Murray Street Bridge (# 36C-0108)
Seismic Retrofit Project

Marine Mammal Mitigation Plan

Murray Street Bridge
Santa Cruz Yacht Harbor
City of Santa Cruz
Santa Cruz County, CA
Federal Project Number STPLX-5025 (048)

July 2010

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MARINE MAMMAL MITIGATION PLAN

MURRAY STREET BRIDGE SEISMIC RETROFIT PROJECT (#36C-0108),
CITY OF SANTA CRUZ, SANTA CRUZ COUNTY, CALIFORNIA

INTRODUCTION

The marine mammal mitigation plan consists of protection measures incorporated into the project to avoid or minimize impacts on marine mammals. Three marine mammals are known to occur within the Santa Cruz Yacht Harbor, the southern sea otter (*Enhydra lutris nereis*), federally listed as threatened, and listed by the California Department of Fish and Game as "Fully Protected", the Eastern Pacific harbor seal (*Phoca vitulina richardsi),* and the California sea lion (*Zalophus californianus*). All marine mammals are protected under the Marine Mammal Protection Act. The docks and other features within the study area are haul-out sites for Eastern Pacific harbor seal and California sea lion. The open water of the study area provides habitat for the southern sea otter, the harbor seal, and the California sea lion.

INCIDENTAL TAKE AUTHORIZATION APPLICATION QUESTIONS

1. Project Description

The proposed project is located at the eastern edge of the City of Santa Cruz in the County of Santa Cruz (see Figure 1). The project area includes the Murray Street Bridge which spans the Santa Cruz Harbor, portions of lands within the Santa Cruz Port District harbor area, portions of the harbor waters, and the area along the Murray Street road right-of-way, west of Lake Avenue (Figure 2).

The proposed project consists of a seismic retrofit of the existing Murray Street Bridge, which spans the Santa Cruz Small Craft Harbor and additional minor modifications to replace deficient bridge barriers (widening shoulders to standard widths and replacement and improvement of sidewalks and railings). The seismic retrofit project will provide the bridge with additional vertical support and resistance to lateral seismic forces by installing additional pilings and supplemental structural elements. In order to provide sufficient area for construction operations, some boats, Harbor facilities, and commercial businesses will require temporary relocation.

The nine-span bridge is supported by two abutments (identified as Abutments 1 and 10, located at the western and eastern ends of the bridge, respectively) and 8 "bents" (identified as Bents 2 through 9, located at 60-foot intervals between the abutments). The seismic retrofit project consists of the following basic elements:

(1) Installation of concrete infill walls at Bents 2, 3, 4, and 9 to span the voids between the existing concrete support columns.

(2) Installation of shear keys and seat extenders at Abutment 1 and Bents 2 through 9.

(3) Retrofit of foundations with 16-inch diameter CISS (cast-in-steel-shell) piles at Bent 9 and Abutment 10. These piles will extend to depths of approximately –55 feet to –85 feet at Bent 9 and to depths of approximately –30 feet to –50 feet at Abutment 10.

(4) Retrofit abutment with two 96-inch CIDH piles behind Abutment 10 to a depth of -50 feet.

(5) Retrofit of both outriggers and bents with 30-inch diameter CISS piles at Bents 6, 7, and 8 and 30-inch diameter CIDH (cast-in-drilled-hole) piles at Bent 5. These piles will extend to depths of approximately -55 feet to -80 feet at Bent 5 and at approximately –85 feet to –110 feet at Bents 6-8.

(6) Installation of fenders to protect new piles.

Figure 3 provides a cross section showing the abutment and bents and proposed improvements. The installation of new piles at Abutment 10 and Bents 5 through 9 will include two piles on each side for a total of 24 piles.

In-Water Activities. The construction schedule includes 10 months of potential in-water construction activity over 2 years – 5 months during the first year and 5 months during the second year. The construction schedule includes 5 months of potential in-water construction activity for two years. Activities include: removal of docks to accommodate construction access; potential installation of piles for a construction trestle from the bridge; pile driving; transport of materials; and replacement of harbor docks upon completion of the bridge seismic retrofit project. In-water activities would be intermittent throughout the 5-month period, but it is conservatively assumed that some activity could occur daily throughout this period.

The most intense activity would be the installation of new bridge support piles, which will also involve the demolition of the existing piles at Bent 6. CISS piles at Bents 5 through 8 will be installed within the waterway by driving 30-inch steel casings either to refusal at rock or into a shaft drilled within rock (depending on the location). The installation of new piles at Bents 5 through 8 will include two piles on each side for a total of 16 piles in the water (and 8 additional on-land piles). The work activity will be focused within the area of the bridge. Overall the installation of piles is expected to take a total of approximately 2 days for each pile for a total of 32 days. Piles will be partially or entirely vibrated into the Harbor substrate rather than driving them by means of "hammering". The onland installation of piles at Bent 9 and Abutment 10 also will have two piles on each side for a total of 8 piles.

Installation of an in-water barge or temporary bridge trestle is planned to accommodate equipment for pile installation. Work within the waterway will require either the use of barges or construction of trestles to provide work platforms. If barges are utilized, prefabricated modular units may be brought to the site and locked together. This type of platform can be installed, reconfigured, and removed relatively quickly, but the system is not suitable for areas that are too narrow to accommodate the modules. For example, footings from the Union Pacific Railroad Bridge to the north and footings from the Murray Street Bridge appear too close together to allow use of a modular barge between footings. In these areas, a trestle likely will need to be constructed.

FIGURE 1: PROJECT LOCATION

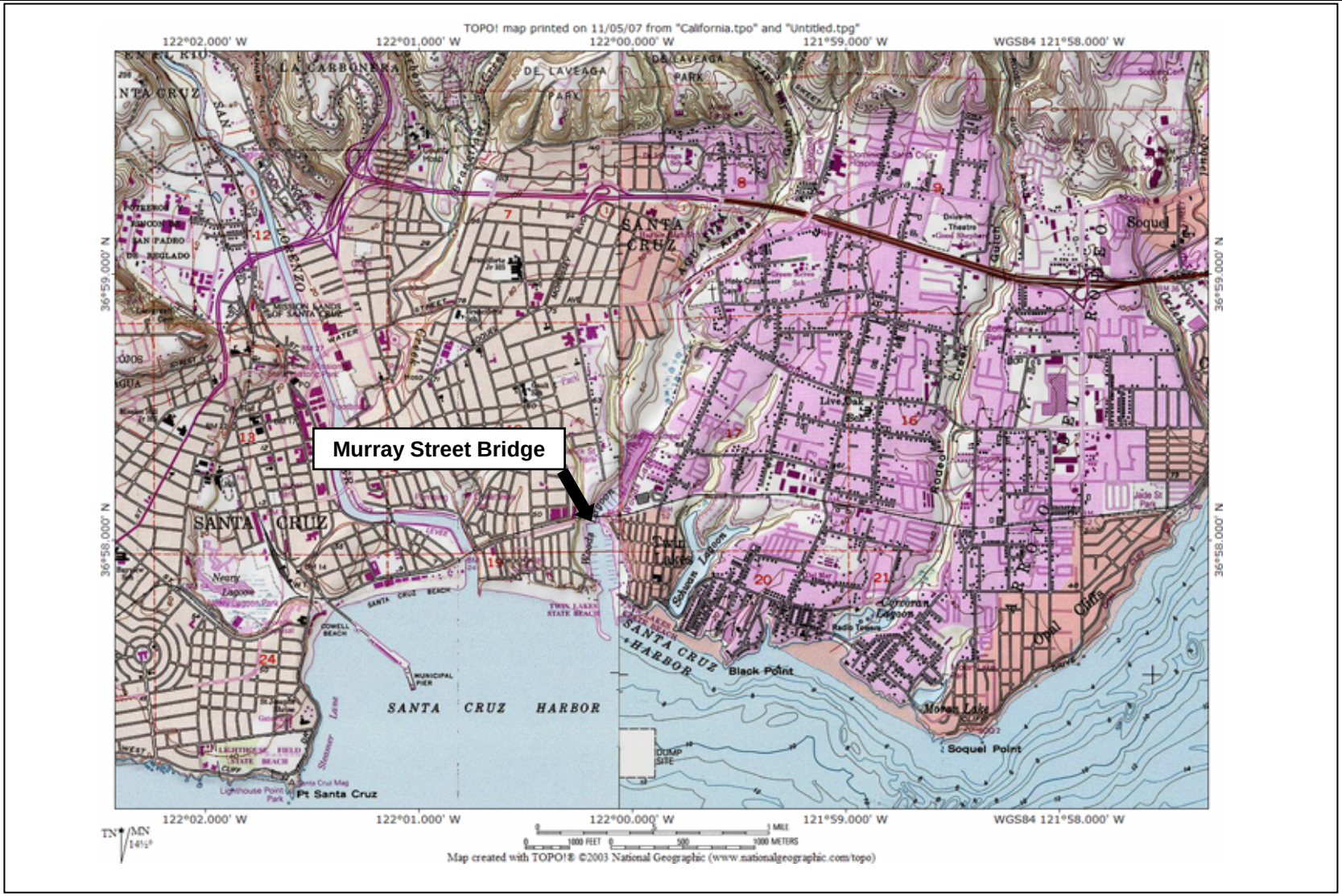
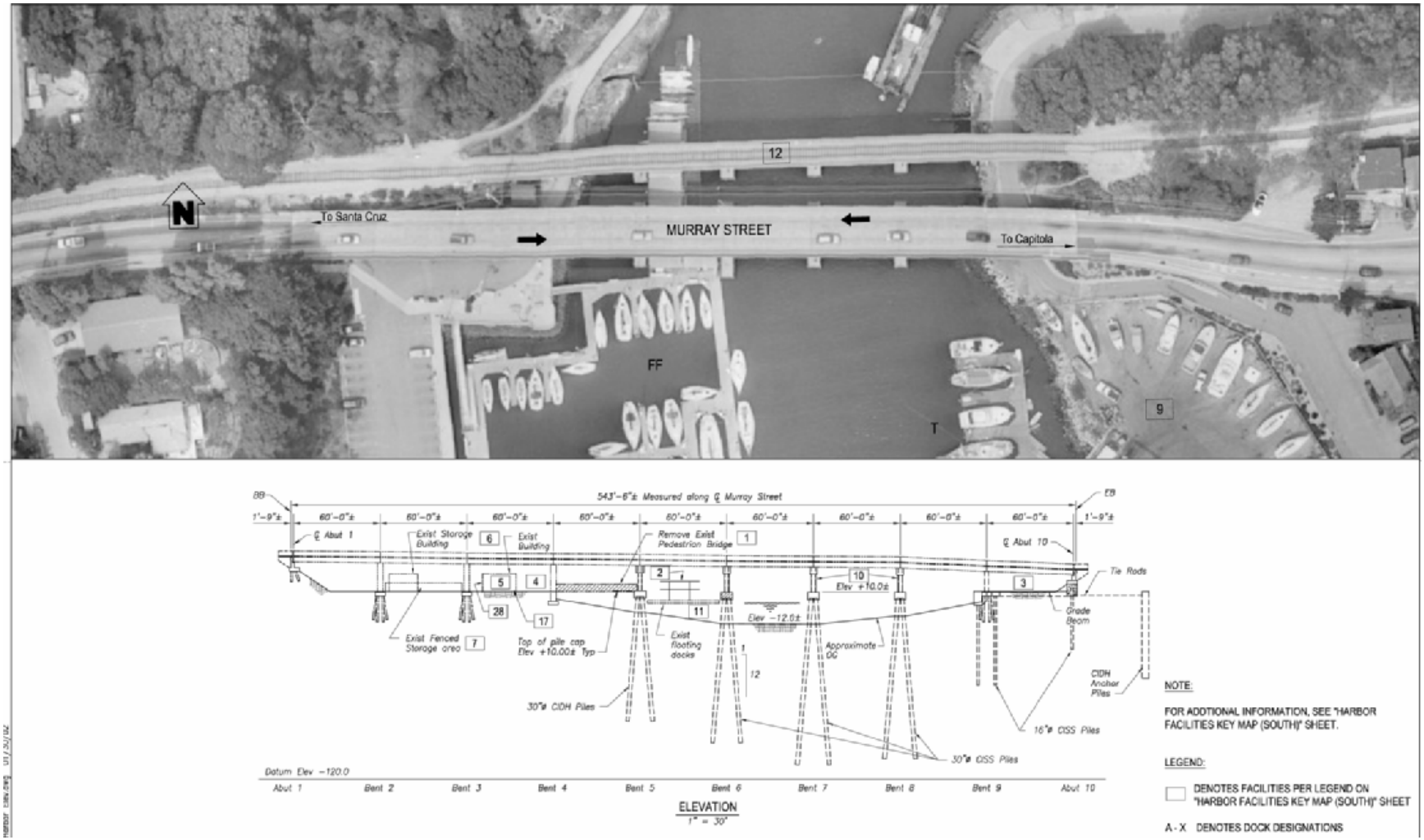


FIGURE 2: Area of Potential Impact

FIGURE 3: BRIDGE CROSS SECTION



Construction of a trestle could vary depending on materials available to contractors. One possible trestle configuration would be 60-foot long steel girders over the Harbor navigation channel. The spans would be supported on falsework bents, perhaps constructed of steel piles which are a fairly common falsework material. Piles would be driven in the water by a crane sitting over the land. Preliminary estimates by the project engineer indicate that up to 120 12-inch steel beams would be required for a trestle spanning the bridge; vibratory drivers would be used. Approximately 6-8 of these small size piles could be installed per day. All piles would be removed at the end of construction. The trestle could be made of "Bailey Bridge" panels that can be used to provide bents or towers. The deck might be made of heavy timbers or open-grid panels with a safety railing to keep people and materials on the deck.

Other in-water activities include removal and replacement of existing boat berths to accommodate construction equipment, which includes removal of 2 berths from dock T with replacement at end of Phase 2 (with 2 piles) and removal of 10 berths from dock FF. Prior to removal. To accommodate the removed berths, 11 new berths will be constructed on the west side of the harbor at Docks A through F with installation of 12 piles. A temporary dock FF--with fewer berths—will be constructed at the southern end of the dock (with 6 piles), which will accommodate 6 boats during construction. (Affected portions of Dock FF will be restored at the end of Phase 4.).

Upon completion of the proposed bridge improvements, 11 new berths will be reinstalled on the west side of the harbor at Docks A through F (see Figure 2 for dock locations). Although design plans have not yet been completed for the reinstalled berths, it is expected that the docks would be plastic, wood or concrete over polyethylene floats and would be anchored with pilings. Piles would be drilled into the harbor floor by mechanical hammer. There would be no dredging or placement of fill in Harbor waters with reinstallation of docks and both berths.

2. Dates and Duration of Activity and Specific Locations

The Murray Street Bridge Retrofit project is tentatively proposed for construction in five partially overlapping phases. Generally, work will begin on the eastern side of the Harbor and progress to the western side. The timing of each phase and a brief description of work to be performed during each phase is provided in Table 1. Overall, the seismic retrofit work will be executed over a period of approximately 18 months within four construction phases as described in Table 1. The additional bridge improvements will be constructed over a period of approximately 6 months as part of Phase 5 of the construction.

In-water activity will occur in Phases 2 and 4 over an approximate total 10-month period. It is estimated that up to 5 months of in-water activity will occur over two seasons, although the phases may overlap. Work tasks will vary throughout the phase. The in-water pile driving would occur over a total of 32 days within this period.

3. Marine Mammal Species Found Within the Project Area

Three marine mammals are known to occur within the Santa Cruz Yacht Harbor, the southern sea otter, federally listed as threatened, and listed by the California Department of Fish and Game as "Fully Protected", the Eastern Pacific harbor seal, and the California sea lion.

The open water of the study area provides habitat for the southern sea otter, the eastern Pacific harbor seal, and the California sea lion. Southern sea otters appear to be incidental visitors to the Harbor, using the site for foraging. California sea lions are frequent visitors to the Harbor, using the waters for foraging and the docks and other features within the study area as occasional haul-out sites. Large numbers of California sea lions are present when fish runs occur within the harbor. (Weather, currents, seasonal upwelling conditions, and other oceanographic factors periodically bring anchovies, sardines, and other prey species into the Harbor, in turn drawing great numbers of birds and marine mammals.) Harbor seals are residential within the Harbor, with the greatest numbers occurring during late summer, fall and winter, outside of breeding and molting seasons. Harbor seals use Docks F and FF (see Figure 2) as primary haul-out sites and the surrounding waters as foraging habitat.

4. Status and Distribution of Marine Mammals Within the Project Area

Survey Methods. Initial wildlife surveys were conducted during December 2006. Follow-up surveys for marine mammals were conducted during September/October 2009 to estimate the numbers of each of three species (California sea lion, harbor seal, and southern sea otter) using the area surrounding the Murray Street Bridge (Bridge) and to determine the type of use, especially during the period of time when in-water construction activities are proposed for the Murray Street Bridge Seismic Retrofit (Project). EcoSystems West conducted nineteen surveys between September 17 and October 21, 2009 for 45 minutes to 2 hours, depending on the number of biologists present (one or two) and the time of day (visibility).

The study area consisted of the open waters, docks, and other potential haul-out features of the Harbor from the Harbor Launch Ramp area (including the fuel dock and Vessel Assist dock) to 500 feet upstream of the boundary of the Area of Impact (see Figure 2). A total of 40 survey hours were conducted, including early morning, midday, evening and nighttime surveys with an emphasis on early morning and midday surveys. In an effort to determine the diurnal and nocturnal movement patterns of the harbor seals, initially 3-4 site visits/day were conducted, 2 times per week. Once a general understanding of the harbor seals' use of the area was gained, the surveys were focused on estimating the number of individuals present in the study area in the morning (when pile driving or other in water activities might be expected to begin for the day) and around midday (when pile driving and other in water activities might resume after a lunch break). An effort was made to determine the maximum number of individuals using haul-outs within the study area by arriving pre-dawn, when animals were still at rest and had not been flushed into the water by Harbor activities. During one survey (October 17th, midday), EcoSystems West biologists surveyed the entire Upper Harbor, upstream (north) of the Murray Street Bridge in an effort to determine the whereabouts of the harbor seals during the middle of the day.

Table 1. Murray Street Bridge Retrofit Project: Construction Phasing & Approximate Schedule.

Work Tasks	Effects on Harbor and Road Operations
Phase 1: Construction in East Zone	
2 months (May-July)[1]	
* Temporarily relocate overhead utilities north of bridge * Prepare construction staging area (8,000 sq.ft.) at harbor boat yard * Retrofit Bent 9 & Abutment 10; install anchor piles * Erect Girder Span 9 * Remove existing south rail	* Install traffic control system with alternating 1-way traffic * Close Murray for 7 days for driving anchor piles * Temporary relocation (dry storage) of 9 dry-docked boats from boat yard * Traffic controls along Lake Avenue during construction staging area setup * Close east walkway under bridge * Close bridge sidewalk
Phase 2: Construction in Eastern Waterway	
5 months (July-December)	
* Construct new berths (8) at ends of docks A through F * Remove berths (12) at docks T and FF * Construct work platform(s) (trestle or barge) for Stage 2 work [2] * Retrofit Bents 7 & 8 (includes installing anchor piles at Bents 7 & 8) * Erect Girder Spans 7 & 8 and construct Deck Spans 7, 8, & 9 * Construct north and south rails (optional) [3] * Restore boat yard; reopen pedestrian path * Remove east work platform * Replace berths (2) at Dock T upon construction in the eastern waterway and only between July and mid-November	* Temporary relocation of 2 boats from Dock T to AA or new dock N-Q * Temporary closure of East Drive & part of harbor boat yard * Availability of only one boat channel under the bridge for 6 non-consecutive half-days
Phase 3: Construction in West Zone	
6 months (December-May)	
* Install row boat storage at docks A/B & USCG area * Install temporary building at USCG area * Temporarily relocate existing offices and row boats to above [2] * Close portion of western parking lot [2] * Construct temporary access ramp to Dock FF * Retrofit Abutment 1 and Bents 2, 3, & 4 * Erect Girder Spans 1, 2, & 3 [and construct Deck Spans 1, 2, & 3]	* Closure of West Path, western concrete stairway and access ramp to Dock FF * Temporary relocation of affected facilities (offices, storage, restrooms, etc.)

Phase 4: Construction in Western Waterway

5 months (May-October)

* Construct modifications to Dock FF; move 7 boats to new Dock FF
* Construct work platform(s) (trestle or barge) for Stage 4 work
* Retrofit Bents 5 & 6 (including installation of anchor piles)
* Erect Girder Spans 4, 5, & 6 [and construct Deck Spans 4, 5, & 6]
* Construct north and south rails [3]
* Remove work platform(s)
* Closure of West Path, western concrete stairway and access ramp to Dock FF
* Temporary relocation of affected facilities (offices, storage, restrooms, etc.)
* Temporary relocation of 8 boats from Dock FF
* Availability of only one boat channel under the bridge for 6 non-consecutive half-days

Phase 5: Construction of Superstructure and Barrier Rails

[no timing provided]

* Remove sidewalks & temporary barrier rails
* Construct new barrier rails
* Restore Dock FF, parking lot, existing offices and related facilities
* Restore all remaining facilities to original condition
* Repair deck

Footnotes:

[1] Note that construction phases overlap; the sum of the construction periods specified is therefore greater than the total period indicated by start and finish dates.

[2] These tasks could be initiated and/or completed during the prior stage.

[3] [These tasks could be completed either in Phase 2 or 4.

[4] Temporary closure of Murray Street bridge roadway to all traffic is possible during any phase for a short duration. The alternating one-way traffic with sign control will occur during the construction, but not during the full duration of construction activities.

For each survey, the following were recorded: the time of the survey, the temperature, visibility, wind speed, tide, and moon phase. During surveys, one or two EcoSystems West biologists walked and sat at key observations points, or rowed a small boat, throughout the study area, using binoculars, and examined the site for presence of marine mammals. A general census of the area was taken on each site visit, counting the numbers of each species present, noting the activity of the animals, as well as their location, with reference to an aerial map of the Area of Influence and vicinity. Notations were made on the aerial map of the site, when necessary, to clarify locations of observed animals. When feasible, observed animals were photographed, and the sex of California sea lions was noted.

It was not possible to determine with certainty whether or not an individual had already been counted (unless all animals remain hauled-out for the duration of the survey); however, an effort was made to avoid duplicating counts by taking into account the time and location of the observation with reference to previous observations. Where we were unable to determine if counts were redundant, we noted this on data tables.

Ecosystems West biologists also made note of fish activity, when we observed evidence such as jumping fish or congregations of feeding birds and mammals. EcoSystems West biologists also noted relevant personal communications with Port District employees, Harbor business employees, and marine mammal experts regarding marine mammal presence. Further, EcoSystems West biologists noted incidental observations of other wildlife species, such as bats or bird species, and recorded all observations on a standard data sheet designed for the Project's marine mammal surveys.

Distribution of Marine Mammals. Table 2 presents the estimates of marine mammals present in the survey area during 2009 surveys. Table 3 presents the number of animals observed hauled-out and the haul-out locations during 2009 surveys. Figure 4 shows the spatial distribution of observed marine mammals throughout the survey area. Figure 2 provides an aerial view of the study area and shows the location of the docks referenced on the x-axis of the spatial distribution figure.

Southern Sea Otter. The southern sea otter is regularly sighted in the Harbor waters. During the December 2006 field surveys, one sea otter was observed swimming in the open water of the main Harbor channel, north (upstream) of the Murray Street bridge. During September/October 2009 surveys, southern sea otters were observed foraging in the Harbor during five of the nineteen surveys conducted, with observations concentrated during one week of the four-week-long survey period, between September 17 and 23 (Table 2) . On four of these visits, only one sea otter was observed. On one visit, a mother and juvenile were observed and heard calling and responding until the pair reunited.

Southern sea otters appear to be incidental visitors to the Harbor. Otters occur in the kelp forests just off the coast, where separate groupings of females and young, territorial males, and non-territorial males breed, forage, and groom, in close proximity to the Harbor. Availability of food resources based both on seasonal variation and seasonal and El Nino-influenced ocean currents,

as well as Spring and Fall algal blooms of a diatomic species of *Pseudo-nitzschia*, causing damoic acid poisoning may have been factors influencing the presence of otters in the Harbor during Fall 2009 surveys. Similar factors are likely to exist in subsequent years, but numbers will likely vary. The Harbor does not provide mating or breeding habitat or other habitat of a similar ecological significance for the southern sea otter.

California Sea Lion. During December 2006 surveys, one California sea lion (*Zalophus californianus californianus*) was observed swimming under the western section of the Murray Street Bridge. During September/October 2009 surveys, California sea lions were observed foraging and hauling-out within the Harbor on 18 of 19 survey visits (the exception was a nighttime survey where visibility was limited). Numbers of California sea lions varied widely throughout the survey period, from 1 animal to 13-15 animals/survey. The larger numbers of animals were observed when "rafts" of sea lions were present foraging throughout the survey area and fish presence was evident (September 30 –October 2). Individuals and occasionally pairs of sea lions were observed hauled-out on docks throughout the survey area, on the fuel dock, and more commonly, on the Vessel Assist dock, and the docks on the western side of the Harbor, from AA to FF (see Table 3). One individual was observed hauled-out on the rubber Kayak docks under the Bridge. Figure 2 provides an aerial view of the survey area, with docks and other haul-out features identified. Some of the animals that were observed hauled-out appeared to be lethargic, remaining on the same or proximate dock for two or more days in a row, sometimes with a cough, or swimming without vigor in the adjacent waters. One juvenile was observed hauled-out on the cement wall on the western border of the Harbor between E and F Docks (see Figure 5). Observations of sea lions were distributed throughout the Survey Area, with a spike of observations in the area near the launch ramp, fuel dock, and Vessel Assist dock (see Figure 4).

California sea lions appear to be incidental visitors to the Harbor, appearing in the greatest numbers when schools of fish are abundant within the Harbor, as evidenced by jumping fish and large congregations of feeding birds and "rafts" of sea lions. Sick and weakened sea lions also appear to use the Harbor as a haul-out refuge. Young of the year sea lions faced an 85% mortality in 2009 due to starvation. This is likely caused by an El Nino-like response in prey resources (G. Oliver, personal communication, 2009). While juvenile rock fish were abundant, anchovies were essentially absent, and while sardines were abundant, juvenile sardines were scarce (G. Oliver, personal communication, 2009; K. Carney, personal communication, 2009). Rock fish and adult sardines provide an adequate prey base for healthy adult sea lions, but may be too fast for juveniles or weakened adults to catch. In addition, more varied and scarce prey resources may require greater traveling distances and deeper diving for successful hunting, placing too great a metabolic demand on young of the year or weakened sea lions (M. Weise, personal communication, 2009; G. Oliver, personal communication, 2009). Spring and Fall algal blooms causing damoic acid poisoning in sea lions may have also been a factor in the presence of hauled-out sea lions in the Harbor (N. Crane, personal communication, 2009). Similar influences will affect the presence of sea lions in the Harbor in subsequent years, but numbers will likely vary. The Harbor does not provide mating or breeding habitat or other habitat of a similar ecological significance for the California sea lion.

Table 2 Estimated Numbers of Marine Mammals in the Murray Street Bridge Seismic Retrofit Survey Area[1] during 2009 Surveys

		Work Area[2]				Upper Harbor[3]				Lower Harbor[4]				Total in Survey Area			
		CASL	HASE	SEOT	Unk[5]	CASL	HASE	SEOT	Unk[5]	CASL	HASE	SEOT	Unk[5]	CASL	HASE	SEOT	Unk[5]
Date	Time																
17-Sep	Morning		3							1				1	3		
17-Sep	Midday						1			1	1			1	2		
17-Sep	Evening									1	1	1		1	1	1	
17-Sep	Night											2				2	
20-Sep	Evening									1				1			
20-Sep	Night	1								3	3			4	3		
21-Sep	Morning				1					1	4	1		1	4	1	1
21-Sep	Midday		1							2	1			2	2		
22-Sep	Night		1							2	2			2	3		
23-Sep	Morning		2							4		1		4	2	1	
23-Sep	Midday		1							2		1		2	1	1	
29-Sep	Night	1	2		2				1					1	2		3
30-Sep	Midday	6	8							9*	6*			9 to 15	8 to 11		
1-Oct	Morning		6 to 9							10	4*			10	6 to 11		
2-Oct	Morning	8	2							13*	4*			13 to 15[6]	4 to 6		
6-Oct	Midday	1	2				1			3	1			4	3		
7-Oct	Morning	1	3			4	1*			2	6			7	9 to 10		
17-Oct	Midday		3				6			1	1 to 2			1	10 to 11		
21-Oct	Midday	1	2				1							1	3		

Notes: CASL – California Sea Lion; HASE – Eastern Pacific Harbor Seal; SEOT – Southern Sea Otter

1. Survey Area = Harbor Launch Area to 500 ft north of the Area of Impact ; 17-Oct midday survey included entire Upper Harbor ≈ 2300 ft north of the Murray St Bridge

2. Work Area = Immediate Area around Murray St Bridge

3. Upper Harbor = Work Area to 500 north of Work Area

4. Lower Harbor = Work Area to Harbor Launch

5. Unknown Marine Mammal due to Darkness

6. "Raft" of 7 CASL foraging throughout the survey area

* Some individuals may have already been counted in other locations

Table 3 Numbers of Animals Hauled Out and Haul-Out Locations within Murray Street Bridge Retrofit Survey Area* during 2009 Surveys

		CASL		HASE	
Date	Time	# of animals-dock	Notes	# of animals-dock	Notes
17-Sep	Morning			3-FF	2 flushed into water when I came within ≈ 30 ft[1]
17-Sep	Midday				
17-Sep	Evening				
17-Sep	Night				
20-Sep	Evening	1-AA			
20-Sep	Night	1-AA, 1-F	same CASL as evening survey still present on AA Dock, large bull CASL with white topknot on D Dock, coughing[2]		
21-Sep	Morning	1-F	large bull CASL with white topknot from 20-Sept still present		
21-Sep	Midday	1-AA, 1-E/F	Sub-adult male or female on end of AA Dock[3]; juvenile on cement wall along harbor[4]		
22-Sep	Night	1-D	large bull CASL with white topknot		
23-Sep	Morning	1-FD, 1-D	CASL on Fuel Dock, flushed when approached by fishermen; large bull CASL with white topknot on D Dock	1-FF, 1-F	HASE on F Dock flushed with arrival of "Velocity" crew
23-Sep	Midday				
29-Sep	Night				
30-Sep	Midday				
1-Oct	Morning	1-AA	sub-adult male or female CASL on end of AA Dock	2-FF	2 HASE on F Dock, growling at HASE in water
2-Oct	Morning	1-AA	sub-adult male or female CASL on end of AA Dock	2-FF, 1-F	HASEs on FF flushed when I approached
6-Oct	Midday	1-AA	sub-adult male or female CASL on end of AA Dock[6]		
7-Oct	Morning			3-FF, 6-F	2 of 3 HASE on FF Dock flushed with arrival of kayakers
17-Oct	Midday				
21-Oct	Midday	1-FF	large bull CASL on rubber docks by UCSC Kayaks[7]		

Notes: CASL – California Sea Lion; HASE – Eastern Pacific Harbor Seal; *Survey Area = Harbor Launch Ramp Area (including Fuel Dock and Vessel Assist Dock) to 500 ft upstream of the Area of Impact

1. See Figure 5a
2. See Figure 5b
3. See Figure 5c
4. See Figure 5d, e
5. See Figure 5f
6. See Figure 5g
7. See Figure 5h

FIGURE 4: DISTRIBUTION OF OBSERVED MARINE MAMMALS

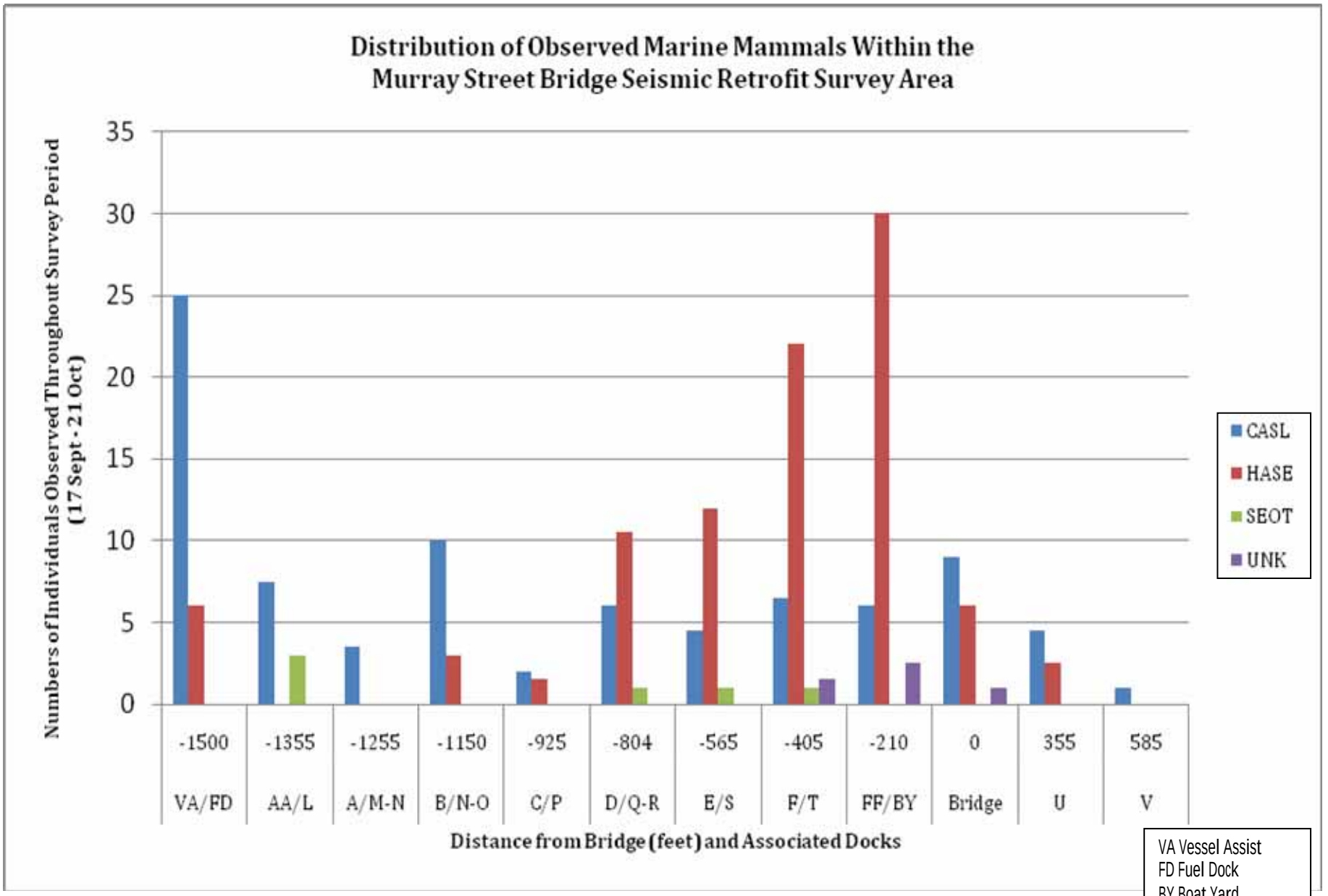
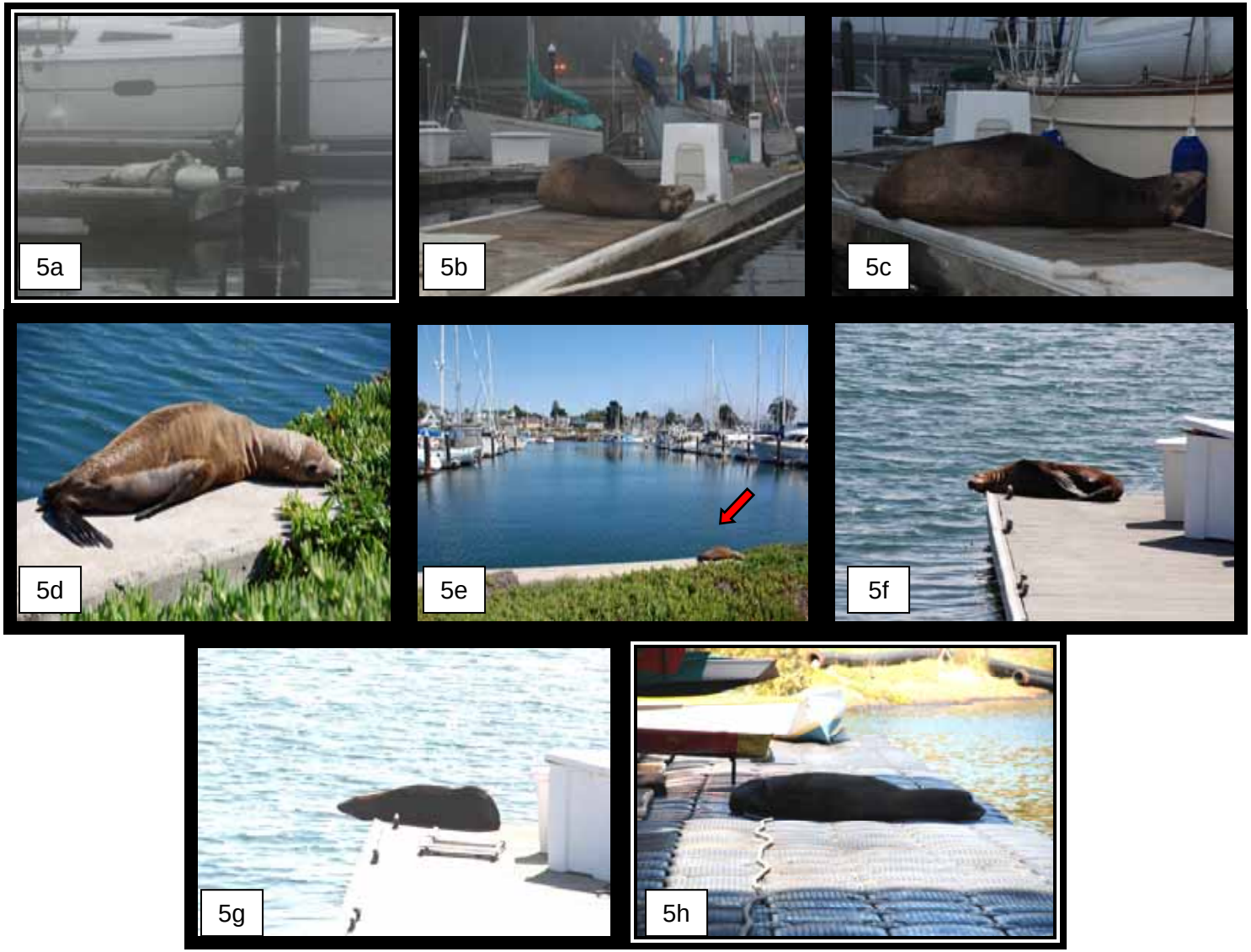


FIGURE 5: PHOTOGRAPHS OF HAULED-OUT MARINE MAMMALS DURING FALL 2009 SURVEYS OF THE MURRAY STREET BRIDGE SEISMIC RETROFIT SURVEY AREA.



Eastern Pacific Harbor Seal. During December 2006 surveys, six Eastern Pacific harbor seals were observed hauled-out on dock FF at night. During Fall 2009 surveys, harbor seals were observed foraging and telescoping on 18 out of 19 surveys. Numbers of observed harbor seals varied widely from 1 to 11 animals. Harbor Seals were only observed hauled-out on F and FF Docks, only during early morning surveys, and when biologists arrived prior to the onset of nearby early morning Harbor activities, such as the arrival of kayakers at FF Dock and "Velocity" Crew at F Dock. With any proximate activity, including the quiet approach of EcoSystems West biologists within approximately 30 feet (close enough to count the animals in the darkness), harbor seals flushed from their haul-out locations into the water.

Observations of harbor seals were concentrated in two locations: to a lesser degree in the area around the launch ramp, fuel dock and Vessel Assist dock; and primarily in the area around Docks F and FF and Dock S, the Live Bait dock, where harbor seals were frequently observed telescoping just off Dock S. The Live Bait dock clerk, Kevin Carney, and well as Port District staff report that five or six of the harbor seals appear to be residential, hauling-out, foraging, and telescoping in the area of Docks FF through S throughout the year (K. Carney, personal communication, 2009; B. Foss, personal communication, 2009).

On only one survey date did we survey the entire Upper Harbor, upstream (north) of the Bridge. This survey was conducted in an effort to assess potential use of the Upper Harbor during midday. Six harbor seals were observed foraging in the Upper Harbor.

Harbor seals are residential within the Harbor, using Docks F and FF as a primary haul-out and the surrounding area as foraging habitat. The Harbor does not provide breeding or molting habitat. Nearby known breeding and molting locations include Point Lobos, Elkhorn Slough (NOAA 2007), and Lover's Point State Marine Reserve (SIMON 2008). The numbers of harbor seals occupying the Harbor are likely to be highest during late summer, fall and winter, outside of breeding (March - May) and molting (June - July) seasons. Individuals that are not sexually reproductive may remain at the Harbor later into the spring, until molting season.

The harbor seals only use Docks F and FF as haul-out sites at night, when disturbances in the Harbor are at a minimum. The animals flush with any disturbance in the early morning. The total number of hours of haul-out time/day for harbor seals outside of breeding and molting season averages seven hours. It is unknown if the harbor seals occupying the Harbor use the site exclusively as their haul-out during the fall and winter or if they use other nearby haul-outs in conjunction with the Harbor. Use of multiple haul-out sites by harbor seals varies, as does distance travelled between multiple haul-out sites and for foraging. In one study in Humboldt and Del Norte Counties, approximately half of the harbor seals tagged used one to two haul-out sites, and half used three or more, traveling an average distance of 28 km between sites. Males travelled further and sub-adult females travelled slightly further than sexually reproductive females (Pecharich, A.G. and P.D. Goley 2003). In a monitoring study of harbor seals for the Richmond San Rafael Bridge, 65% used more than one haul-out site, and when seals used Castle Rock as their primary haul-out, mean in-water distances from the haul-out site for most seals ≤ 5 km (i.e. foraging areas were located close to the primary haul-out site) (Green, D. et al. 2006). In an unpublished study of harbor seal prey base, harbor seals using the San Lorenzo River in Santa

Cruz were found to use the river as their haul-out exclusively, foraging in the ocean and returning during the night when disturbances were at a minimum (Weise, M. personal communication, 2009). Nearby known haul-outs for the eastern Pacific harbor seal include Pleasure Point in Live Oak; the Cement Boat at Seacliff State Beach in Aptos; Table Rock, off Wilder State Park; as well as numerous other sites along the north coast from Wilder State Park to Ano Nuevo State Park (NOAA 2007).

5. Type of Incidental Taking

The potential for incidental take is to eastern Pacific harbor seals, California sea lions, and southern sea otter via potential incidental harassment occurring near the Murray Street Bridge. The method of take is incidental harassment from disturbance associated with construction activities, personnel and equipment, and noise, deterring regular foraging and haul-out activities as well as from temporary removal of primary haul-out sites (Dock FF) for harbors seals. In addition, animals present in the Upper Harbor may be temporarily restricted (until the end of daily construction activities) from moving through the Work Area under the bridge to access the Harbor exit and other areas for foraging or hauling out.

6. Number of Marine Mammals Potentially Taken and Frequency of Take

Incidental harassment of marine mammals during the Murray Street Bridge Retrofit Project may occur to all three marine mammal species (southern sea otter, California sea lion, and eastern Pacific harbor seal) present in the Area of Impact and vicinity. Avoidance and minimization measures will be implemented to reduce the potential for harassment to the maximum extent possible, as detailed in the Mitigation Measure section below.

Estimates of numbers of animals and potential incidents of harassment are based on 2009 Marine Mammal Surveys. Numbers of residential eastern Pacific harbor seals are expected to be at a maximum during the season in which surveys were conducted (outside of breeding and molting seasons). Because pile driving (in-water and on-land) has not been scheduled in detail, estimates are based on the maximum number of days that pile driving could potentially affect marine mammals (installation of 16 permanent in-water piles and 8 on-land piles; installation of 120 temporary piles to support a construction trestle, if used; and 35 boat berth piles). Further, estimates are based on the assumption that potential incidents of harassment may occur both in the morning, when pile-driving activities begin for the day, and in the afternoon, when pile-driving activities resume after the lunch break. In addition, we estimated a one-time harassment of harbor seals when Dock FF is temporarily removed.

Table 4. Estimated Potential Harassment of Marine Mammals During Murray Street Bridge Seismic Retrofit Construction Activities

	Average # of Animals/Day	Maximum # of Animals/Day	Estimated Incidents of Harassment/ Animal/Day	Estimated # of Days of Potential Harassment
Southern sea otter	0.3	2	2	86
California sea lion	4	15	2	86
Eastern Pacific harbor seal	4	11	1 to 2	86

7. Anticipated Impact of the Activity on Marine Mammals

The waters and haul-out features within the Harbor do not provide rookery, mating, breeding, molting, or other habitat of a similar ecological significance for sea otters, California sea lion or Pacific harbor seal. Nevertheless, construction activities may impact marine mammals using the Harbor for foraging and haul-out activities.

Pile-driving activities within Harbor waters may deter otters from regular foraging in the project area. Disruption of movement may be considered temporary harassment and a direct project impact. Pile-driving activities within Harbor waters may deter sea lions from foraging or hauling-out in the project area. Disruption of movement may be considered temporary harassment and a direct project impact. No alterations to sea lion habitat are anticipated as a result of the project. No other direct or indirect impacts are anticipated.

Pile-driving activities will affect harbor seals congregating and foraging around Dock S, immediately downstream of the Work Area, as well as harbor seals using the nighttime haul-outs (Dock F and FF) immediately adjacent to the Bridge. Dock FF is slated to be removed temporarily for the duration of construction and a temporary dock FF--with fewer berths—will be constructed at the southern end of the current FF dock immediately adjacent to the work area. Pile driving, other in-water construction activities, and construction activities with a higher noise level than normal Harbor activities may deter harbor seals from regular foraging in the project area. Disruption of regular haul-out behavior and movement and foraging patterns may be considered temporary harassment and a direct project impact.

In addition, animals foraging in the Upper Harbor may be impacted by construction activities. During EcoSystems West Fall 2009 surveys Harbor seals were observed regularly in the Upper Harbor, while greater numbers of California sea lions were observed sporadically, largely depending on available prey resources. No southern sea otters were observed in the Upper Harbor, although an individual was observed immediately under the Murray Street Bridge. Marine mammals may travel into the Upper Harbor in the morning before construction begins for the day or during a lunch break, but one navigable channel will always be open for boats and

passage of animals. In addition, these animals may be likely to approach the work area and noise levels that may cause harassment or injury.

With implementation of avoidance and minimization efforts, potential effects will be minimized; however, temporary harassment may occur. With implementation of the proposed work restrictions, monitoring and other mitigation measures specified in the following section, disturbance from project-related construction activities is expected to have only a short-term impact. No long-term avoidance or permanent abandonment of work sites or nearby areas is expected. A NMFS Incidental Harassment Authorization will be required for all three species. A USFWS Biological Opinion will be required for the southern sea otter.

8. Anticipated Impact of the Activity on Availability of Marine Mammals for Subsistence Uses

Not applicable.

9. Anticipated Impact on the Habitat of Marine Mammals & Likelihood of Restoration

The proposed activities are not expected to have any long-term detrimental impact on the habitat of harbor seals, California sea lions or sea otters. Construction-related effects will be temporary and minimized with implementation of the proposed avoidance/minimization and mitigation measures. No permanent removal of habitat will occur. The project includes installation of temporary boat docks during construction and replacement of boat docks temporarily removed for construction upon completion of the bridge retrofit.

10. Anticipated Impact of Habitat Loss or Modification on Marine Mammal Population

There is no anticipated impact of habitat loss or modification of harbor seal, California sea lion or southern sea otter populations as a result of the Murray Street Bridge Seismic Retrofit Project.

11. Availability and Feasibility of Measures to Minimize Impacts

Avoidance/minimization and other mitigation measures will be implemented to avoid or minimize the potential construction-related effects to marine mammals at or near the Murray Street Bridge Seismic Retrofit site. These measures are outlined in the last section of this report, and generally include:

- Limitation on timing of pile driving;
- Pre-construction monitoring; and
- Establishment of a buffer and monitoring of noise levels.

12. Measures to Minimize Impacts on the Availability of Marine Mammals for Subsistence Uses

Not applicable.

13. Suggested Means of Monitoring and Reporting

To assess the level of project-specific impacts(s), the City will implement the following measures as a component of the Marine Mammal Mitigation Plan:

2. Prior to initiation of in-water construction, a qualified biological monitor, approved by the Caltrans and U.S. Fish and Wildlife Service, will conduct monitoring of marine mammals to update existing information on the animals' occurrence in and near the project area, their movement patterns, and their use of any haul-out sites. This preconstruction monitoring will take place at least five days prior to the start of in-water construction and will cover a period of at least one week (with at least 5 days of actual observation over a period of 4 hours each day), 2 hours in the morning at the time that construction activities would begin and 2 hours at midday, when construction activities would resume after a lunch break.

4. The qualified biological monitor will be present during in-water construction activities to search for target marine mammal species and halt project activities that could result in injury or mortality to these species. Each day, before pile driving (or other loud in-water construction activity) begins, the monitor will survey the buffer zone for marine mammals. The monitor will also scan for target species throughout the project vicinity, i.e., the areas adjacent to the project site and buffer zone.

11. The biological monitor will keep a record of all observations of the target species. The information on each observation will include: a) species identification and approximate number of animals observed; b)age and sex class of each animal (if possible); c) activity and direction of movement; d) ongoing project activities at the time of observation; e) responses of target species to project activities; f) any unusual behavior or circumstances observed (project- or non-project related); and g) location, date and time of each observation. Summary monitoring reports will be submitted to Caltrans, who will forward reports to NMFS and USFWS by December 31 of each year that in-water construction activities take place.

12. In the event that the monitor determines that a marine mammal has been injured by project activities, all work shall cease and Caltrans shall be notified. Caltrans will consult with NMFS and/or USFWS to determine if additional measures are necessary. Work may resume upon notification by Caltrans.

14. Post-construction monitoring will be conducted to determine if harbor seals resume their use of Dock F and FF as primary haul-out sites. NMFS may require additional project conditions, to be applied depending on the outcome of post-construction monitoring.

14. Suggested Means of Encouraging Research

All marine mammal monitoring data collected during the pre-construction and in-construction phases of the project will be submitted to Caltrans for submittal to NMFS. This information will also be made by the City available to the Santa Cruz Port District, other marine mammal researchers (i.e., at UCSC, Moss Landing Marine Lab), other interested agencies and the general public.

MARINE MAMMAL MITIGATION MEASURES

The following mitigation measures will be implemented to avoid or minimize potential project-related effects to southern sea otters, eastern Pacific harbor seals, and California sea lions. The term "target species" will be used below when referring to all these species collectively. Caltrans will initiate consultation with USFWS regarding potential harassment of southern sea otters during in-water construction activities to determine the need for additional project conditions. Caltrans will submit an application for an Incidental Harassment Authorization to NMFS for potential harassment of southern sea otters, eastern Pacific harbor seals and California sea lions during in-water construction activities.

1. In-water pile-driving activities in Harbor waters will be limited to the period of July 1 to mid-November, unless otherwise permitted by the National Marine Fisheries Service (NMFS).

2. Prior to initiation of in-water construction, a qualified biological monitor, approved by the National Marine Fisheries Service, will conduct monitoring of marine mammals to update existing information on the animals' occurrence in and near the project area, their movement patterns, and their use of any haul-out sites. This preconstruction monitoring will take place at least five days prior to the start of in-water construction and will cover a period of at least one week (with at least 5 days of actual observation over a period of 4 hours each day), 2 hours in the morning at the time that construction activities would begin and 2 hours at midday, when construction activities would resume after a lunch break.

3. All known and potential haul-out sites that occur in the construction work area shall be removed, preferably to a near-by location outside of the work area prior to construction. These sites could include floating docks (i.e. Dock FF) rubber docks, or boats, such as those used by UCSC.

4. Prior to in-water construction, the approved monitor will conduct a workers training to instruct construction crews regarding the status and sensitivity of the target species in the area and the actions to be taken to avoid or minimize impacts in the event of a target species entering the in-water work area.

5. The qualified biological monitor will be present during in-water construction activities to search for target marine mammal species and halt project activities that could result in injury or mortality to these species [an estimated 8 hour/day (or for the duration of in-water construction activities each day) during the estimated 10 months of in-water activities plus an additional 16 days of on-land pile driving]. Each day, before pile driving (or other loud in-water construction activity) begins, the monitor will survey the buffer zone for marine mammals. The monitor will also scan for target species throughout the project vicinity, i.e., the areas adjacent to the project site and buffer zone.

6. The commencement of pile driving activities will be delayed if marine mammals are present within a 500-foot radius of the work area. This 500-foot radius is based on pile-driving activities for similar projects (Sandholt Bridge) and on the feasibility of monitoring the area for animals entering the Harbor from the open waters of the Monterey Bay. The buffer radius may be reduced or increased based on a measurement of the distance the 160 db pressure travels in the underwater harbor waters and/or through the air. This radius will be visibly flagged on the banks of the harbor during these activities. Each day prior to the start of pile-driving, the approved monitor will survey the buffer zone for marine mammals. If a marine mammal is detected, pile driving will be delayed until the marine mammal(s) has moved beyond the buffer zone, verified by visual confirmation or lack of visual sighting within the next 15 minutes of the last sighting, to assume that the animal has moved beyond the buffer zone. If the animal should move back into the buffer zone after the commencement of pile-driving, no further work stoppage will be necessary, unless the animal comes within an unsafe distance of the work area that may result in injury to the animal. At this point, work will cease to avoid physical injury to the animal. This distance will be determined by USFWS and/or NMFS. The monitor will record the species, numbers and behaviors of any animal(s) entering the buffer zone after commencement of work and notify Caltrans, NMFS (regarding harbor seals or California sea lions) or USFWS (regarding sea otters) via telephone and in writing within 48 hours. The monitor will also submit a written description of the event to Caltrans (and in turn NMFS or USFWS, as applicable) within 7 days.

7. The buffer radius may be reduced or increased based on a measurement of the distance the 160 db pressure travels in the underwater harbor waters and/or through the air. This would be determined using approved in-water and in-air acoustic monitoring devices. The City of Santa Cruz shall notify Caltrans in writing of the proposed change in buffer zone area, who in turn will notify NMFS. An approved biological monitor will operate the monitoring devices during pile driving and any other loud construction activities, such as bridge demolition or use of hydraulic tools. The devices, placed at the

8. No disturbance or noise will be used to encourage the movement of the target species from the work area. The City will contact USFWS and NMFS to determine the best approach for exclusion of the target species from the in-water work area.

9. No intentional hazing will be used on eastern Pacific harbor seals, California sea lions, southern sea otters, or other state- or federally-listed threatened or endangered species. The City will contact the Caltrans, USFWS and CDFG if sea otters begin to occur in the vicinity of the bridge work, to determine whether any changes to this mitigation plan may be required.

10. Other in-water construction activities, such as the use of heavy equipment to construct bridge abutments (i.e., activities not involving loud, impulsive hammering sounds) will generate noise levels equivalent to that of a diesel truck. For these activities, a 50-foot radius buffer zone will be established. This buffer zone will be clearly marked by highly visible stakes securely placed into the banks. Each day, before construction begins, the monitor will search the 50-foot radius for marine mammals. If a marine mammal is sighted within the buffer zone, the monitor will require the contractor to delay in-water construction activities until the monitor determines that no marine mammals are present within the buffer area.

11. The biological monitor will keep a record of all observations of the target species. The information on each observation will include: a) species identification and approximate number of animals observed; b) age and sex class of each animal (if possible); c) activity and direction of movement; d) ongoing project activities at the time of observation; e) responses of target species to project activities; f) any unusual behavior or circumstances observed (project- or non-project related); and g) location, date and time of each observation. Summary monitoring reports will be submitted to Caltrans, who will forward reports to NMFS and USFWS by December 31 of each year that in-water construction activities take place.

12. In the event that the monitor determines that a marine mammal has been injured by project activities, all work shall cease and Caltrans shall be notified. Caltrans will consult with NMFS and/or USFWS to determine if additional measures are necessary. Work may resume upon notification by Caltrans.

13. All known and potential haul-out sites that were removed from the work area prior to construction will be returned to their approximate location.

14. Post-construction monitoring will be conducted to determine if harbor seals resume their use of Dock F and FF as primary haul-out sites. NMFS may require additional project conditions, to be applied depending on the outcome of post-construction monitoring.

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