Request for Incidental Harassment Authorization

Parsons Slough Project
Monterey County, California

Project Applicant:

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Prepared For:

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1. Project Description

The California Department of Fish and Game (CDFG) and the Elkhorn Slough National Estuarine Research Reserve (ESNERR) are proposing to construct a partially submerged tidal barrier (sill), similar to an underwater wall, across the mouth of the Parsons Slough Channel, which is located on the southeast side of Elkhorn Slough in Monterey County, California (Figure 1). The sill structure would prevent head cutting (i.e., erosion in a channel caused by an abrupt change in slope) in Elkhorn Slough from migrating upstream into Parsons Slough, would retain sediment that accretes within Parsons Slough, and would reduce the tidal prism of Parsons Slough. This reduction in tidal prism would reduce current velocities between Parsons Slough and the mouth of Elkhorn Slough, thereby reducing tidal scour. The proposed project, which is referred to as the Parsons Slough Project, would also include establishment of artificial reefs to support populations of Olympia oysters (*Ostrea lurida*) in the northeastern portions of the Parsons Slough Complex (Figure 1). The Parsons Slough Project is a stimulus project funded by the National Oceanic and Atmospheric Administration Restoration Center, which is a branch of the National Marine Fisheries Service.

The overall goal of the proposed action is to reduce tidal scour within the Elkhorn Slough action area in general and the Parsons Slough study area in particular. Within the past 60 years, the proportion of salt marsh habitat to mudflat habitat within Elkhorn Slough has reversed as a result of tidal erosion and inundation of interior marsh areas. Currently, there are approximately 800 acres of salt marsh and tidal creeks within Elkhorn Slough, 1,600 acres of mudflat, and 300 acres of tidal channels. Modeling efforts predict that an additional 550 acres of salt marsh would be lost over the next 50 years if tidal erosion in Elkhorn Slough is not addressed. Without intervention, excessive erosion would continue to widen tidal channels and convert salt marsh to mudflat. This would result in a significant loss of habitat function and a decrease in estuarine biodiversity.

The sill structure would be constructed of steel sheet piles and would extend 270 feet across the mouth of the Parsons Slough Channel. A 100 foot wide lower area, located in the center of the structure, would allow water to flow between Parsons Slough and Elkhorn Slough. This portion of the structure would be submerged more than 99 percent of the time. The center of this lower part of the structure would include a notch approximately 25 feet wide, with the top elevation of the sheet pile in this notch at an elevation of -5 feet (all elevations are in North American Vertical Datum of 1988 [NAVD88]). The notch would provide for the passage of water at all tide levels and would facilitate the movement of fish and wildlife into and out of Parsons Slough. The top elevation of the sheet pile in the remaining 75 feet of the central section of the base structure would be -2 feet. The remaining portions of the sheet piles to the left and right of the center portion of the structure would have a top elevation of 9.6 feet.

The sheet pile wall would be supported on two rows of seven end-bearing piles. The end-bearing piles would be driven through the soft soils, into the underlying dense sandy deposits, to an elevation of approximately -90 feet. A rockfill buttress would be placed on both sides of the sheet pile wall, extending from the bottom of the channel to the crest of the sheet piles in the open, center section of the sill at a slope of 2:1 (2 feet wide for every 1 foot high). The rockfill buttress, which would be entirely underwater, would serve several purposes. It would (1) guide fish and marine animals over the sill; (2) prevent vortex flows that might occur at the base of the sheet piles as tidal water flows over the sill and that could potentially trap marine life; (3) protect the channel bed from scour in areas where existing sediments could be easily mobilized; and (4) provide additional lateral support for the sheet pile wall.

Short earthen embankments that wrap around the ends of the sheetpile would be used to attach the sill structure to the railroad embankment. These embankments would provide “closure” between the end of the sheetpile and the UPRR embankment. Because the materials used to construct the earthen embankments would be susceptible to erosion from wave action, a layer of riprap (likely a 0.5-foot thick layer of 6-inch riprap) would be placed at the location where the earthen embankment attaches to the UPRR embankment. An additional 2-foot thick, 10-foot wide apron of riprap would be placed between the rockfill buttress and the embankment (i.e., extending into the channel) where tidal flows are more likely to prevent scour adjacent to the remaining portion of the exposed sheet pile. The riprap apron would also extend to the UPRR bridge abutments to protect the banks between the sill structure and the bridge abutments against scour induced by potential vortices that may form as tides flow from Elkhorn Slough into Parsons Slough.

Project staging would occur at Kirby Park, which is located in the upper portions of Elkhorn Slough, about 2 miles from the proposed sill site (Figure 2). Kirby Park was selected as the staging area for the proposed project because it is accessible both by water and via Elkhorn Road, has a paved parking area and boat ramp that can be used to safely store equipment and access the water, and because it is located on the east side of the Highway 1 bridge. Staging at Kirby Park would require construction of three temporary floating docks as described below.

1. One of the three docks would be either a pile-supported dock outfitted with a crane to load barges, or a dock constructed on temporary rock-fill that would allow front end loaders to transport equipment and material from the staging area directly onto barges. A pile-supported dock would be approximately 40-feet wide by 80-feet long and would consist of “I” beams and crane mats supported on piles installed on a 10 foot by 10 foot grid. Up to 45 piles may be required to support this dock. These piles would be installed with a vibratory hammer. A rock-fill dock would be approximately 40-feet wide by 50-feet long and would require temporary placement of up to 350 CY of rock material, constructed at a gradual slope leading to the adjacent channel. The type of dock constructed would be determined by the construction contractor based on cost and current site conditions.

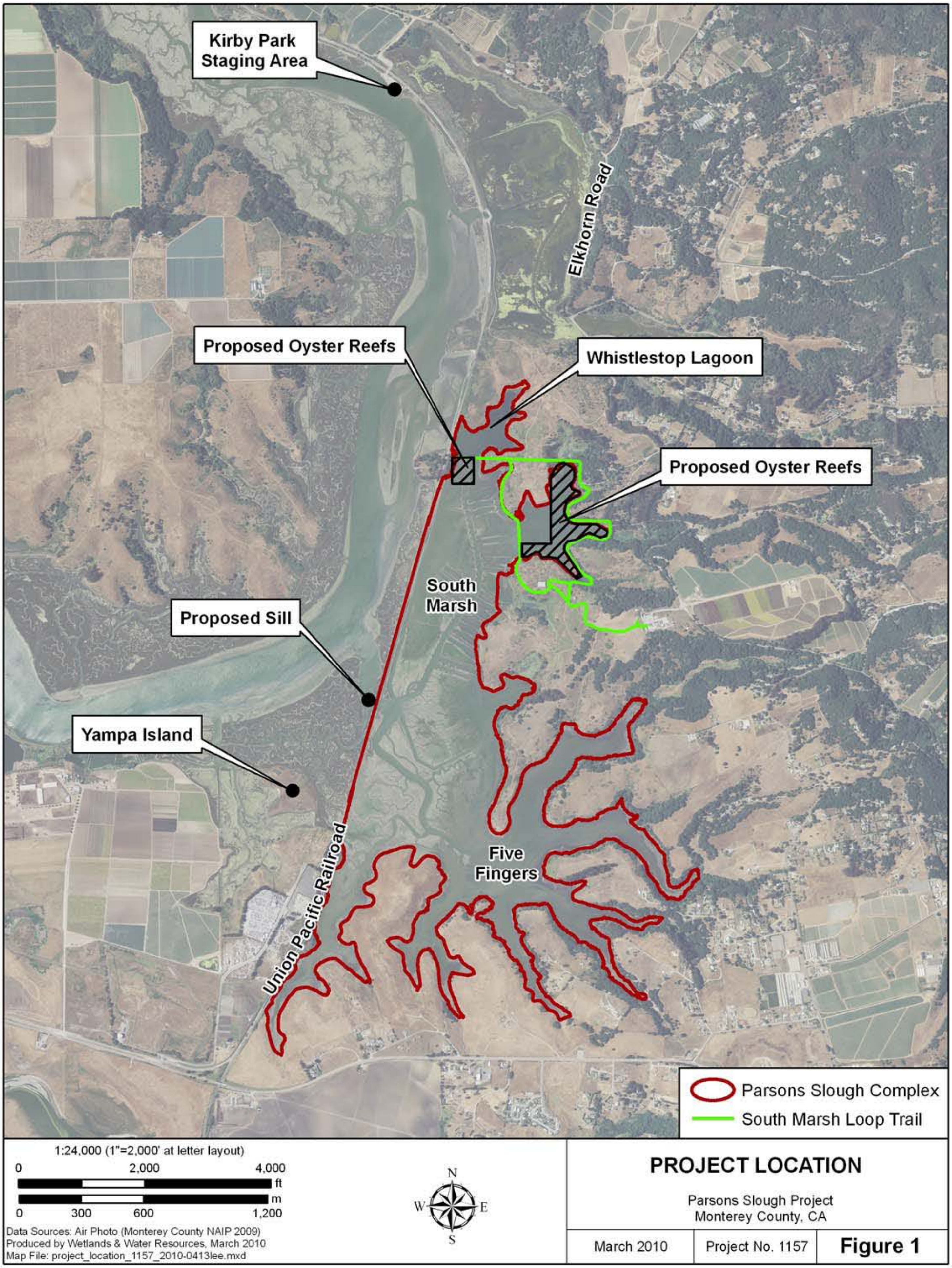
2. Construction of a 10-foot wide by 100-foot long floating dock for tying off push boats necessary for barge movement. This dock would be tied to the existing concrete piles near the existing boat ramp on the south side of Kirby Park.

3. Construction of a 10-foot wide by 40-foot long floating dock, and a 10-foot wide gravel boat ramp, for use by the public during construction activitiy. This temporary dock would be held in place with two end-bearing piles that would be removed when the dock and boat ramp are dissembled. These piles would be installed with a vibratory hammer. The boat ramp and dock would be installed at Kirby Park before access to the existing boat ramp is limited by construction.

A crane or excavator would also be set up to assist in loading material onto barges, and loaders would be used to move materials around the staging area. Other equipment that would be used during construction include push boats, material barges, loading cranes, barge mounted cranes, loaders, and highway dumps.

The final component of the proposed action includes establishment of artificial reefs in the northern portions of Parsons Slough to restore rare populations of Olympia oyster in the action area. Recent monitoring efforts by ESNERR have found that Parsons Slough and the Azevedo wetland complex (about 0.5 miles north of Parsons Slough) currently support some of the densest adult oyster populations on available hard substrates within Elkhorn Slough, and the highest recruitment rates in the estuary. However, total oyster populations in these areas are small because very few hard substrates, which help oysters avoid burial in the mud, are available for oyster recruitment. The proposed Olympia oyster restoration effort would address this limiting factor by creating new hard substrate for the oysters to populate.

Up to ten reefs would be constructed by ESNERR staff and volunteers and placed in the northeastern portion of the Parsons Slough Complex (Figure 1). Each reef would be composed of several modular sections, each of which would be about 5 feet long, 2 feet wide and a half foot tall. As many as 6 modular sections could be assembled together to create a reef up to 30 feet long. The reefs would remain modular and mobile (i.e., modular sections would not be permanently attached to each other) to allow for adjustment of their location and tidal elevation; this would allow ESNERR to optimize oyster recruitment and growth, and to minimize the potential for the reefs to be covered by mud or other non-native fouling species. Reef modules would be constructed of a mix of large native clam shells secured in a matrix of cement made from local estuarine sediment. Clam shells would be harvested from the Elkhorn Slough estuary (primarily the mouth of the estuary when sea otters forage and dispose of clam shells). Prior to placement in the Parsons Slough Complex, each reef would be cured for up to two months to minimize the potential for the cement component to degrade once in the water column. Based on a smaller pilot project completed in 2008 (Wasson pers. comm. 2010), it is anticipated that reefs would be placed between 1 and 2 feet above mean lower low water (MLLW) at up to 10 sites.



Data Sources: Air Photo (Monterey County NAIP 2009)
Produced by Wetlands & Water Resources, March 2010
Map File: project_location_1157_2010-0413lee.mxd

PROJECT LOCATION

Parsons Slough Project
Monterey County, CA

March 2010 | Project No. 1157 | **Figure 1**

2. Dates, Duration and Project Location

It is anticipated that construction would last 11 to 15 weeks beginning around October 1, 2010 and ending in February 2011. Construction would primarily occur during slack tide. This limited in-water construction window would prevent barges from being manipulated by tidal currents, although the construction contractor may operate during other tidal cycles depending on site conditions and the nature of the construction activity. This 11 to 15 week construction period assumes that the construction contractors could work up to 24 hours a day, 6 days a week. Night-time construction activities would typically last no more than 5 hours at a time (duration of slack tide at night) and would occur for approximately 20 non-consecutive nights (estimated number of night-time slack tide events that coincide with proposed construction window).

The proposed sill structure would be located in the vicinity of the Union Pacific Railroad (UPRR) bridge, milepost (MP) 103.27 Coast Subdivision, which is located at the mouth of the Parsons Slough Complex. The existing UPRR bridge is a 165 foot long concrete slab girder bridge that spans the Parsons Slough Channel. The rail line embankment has a crest elevation of about 8 feet in the vicinity of the bridge based on Light Detection and Ranging (LiDAR) data. The Parsons Slough Channel invert ranges between elevation -10 to -14 feet in the area downstream of the UPRR bridge. Tides at the UPRR bridge and within Parsons Slough are approximately the same as that of the ocean, with a mean tide range of 5.6 feet (Moffat & Nichol 2008). The spring tide range is 8.2 feet and the neap tide range is 3.0 feet (Broenkow and Breaker 2005 cited in ESNERR et al. 2007).

The Parsons Slough Complex is dominated by mudflats intersected by subtidal channels. The average land elevation in the Parsons Slough Complex is now approximately 2.4 feet (0.7 meters) below the level that can support tidal marsh vegetation. Apart from constructed marsh islands in the northern part of the study area and a narrow fringe of tidal marsh adjacent to upland areas, the present-day habitat type in the Parsons Slough Complex is predominantly (approximately 88 percent) intertidal mudflats (Moffat & Nichol 2008).

Ambient Sound Levels in the Action Area

Neither above-water nor underwater acoustic monitoring has been conducted within the Parsons Slough action area. Given its location within the Elkhorn Slough National Estuarine Research Reserve, ambient noise levels within the action area are generally low. Land use activities in Elkhorn Slough are generally limited to recreational boating, kayaking, hunting, fishing, bird watching, and hiking. Of note are the approximately 15-20 trains that pass through the project area each day along the UPRR bridge.

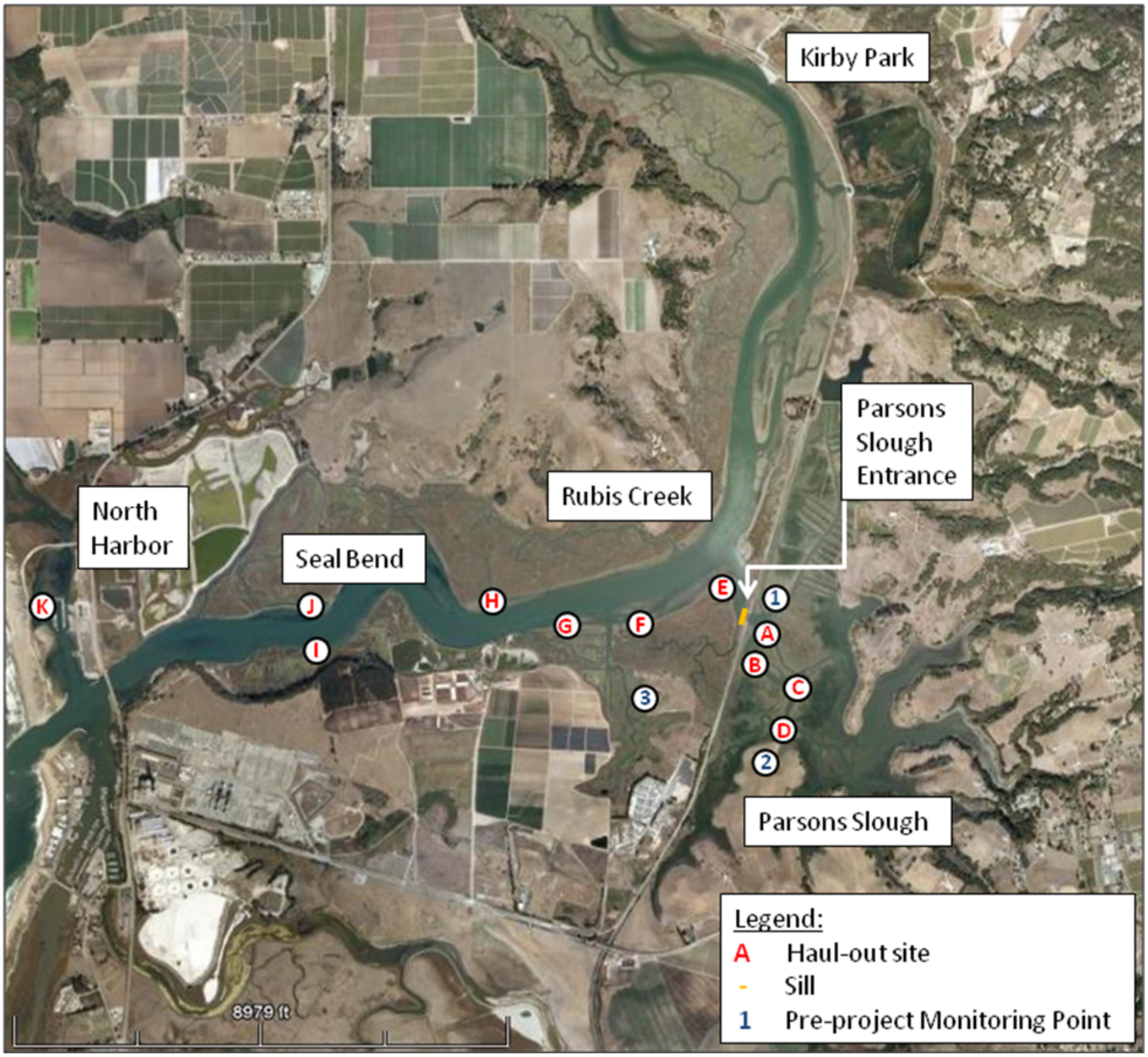
3. Species and Numbers of Marine Mammals Likely to be found within Project Area

Two species of marine mammals occupy the larger project area: southern sea otter (*Enhydra lutris nereis*) and harbor seals (*Phoca vitulina richardsi*). The southern sea otter, federally listed as threatened, is not included in this request because a description of this species and potential project effects are provided in the Biological Assessment for the proposed project. To date, USFWS issued a draft Biological Opinion for the southern sea otter and expects to issue an IHA for this species on August 25, 2010. The harbor seal, a non-listed species, will require consultation with NMFS under the MMPA, and warrant request for an IHA.

Counts of harbor seals in the greater Elkhorn Slough began in 1975 and at that time averaged about 30 seals (Harvey et al. 1995, Oxman 1995). Counts conducted by Osborn (1985) in 1984 averaged 35, and during 1991, maximum counts reported by Oxman (1995) were five times greater. Oxman also reported a 20 percent increase between 1990 and 1991, from 150 to 180 seals. Average counts remained comparable from 1994 through 1997, with peaks coinciding with pupping and molting seasons. A count of 339 seals was reported in 1997 (Jones et al. 2002, Richman 1997). Harvey et al. recently counted 345 seals (J. Harvey,), which amounts to about 530 when applying a correction factor of 1.54 (J. Harvey, pers. comm. 2009). Harbor seal count data as reported are collected from a variety of sources using various methodology. There is no long-term consistent seal count data for Elkhorn Slough. Data sources include former graduate student research, occasional counts by Jim Harvey et al. at Moss Landing Marine Labs, and ESNERR staff observations.

Harbor seals use Elkhorn Slough for hauling out, resting, socializing, foraging, molting and reproduction. The first pup was sighted in Elkhorn Slough in 1989. From 1995 through 1997, there was a significant annual increase in pups, from 14 in 1995 to 29 in 1997 (Richman 1997). Marine mammal research scientists speculate that this increase was due to removal of public restrooms from the Seal Bend area in the early 1990s (Maldini pers. comm.). Some seals may depart during pupping/breeding season, which peaks in May on the central California coast. Seals in Elkhorn Slough likely head 25 kilometers south to Cypress Point, Carmel, or 60 kilometers north to Año Nuevo to pup and breed (Osborn 1992, Oxman 1995). Figure 2 below depicts the current haul-out areas (in red) used by Elkhorn Slough harbor seals (Maldini et al. 2009). Recent observations (McCarthy, pers. comm., July 2010) documented approximately 40-50 seals each at the two haul out sites closest (within 300-400 feet) to the sill site (at mid-day, +2 feet tide).

Figure 2 Map of Areas Used by Harbor Seals for Hauling-out in Elkhorn Slough



(Source: Maldini et al. 2009)

4. Description of Status, Distribution and Seasonal Distribution of the Stocks of Marine Mammals Likely to be Affected

Harbor seals are nonmigratory marine mammals found in subarctic and temperate waters of the North Atlantic and North Pacific Oceans and contiguous seas. Harbor seals are protected under the Marine Mammal Protection Act (MMPA) of 1972, as amended. Harbor seals are not listed as "endangered" or "threatened" under the federal ESA or as "depleted" under the MMPA. There is no designated critical habitat for harbor seals. Prior to state and federal protection, populations of North Pacific harbor seals had been greatly depleted by the end of the 19th century by commercial hunting. During the last half of the twentieth century, and since the MMPA was first passed, the population increased dramatically (Caretta et. al. 2009). Two subspecies of harbor seals exist in the Pacific: *P. v. stejnegeri* in the western North Pacific and *P. v. richardsi* in the eastern North Pacific.

Three stocks of *P. v. richardsi* are recognized along the west coast. These three stocks include California, Oregon and Washington outer coast waters, and inland waters of Washington. Although the need for stock boundaries for management is supported by biological information, the exact placement of a boundary between California and Oregon was largely a political/jurisdictional convenience (Caretta et. al. 2009). The boundaries defining stocks are largely management-based and have little biological significance. This request for IHA addresses proposed project effects on the California stock.

Hanan (1996) conducted a review of harbor seal population dynamics through 1991 and concluded that their status relative to OSP could not be determined with certainty (Hanan 1996). Harbor seals are not considered a "strategic" stock under the MMPA because the population appears to be stabilizing at what may be their carrying capacity and the fishery mortality is declining (Caretta et. al. 2009).

Distribution Trends in Elkhorn Slough

Harbor seals inhabit Elkhorn Slough year-round and occur individually or in groups. They usually occupy areas just beyond the mouth of the Slough in the Moss Landing harbor and in the Salinas River channel south of the Moss Landing bridge, and the lower portion of the Slough extending up to Parsons Slough and Rubis Creek. They are rarely seen in tidally restricted areas.

Haul-outs

Sites used by harbor seals since their establishment in Elkhorn Slough have increased in number and changed in location. Seal Bend was the most frequented haul-out site for more than 60 years prior to the mid-1980s. It is located about 2 km from the Slough mouth, and had two mud terraces rising from the water that seals hauled out on (Vierra, pers. comm., 1977 from Harvey et al. 1995). Between 1984 and 1988, harbor seals abandoned the haul-out site after a nearby dike was breached creating a more isolated haul-out area (Harvey et al. 1995). Norris (1991) noted use of an additional location on a beach in the north harbor. From 1994-1997, Richman (1997) observed regular use of the Rubis Creek area mudflat, and intermittent use of Seal Point (across from Seal Bend). Recently established haul-out sites also exist near the entrance to Parsons Slough (west of the railroad tracks) and inside Parsons Slough (east of the railroad tracks), and seals are regularly observed in tidal creeks within the Parsons Slough complex (Figure 2).

Reproduction

During the pupping season, reproductive females tend to remove themselves from the large group to give birth and then return to the group within a week. The areas mothers and pups can be found have expanded up-slough over time, into various mudflats and in tidal and subtidal creeks, such as Rubis Creek and in the Parsons Slough (Richman 1997) (Figure 2 & 5). More data is needed to better understand how these areas are used.

Foraging Locations

Harbor seal distributions within the estuary reflect foraging locations to some extent. Research by Oxman (1995) and Harvey et al. (1995) comparing catch rates from trawls conducted in the Slough (Orre et al. 2005, Yoklavich et al. 1991) to species detected in seal scat indicates that they primarily feed between Seal Bend and the oceanic nearshore shelf in Monterey Bay. Additionally, Oxman (1995) radio-tagged seals and found that they all spent their nights diving within 0.5 to 7 km of shore, most (88%) 1.25 km south of the Slough entrance, with the others (12%) either 4 km north at the Pajaro Rivermouth, or 7.25 km north at Sunset Beach, Santa Cruz. In conclusion, harbor seals may conduct limited foraging near the Slough mouth, but most is done in the nearshore oceanic, which may explain why haul-out sites are located in the lower half of the estuary.

Tidal Barriers

Harbor seals are concentrated in the lower reaches of the Slough, up to the Parsons complex and Rubis Creek areas, all open to full tidal exchange. They are generally not observed behind water control structures, as those areas are largely inaccessible or unsuitable. Removal of tidal barriers, or breaching of a levee, can lead to expansion into areas with tidal exchange and can lead to creation of new haul-out habitat. Additionally, modification of the slope and geography of mudflats over time may contribute to shifts in haul-out locations.

Human Disturbance

The expansion of the harbor seals into more areas of Elkhorn Slough may be partially related to decreased disturbance by humans. Closure of a trail and restroom near Seal Bend has resulted in less human presence in this area and a portion of the lower slough was recently closed to fishing. The increase in kayak traffic in the last ten years may also have caused subtle shifts over time.

5. Type of Incidental Taking Authorization Requested

The purpose of this document is to address the requirements of the MMPA as it relates to harbor seals in the vicinity of the Parsons Slough Project. Activities addressed in this request for an Incidental Harassment Authorization (IHA) include actions that may temporarily result in a certain level of incidental take corresponding to non-lethal take described as Level B harassment under the MMPA.

6. Number of Marine Mammals Potentially Taken and Frequency

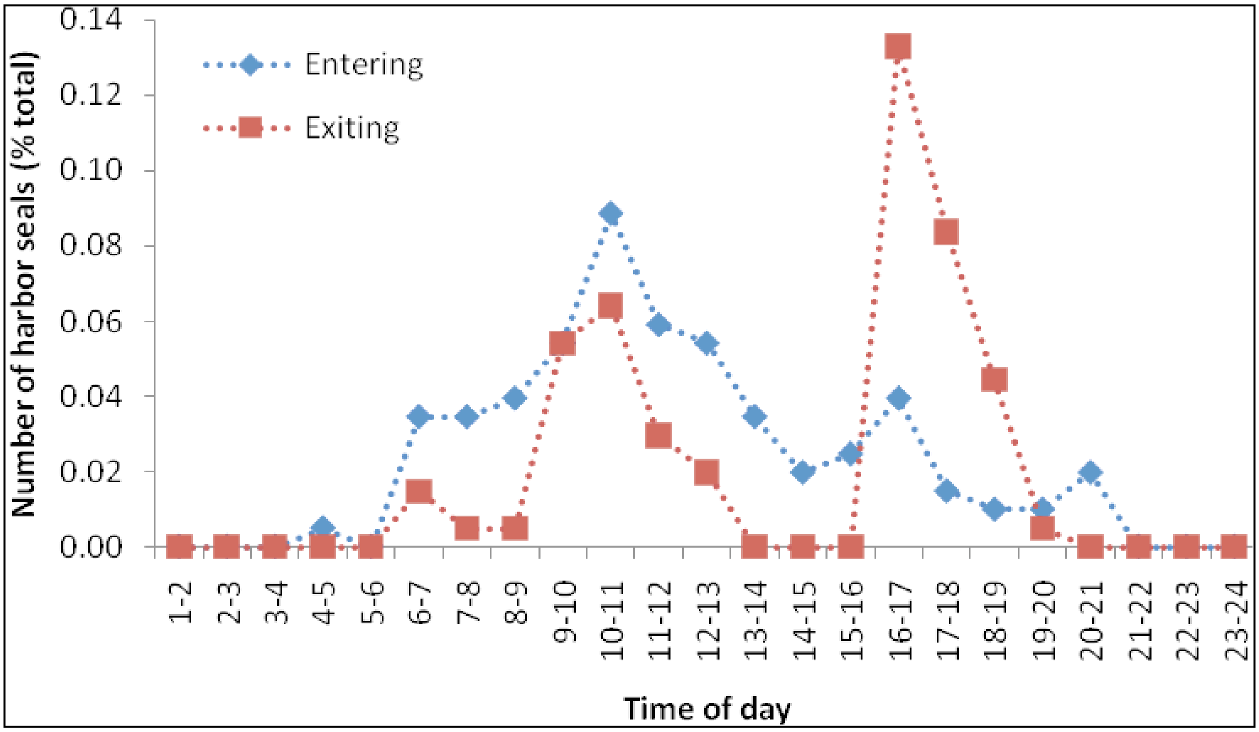
There are an estimated 100 harbor seals using the Parsons Slough Complex on a daily basis (Maldini et al. 2009). Harbor seals in Parsons Slough use exposed mudflats during low tide to haul out. During low tide approximately 60 percent of Parsons Slough consists of mudflats during low tide.

There are five main haul-out areas for harbor seals within the Parsons Slough Complex and one haul-out site at the entrance just south and west of the UPRR bridge (Maldini et al. 2009). Consistent with harbor seal behavior, abundance on the mudflats is highest during the day and drops after sunset. Activity at night is unknown, but Okeanis researchers speculate that harbor seals leave Parsons Slough at night to forage in the main channel or Monterey Bay (Maldini et al. 2009). The graph below (Figure 3) was created by Okeanis researchers and displays the number of harbor seals entering and exiting Parsons Slough via the Parsons Slough Channel by time of day during the month of October in 2009.

Exit times peaked at 5:00 PM (13 individuals) and continued to be high until 8:00 PM. Another, smaller peak of six individuals occurs occurred around 10:00 AM. Entrance time showed less fluctuation throughout the day light hours with a peak between 10:00 AM and 11:00 AM. Based on this data, it is estimated that during construction of the project no more than 100, non-breeding, harbor seals could be incidentally harassed during low tide, daytime conditions.

During high tide harbor seals are absent from Parsons Slough (Maldini et al. 2009); however, many of the approximately 500 harbor seals occupying the entire Elkhorn Slough estuary could be subjected to incidental harassment as a result of construction noise. Specifically, the underwater disturbance zone calculated in Table 4 for Level B Harassment during vibratory hammering of sheet piles is 7,400-feet – a distance that covers half the length of Elkhorn Slough. Based on this disturbance zone distance, noise from vibratory hammering could potentially harass all harbor seals present within the estuary. This IHA requests permission to temporarily harass up to 500 individual harbor seals. This is a conservative estimate, as not all the seals in Elkhorn Slough are likely to be east of Seal Bend at the same time and not all seals would be affected by noise from construction – especially given the terrain of Elkhorn Slough, where noise attenuates quickly due to shallow water, tidal influence and sinewy channels.

Figure 3 Graph Depicting Harbor Seal Movement through the Parson Slough Channel at the UPRR Bridge



(Source: Maldini et al. 2009)

7. Anticipated Impact of the Activity on Harbor Seal Stock

Construction-Related Effects

Construction Noise and Disturbance: Project effects during construction would cause a temporary disturbance (non-lethal harassment) to approximately 500 individual harbor seals that occupy haul out in Parsons Slough and those seals that occupy portions of Elkhorn Slough that are within 7,400 feet of the construction site. The approximately 100 harbor seals in Parsons Slough may be temporarily disturbed or harassed by construction noise, human presence and artificial lighting. Seals in the larger Elkhorn Slough (from Parsons west to Seal Bend) may be slightly harassed by underwater construction noise (see Table 4 of this document for disturbance zone distances).

In general, pinnipeds are highly sensitive to acoustic disturbance (USFWS 2008). In Elkhorn Slough, Osborn (1985) documented a critical zone of less than 100 meters for harassment by humans. Biologists agree that the estimated 12 – 15 weeks required for construction may result in temporary abandonment of the haul out sites near the UPRR bridge and within Parsons Slough. Of note, in October 2002, UPRR replaced the existing wooden pile trestle bridge spanning the Parsons Slough Channel with a 165-foot slab girder bridge. Construction of the bridge ended in mid-January 2003 and involved pylon driving equipment mounted on a barge platform. Construction also involved artificial lighting for nighttime activities (MACTEC Engineering and Consulting 2003). Biological monitors for that project reported incidental sightings of harbor seals. Harbor seals were present during construction and came and went from the site without any visible signs of stress or undue harassment (MACTEC Engineering and Consulting 2003).

Haul out site abandonment is not considered an adverse effect during the non-breeding season because the larger action area provides an abundance of haul-out habitat for harbor seals. Abandonment of Parsons Slough during the pupping season would be considered an adverse effect and could result in reduced pup survival due to mother/pup separation and interrupted suckling bouts. Implementation of the project minimization measures would avoid this potentially adverse effect by restricting construction to the non-breeding season for harbor seals.

The short-term displacement of resting harbor seals that is likely to occur as a result of proposed project noise and is not anticipated to affect the overall fitness of any individual animal because there is an abundance of suitable resting habitat available in the greater Elkhorn Slough estuary. Furthermore, regional marine mammal experts conclude that compared to other areas in larger the action area (e.g. Seal Bend) the Parsons Slough Complex is not considered important habitat for this species (Harvey pers. comm.).

8. Anticipated Impact of the Activity on the Availability of the Stock of Marine Mammals to Subsistence Use

Not Applicable.

9. Anticipated Impact on Habitat

Barrier to Movement

It is unlikely that the proposed action would result in long-term adverse effects on movement of harbor seals because the sill structure would allow for continued access to Parsons Slough by aquatic species, including harbor seals. The sill structure has been designed to minimize interference with the movement of marine mammals and special-status fish into and out of Parsons Slough. A 25-foot long section of the sill is completely underwater with a minimum of 5-feet of water above it at all times. On either side of this 25-foot section would be two 37-foot long sections that are under 2 feet of water. The remaining 170-feet of the sill structure is above water. In addition, the sill design includes a rockfill buttress on both sides of the sheet pile wall extending from the top of the structure to the channel invert with a slope of 2:1. The rockfill buttress would guide benthic fish and marine mammals moving over the sill through this notch and back down to the channel invert. The buttress would also function to minimize plunging flows across the central bay that could trap aquatic species at the base of the sheet pile as tidal water flows over the sill. Figures 4 and 5 in this document depict aerial and sill level views of the project site pre and post construction.

Of note, the sill was designed to accommodate a .5 meter rise in sea level - however, over time sea level rise would make the sill less effective while also reduce potential impacts of the structure.

Increased Velocities

The current velocity of water flowing under the UPRR bridge is 5.6 feet per second during ebbing tides and 4.9 cubic feet per second (CFS) during flooding tides (Moffat & Nichol 2008). The sill would result in turbulence and increased current velocities in the vicinity of the structure. The greatest turbulence would occur during spring tides near low tide.

Modeling results indicate that peak velocities at the sill during spring ebb tide would not exceed 10.7 feet per second (URS pers. comm. 2010). This estimated velocity is much slower than average wave velocities in Monterey Bay, which harbor seals easily navigate on a daily basis. Figure 6a illustrates the frequency (as a percentage) of anticipated velocities over the sill, both at a -2 foot and -5 foot elevation (the elevations of the center 100-feet of the sill), independent of the tidal cycle (i.e. does not distinguish between ebb and flood flows). At -5 feet elevation, where velocities are anticipated to be higher, velocities into or out of Parsons Slough would be less than 5.6 feet per second approximately 94 percent of the time; similarly, velocities would reach a maximum of 10.7 feet per second less than 1 percent of the time. Figure 6b illustrates the frequency of anticipated velocities over the sill on both ebb and flood tides. At -5 feet elevation, velocities on an ebb tide would be less than 5.6 feet per second about 90 percent of the time; velocities would never exceed about 4.5 feet per second on a flood tide. As noted above, velocities would reach a maximum of 10.7 feet per second less than 1 percent of the time on an ebb tide and would not exceed that velocity on a flood tide.

Sill placement would not alter velocities during slack tide; therefore conditions at optimal movement times would not change from the baseline conditions (Maldini pers. comm.). During times of high velocity the seals would likely avoid crossing the sill structure. The exception to this may be inexperienced mothers with young pups that could get swept into Parsons Slough. This would not injure the pups, but may mean that they stay in Parsons longer than they would otherwise (Harvey pers. comm.).

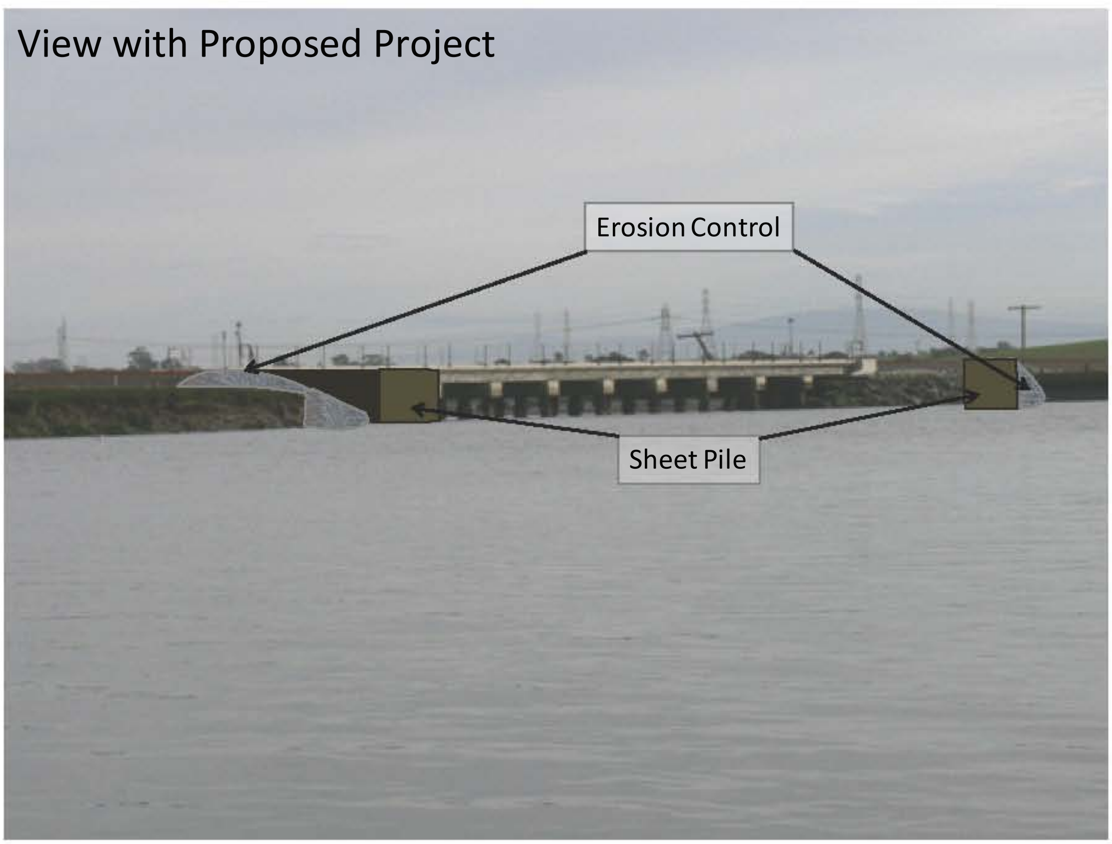
Representative of visible portion of the sill structure, as
seen from an aerial perspective, at mean low tide. Approximately
170 feet of sheetpile and erosion protection represented.

Graphics File: Fig04-air-view-sill-config_2010-0611lee.ai

AERIAL VIEW:
PROPOSED SILL CONFIGURATION

Parsons Sill Project

June 2010	Project No. 1157	Figure 4



Representative of visible portion of the sill structure, as seen from the water, at mean low tide. Approximately 170 feet of sheetpile and erosion protection represented.

Graphic file: Fig05-pre-post-project_2010-0611lee.ai

VIEW OF UPRR BRIDGE LOOKING EAST FROM ELKHORN SLOUGH TOWARDS PARSONS SLOUGH

Parsons Sill Project

June 2010	Project No. 1157	Figure 5

Figure 6a Frequency of Velocities Over Sill Without Consideration of Tidal Cycle

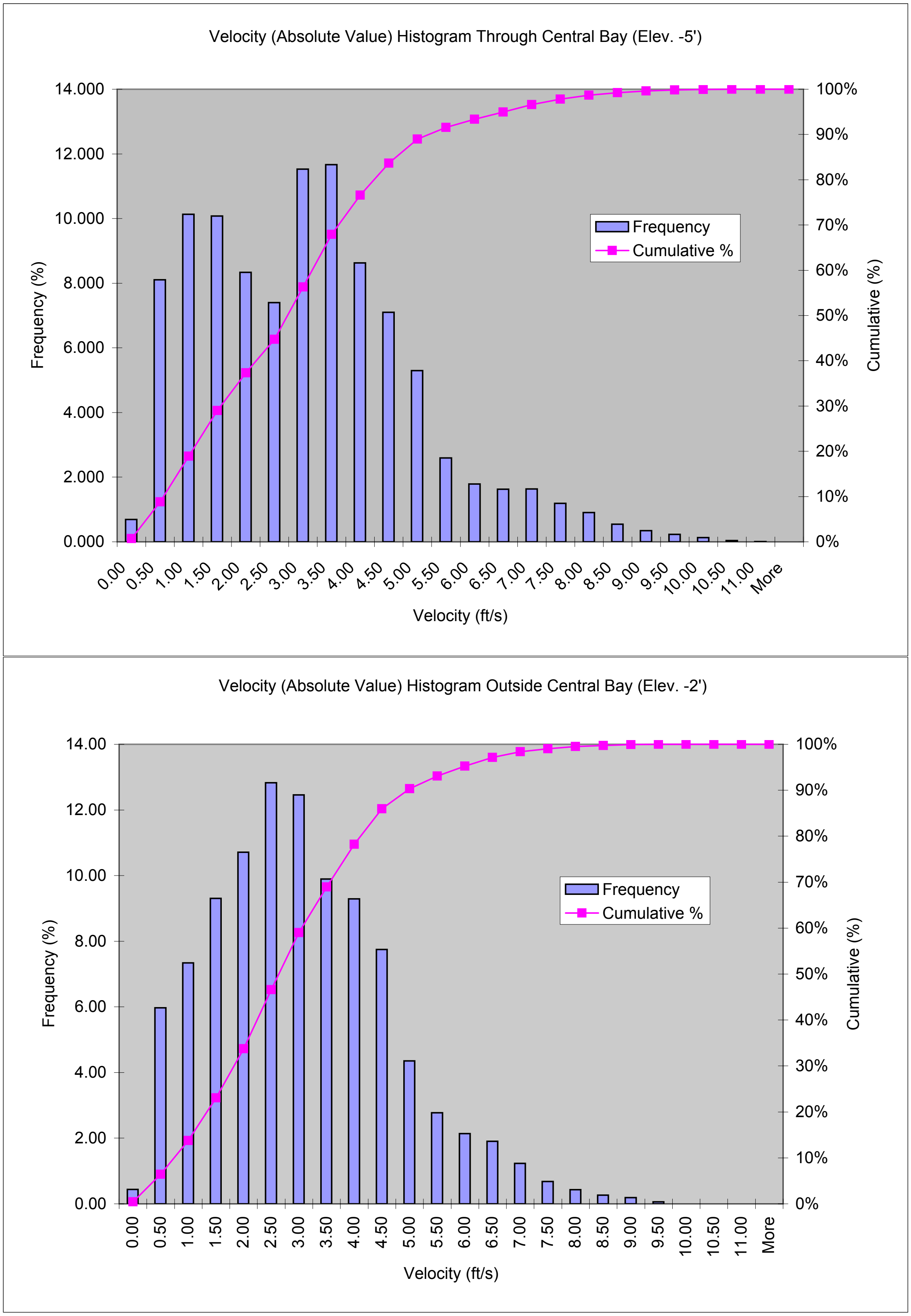
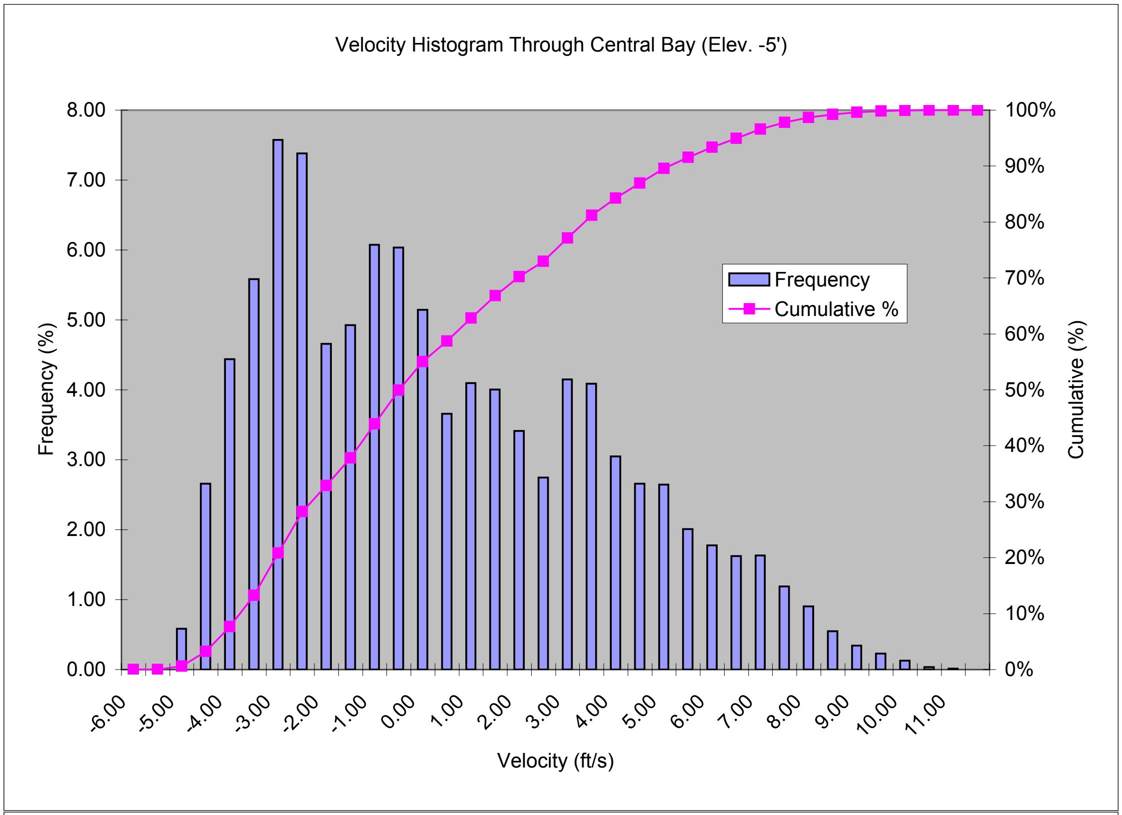
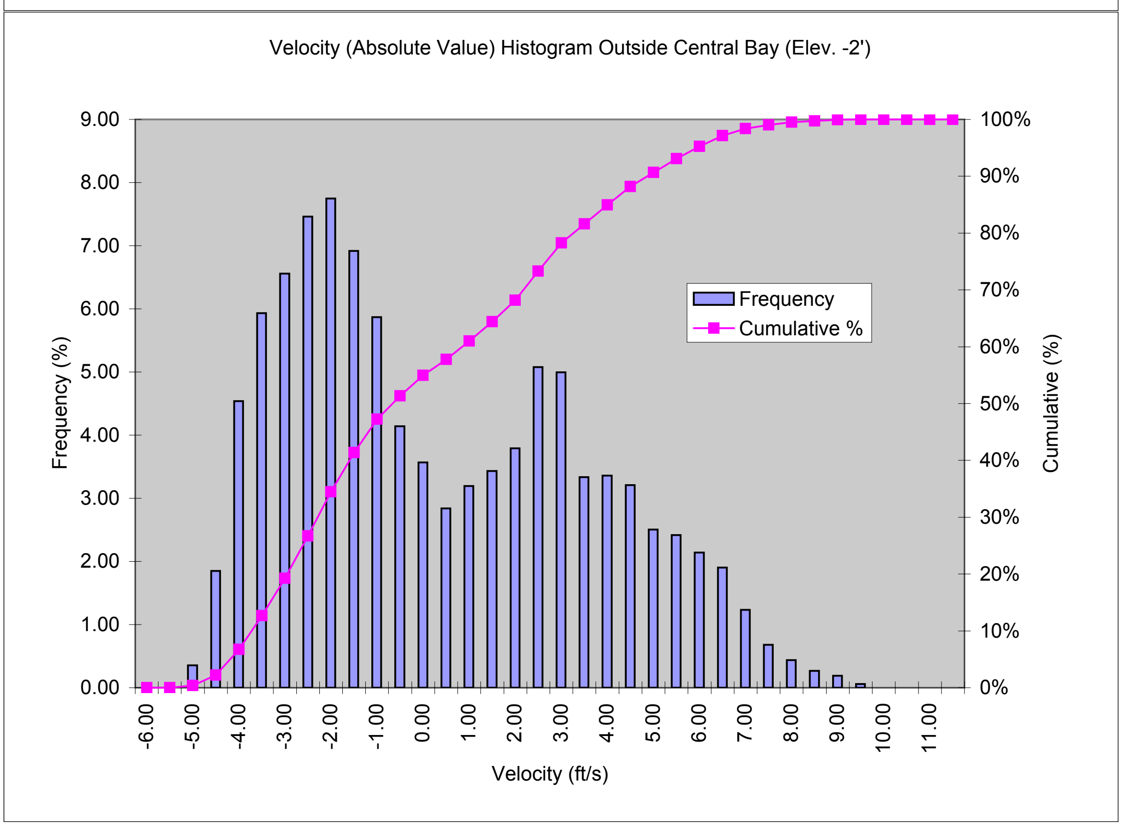


Figure 6b Frequency of Velocities Over Sill on Ebb and Flood Tides





Changes to Water Quality

Dissolved Oxygen

Implementation of the proposed action may result in a slight increase in residence time and/or localized stratification of water in Parsons Slough. Large-scale increases in residence time or stratification could potentially result in a shift in the compositions of ecologic communities. Within tidal systems, residence time is longest during neap tides series, which are characterized by low tidal ranges and low tidal prism. The sill is not expected to affect residence time under neap tide conditions (Largay pers. comm.). Residence time is shortest during spring tides, which are characterized by larger tidal ranges and prisms. The sill is expected to reduce tidal prisms under those conditions by 5 to 10 percent, and result in a concomitant lengthening of residence time by 5 to 10 percent (Largay pers. comm.). Since increased residence time would be more of a concern during neap tides, which have a lower flushing potential, implementation of the proposed action is expected to result in a negligible effect on residence time.

The proposed sill structure is not expected to affect stratification in the vast majority of Parsons Slough or Elkhorn Slough. Within a few hundred feet of the sill, the structure may cause localized stratification by forcing flowing water to the surface, resulting in slower moving water near the bottom that could potentially become stratified. It is expected that stratification would affect an area of less than 5 acres within the vicinity of the sill structure (Largay pers. comm.).

The monitoring threshold for water quality would ensure that hypoxic conditions within the slough would not occur more than 10 percent of the time. This potential increase in hypoxic conditions may adversely affect the habitat suitability of the Parson Sough Complex for estuarine fish populations; however, compared to existing conditions, this potential maximum increase in hypoxic conditions would not appreciably reduce the current sub-optimal habitat conditions within the slough. Furthermore, because harbor seals only forage in Parsons Slough on occasion (the majority of harbor seals leave Parsons Slough at night to feed in Monterey Bay) changes to estuarine fish populations would not affect food resources for this subpopulation (Maldini et al. 2009).

10. Anticipated Impact of Loss of Habitat on the Marine Mammal Population

Direct Habitat Loss

Construction of the proposed Parsons Slough Project would require placement of about 2,000 CY of fill (rock and sheet-pile) and result in the permanent loss of approximately 0.75 acres of subtidal habitat within the project footprint. The expected extent of direct habitat loss is equivalent to approximately 2.3 percent of the subtidal habitat area (32.9 acres) present within Parsons Slough and a fraction of the subtidal habitat within Elkhorn Slough. Although this alteration would be permanent, the proposed action would not appreciably diminish the value of this non-critical habitat for both the survival and recovery of the species.

Habitat Conversion

Long-term operation of the proposed sill is expected to result in conversion of approximately 11 acres of intertidal mudflat habitat to subtidal habitat. The conversion of intertidal habitat to subtidal habitat will have no adverse effect and possibly a long-term beneficial effect on harbor seals by improving ecological function of the slough. Moreover, decrease of mudflat area by up to 11 acres would not adversely affect amount of haul-out habitat for harbor seals. Harbor seals use a very small percentage of the potential haul-out habitat that currently exists in Elkhorn Slough; it would probably require huge losses of mudflat habitat for this effect to become limiting to the subpopulation (McCarthy in press).

11. Availability and Feasibility of Techniques to Minimize Impacts

All in-channel construction activities would be conducted from barges and no heavy equipment would enter the sub channels. Most of these construction activities would require some degree of in-water activities (e.g., installation of end bearing piles and sheet piles, placement of rockfill buttress).

Installation of the sheetpile wall would be supported on two rows of seven end bearing piles, as well as a single row of sheetpile located between the piles. The end bearing piles would be driven through the soft soils to penetrate 10 feet below the top of the dense sandy deposits that underlie the soft soils at an elevation of approximately -80 feet. All sheet pile and end bearing piles would be driven starting with a vibratory hammer to set the sheets, but may require an impact hammer to complete driving. Project Engineers indicated that if an impact hammer is required during construction, then cushioning blocks would be used to dampen the sound. Vibratory hammers clamp onto the sheetpile; thus no cushioning blocks would be used during vibratory pile driving. Additionally, up to 45 temporary end-bearing piles may be installed in the main channel of Elkhorn Slough at the Kirby Park staging site to facilitate barge docking and loading (if the temporary dock is constructed on pilings, rather than temporary rock-fill). These potential end-bearing piles would be installed with a vibratory hammer.

While the sound levels that will be generated during pile driving activities cannot be predicted with certainty, a review acoustic monitoring data collected during other projects involving pile driving suggests that the following Root Mean Square (RMS) levels would be generated while installing end-bearing piles and sheet piles using an impact hammer or vibratory driver (Table 1):

Table 1 Typical Near-source (10m) Underwater Noise Levels

Type of Pile	Driving Technique	RMS
H-Piles	Impact Hammer	183 dB
H-Piles	Vibratory Driver	155 dB
Sheet Piles	Impact Hammer	175 dB
Sheet Piles	Vibratory Driver	160 dB

Source personal memos from Illingworth & Rodkin, Inc to Caltrans, Ten Mile Bridge Replacement Project;

Caltrans Underwater Noise Compendium, September 2007, URS Port of Anchorage

Given the fact that the channel substrates within the action area consist of soft soils and dense sandy deposits, we expect sound levels generated by the proposed activities may be somewhat lower than levels listed in Table 1.

Along with the potential underwater impacts to marine mammals there is the possibility of impacts due to airborne noise from pile driving. Table 2 shows the expected noise levels form various types of pile driving.

Table 2 Airborne Noise Levels (50 feet)

Type of Pile	Driving Technique	L_{max}/RMS
H-Piles	Impact Hammer	109dBA
H-Piles	Vibratory Driver	95dBA
Sheet Piles	Impact Hammer	106 dBA
Sheet Piles	Vibratory Driver	97 dBA

Source Illingworth & Rodkin June 2010

NMFS is currently developing comprehensive guidance on sound levels likely to cause injury and behavioral disruption in the context of the MMPA. Until formal guidance is available, NMFS uses conservative thresholds of sound pressure levels from broadband sounds that cause behavioral disturbance. Table 3 outlines the various thresholds currently used by NMFS.

Table 3 Marine Mammal Disturbance Thresholds for Marine Construction Activities

	Airborne Noise Threshold (dB re: 20µPa)	Underwater Noise threshold (dB re: 1µPa)		
Species	**In Air Sound Pressure Levels (RMS)**	**Vibratory Pile Driving Disturbance Threshold**	**Impact Pile Driving Disturbance Threshold**	**Injury Threshold**
Harbor Seals	90 dB RMS1 (un-weighted)	120 dB RMS	160 dB RMS	190 dB RMS
Sea Lions and Sea Otters	100 dB RMS1 (un-weighted)	120 dB RMS	160 dB RMS	190 dB RMS

Source: (70 FR 1871), Southal et al. 2007: 71FR 3260 January 20, 2006;

Table 4 Distance – Disturbance Threshold (meters)

Hydroacoustic Received Levels (dB re: 1µ Pa RMS)	Impact H-Piles	Vibrate H-Piles	Impact Sheet Piles	Vibrate Sheet Piles
190[1]	10	0	5	0
160[2]	745	NA	245	NA
120[3]	NA	3,740	N/A	7,400
Airborne Received Levels (dB re: 20µ Pa RMS)	**Impact H-Piles**	**Vibrate H-Piles**	**Impact Sheet Piles**	**Vibrate Sheet Piles**
90[4]	600	100	450	120
100[5]	200	40	140	50

Source personal memos from Illingworth & Rodkin, Inc to Caltrans, Ten Mile Bridge Replacement Project;

Caltrans Underwater Noise Compendium, September 2007, URS Port of Anchorage

[1] Lower limit of Level A harassment for pinnipeds with impact or vibratory hammers

[2] Lower limit of Level B harassment for pinnipeds with impact hammers

[3] Lower limit of Level B harassment for pinnipeds with vibratory hammers

[4] Disturbance limit – Level B Harassment – for Harbor Seals

[5] Disturbance limit – Level B Harassment – for California Sea Lions and Sea Otters

Table 4 shows the distances of the Level A marine mammal safety zones, based on the type of driving, species, and where the marine mammals are located (in water or in a haul out area). Under water safety zones during impact hammering would be 10-meters for H-piles 5-meters for sheet piles for harbor seals. If harbor seals enter or approach the 190dB radius safety zone then all sources of noise will be shut down in order to prevent the potential for injury. The distances to the 160 and 120 dB marine mammal safety zones are based on a worst-case scenario. In reality these distances are less due to the shallow depth of the slough and the meandering of the channels, which does not allow for a direct transmission path for the underwater sound.

At the beginning of the pile driving activities the marine mammal safety zone would be set at a minimum of 10 meters for both impact and vibratory pile driving. If required by the permitting agency, the project applicant will conduct sound pressure measurements to verify this as the appropriate distance for the marine mammal safety zone. If necessary, ESNERR will prepare a Hydroacoustic Monitoring Plan that identifies the exact locations and frequency of measurements. The plan will outline the type of equipment required, the number of measurement locations, and frequency of measurements. At a minimum there will be two measurement locations, the first located approximately 10 meters from the pile driving and the second location, to establish the drop off rate of the sound pressure levels, will be between 20 and 50 meters from the pile driving depending on the conditions in the field. This will allow for verification and adjustment of the marine mammal safety zone based on the actual measured sound levels for this project.

For the airborne component of the analysis the levels shown in Table 2 are A-weighted not unweighted. At this time the frequency spectra is not available to make the conversion from a weighted noise levels to a un-weighted measurement however based on data from larger sized piles the difference between the A-weighed and un-weighted noise level is approximately 3 dB, with the unweighted noise level higher than the A-weighted noise level. The disturbance area shown in Table 4 is based on this adjustment.

The implementation of the following additional minimization measures would lessen the adverse construction-related effects, including noise, on marine mammals.

Additional Project Minimization Measures

ESNERR would implement the following minimization measures to reduce the potential adverse effect of construction activities on marine mammals.

1. Seasonal timing of construction would correspond with the non-pupping season for marine mammals. All project related construction activities will cease on or before March 1, 2011.
2. ENSERR would provide construction awareness training specific to marine mammals for all personnel. Before the onset of construction activities a qualified biologist will conduct an education program for all construction personnel. At a minimum the training will include a description of southern sea otter and harbor seals, and their habitats; the occurrence of these species within the project action area; an explanation of the status of these species and protection under the Federal ESA and MMPA; the measures that are being implemented to minimize disturbance to marine mammals and their habitats as they relate to the construction; and the authority given to the biological monitor to stop construction at any point. A fact sheet conveying this information will be prepared for distribution to the construction personnel and other project personnel who may enter the project area. Upon completion of the program, personnel will sign a form stating that they attended the program and understand all the avoidance and minimization measures and implications of the Federal ESA and MMPA.
3. Because marine mammals presence is lowest during high tide events (Maldini et al. 2009), the construction contractor would be encouraged to conduct most of the noise disturbing construction activities (pile driving) during high tide.
4. To reduce the risk of potentially startling harbor seals with a sudden intensive sound, the construction contractor would begin construction activities gradually. A "soft start" technique would be used at the beginning of each pile installation to allow any harbor seal that may be in the immediate area to leave before vibratory pile driving reaches full energy. The soft start requires contractors to initiate noise from vibratory hammers for 15 seconds at reduced energy followed by a 1-minute waiting period. The procedure would be repeated two additional times. Due to the short duration of impact pile driving (typically lasting between 1 and 10 minutes), the traditional ramp-up requirement for impact pile driving does not apply because it would actually increase the duration of noise emitted into the environment. Biological monitoring should effectively detect harbor seals within or near the proposed impact pile driving safety zone of 10

meters. If any harbor seal is sighted within or approaching this safety zone prior to pile driving, the construction contractor would delay pile driving until the animal(s) has moved outside and is on a path away from the safety zone or after 15 minutes have elapsed since the last sighting. Biological monitors will have authority to stop construction at any point if animals appear severely distressed or in danger of injury.

5. All fueling and equipment maintenance activities will be conducted in a designated area to prevent inadvertent fluid spills from adversely impacting water quality. To the extent possible, maintenance and fueling activities will be conducted at Kirby Park, or another off-site location, on impervious surfaces at least 50 feet away from surface waters. If maintenance or fueling must occur on-site (i.e., on barges or on land adjacent to the sill construction site), the maintenance/refueling area will be set up to ensure that spills or runoff are not able to discharge to surface waters. For maintenance and fueling activities that must occur on barges, barriers (e.g., sandbags, scupper blocks) will be placed over all overboard discharge locations to prevent the introduction of contaminants to adjacent water bodies. Fuel shall be kept in a double containment system with a spill prevention kit present at all times. All fuel nozzles shall have a shut off valve and sufficient personnel on site to facilitate the refueling. No refueling shall be allowed during inclement weather. Maintenance and fueling activities that occur on land adjacent to the sill construction site shall be located in an area that prevents a direct connection to surface waters. This area will be clearly designated with berms, sandbags, or other barrier.

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

Not Applicable.

13. Suggested Means of Monitoring and Reporting

Preconstruction Monitoring

The project applicant, ESNERR, has initiated biological monitoring of marine mammals to determine current population abundance and dynamics (see Maldini et al. 2009). This monitoring effort has provided a foundation for evaluating effects of the construction disturbance, as well as post construction response by marine mammals to presence of the sill structure.

Preconstruction monitoring was conducted in October 2009 and continued periodically through March 2010 by researchers with Okeanis. Monitoring protocol involved observing sea otters and harbor seals from three observation sites during one 24-hour cycle and four 6-hour cycles each month (Figure 7). Sea otters and harbor seals were counted from three locations, allowing for complete coverage of the study area. Observations were conducted using high powered image stabilized binoculars during the day and with a night scope with infrared enhancement at night. Researchers documented presence location, foraging activity and movement into and out of the Parsons Slough Complex for both harbor seals and sea otters, and also included activity status for sea otters (i.e., active, inactive and hauled out). Results of these surveys provided scientists and regulators with baseline information on marine mammal use of Parsons Slough (See Figures 2 and 7 for the location of most current haul out sites). Figure 7 and Table 5 below identify location of harbor seal haul out areas and distances from the sill site. Harbor seals do not haul out in the vicinity of Kirby Park staging area. Kirby Park is located 2 miles north of the sill site and nearest harbor seal haul out area.

Additional preconstruction monitoring will occur up to two weeks prior to the onset of construction activities and no sooner than 24 hours before construction activities begin. This preconstruction monitoring will be used to provide additional information needed to build a robust protocol to be used during construction and will include training of field personnel. All harbor seals present within Parsons Slough Complex will be counted during both daytime and nighttime flood and ebb tide cycles and will be counted every half-hour for two hours. Movement into and out of the Parsons Slough Complex and activity status will also be recorded. Visibility from the observation points will be tested to ensure complete coverage and effective methods of communication between field personnel will be established. Weather conditions including visibility, air temperature and wind speed will be collected. This preconstruction monitoring will take place approximately of six times prior to construction, depending on weather conditions.

Figure 7 Map of Harbor Seal Haul-out and Monitoring Sites in Parsons Slough

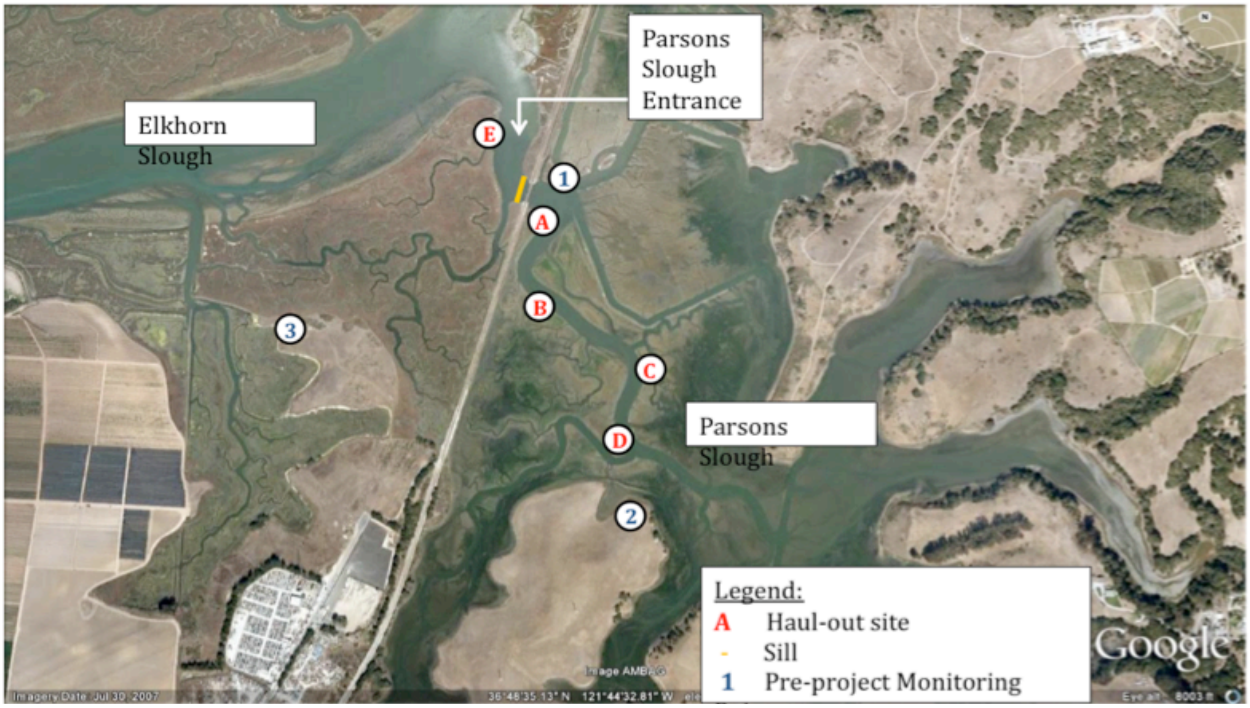


Table 5 Distance of Haul-out Sites from Proposed Sill Location

Haul-out Location	Distance from Sill (in feet)
A	200
B	700
C	1,475
D	2,000
E	680

Construction Monitoring

Monitoring during construction of the sill would occur from observation points adjacent to the UPRR bridge as well as intermittent monitoring from a zodiac. Daily construction monitoring would begin 30 minutes prior to construction activities and continue until 30 minutes after construction personnel have left the site. The biological monitor would maintain a log that documents numbers of marine mammals present before, during and after the end of daily activities. The monitor would record basic weather conditions (ambient temperature, tidal activity, precipitation, wind, horizontal visibility, etc.), as well as document marine mammal behavior and the type of construction activity at the time of the noted behavior/reaction.

The lead biological monitor will be Erin McCarthy of ESNERR. McCarthy has marine mammal monitoring experience and is familiar with marine mammal habitat use of Elkhorn Slough (see attached curriculum vitae). Additional field personnel will be composed of qualified biological monitors that may include ESNERR staff with experience in construction monitoring and/or graduate students with a focus in marine mammal research.

The biological monitor would have authority to stop construction in the event a marine mammal becomes severely distressed or in danger of injury (Level A harassment under the MMPA defined as potential to injure a marine mammal or marine mammal stock in the wild).

The lead biological monitor will prepare and submit a summary report within 30 days of the completion of the sill construction. This report will be submitted to USFWS, NMFS, NOAA and ESNERR and will include a summary of the daily log maintained by the biological monitor(s) during construction.

Post Construction Monitoring

Post construction monitoring would consist of a weekly survey during peak occupational time and tidal cycle for four weeks following construction of the sill. If marine mammals demonstrate the ability to move freely across the structure, without evidence of harm or injury, and if marine mammals appear to have resumed normal behavior, then post construction monitoring would cease. Monitoring data collected in the four weeks following construction of the sill will be included in the report. Additional monitoring may occur (if funding allows) consisting of a monthly census of marine mammals during peak occupational times and tidal cycles for six months post construction. USFWS, NMFS and NOAA would be consulted before the cessation of post construction monitoring. Data collected after the first 30 days of post construction monitoring will be reported as an addendum.

14. Suggested Means of Encouraging Research

All marine mammal monitoring data collected before, during and after construction of the proposed project would be made available to NMFS, NOAA, USFWS and the general public.

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