

State of California Department of Transportation



San Francisco – Oakland Bay Bridge

East Span Seismic Safety Project

**MARINE MAMMAL MONITORING ANNUAL REPORT
PIER E3 DEMOLITION: TEST BLASTS AND IMPLOSION
SEPTEMBER 9, 2015 –DECEMBER 30, 2015**

**(in accordance with the Incidental Harassment Authorization
issued September 9, 2015)**



January 2016

EA 013544

04-SF-80 KP 12.2/KP 14.3

04-ALA-80 KP 0.0/KP 2.1

San Francisco – Oakland Bay Bridge

East Span Seismic Safety Project

MARINE MAMMAL MONITORING ANNUAL REPORT

PIER E3 DEMOLITION: TEST BLASTS AND IMPLOSION

SEPTEMBER 9, 2015 –DECEMBER 30, 2015

**(in accordance with the Incidental Harassment Authorization issued
September 9, 2015)**



Prepared by

Philip Thorson

Philip Thorson
BioMaAS

Reviewed by

William H. Martin

William H. Martin
AECOM

Approved by

Stefan Galvez-Abadia

Stefan Galvez-Abadia
Chief – Office of Environmental Analysis
Caltrans District 4

For individuals with sensory disabilities, this document is available in Braille, large print, on audiocassette, or computer disk. To obtain a copy in one of these alternate formats, please call or write to Caltrans, Attn: Stefan Galvez-Abadia, District Office Chief, Environmental Analysis, 111 Grand Avenue, Oakland, CA 94612; (510)-867-6785 Voice, or use the California Relay Service TTY number (800)-735-2929.

TABLE OF CONTENTS

EXECUTIVE SUMMARY..... 1

CHAPTER 1. INTRODUCTION 3

CHAPTER 2. MONITORING PROTOCOL 5

 2.1 Real-Time Hydroacoustic Monitoring Protocol 9

 2.2 Acoustic Deterrent Devices 10

CHAPTER 3. RESULTS 12

 3.1 Test Blast 1, October 31, 2015..... 12

 3.2 Test Blast 2, November 5, 2015..... 14

 3.3 Pier E3 Implosion, November 14, 2015..... 14

 3.4 Stranding Survey, November 15, 2015..... 16

 3.5 Stranding Survey, November 16, 2015..... 16

 3.6 Stranding Survey, November 17, 2015..... 17

CHAPTER 4. DISCUSSION..... 18

CHAPTER 5. REFERENCES..... 19

List of Tables

Table ES1. Summary of Pier E3 Test Blasts, Implosion, and Post-Implosion Monitoring 1

Table ES2. Summary of Harbor Seals and California Sea Lions Observed..... 2

Table 1. Summary of Pier E3 Demolition Monitoring 4

Table 2. Threshold Criteria Distances 5

Table 3. Summary of the Environmental Conditions during the Pier E3 Implosion Monitoring..... 8

Table 4. Marine Mammal Monitoring Summary for Pier E3 Test Blasts, Implosion, and Post-Implosion Stranding Surveys 13

Table 5. Summary of Marine Mammals Observed..... 18

Table 6. Summary of Incidental Harassment Take for the Pier E3 Implosion 18

List of Figures

Figure 1. Sections of the Original East Span for Removal 3

Figure 2. Pinniped Exclusion and Level B Behavioral Harassment Zones and Monitoring Positions 6

Figure 3. Harbor Porpoise Exclusion and Level B Behavioral Harassment Zones and Monitoring Positions 7

Figure 4. Aerial View of the Locations of the Stranding Surveys 9

Figure 5. Photo of Pier E3 with the Blast Attenuation System Operating 11

List of Abbreviated Terms

μPa	micropascal(s)
ADD	Acoustic Deterrent Devices
BAS	Blast Attenuation System
Bay	San Francisco Bay
dB	decibel(s)
Department	California Department of Transportation
IHA	Incidental Harassment Authorization
kHz	kilohertz
MMO	Marine Mammal Observers
ms	milliseconds
NMFS	National Marine Fisheries Service
sec	second(s)
SFOBB	San Francisco–Oakland Bay Bridge
SFOBB Project	San Francisco–Oakland Bay Bridge East Span Seismic Safety Project
YBI	Yerba Buena Island

EXECUTIVE SUMMARY

The California Department of Transportation (Department), as part of the San Francisco-Oakland Bay Bridge (SFOBB) East Span Seismic Safety Project (SFOBB Project) is dismantling the original east span of the SFOBB. As part of the dismantling phase of the SFOBB Project, the Department proposed a demonstration project to remove Pier E3 via implosion using highly controlled charges. Controlled implosion was proposed as an alternate method to the originally permitted mechanical methods for dismantling Pier E3 because it was expected to result in fewer in-water workdays and require a shorter time frame for completion, resulting in reduced impacts on aquatic resources in San Francisco Bay (Bay).

This report summarizes the Pier E3 demolition activities, including two test blasts, the Pier E3 implosion, and the associated marine mammal monitoring that occurred in October and November 2015. Marine mammal monitoring was conducted during 3 days of test blast and implosion activities, and 4 days of post-implosion stranding surveys (Table ES1).

Table ES1. Summary of Pier E3 Test Blasts, Implosion, and Post-Implosion Monitoring

Project	Activity Dates	Days Of Monitoring	Monitoring Period (Pacific Standard Time)
Pier E3 Test Blast 1	31 October	1	0650–1035 PDT ¹
Pier E3 Test Blast 2	5 November	1	0845–1445
Pier E3 Implosion	14 November	1	0630–0820
Pier E3 Post-Implosion	14-17 November	4	Three Stranding Surveys (low tide) and one survey 2 hours post-implosion

Note:
 1. Pacific Daylight Time ended on November 1, 2015 at 02:00.
 Source: compiled by AECOM in 2015

Pursuant to the SFOBB Project *Revised Marine Mammal Monitoring Plan* (Department 2015a), observers surveyed the respective Level B harassment zones and exclusion zones. If a marine mammal was found within an exclusion zone before the test blasts or implosion began, blasting was to be delayed until the marine mammal had moved beyond the exclusion zone, verified either visually exiting the zone or if not sighted for 30 minutes.

Marine mammal monitoring started at least 30 minutes before the test blasts and implosion, and was conducted for 60 minutes following each blasting event. During 7 days of monitoring, 17 Pacific harbor seals (*Phoca vitulina richardii*) and three California sea lions (*Zalophus californianus*) were observed (Table ES2). No marine mammals were in the respective exclusion zones at the moment of the test blasts or the moment of the Pier E3 implosion; therefore, no National Marine Fisheries Service (NMFS) Incidental Harassment Authorization take of marine mammals or delays because of marine mammals occurred.

Only one marine mammal, a juvenile harbor seal, was present during any of the blasts (Test Blast 1, October 31). This harbor seal was foraging in the Coast Guard Cove, well outside the exclusion zone, and it continued foraging after the test blast for 46 minutes.

One harbor seal was observed once near Treasure Island, 32 minutes before the Pier E3 implosion within the 5,700-foot (1,737-meter) Level B TTS zone. No other marine mammals were observed until after the Pier E3 implosion when several harbor seals and California sea lions began moving through the Pier E3 area within 1 hour after the implosion. No injured or stranded marine mammals were observed during the four post-implosion stranding surveys conducted between November 14 and 17, and the local NMFS-designated marine mammal stranding, rescue, and rehabilitation center (the Marine Mammal Center in Sausalito, California) reported no recoveries of any injured marine mammals with evidence of barotrauma related to the Pier E3 implosion. The lack of any injured or stranded marine mammals and the continued presence of marine mammals in the Pier E3 area after implosion suggest that no impacts occurred on marine mammals from the Pier E3 implosion.

Table ES2. Summary of Harbor Seals and California Sea Lions Observed

Site	Harbor Seals Observed Outside the Level B Zones	Sea Lions Observed Outside the Level B Zones	Harbor Seals Observed in the Level B Zones during Blasting ¹	California Sea Lions Observed in the Level B Zones during Blasting ¹
Test Blast 1, October 31	5	1	0	0
Test Blast 2, November 5	2	0	0	0
Pier E3 Implosion, November 14	4	2	0	0
Stranding Survey Post-Implosion, November 14	1	0	--	--
Stranding Survey 1, November 15	2	0	--	--
Stranding Survey 2, November 16	1	0	--	--
Stranding Survey 3, November 17	2	0	--	--
Total	17	3	0	0

Note:
 1. The test blast exclusion zone for pinnipeds was 45 feet (14 meters).
 Source: compiled by AECOM in 2015

No marine mammals were within the exclusion zones at the moment of the test blasts or implosion. No northern elephant seals (*Mirounga angustirostris*), harbor porpoises (*Phocoena phocoena*), or other cetaceans were observed during any of the monitoring events.

CHAPTER 1. INTRODUCTION

The California Department of Transportation (Department), as part of the San Francisco–Oakland Bay Bridge (SFOBB) East Span Seismic Safety Project (SFOBB Project) is dismantling the original east span of the SFOBB (Figure 1). As part of the dismantling phase of the SFOBB Project, the Department proposed a demonstration project to remove Pier E3 via implosion using highly controlled charges (Demonstration Project). Controlled implosion was proposed as an alternate method to the originally permitted mechanical methods for dismantling Pier E3, because it was expected to result in fewer in-water workdays and require a shorter time frame for completion, resulting in reduced impacts on aquatic resources in San Francisco Bay (Bay).



Source: compiled by AECOM in 2015

Figure 1. Sections of the Original East Span for Removal

Pier E3 was located on the original east span, 1,535 feet (468 meters) east of Yerba Buena Island (YBI) near the coordinates 37048'56.75"N, 122021'14.75"W in San Francisco County. Pier E3 flanked the east side of the approximately 50-foot-deep (15 meters) shipping channel of the SFOBB original east span. Top dimensions of the pier cap were 80 by 135 feet (24 by 41 meters), not including the fender apron. Exterior walls along the perimeter of the caisson were 4 feet (1.2 meters) wide, while the interior walls that included the rectangular chambers were 3 feet (1 meter) in width. The mudline (i.e., the bottom of the Bay floor) at Pier E3 ranged in elevation from -43 to -51 feet (-13 to -16 meters). The pier cap, fender system, and uppermost portions extended above the water line to support the steel superstructure of the cantilever section and were visible from the Bay.

Pier E3 dismantling began in June 2015, following removal of the SFOBB cantilever truss section and steel support tower on the original east span. The basic steps involved removing the timber and steel-supported fender system that surrounded Pier E3, dismantling the concrete pier cap by mechanical means to an elevation of +9 feet (3 meters) above the water line, and drilling vertical boreholes to load charges for the controlled implosion. Controlled implosion was accomplished using 588 small charges, ranging from 21 to 35 pounds/delay with 9-millisecond

delays between the individual charges. The entire detonation sequence lasted 5.3 seconds and removed the pier to, or below, the surrounding scour elevation of -51 feet (-16 meters). To minimize impacts on aquatic biological resources in the Bay, a Blast Attenuation System (BAS) was installed around the base of the pier. The BAS was designed specifically to minimize noise and pressure impacts generated by the controlled implosion. Installation of the BAS was concurrent with the borehole drilling process in October.

The Demonstration Project implosion took place on November 14, 2015 at 07:17. November was determined to be the optimal month to minimize impacts on biological resources in the Bay. Harbor seals and California sea lions inhabit the Bay waters throughout the year, but listed fish species (protected under the Endangered Species Act) generally are in lower numbers or absent in November. Other marine mammal species, such as the gray whale, do not enter the Bay until late winter, and harbor porpoises primarily are seen in the SFOBB area during spring and summer, although one sighting of a harbor porpoise was reported in October.

This report summarizes only the demolition activities using explosives and the associated marine mammal monitoring that occurred between October 31, 2015 and November 17, 2015, as required by the Incidental Harassment Authorization (IHA) of September 9, 2015, issued by the National Marine Fisheries Service (NMFS) to the Department (NMFS 2015b) in accordance with the Marine Mammal Protection Act of 1972 (16 U.S.C. 1371 Sec.101).

During 2015, the Department conducted several activities related to demolition of the original east span. These included mechanical dismantling of the Pier E3 cap and drilling holes for placement of the explosives. These activities were authorized under the July 17, 2015 IHA, issued to the Department for mechanical dismantling (NMFS 2015a).

Marine mammal monitoring was conducted during two test blasts at Pier E3, the Pier E3 implosion, and the post-implosion stranding surveys (Table 1). All monitoring was conducted in accordance with the requirements of the September 9, 2015 IHA (henceforth referred to as the IHA) (Sections 6 and 7), issued to the Department (NMFS 2015b). The marine mammal exclusion zones and Level B harassment zones for the test blasts and the implosion were observed, in accordance with Table 2 of the IHA.

Table 1. Summary of Pier E3 Demolition Monitoring

Project	Monitoring Dates	Days Of Monitoring	Project Area
Test Blast 1	October 31, 2015	1	45–270 feet (14–82 meters) around Pier E3
Test Blast 2	November 5, 2015	1	45–270 feet (14–82 meters) around Pier E3
Pier E3 Implosion	November 14, 2015	1	470–44,500 feet (143–13,564 meters) around Pier E3
Post-Implosion Stranding Surveys	November 14–17, 2015	4	Treasure Yerba Buena Islands, Bay Bridge Piers, Oakland Touchdown, Emeryville Crescent, and Oakland Outer Harbor

Source: compiled by AECOM in 2015

CHAPTER 2. MONITORING PROTOCOL

A detailed monitoring plan was developed in 2015, based on previous pile driving monitoring but expanded for the Pier E3 implosion (Department 2015a). The following discussion summarizes the marine mammal monitoring plan.

Several pre-blast briefings, including the morning of the implosion, were held between the construction supervisors, construction crew, the marine mammal monitoring and hydroacoustic monitoring teams, and Department staff. The purpose of the briefings was to establish the responsibilities of each party, define chains of command, discuss communication procedures, provide an overview of monitoring purposes, and review operational procedures. The Blaster-in-Charge and Resident Engineer, in coordination with the Lead Biological Monitor, had the authority to stop or delay any demolition activity if a marine mammal entered the exclusion zone.

Only experienced, NMFS-approved Marine Mammal Observers (MMOs) were used to monitor activities. During the test blasts, three MMOs, including the lead MMO, were positioned on the new bridge bike path and on a marine vessel to monitor the exclusion zones set forth in the IHA. The exclusion zones were considerably smaller for the test blasts than the actual implosion. Therefore, fewer monitors were needed to ensure coverage of the zones. Monitoring of the exclusion and Level B zones on the day of the implosion was conducted by 13 MMOs. In addition, two bioacousticians deployed acoustic equipment to listen for cetaceans in real time to alert the lead MMO of any harbor porpoises in the Level B TTS monitoring area. The MMOs began monitoring more than 30 minutes before the anticipated time of blasting. MMOs conducted monitoring from boats, existing bridge piers, YBI and Treasure Island, and the new and original SFOBB (Figures 2 and 3). Blasting was to be delayed if any marine mammals were observed in their respective exclusion zones before the blast (Table 2). Blasting was not to occur until either the MMOs observed the marine mammal leaving the exclusion zone or the marine mammal had not been observed for at least 30 minutes.

Table 2. Threshold Criteria Distances

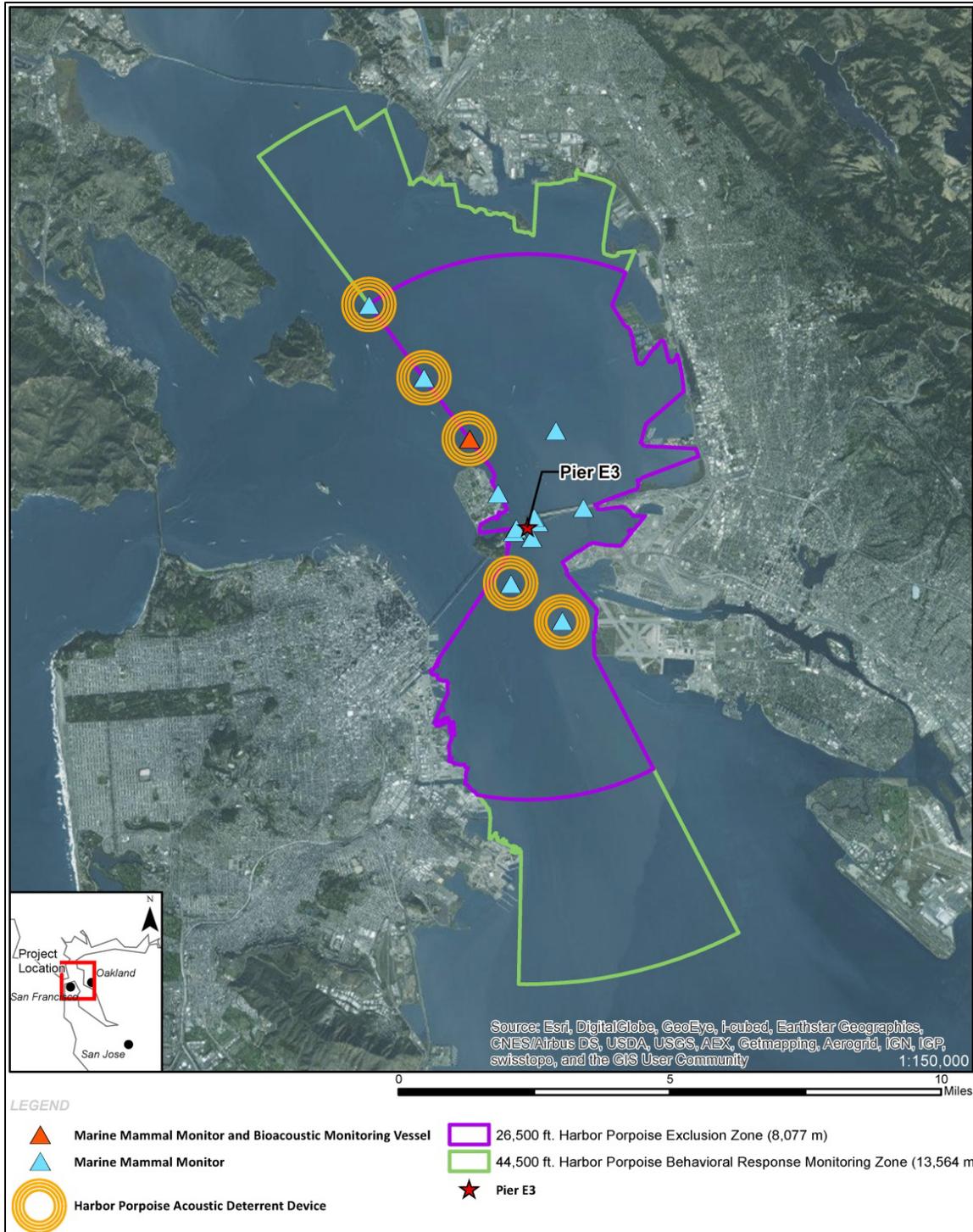
Species	Level B Threshold Criteria		Level A Threshold Criteria			Mortality
	Behavioral Response	TTS	PTS	Gastro-Intestinal Track	Lung Injury	
Harbor Seal	9,700 feet (2,957 meters)	5,700 ft (1,737 m)	1,160 ft (354 m)	35 ft (11 m)	450 ft (137 m)	205 ft (63 m)
Elephant Seal	9,700 ft (2,957 m)	5,700 ft (1,737 m)	1,160 ft (354 m)	35 ft (11 m)	450 ft (137 m)	205 ft (63 m)
California Sea Lion	800 ft (244 m)	470 ft (143 m)	245 ft (75 m)	35 ft (11 m)	450 ft (137 m)	205 ft (63 m)
Harbor Porpoise	44,500 ft (13,564 m)	26,500 ft (8,077 m)	5,800 ft (1,768 m)	35 ft (11 m)	450 ft (137 m)	205 ft (63 m)

Source: compiled by AECOM in 2015



Source: compiled by AECOM in 2015

Figure 2. Pinniped Exclusion and Level B Behavioral Harassment Zones and Monitoring Positions



Source: compiled by AECOM in 2015

Figure 3. Harbor Porpoise Exclusion and Level B Behavioral Harassment Zones and Monitoring Positions

Observations were made only during daylight hours using binoculars (10x42 or 7x50 power). Each MMO had a radio with a dedicated channel only for the MMOs (with mobile phones or marine radio for monitors on boats for backup) to contact the lead MMO and other MMOs. Within 30 minutes of the scheduled test blast or implosion, the MMOs began continuous observations and checked in with the lead MMO every 10 minutes. Any MMO who observed a marine mammal was to notify the lead MMO immediately and determine whether it could delay the blast. The MMOs were to track the animal until it had left the area or had not been seen for 30 minutes. The lead MMO was positioned on the pedestrian bike path on the new east span structure, approximately 500 feet (152 meters) from Pier E3. The lead MMO was in direct contact with the SFOBB Environmental Manager (Lead Biological Monitor) to notify the blasting crew if any marine mammals were sighted in the respective exclusion zones and determine whether the implosion had to be delayed.

Data on all observations was recorded on waterproof datasheets (“Rite in the Rain” paper) that included items such as species, numbers, sex, age class (when possible), behavior, time of observation, location, direction of travel, other acoustic or visual disturbances, and weather and sighting conditions. Table 3 includes a summary of the environmental conditions during the monitoring events that occurred in October and November 2015.

Table 3. Summary of the Environmental Conditions during the Pier E3 Implosion Monitoring

Date	Observation Period	Activity	Blast Time	Air Temperature degrees Centigrade (Fahrenheit)	Wind Speed kilometer/hour (miles per hour)
October 31	0650–1035	Test Blast 1	0931	15.5–18.8°C (45.5–52.3°F)	1.2–2.1 km/hr (2.7–8.9 mph)
November 5	0845–1445	Test Blast 2 Test Blast 3	1303 1326	12.1–15.3°C (45.5–50.4°F)	0.6–3.3 km/hr (2.7–8.3 mph)
November 14	0630–0820	Pier E3 Implosion	0717	10.3–12.3°C (43.9–50.9°F)	0.2–0.5 km/hr (3.6–8.5 mph)
November 14	0930–1330	Stranding Survey	--	12.3–14.9°C (43.9–50.9°F)	0.5–2.3 km/hr (3.6–8.5 mph)
November 15	0800–1200	Stranding Survey	--	12.5–15.9°C (47.7–50.4°F)	5.2–5.7 km/hr (3.1–9.2 mph)
November 16	1000–1300	Stranding Survey	--	9.2–12.2°C (51.6–53.1°F)	3.6–5.3 km/hr (8.5–18.1 mph)
November 17	1030–1330	Stranding Survey	--	12.1–15.0°C (51.5–57.4°F)	1.0–3.4 km/hr (7.6–10.9 mph)

Source: compiled by AECOM in 2015

Stranding surveys were conducted immediately after the Pier E3 implosion and for 3 days immediately following the implosion (Table 3). Both vessel and shore surveys were used to determine whether any injured or dead marine mammals were in the Bay, or were stranded on the shore, on the bridge or dock structures. The surveys encompassed the shoreline and Bay waters around the east span of the new and original Bay Bridge, YBI and Treasure Island, the Oakland Touchdown area (east of Pier E3), the Emeryville Crescent, and the Oakland Outer

Harbor (Figure 4). These were the areas nearest to Pier E3 and likely to be the first place an injured marine mammal would strand.



Source: Google Earth; compiled by AECOM in 2015

Figure 4. Aerial View of the Locations of the Stranding Surveys

2.1 Real-Time Hydroacoustic Monitoring Protocol

As a supplement to the visual monitoring of marine mammals, two additional techniques were to be used to reduce the likelihood that marine mammals would enter the exclusion zones. Real-time acoustic monitoring was used to detect sounds produced by cetaceans, to determine absence or presence in the respective exclusion zones. Monitoring was primarily for harbor porpoises, although bottlenose dolphins occasionally enter the Bay and could be detected by the equipment and techniques used.

Real-time acoustic monitoring of cetaceans was conducted using a C75 broadband, omnidirectional hydrophone with integral 20-decibel (dB) preamplifier with a TASCAM DR-680MKII High-Res 8-Track Portable SD/SDHC/SDXC Recorder. The system can detect and record up to 96 kilohertz (kHz)/24-bit in Broadcast WAV file resolution for 8 channels (6 analog, 2 digital) and stereo 192 kHz/24-bit recording mode.

2.2 Acoustic Deterrent Devices

Acoustic deterrent devices (AQUAmark® 300) were to be used to discourage marine mammals from entering the respective exclusion zones (primarily harbor seals around the 1,160-foot [354-meter] exclusion zone). Acoustic Deterrent Devices (ADD) typically are used around fish farms and on fishing nets to deter marine mammals from stealing fish by emitting a sound that is considered irritating, and thus a deterrent to the area. ADDs come in a wide assortment of source levels, repeat intervals, frequencies, and effective radii, depending on the species to be deterred. Marine mammals in the Bay would not have been exposed to ADDs, making their use more effective. In addition, unlike fish farms and fishing nets, no substantial food source for marine mammals exists in the Pier E3 exclusion area; therefore, less motivation exists to pass through the ADDs zones. The AQUAmark 300 operates at a frequency of 10 kHz (± 2 kHz), with a duration of 300 milliseconds (ms) (± 15 ms), a repeat interval of 4 seconds (± 0.2 secs), and a source level of 132 dB re 1 micropascal (μ Pa) at 1 meter (± 4 dB). The source level of 132 dB re 1 μ Pa at 1 meter is above the ambient sound level of the Bay (the ambient conditions measured approximately 4,000 feet from Pier E3 was 114 dB, aligning with historical data taken from the Bay) and below the NMFS marine mammal harassment threshold criteria for an impulse sound (160 dB Root Mean Square for impulse sounds).

The ADDs were deployed at a depth of 20 feet (6 meters) from each of the 12 marker buoys around the 1,160-foot (354-meter) harbor seal exclusion zone approximately 16 hours before the Pier E3 implosion. ADDs also were deployed from each monitoring vessel and Pier E2 of the new Bay Bridge, 500 feet (152 meters) north of the Pier E3 implosion site on the day of the implosion.

To attenuate sound pressure levels from the test blasts and the Pier E3 implosion, a BAS (bubble curtain) was installed around Pier E3. Details of the BAS configuration and effectiveness were presented in the Pier E3 implosion IHA application (Department 2015b). The BAS was in operation during both test blasts and the Pier E3 implosion. Figure 5 shows the BAS in operation before one of the test blasts.



Source: Biomaas

Figure 5. Photo of Pier E3 with the Blast Attenuation System Operating, view looking south from bike path on new east span

CHAPTER 3. RESULTS

A total of 20 marine mammals (17 harbor seals and three California sea lions) were observed in the SFOBB Pier E3 project area during the 7 days of monitoring for the test blasts, the Pier E3 implosion, including four post-implosion stranding surveys (Table 4). No other marine mammals, including elephant seals or harbor porpoises, were sighted or detected acoustically during any of the monitoring periods.

No marine mammals were observed within any of the respective exclusion or Level B zones at the time of the test blasts or the Pier E3 implosion. One harbor seal was observed foraging in Coast Guard Cove during test blast 1 on October 31, but was well outside any of the exclusion zones (pinniped exclusion zone = 45 feet [14 meters]). The Coast Guard Cove area is used regularly for foraging by harbor seals, and the harbor seal continued foraging during and after the test blast, not showing any effects. Only one marine mammal was observed before the Pier E3 implosion on November 14. A single adult harbor seal was observed at 0645, eating a fish near the eastern side of Treasure Island, 4,500 feet (1,372 meters) northwest of Pier E3 within the Level B TTS zone (5,700 feet [1,737 meters]). The seal dove and was not seen again before the implosion occurred 32 minutes later.

3.1 Test Blast 1, October 31, 2015

Three MMOs conducted monitoring for Test Blast 1. The lead MMO (MMO 1) was on the new east span bike path, 500 feet (152 meters) north of Pier E3. MMO 2 also was on the bike path but 500 feet (152 meters) west of the lead MMO, and MMO 3 was on a boat 1,500 feet (457 meters) south of Pier E3. The exclusion zone for pinnipeds was 45 feet (14 meters), and for harbor porpoises was 270 feet (82 meters). Visibility was good and the winds were calm (Table 3).

0530 PDT	Pre-implosion safety meeting between Department staff, the blasting crew, and the lead marine mammal observer
0700	All three marine mammal observers are in place at their monitoring sites
0713-0717	One adult harbor seal was observed 656 feet (200 meters) southeast of Pier E3 and was swimming southwest
0800	MMOs check in with Lead MMO, no marine mammals observed
0803	One adult harbor seal was observed 2,133 feet (650 meters) northeast of Pier E3 near Pier E4 of the new Bay Bridge
0818-0822	One adult harbor seal was observed 328 feet (100 meters) south of Pier E3 and was swimming southwest near the fish cages
0900	Continuous marine mammal monitoring begins. MMOs check in with Lead MMO, no marine mammals observed
0917-1036	One juvenile harbor seal was observed 2,625 feet (800 meters) west of Pier E3 and was foraging in Coast Guard Cove

Table 4. Marine Mammal Monitoring Summary for Pier E3 Test Blasts, Implosion, and Post-Implosion Stranding Surveys

Date	Activity	Total Harbor Seals Observed Outside Exclusion Zones	Total Sea Lions Observed Outside Exclusion Zones	Total Harbor Porpoises Observed Outside Exclusion Zones	At Time of Blast			
					Harbor Seals within TTS Zone 5,700 feet (1,737 meters)	Harbor Seals within Behavior Zone 9,700 feet (2,957 meters)	Sea Lions within Behavioral Response Zone 800 feet (244 meters)	Harbor Porpoises within Behavioral Response Zone 44,500 feet (13,564 meters)
October 31	Test Blast	5	1	0	1*	0	0	0
November 5	Test Blast	2		0	0	0	0	0
November 14	Pier E3 Implosion	4	2	0	0	0	0	0
November 14	Stranding Survey	1	0	0	--	--	--	--
November 15	Stranding Survey	2	0	0	--	--	--	--
November 16	Stranding Survey	1	0	0	--	--	--	--
November 17	Stranding Survey	2	0	0	--	--	--	--
Totals		17	3	0	1*	0	0	0

Note:

* The exclusion zones for the test blasts were only 45 feet (14 meters) for pinnipeds and 270 feet (82 meters) for harbor porpoises.

Source: compiled by AECOM in 2015

0931	Test Blast 1
0948	One juvenile sea lion was observed 492 feet (150 meters) north of Pier E3 and was swimming east-northeast along the new Bay Bridge
1017	One juvenile harbor seal was observed 492 feet (150 meters) north of Pier E3 and was swimming east-northeast along the new Bay Bridge
1035	End of observations

3.2 Test Blast 2, November 5, 2015

Three MMOs conducted monitoring for Test Blast 2. MMO 1 was on the new east span bike path, 500 feet (152 meters) north of Pier E3. MMO 2 also was on the bike path but 500 feet (152 meters) west of the lead MMO, and MM3 was on a boat 1,500 feet (456 meters) south of Pier E3. The exclusion zone for pinnipeds was 45 feet (14 meters), and for harbor porpoises was 270 feet (82 meters). Visibility was good and the winds were calm. The order of events during monitoring was as follows:

0730 PST	Pre-implosion safety meeting attended by Department staff, the blasting crew, and the lead MMO
1000	All three MMOs in place at their monitoring sites; MMOs checked in with the lead MMO; no marine mammals observed
1100	MMOs checked in with the lead MMO; no marine mammals observed
1200	MMOs checked in with the lead MMO; no marine mammals observed
1253	One juvenile harbor seal observed 492 feet (150 meters) northeast of Pier E3
1300	Continuous marine mammal monitoring begun; MMOs checked in with the lead MMO; no marine mammals observed
1303	First test blast of the day
1326	Second test blast of the day
1418–1421	One adult harbor seal observed 656 feet (200 meters) south of Pier E3, swimming northwest
1430	End of observations

3.3 Pier E3 Implosion, November 14, 2015

On the afternoon of November 13, 12 buoys were installed, marking the 1,160 feet (354 meters) harbor seal exclusion zone. An ADD was deployed on each buoy at a depth of 20 feet (6 meters). On the morning of the Pier E3 implosion, each monitoring vessel deployed an ADD, and two were deployed from Pier E2—one on the south face and one on the west face. The Pier E3 implosion was scheduled for 0703 PST, but a 45-minute window occurred during which the

slack tide was optimal for the BAS. All 13 MMOs conducted visual surveys, and the two acousticians conducted real-time acoustic monitoring for cetaceans (Figures 2 and 3). The weather was clear and visibility was good, after the sun rose high enough to provide sufficient light, and the winds were calm.

- 0430 PST Pre-implosion safety meeting attended by Department staff, the blasting crew, and the lead MMO
- 0500 Pre-implosion safety meeting attended by all MMOs and the lead MMO
- 0600 All MMOs and acousticians with real-time monitoring equipment in place at their monitoring sites; each of the boats deployed an ADD.
- 0615 The acousticians deployed the real-time acoustic monitoring system and began monitoring for cetacean sounds
- 0620 The stranding team from the Marine Mammal Center arrived at the contractor's loading dock (Berth 9), including one marine mammal veterinarian and three experienced members of the stranding staff
- 0630 Continuous marine mammal monitoring began when sufficient light existed to monitor the respective zones
- 0630 All MMOs checked in with the lead MMO; no marine mammals observed; all MMOs began check-ins every 10 minutes
- 0640 All MMOs checked in with the lead MMO; no marine mammals observed
- 0645 MMO 2 (east shore of Treasure Island) reported an adult harbor seal at the surface, feeding on a fish approximately 4,500 feet (1,372 meters) northwest of Pier E3 along the eastern side of Treasure Island (within the harbor seal TTS Level B zone); the seal dove and was not seen again (the last sighting was 32 minutes before the Pier E3 implosion)
- 0650 All MMOs checked in with the lead MMO; no marine mammals observed
- 0700 All MMOs checked in with the lead MMO; no marine mammals observed; the Pier E3 implosion was delayed because of technical issues with the blasting equipment; marine mammal monitoring continued without pause
- 0710 All MMOs checked in with the lead MMO; no marine mammals observed
- 0716 The lead MMO informed that the Pier E3 implosion would occur within 1 minute; all MMOs notified and asked to report any sightings immediately; no observations of marine mammals reported
- 0717 Pier E3 implosion, lasting approximately 5 seconds
- 0808 One adult harbor seal observed 9,600 feet (2,926 meters) southwest of Pier E3 (within the harbor seal behavioral zone), swimming west toward the west span of the Bay Bridge

- 0808 One sub-adult California sea lion observed 1,300 feet (396 meters) northwest of Pier E3 (outside the sea lion behavioral zone), swimming west
- 0816–0817 One sub-adult California sea lion observed 1,200 feet (366 meters) southwest of Pier E3 (outside the sea lion behavioral zone), swimming west
- 0820 After 63 minutes post-implosion monitoring, all MMOs and acousticians returned to shore after completing the 1-hour post-implosion monitoring
- 0823–0824 One adult harbor seal observed 1,300 feet (396 meters) southeast of Pier E3 (within the harbor seal TTS zone)
- 0930–1330 The lead MMO and the stranding crew began a vessel-based stranding survey
- 1003 One adult harbor seal observed 2,625 feet (800 meters) west of Pier E3 within Coast Guard Cove

After the vessel survey, a shore survey was conducted in areas around the Oakland Touchdown and Emeryville Crescent that were too shallow for the vessel to enter. No stranded or injured marine mammals were found.

3.4 Stranding Survey, November 15, 2015

- 0800 PST Stranding survey began
- 0902 One adult harbor seal observed 4,265 feet (1,300 meters) west of Pier E3 within Clipper Cove
- 0855 Three harbor seals hauled out at the YBI haul-out site
- 1003 One juvenile harbor seal observed 2,625 feet (800 meters) west of Pier E3 within Coast Guard Cove
- 1200 Stranding survey ended; no injured or stranded marine mammals found

3.5 Stranding Survey, November 16, 2015

- 1000 PST Stranding survey began
- 1037 27 harbor seals hauled out at the YBI haul-out site on the southwest side of the island
- 1132 One adult harbor seal observed 750 meters (2,461 feet) west of Pier E3 near the Coast Guard dock, appearing healthy as it swam briefly at the surface then dove.
- 1300 Stranding survey ended; no injured or stranded marine mammals found

3.6 Stranding Survey, November 17, 2015

- 1030 PST Stranding survey began
- 1041 One adult harbor seal observed 2,625 feet (800 meters) west of Pier E3 within Coast Guard Cove
- 1148 29 harbor seals hauled out at the YBI haul-out site
- 1109 One juvenile harbor seal observed 2,789 feet (850 meters) northwest of Pier E3 near the Treasure Island Pier
- 1330 Stranding survey ended; no injured or stranded marine mammals found

CHAPTER 4. DISCUSSION

During the 7 days of marine mammal monitoring for the test blasts, Pier E3 implosion, and stranding surveys, 20 marine mammals were observed, including 17 harbor seals and three sea lions (Table 4). No elephant seals, harbor porpoises, or other marine mammals were observed in any of the monitoring zones. No marine mammals were observed within the respective exclusion zones or the Level B harassment zones during any of the blast activities (Table 5); therefore, none of the three blasting events caused any incidental take of marine mammals (Table 6).

Table 5. Summary of Marine Mammals Observed

Species	Total Marine Mammals Observed Outside Exclusion Zones	Marine Mammals Observed in the Exclusion Zones 30 Minutes before Blasting	Marine Mammals in Level B Zones during Blasting
Harbor Seals	17	0	0
Sea Lions	3	0	0
Elephant Seal	0	0	0
Harbor Porpoises	0	0	0
All Species	20	0	0

Source: compiled by AECOM in 2015

Table 6. Summary of Incidental Harassment Take for the Pier E3 Implosion

Species	Authorized Number of Level B Takes		Level B Takes Observed during Test Blast and Pier E3 Implosion Monitoring	
	Behavioral	TTS	Behavioral	TTS
Pacific Harbor Seal	12	6	0	0
California Sea Lion	2	0	0	0
Northern Elephant Seal	2	0	0	0
Harbor Porpoise	2	0	0	0

Source: compiled by AECOM in 2015

No injured or stranded marine mammals were observed during the four stranding surveys conducted between November 14 and 17, 2015. The first survey was conducted approximately 2 hours after the Pier E3 implosion, although MMOs were in the designated monitoring areas for at least 60 minutes post-implosion, as required by the IHA. The Marine Mammal Center reported that they did not recover any injured marine mammals or receive any calls of an injured marine mammal showing signs of barotrauma associated with the Pier E3 implosion (Johnson, pers. comm., 2015).

Harbor seal and sea lion movements in the Pier E3 area generally are sporadic, but several seals and sea lions began to move through the area approximately 1 hour after the implosion. The lack of any injured or stranded marine mammals and the continued presence of marine mammals in the Pier E3 area immediately after the implosion suggest that no impacts occurred on marine mammals from the Pier E3 implosion.

CHAPTER 5. REFERENCES

California Department of Transportation (Department). 2015a (October). *San Francisco–Oakland Bay Bridge East Span Seismic Safety Project: Pier E3 Demonstration Project Biological Monitoring Programs, Revised Marine Mammal Monitoring Plan*. Prepared by AECOM.

———. 2015b. *Incidental Harassment Authorization Application: Activities Related to the Demolition of Pier E3 of the East Span of the Original San Francisco–Oakland Bay Bridge*. Submitted to the National Marine Fisheries Service on April 16, 2015.

Johnson, Shawn. Head Veterinarian, The Marine Mammal Center. November 17, 2015—e-mail with Phil Thorson regarding the absence of any stranded injured marine mammals.

National Marine Fisheries Service (NMFS). 2015a (July 17). *Incidental Harassment Authorization*. Issued to the California Department of Transportation. Authorization permitted under the Marine Mammal Protection Act to take, incidentally by Level B harassment, small numbers of marine mammals incidental to construction of a replacement bridge for the East Span of the San Francisco–Oakland Bay Bridge, California.

———. 2015b (September 9). *Incidental Harassment Authorization*. Issued to the California Department of Transportation. Authorization permitted under the Marine Mammal Protection Act: Taking of Marine Mammals Incidental to Specified Activities, San Francisco–Oakland Bay Bridge Pier E3 Demolition via Controlled Implosion.