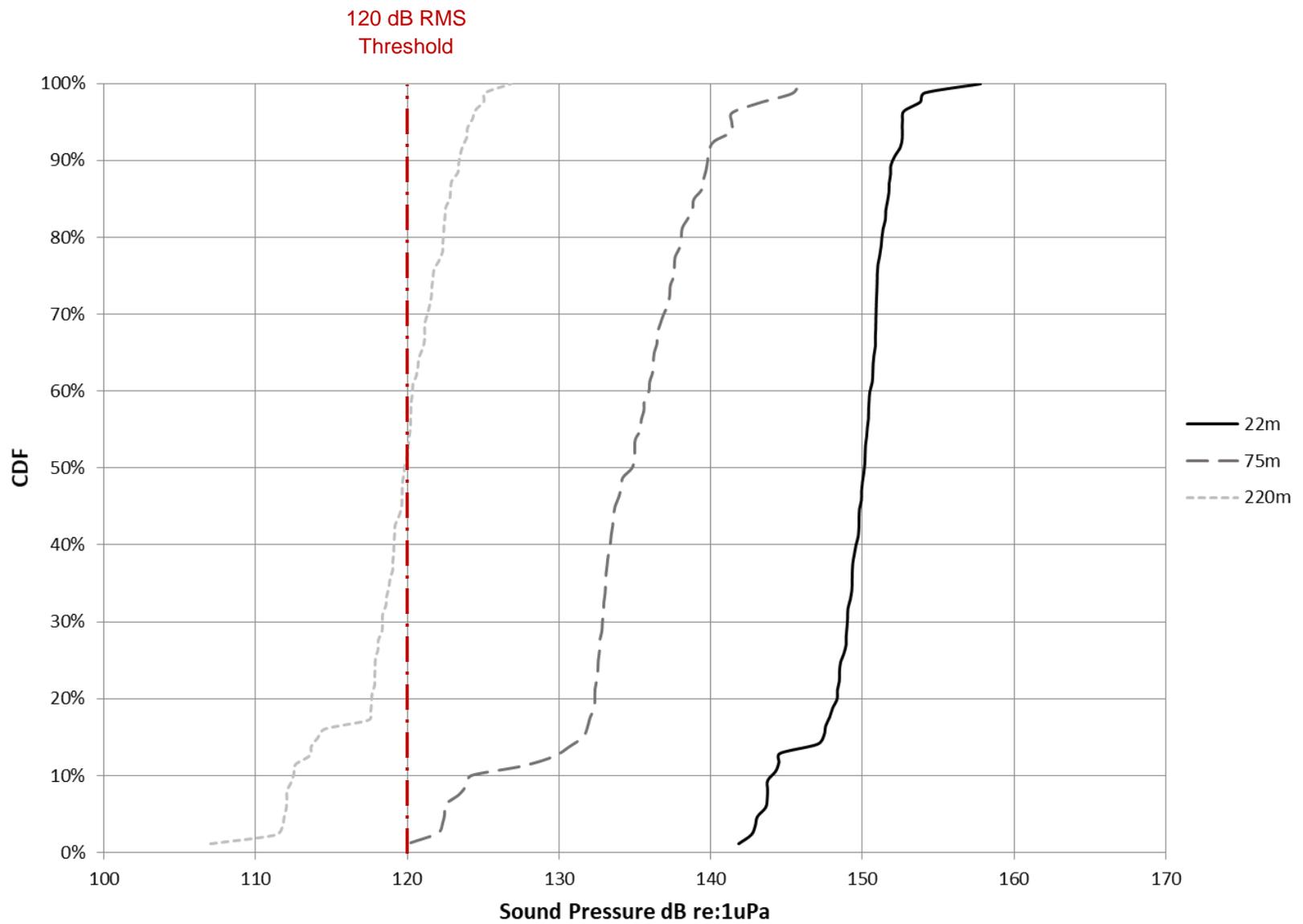


Figure C-2. CDF (RMS values) of the Installation of 20-inch Steel Pile #1 with a Vibratory Hammer on June 21<sup>st</sup>, 2019

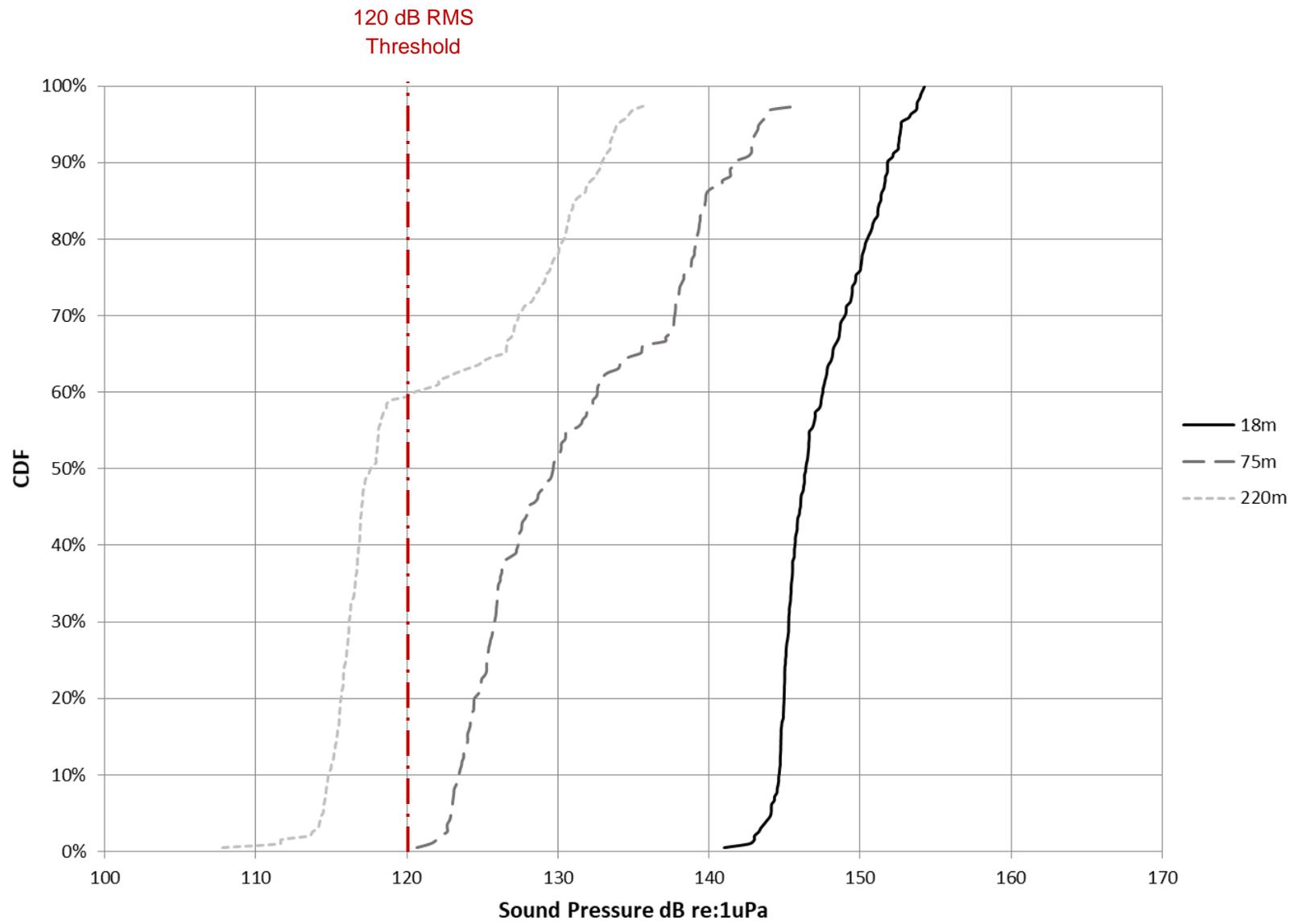


Figure C-3. CDF (RMS values) of the Installation of 20-inch Steel Pile #2 with a Vibratory Hammer on June 21st, 2019

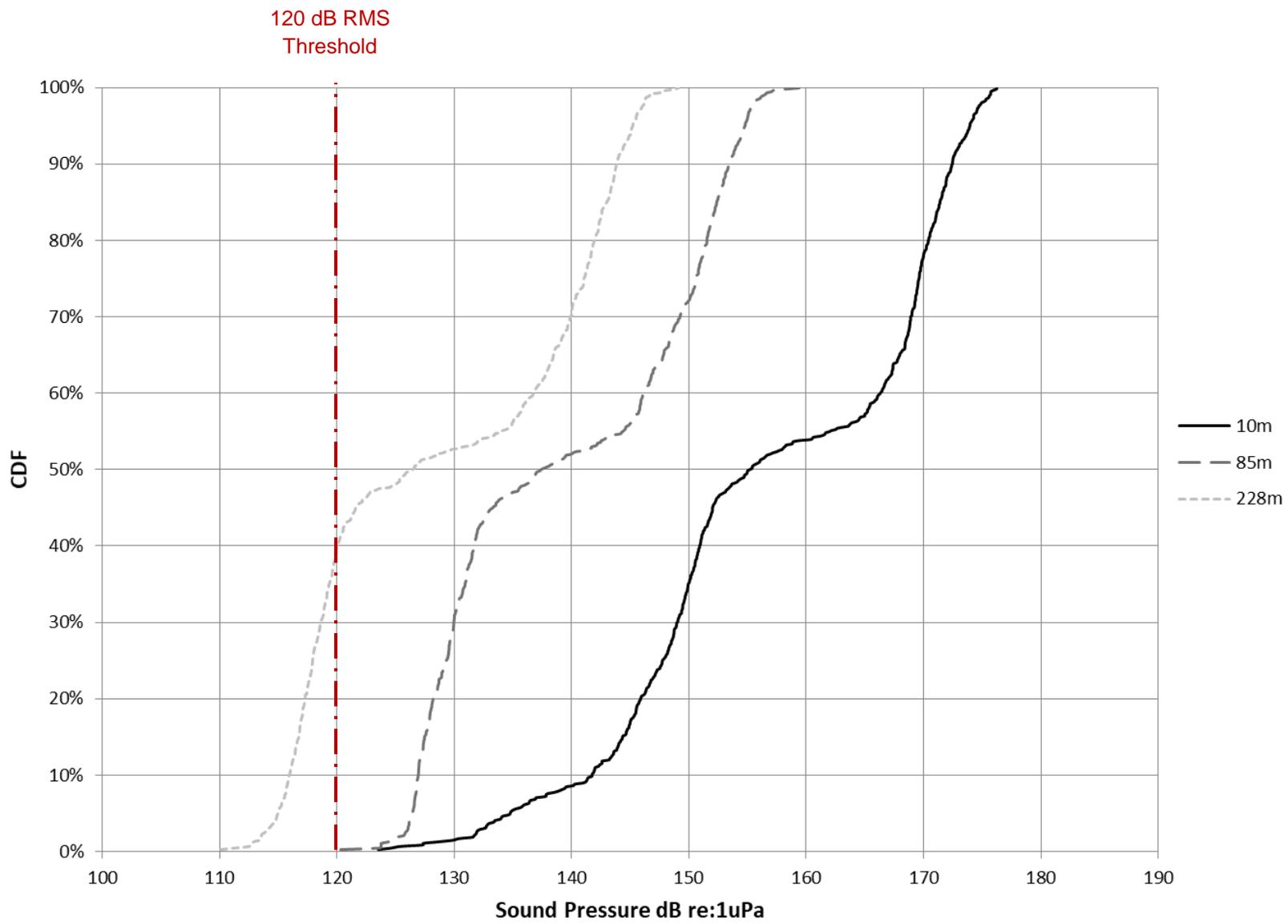


Figure C-4. CDF (RMS values) of the Installation of 36-inch Steel Pile #1 with a Vibratory Hammer on August 22<sup>nd</sup>, 2019

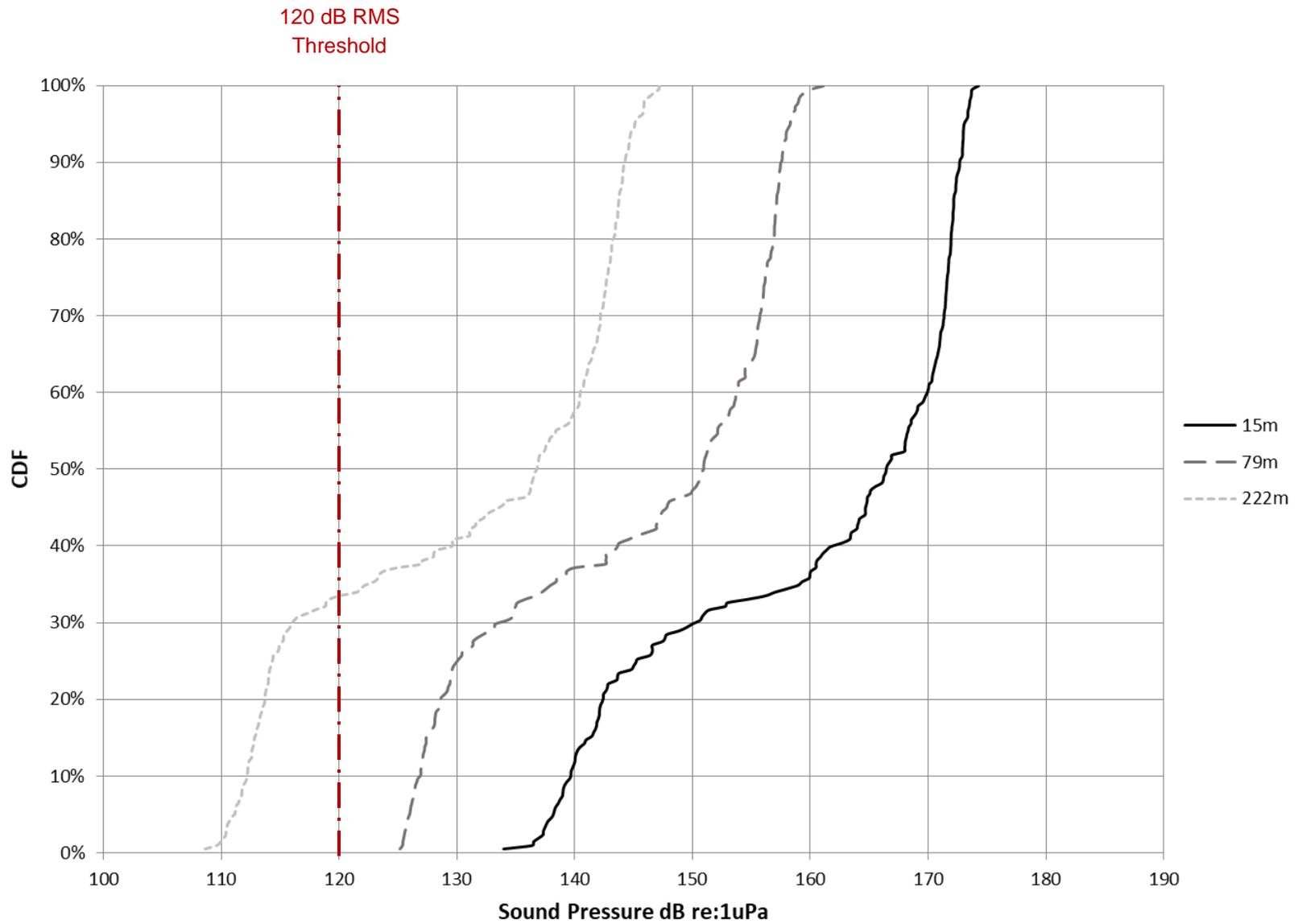


Figure C-5. CDF (RMS values) of the Installation of 36-inch Steel Pile #2 with a Vibratory Hammer on August 22<sup>nd</sup>, 2019

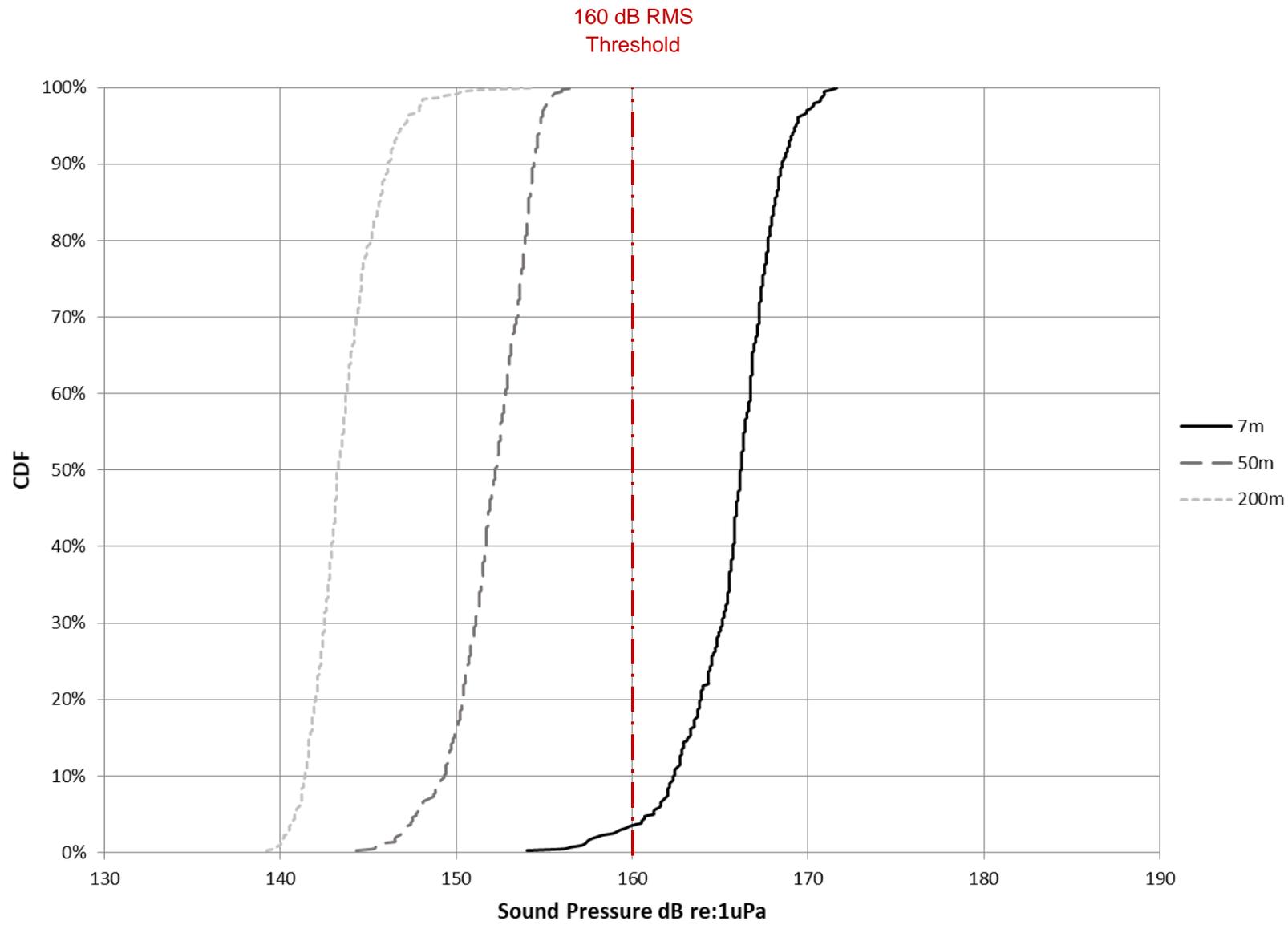


Figure C-6. CDF (RMS values) of the Installation of 20-inch Concrete Pile #1 with a Diesel Impact Hammer on October 3<sup>rd</sup>, 2019

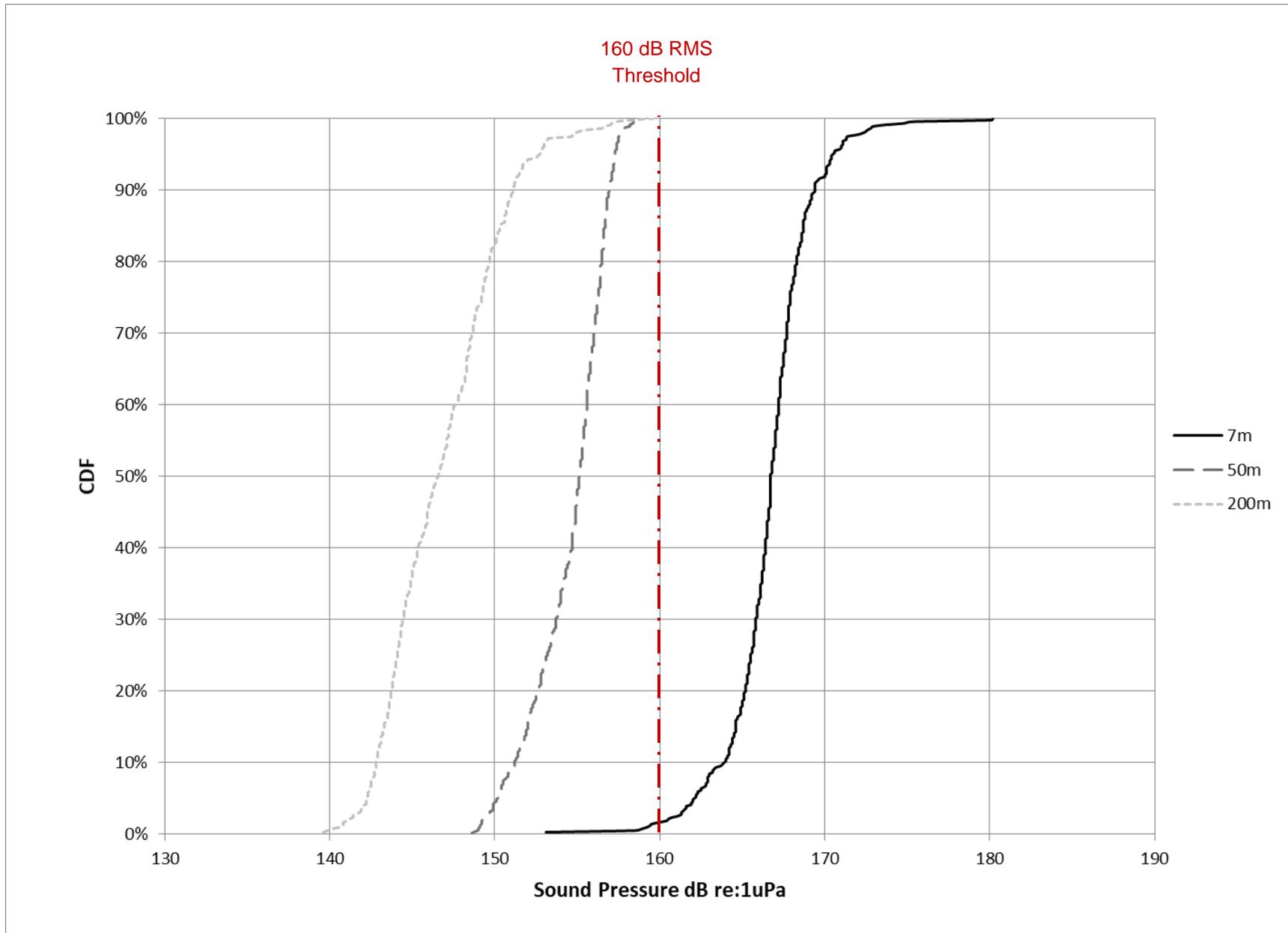


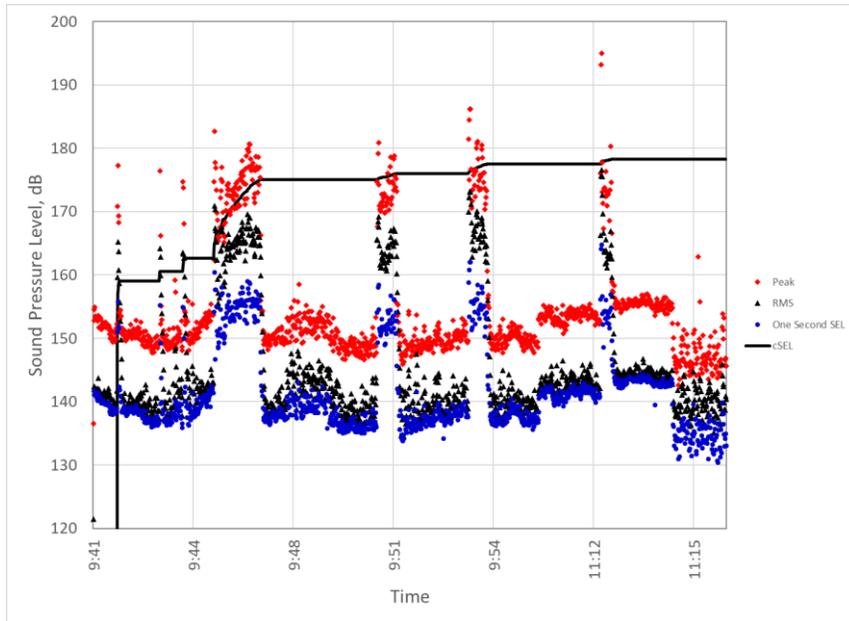
Figure C-7. CDF (RMS values) of the Installation of 20-inch Concrete Pile #2 with a Diesel Impact Hammer on October 3<sup>rd</sup>, 2019



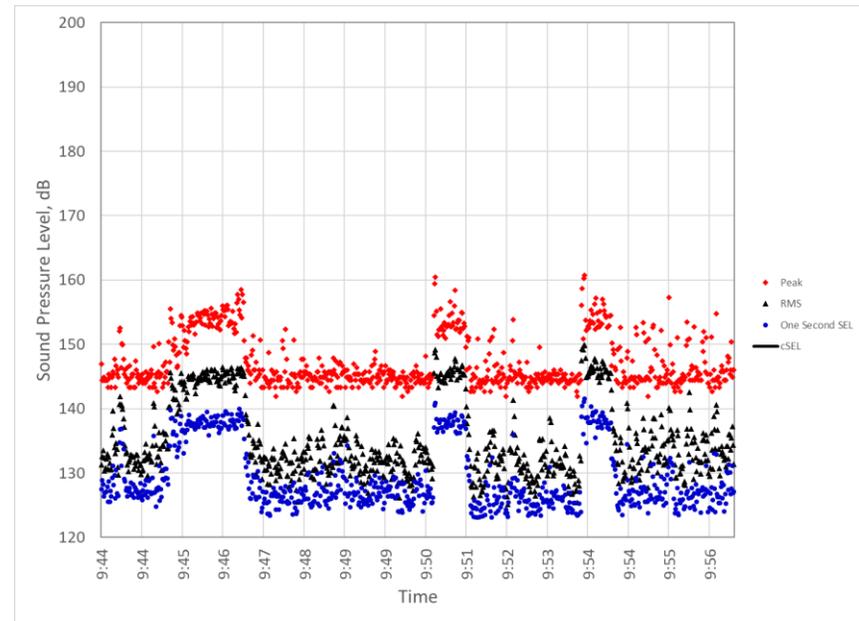
D

Time History Plots

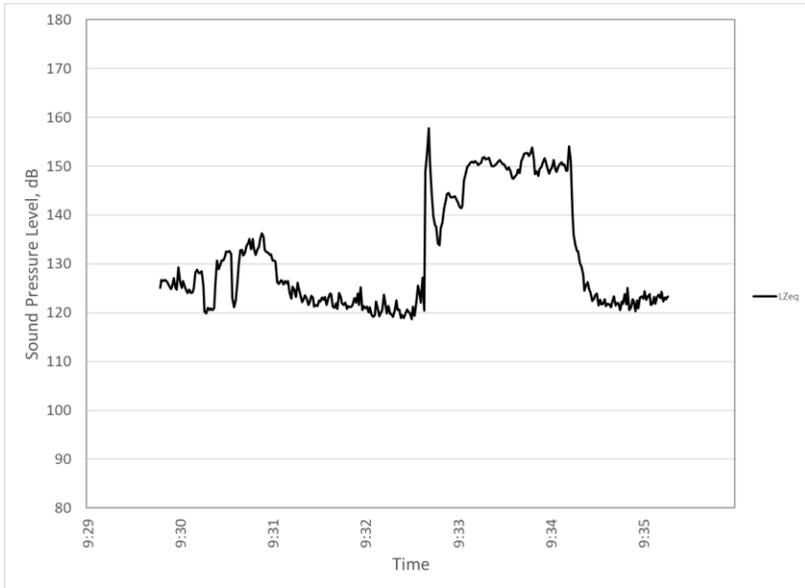




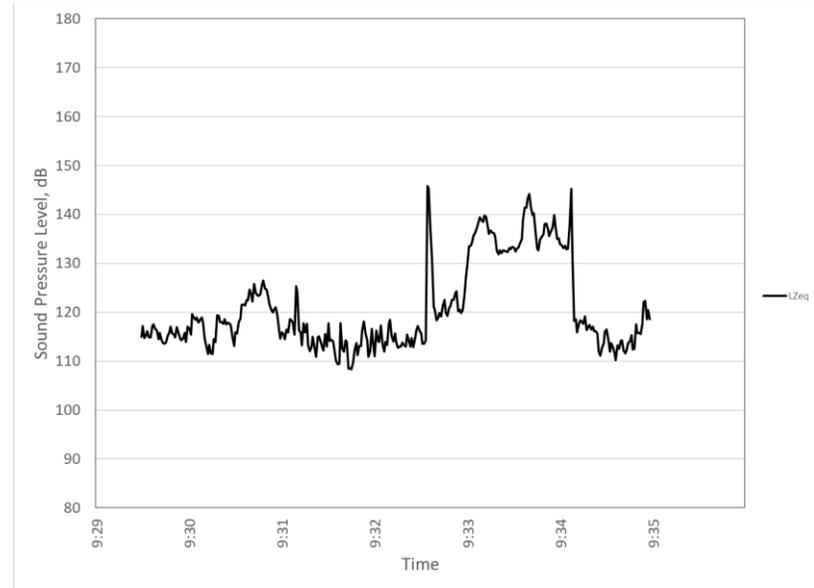
**Figure D-1. Time History Plot of the Installation of a 24-inch Concrete Pile with a Diesel Impact Hammer on June 5<sup>th</sup>, 2019 at 10 meters**



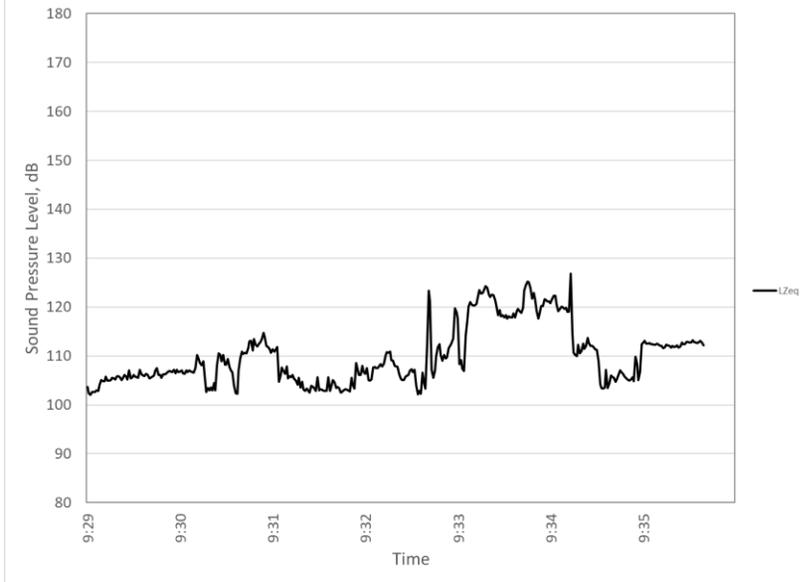
**Figure D-2. Time History Plot of the Installation of a 24-inch Concrete Pile with a Diesel Impact Hammer on June 5<sup>th</sup>, 2019 at 66 meters**



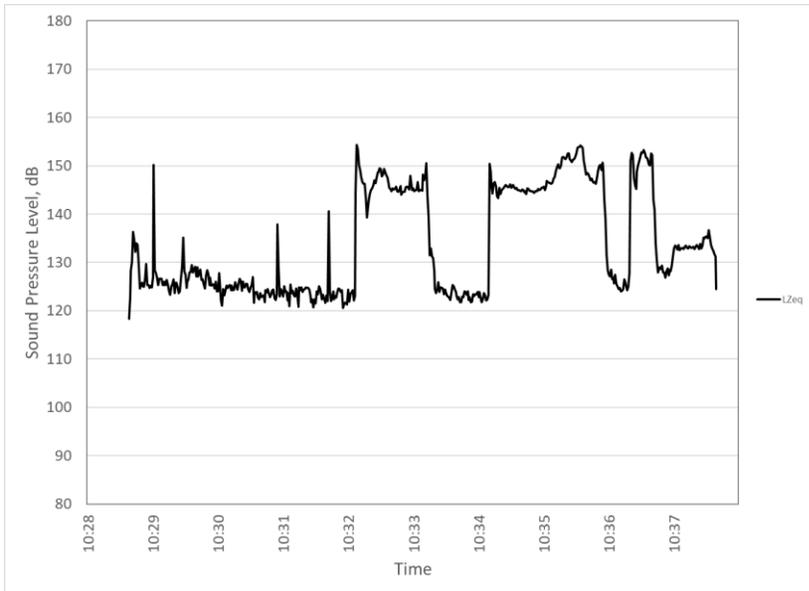
**Figure D-3. Time History Plot of the Installation of 20-inch Steel Pile #1 with a Vibratory Hammer on June 21<sup>st</sup>, 2019 at 22 meters**



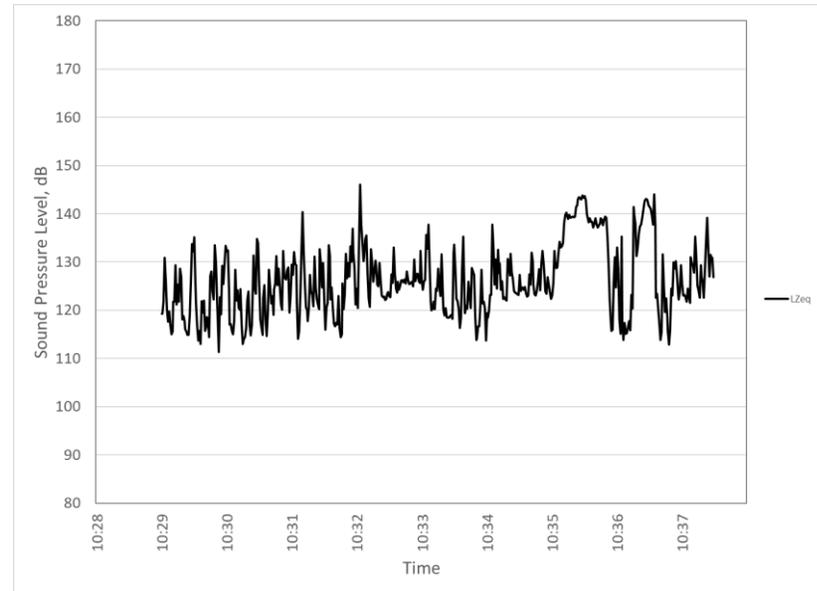
**Figure D-4. Time History Plot of the Installation of 20-inch Steel Pile #1 with a Vibratory Hammer on June 21<sup>st</sup>, 2019 at 75 meters**



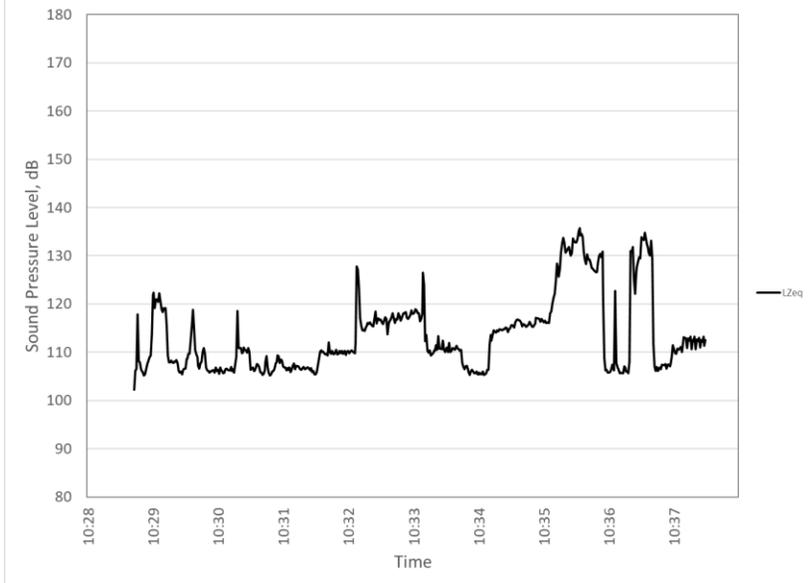
**Figure D-5. Time History Plot of the Installation of 20-inch Steel Pile #1 with a Vibratory Hammer on June 21<sup>st</sup>, 2019 at 220 meters**



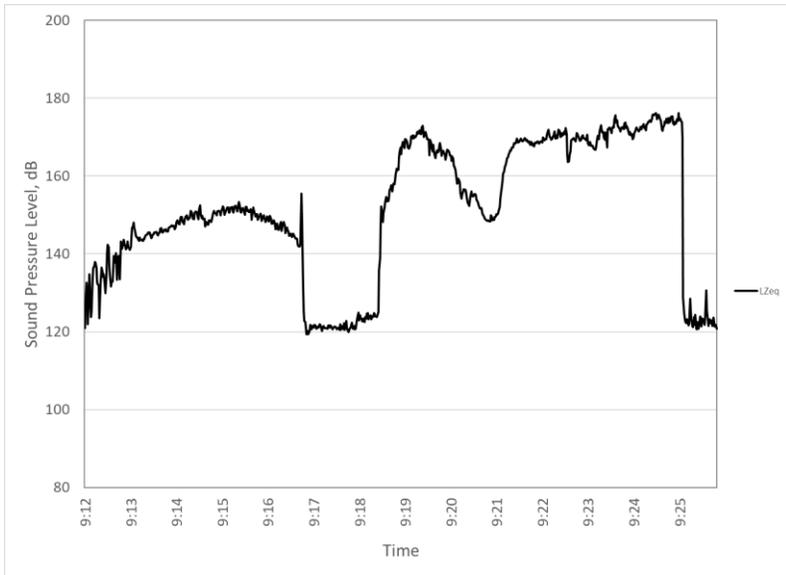
**Figure D-6. Time History Plot of the Installation of 20-inch Steel Pile #2 with a Vibratory Hammer on June 21<sup>st</sup>, 2019 at 18 meters**



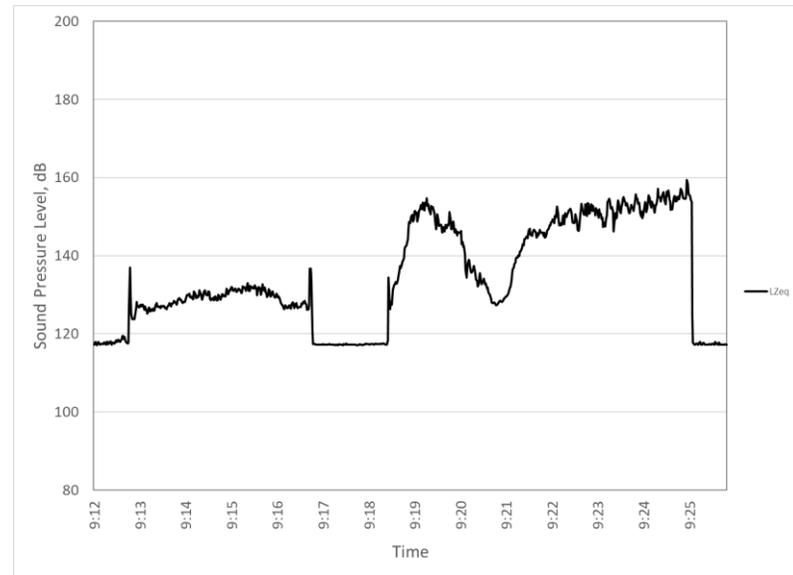
**Figure D-7. Time History Plot of the Installation of 20-inch Steel Pile #2 with a Vibratory Hammer on June 21<sup>st</sup>, 2019 at 75 meters**



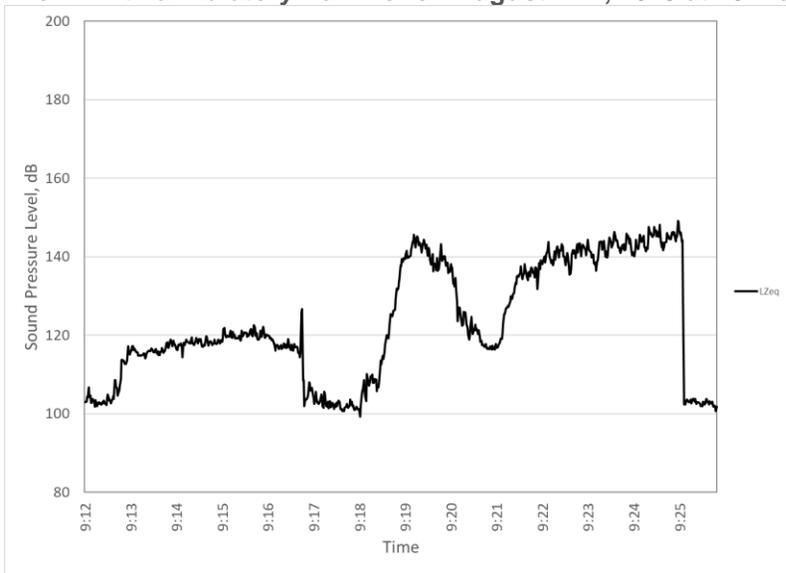
**Figure D-8. Time History Plot of the Installation of 20-inch Steel Pile #2 with a Vibratory Hammer on June 21<sup>st</sup>, 2019 at 220 meters**



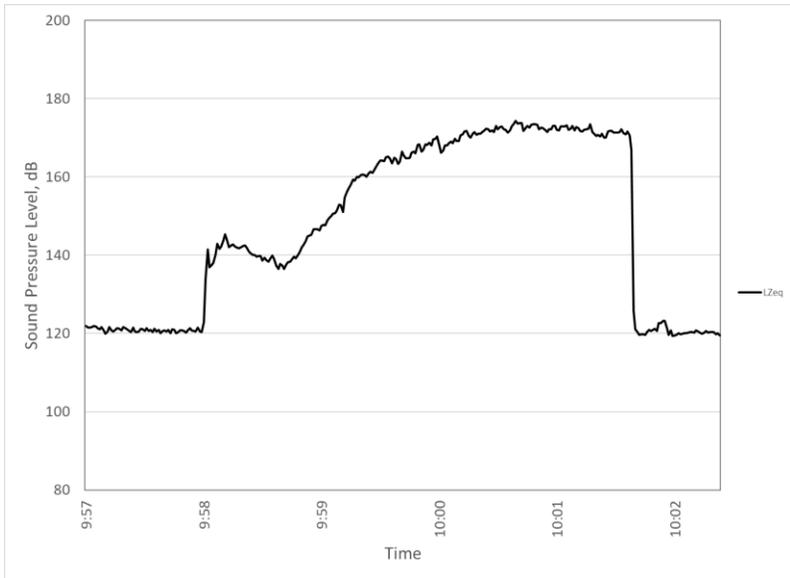
**Figure D-9. Time History Plot of the Installation of 36-inch Steel Pile #1 with a Vibratory Hammer on August 22<sup>nd</sup>, 2019 at 10 meters**



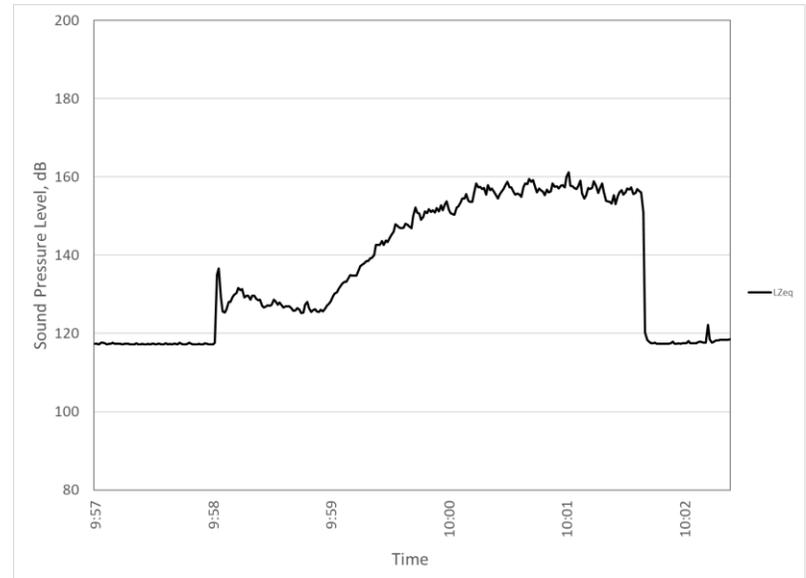
**Figure D-10. Time History Plot of the Installation of 36-inch Steel Pile #1 with a Vibratory Hammer on August 22<sup>nd</sup>, 2019 at 85 meters**



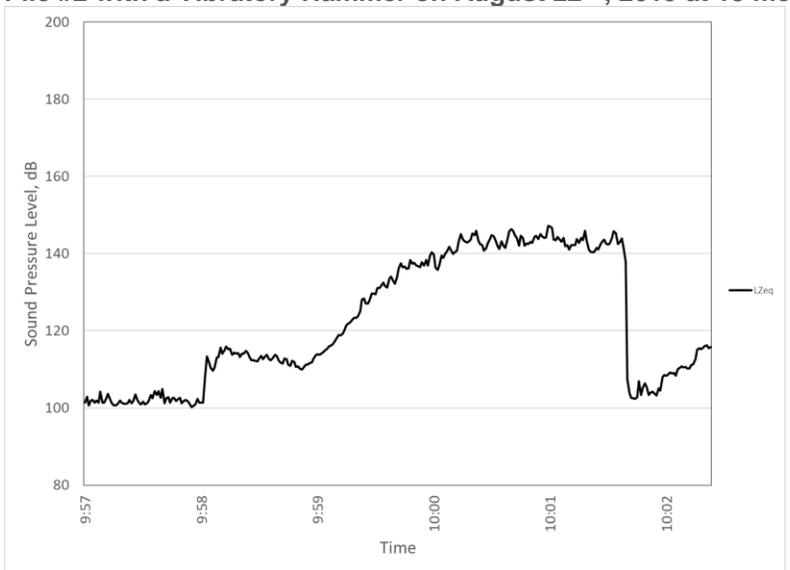
**Figure D-11. Time History Plot of the Installation of 36-inch Steel Pile #1 with a Vibratory Hammer on August 22<sup>nd</sup>, 2019 at 228 meters**



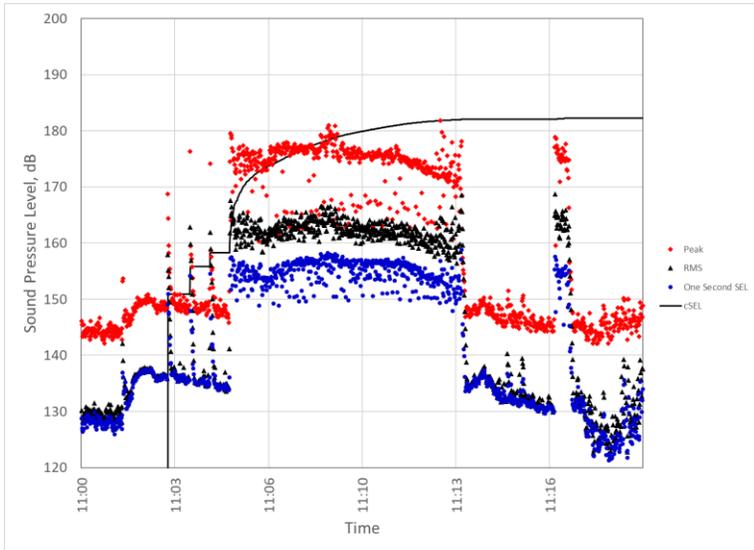
**Figure D-12. Time History Plot of the Installation of 36-inch Steel Pile #2 with a Vibratory Hammer on August 22<sup>nd</sup>, 2019 at 15 meters**



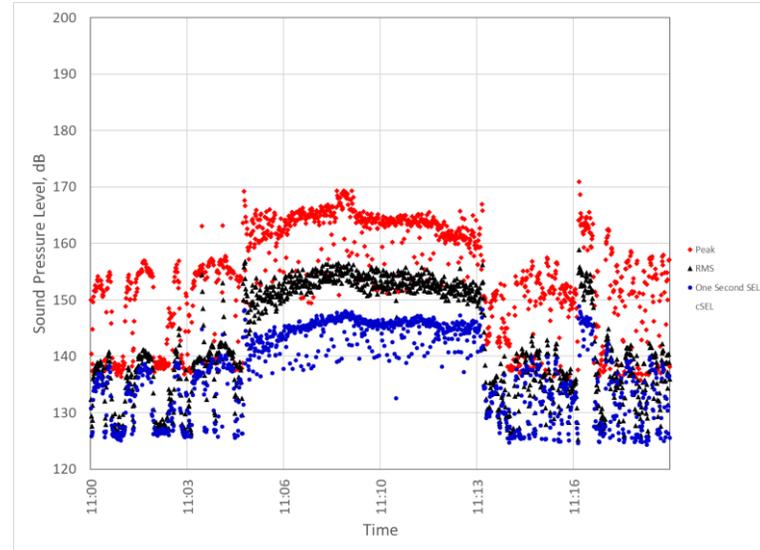
**Figure D-13. Time History Plot of the Installation of 36-inch Steel Pile #2 with a Vibratory Hammer on August 22<sup>nd</sup>, 2019 at 79 meters**



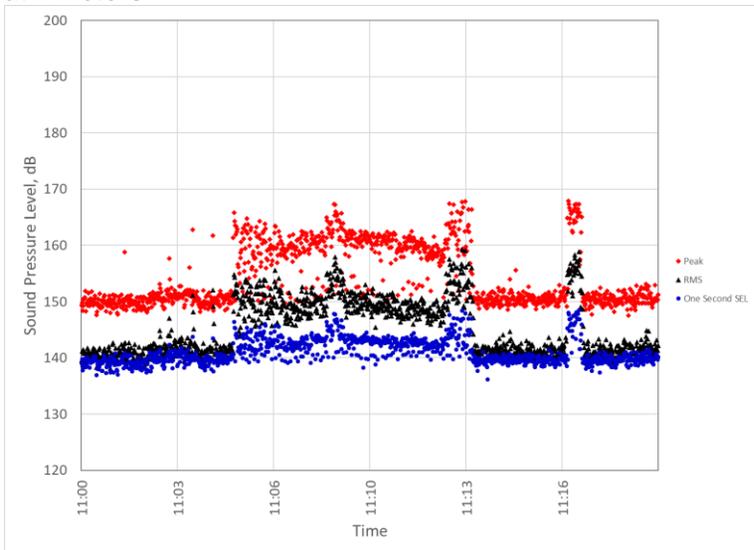
**Figure D-14. Time History Plot of the Installation of 36-inch Steel Pile #2 with a Vibratory Hammer on August 22<sup>nd</sup>, 2019 at 222 meters**



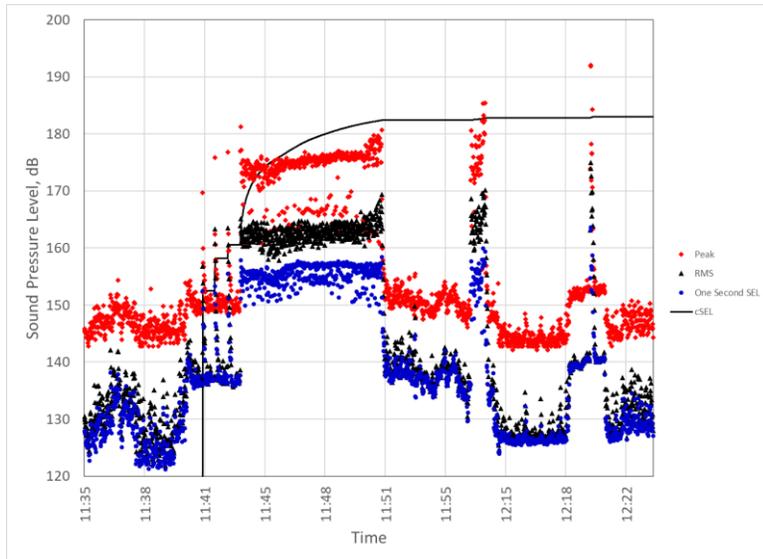
**Figure D-15. Time History Plot of the Installation of 24-inch Concrete Pile #1 with a Diesel Impact Hammer on October 3<sup>rd</sup>, 2019 at 7 meters**



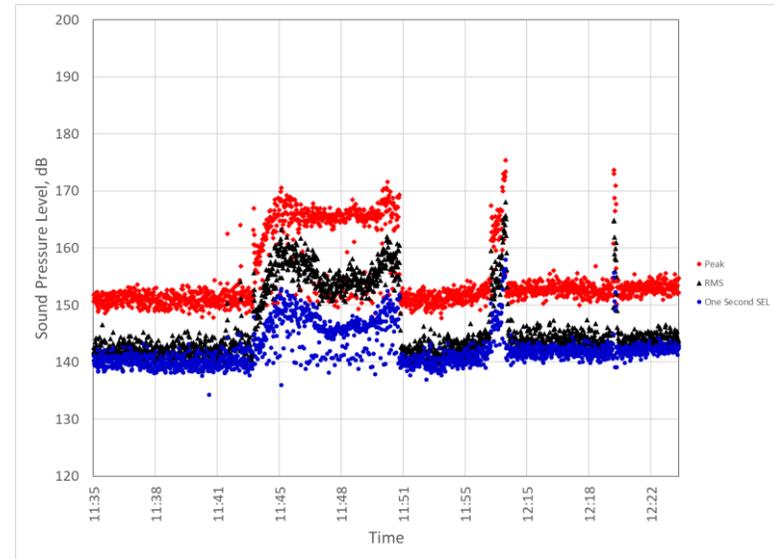
**Figure D-16. Time History Plot of the Installation of 24-inch Concrete Pile #1 with a Diesel Impact Hammer on October 3<sup>rd</sup>, 2019 at 52 meters**



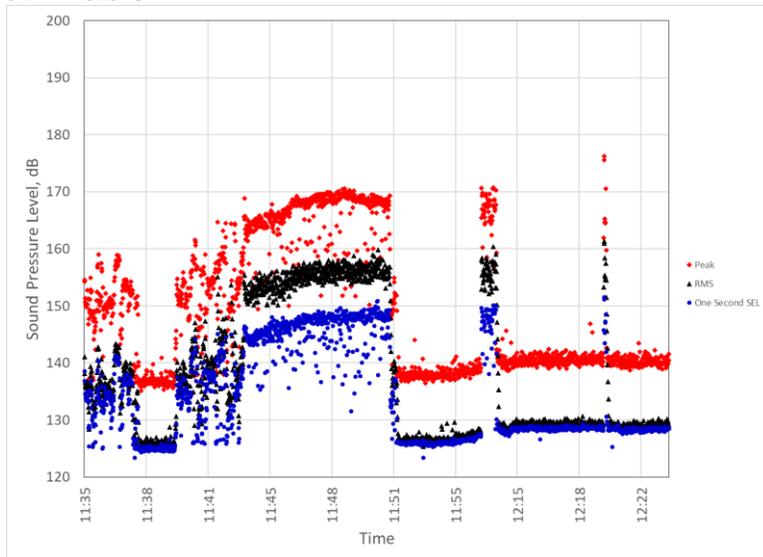
**Figure D-17. Time History Plot of the Installation of 24-inch Concrete Pile #1 with a Diesel Impact Hammer on October 3<sup>rd</sup>, 2019 at 195 meters**



**Figure D-18. Time History Plot of the Installation of 24-inch Concrete Pile #2 with a Diesel Impact Hammer on October 3<sup>rd</sup>, 2019 at 7 meters**



**Figure D-19. Time History Plot of the Installation of 24-inch Concrete Pile #2 with a Diesel Impact Hammer on October 3<sup>rd</sup>, 2019 at 50 meters**



**Figure D-20. Time History Plot of the Installation of 24-inch Concrete Pile #2 with a Diesel Impact Hammer on October 3<sup>rd</sup>, 2019 at 195 meters**

# Appendix C 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 enters the shutdown zone, all activities shall be shut down until the animal is seen leaving the zone 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.

**AECOM**

## Long Wharf Maintenance and Efficiency Project

### WORKER ENVIRONMENTAL AWARENESS TRAINING

#### Protection of



Marine Mammals



Fish



## SENSITIVE SPECIES

### 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.

### 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.

◆ Has spotted coat in a variety of shades from white or silver-gray to dark brown or black. They are true seals, having no external ear flaps. Has small flippers and move on land by flopping along on their bellies.

California Sea Lion



◆ Second most common marine mammal species in the Project area.

◆ Color ranges from chocolate brown in males to a lighter golden brown in females. Known for noisy barking. They are not “true” seals, having external ear flaps and large flippers that they use to “walk” on land.

Harbor Porpoise



◆ 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.

Gray Whale



◆ 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). Has a dorsal hump instead of a fin, and a series of small bumps between the hump and tail flukes.

Marine Mammal Exclusion Zones to be Enforced					
Project Element Requiring Pile Installation	Shutdown Distance from Pile (meters)				
	Gray whale	Bottlenose dolphin	Harbor porpoise	Harbor seal, Northern elephant seal	California sea lion, Northern fur seal
<b>Impact Driving (with bubble curtain)</b>					
24-inch square concrete	20	10	50	15	10
<b>Impact Pile Proofing (no bubble curtain)</b>					
36-inch steel pipe pile	60	10	80	30	10
<b>Vibratory Driving/Extraction</b>					
36-inch steel pipe pile	15	10	50	15	10
20-inch steel pipe pile	10	10	50	10	10
Wood and concrete pile extraction	10	10	50	15	10

### 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

# Appendix D Training Attendance Record



# **Chevron Richmond Refinery Long Wharf Maintenance & Efficiency Project Training and Education Plan 2019 In-water Work Training Acknowledgement**

## **1.0 Introduction and Purpose**

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Incidental Take Permit (ITP) condition ITP #5.4 issued by the California Department of Fish and Wildlife (CDFW) specifies that the training and education required for the Refinery Long Wharf Maintenance and Efficiency Project (LWMEP) must be acknowledged by every employee and contract worker involved with the Project. This document specifies how condition ITP #5.4 will be complied with.

## **2.0 Acknowledgement**

---

The person completing and signing the Training and Education Session 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.

## **3.0 Employee and Contractor Worker Information and Certification**

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*“By signing the Education and Training Meeting Sign-in Sheet, I hereby acknowledge that I have attended the training and education program session that has been developed for the Chevron Richmond Refinery Long Wharf Maintenance and Efficiency Project, and that I understand all protective measures required by the ITP issued by CDFW.”*











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

**Date: May 28, 2019**

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
Scott Williams	PEC	510-332-7692	williams@powerengconstruction.co
Rafael Otero	PEC		
Cedric Lea	PEC.		
Russell Cadden	PEC		
Tony Castillo	PEL		
Ben Unerton	PEC		
Matthew Taylor	PEC		
Stuart Smith	CSG	5-2522	UJMV
Joshua Desmuke	Conrexsys	5-	joshuadesmuke@clever.c

