Appendix C

Essential Fish Habitat Assessment

BERTHS 226-236 (EVERPORT) CONTAINER TERMINAL IMPROVEMENTS PROJECT

September, 2016

Essential Fish Habitat Assessment

Prepared for:

CDM Smith
Irvine, California

Prepared by:

MBC *Applied Environmental Sciences*
Costa Mesa, California

BERTHS 226-236(EVERPORT) CONTAINER TERMINAL IMPROVEMENTS PROJECT

Prepared for:

CDM Smith
111 Academy Way
Suite 150
Irvine, California 92617

Prepared by:

MBC *Applied Environmental Sciences*
3000 Red Hill Avenue
Costa Mesa, California 92626

PROJECT STAFF

CDM Smith

Dorothy Meyer, Principal Planner

Envicraft LLC

Louis Utsumi

MBC *Applied Environmental Sciences*

Shane Beck – Project Manager

Eric F. Miller
Jennifer L. Rankin
David G. Vilas

Table of Contents

List of Figures and Tables

Appendix

Lists of EFH Species

- Coastal Pelagic Species
- Pacific Groundfish Species
    - Shared Ecosystem Component Species
    - Pacific Groundfish Ecosystem Component Species
    - Pacific Groundfish Species

EXECUTIVE SUMMARY

The proposed Project would improve and expand the existing Everport Container Terminal currently in operation at Berths 226–236 on Terminal Island within the Port of Los Angeles (Port). Essential Fish Habitat (EFH) is managed under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), which is designed to protect waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. This EFH Assessment was prepared pursuant to the Magnuson-Stevens Act to analyze potential impacts to federally managed fish and invertebrates from construction and operation of the proposed Project.

The primary Project elements that could affect the marine environment, including EFH, include:

- Dredging (including installation of king piles and approximately 1,400 linear feet of sheet piling to stabilize the wharf) at Berths 226-229 to a design depth of -53 feet mean lower low water (MLLW) plus two feet of overdepth tolerance (for a total depth of -55 feet MLLW) to accommodate larger ships (the existing design depth is -45 feet MLLW);
- Dredging (including installation of approximately 1,400 linear feet of sheet piling to stabilize the wharf) at Berths 230-232 to a design depth of -47 feet MLLW plus two feet of overdepth tolerance (for a total depth of -49 feet MLLW) to accommodate larger ships (the existing design depth is -45 feet MLLW);
- Disposal of approximately 38,000 cubic yards of dredged materials (30,000 cubic yards from Berths 226-229 and 8,000 cubic yards from Berths 230-232) at an ocean disposal site (i.e., LA-2), assuming an approved upland disposal facility, or a combination of the two, is not required;
- Raising of up to five existing cranes and the addition of five new 100-foot gauge A-frame over-water gantry (wharf) cranes manufactured by Shanghai Zhenhua Heavy Industry Co., Ltd. (ZPMC), or equivalent; and
- Operation of the terminal until 2038.

Five alternatives to the proposed Project are also considered. The No Project and No Federal Action alternatives do not include in-water work; accordingly, potential impacts to EFH would only be related to discharges from vessels and runoff from the terminal during future operations. Alternative 3 would include dredging at only one of the two wharfs and installation of new cranes. Alternative 4 would be similar to the proposed Project (including dredging, installation of cranes, and a lease extension); however, backland improvements would be reduced. Alternative 5 would also be similar to the proposed Project, but would include the construction and operation of an on-dock rail line at the existing Terminal Island Container Transfer Facility.

Impacts during construction would be localized and temporary lasting approximately 24 months. Potential impacts from dredging, pile installation, construction runoff, accidental spills, and shading would be less than significant. No habitat loss would occur. Acoustic impacts from pile driving could result in adverse effects to fish species in the construction area. In addition, there would be no physical barriers to movement, and the baseline condition for fish and wildlife access would be essentially unchanged. Due to the limited potential impact area, this is not considered a substantial disruption. Additionally, implementation of mitigation measure MM BIO-1 (Protect Marine Mammals) would ensure that marine mammals would be readily able to avoid pile driving areas, and no injury to marine mammals from pile driving sounds would be expected. Avoidance of the area by aquatic species including federally managed species would be temporary; pile driving would occur intermittently over an approximately 12-month period, and occur mostly during daylight hours. There would be no physical barriers to movement, and the baseline condition for aquatic species would be essentially unchanged. Due to the limited potential impact area, this is not considered a substantial disruption or significant effect on EFH species.

Potential impacts resulting from operation of the Everport Container Terminal and project alternatives include effects to water quality resulting from accidental spills and runoff, disturbance from vessel movements, and introduction of invasive species through ballast water exchange or vessel fouling. Potential impacts resulting from accidental spills, runoff, and disturbance from vessel movements would be less than significant. Potential impacts from introduction of invasive species would significant and unavoidable. No feasible mitigation is currently available to reduce the impact to less than significant.

INTRODUCTION

The proposed Project would improve and expand the existing Everport Container Terminal located at Berths 226–236 on Terminal Island within the Port of Los Angeles (**Figure 1).** Essential Fish Habitat (EFH) is managed under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), which is designed to protect waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 United States Code [U.S.C.] 1801 et seq.).

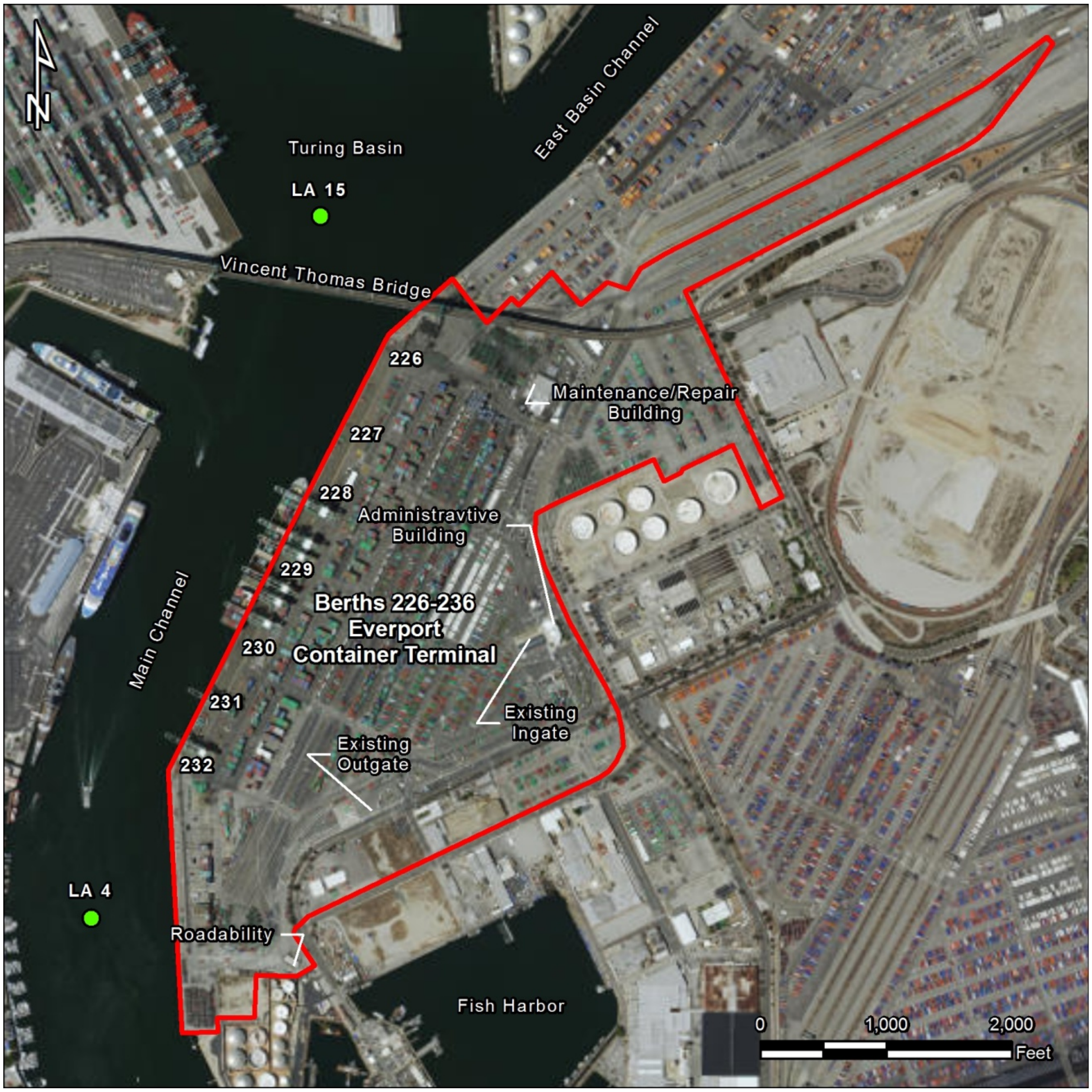

Figure 1. Location of the Project boundary in Los Angeles Harbor.

The National Marine Fisheries Service (NMFS; [2002]) defines specific EFH terms as follows (50 Code of Federal Regulations [CFR] 600.05–600.930):

- “Waters” include all aquatic areas and their associated biological, chemical, and physical properties that are used by fish and may include aquatic areas historically used by fish where appropriate;
- ”Substrate” includes sediment, hard bottom, structures underlying the waters, and associated biological communities;
- “Necessary” means the habitat required to support a sustainable fishery and the managed species’ contribution to a healthy ecosystem; and
- “Spawning, breeding, feeding, or growth to maturity” covers a species’ full life cycle.”

The Port of Los Angeles has been designated EFH for two fishery management plans (FMPs): the Coastal Pelagics FMP and the Pacific Groundfish FMP. Habitat Areas of Particular Concern (HAPCs) are present in the Port in the form of eelgrass beds and kelp forests.

This EFH Assessment was prepared pursuant to the Magnuson-Stevens Act to analyze potential impacts to federally managed fish and invertebrate species from construction and operation of the proposed Project. The proposed Project would be constructed in one phase over an approximately 24-month period, and the earlies construction is expected to begin is late 2017. The primary Project elements that could affect the marine environment, including EFH, include:

- Dredging (including installation of king piles and approximately 1,400 linear feet of sheet piling to stabilize the wharf) at Berths 226-229 to a design depth of -53 feet MLLW plus two feet of overdepth tolerance (for a total depth of -55 feet MLLW) to accommodate larger ships (the existing design depth is -45 feet MLLW);
- Dredging (including installation of approximately 1,400 linear feet of sheet piling to stabilize the wharf) at Berths 230-232 to a design depth of -47 feet MLLW plus two feet of overdepth tolerance (for a total depth of -49 feet MLLW) to accommodate larger ships (the existing design depth is -45 feet MLLW);
- Disposal of approximately 38,000 cubic yards of dredged materials (30,000 cubic yards from Berths 226-229 and 8,000 cubic yards from Berths 230-232) at an ocean disposal site (i.e., LA-2), assuming an approved upland disposal facility, or a combination of the two, is not required;
- Raising of up to five existing cranes and the addition of five new 100-foot gauge A-frame over-water gantry (wharf) cranes manufactured by Shanghai Zhenhua Heavy Industry Co., Ltd. (ZPMC), or equivalent; and
- Operating the terminal until 2038.

The proposed improvements to Berths 226-229 include 1) dredging to increase the depth from -45 to -53 feet Mean Lower Low Water (MLLW) plus two feet of overdepth tolerance (for a total of -55 feet MLLW); and 2) the installation of approximately 1,400 linear feet of king piles and sheet piles to stabilize the wharf and accommodate the dredging activities, deeper design depth, and increased loads associated with the largest ships in the fleet mix that are expected to call at the Everport Container Terminal. The tip elevations of the king piles and sheet piles would be approximately -100 feet MLLW, or about -45 feet below the mudline. Dredging would remove approximately 30,000 cy of sediment from alongside Berths 226-229.

The proposed improvements at Berths 230-232 would include 1) dredging to increase the depth from -45 to -47 feet MLLW plus two feet of overdepth tolerance (for a total of -49 feet MLLW); and 2) the installation of approximately 1,400 linear feet of sheet piles to stabilize the wharf and accommodate the dredging activities, deeper design depth, and increased loads associated with the largest ships in the fleet mix that are expected to call at the Everport Container Terminal. Dredging would remove approximately 8,000 cy of sediment from alongside Berths 230-232. The sheet piles would be installed to approximately -85 feet MLLW (about -36 feet below the mudline).

In total, approximately 38,000 cy of sediment would be dredged and would require disposal. Disposal of dredged material could potentially include disposal at an approved upland facility or disposal of at an approved ocean disposal location (i.e., LA-2 Ocean Dredged Material Disposal Site [ODMDS]), or a combination of the two. A sampling and analysis program was implemented to determine suitability for any offshore disposal of material at LA-2. Effects from sediment disposal at LA-2 were evaluated by the U.S. EPA (EPA) and U.S. Army Corps of Engineers (USACE) during the site designation process (EPA 1988), and subsequently evaluated in consideration of higher maximum annual disposal volume (EPA and USACE 2005).

Five alternatives to the proposed Project are also considered. The No Federal Action and No Project alternatives (Alternatives 1 and 2, respectively) do not include in-water work; accordingly, potential impacts to EFH would only be related to discharges from vessels and runoff from the terminal during future operations. Alternative 3 would include dredging at Berths 226-229, raising of up to five existing cranes, and the installation of five new cranes. Berths 230-232 would remain at its existing depth. Alternative 4 would be similar to the proposed Project (including dredging, pile installation, installation of cranes, and a lease extension); however, the magnitude of backland improvements would be reduced. Lastly, Alternative 5 would be similar to the proposed Project, but would also include the construction and construction and operation of an on-dock rail line.

DESCRIPTION OF THE STUDY AREA

Los Angeles-Long Beach Harbor (the Port Complex), in which the project site is located, was historically an estuary formed at the mouth of the San Gabriel and Los Angeles Rivers. It was characterized by extensive mudflats and marsh areas that provided habitat for birds, fish, and invertebrates. Urbanization and development led to the construction and modifications associated with the current configuration of the Harbor. Dredging, filling, channelization, and construction over the past 100 years has completely altered the local estuarine physiography. The Los Angeles River and the Port Complex are no longer true estuaries because they do not maintain significant year-round fresh water input, and the biota is not distributed along salinity gradients as it is in most estuarine systems.

The habitats available for plants and animals have also changed as a result of harbor modifications. Very little sandy beach, shallow subtidal, or salt marsh habitat remains. Dredge and fill activities have resulted in changes to the benthic (bottom) habitat, including conversion of shallow marsh and tidal channels to deep water channels and dry land. The placement of shoreline structures, such as bulkheads, riprap, and pier pilings, has greatly increased the hard substrate available for fouling organisms, including mussels and barnacles. The construction of the breakwaters in the first half of the 20th Century restricted water circulation within the Port Complex, which in turn affected water quality.

PHYSICAL FEATURES

Los Angeles Harbor consists of Inner and Outer Harbor areas, and is defined by the breakwaters described above and the land masses created by dredge-and-fill operations. The Outer Harbor consists of deep, open-water areas and channels that lead to basins, slips, and marine terminals, as well as basins and slips farther into the Harbor. The channels, basins, and slips vary in size and distance from the harbor entrances. When assessing potential impacts from project development, the term Inner Harbor refers specifically to channels and basins in which marine habitat value, as assessed by an interagency biomitigation team, is lower than in Outer Harbor areas. The West Basin of Los Angeles Harbor, where the proposed Project is located, is Inner Harbor.

The Port of Los Angeles is the leading port by container volume and cargo value in the United States. In addition, the Port provides berthing for cruise ships, sportfishing vessels, commercial fishing vessels, pleasure boats, and support vessels. The physical size of the Port, the diversity of uses, and ongoing upgrade and development projects result in nearly continuous in-water activity throughout the Port. A recent baseline hydroacoustic study in Cerritos Channel (in both Los Angeles and Long Beach Harbors) recorded L_{90} values (sound levels that were exceeded 90% of the time during the measurement period) of 120 to 132 decibels (dB) (Tetra Tech 2011). By comparison, ambient underwater noise in the open ocean coast of central California has been estimated at 74 to 100 dBPEAK.

The specific site of the proposed Project is on Terminal Island in the Port of Los Angeles (**Figure 1**).

Water Quality Parameters

Waters within the Los Angeles Harbor are primarily marine (saline), though there are fresh water inputs from regulated discharges (e.g., cooling water, waste water, storm water, etc.), urban runoff, and flows from Dominguez Channel and the Los Angeles River. The following is a summary of water quality parameters measured at two stations (Stations LA 4 and LA 15; See **Figure 1**) near the Everport Container Terminal during water quality sampling events conducted as part of a Port-wide biological characterization study in summer 2013 and winter and spring 2014 (MBC, 2016):

- Mean surface temperatures were 16.0°C (60.°F) at Station LA 4 and 16.1°C (60.9°F) at Station LA 15. Temperatures throughout the water column during all three surveys ranged from 13.2°C to 16.7°C (55.8°F to 62.1°F);
- Salinity values ranged between 33.2 and 33.6 practical salinity units (psu), which is essentially equivalent to parts per thousand (ppt) in southern California;
- Dissolved oxygen (DO) concentrations ranged from 5.3 to 9.1 milligrams per liter (mg/L), with mean surface values of 7.2 mg/L at Station LA 4 and 7.0 mg/L at Station LA 15;
- Mean station surface pH was 7.9 at both stations, with a maximum range between 7.8 and 8.1 units; and
- Mean surface transmissivity at the two stations was 65.4 and 62.1% transmittance with a range throughout the water column between 46.0 and 75.5%.

Tides and Currents

Tides in southern California are classified as mixed, semi-diurnal, with two unequal high tides (lower high water and higher high water) and two unequal low tides (higher low water and lower low water) each lunar day (approximately 24.5 hour). Since 2005, the highest tide measured at the Los Angeles Harbor tide station (NOAA No. 9410660) is +7.71 feet (+2.35 meters) MLLW (measured in December 2012), and the lowest was -2.34 feet (-0.71 meter) MLLW, measured in January 2009 (NOAA 2015).

To better understand circulation patterns and watershed inputs into Los Angeles-Long Beach Harbor, the Ports undertook a program to develop a hydrodynamic and water quality model to improve their predictions of the effectiveness of current and future control measures (the WRAP Model) (POLA and POLB 2009). Circulation patterns are established and maintained by tidal currents. Flood tides flow into the harbors and up the channels, while ebb tides flow down the channels and out of the harbors (POLA and POLB 2009). The harbors are protected from incoming waves by the Federal Breakwater. In addition to protecting the ports from waves, the Federal Breakwater reduces the exchange of the water between the harbors and the rest of San Pedro Bay, hence creating unique tidal circulation patterns. Modeled current direction and velocity throughout the Port Complex during both ebb and flood tides is summarized in Figure 2.

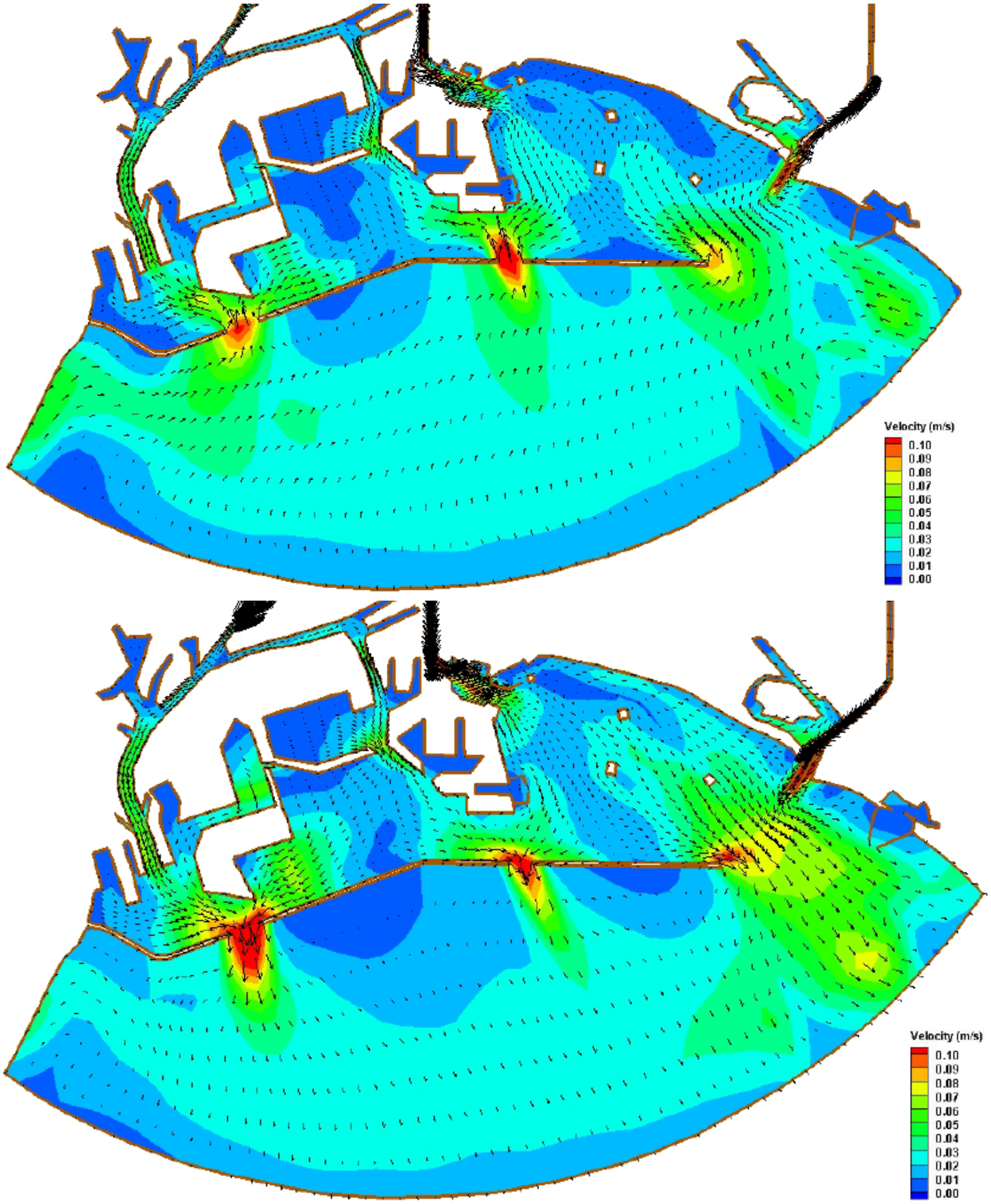

Figure 2. Current patterns in Los Angeles and Long Beach Harbors predicted by the WRAP Model (POLA and POLB 2009). Top: Typical flood tide currents**. Bottom:** Typical ebb tide currents**.**

Sediment Characterization

A sediment characterization study was performed at Berths 226-232 to determine the suitability of the dredged sediments for the range of potential dredged material management options (Ramboll Environ, 2015). The dredge footprint was divided into two separate dredged material management units (DMMUs): DMMU-1 extended from Berth 229 to 232 (with design depths of -45 and -47 feet MLLW) (**Figure 3**). DMMU-2 included the dredge footprint at Berths 226-228 (with a design depth of -53 feet MLLW).

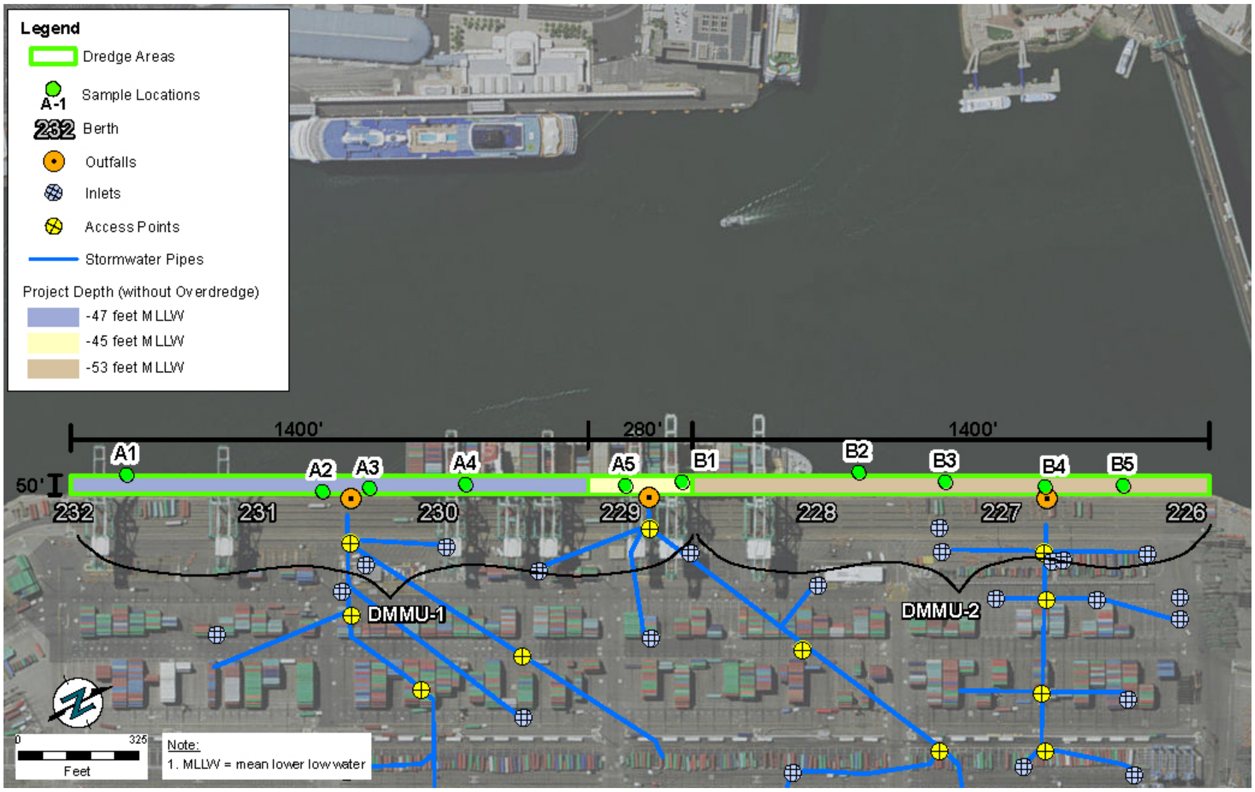

Figure 3. Sediment sampling stations and composite areas (Ramboll Environ, 2015).

Sediments at each location were collected using a vibratory coring device, and water samples for elutriate tests were collected at one location within each of the DMMUs. One composite sediment sample was obtained from each of the two DMMUs (composite samples IDs DMMU-1 and DMMU-2). Each composite sample contained material obtained from five stations within each DMMU (A1-A5 for DMMU-1, B1-B5 for DMMU-2). Sediment cores from Stations B1-B5 were collected October 28 & 29, 2014. Sediment cores from sample locations A1-A5 were collected March 26 and 27, 2015. One composite sample was obtained via pipe dredge from the LA-2 designated reference station along the 620-foot depth contour on October 27, 2014 for comparison to DMMU-2 results. A second composite sample was taken on March 25, 2015 for comparison to DMMU-1 results.

Disposal suitability determinations were conducted through evaluations of sediment chemistry, toxicity, and bioaccumulation potential testing. For ocean disposal testing, sediment contaminant concentrations were compared with Effects Range Low (ERL) and Effects Range Median (ERM) values (Long et al., 1995) as a screening level evaluation. Concentrations of all analytes were below ERM values, although some exceeded ERL values at the DMMUs and at the LA-2 reference station (Ramboll Environ, 2015).

Results from all phases of the sediment suitability study, including sediment analysis, elutriate analysis, solid phase and suspended particle phase testing, and bioaccumulation analysis indicated sediments from both DMMUs were suitable for unconfined aquatic disposal. The bioaccumulation potential analyses indicated that the mean concentrations of total polychlorinated biphenyls (PCBs) in tissues from *Neanthes virens* and *Macoma nasuta* exposed to DMMU-1 and DMMU-2 sediments were significantly elevated compared to their respective LA-2 reference samples. However, a screening level risk assessment determined there would be little to no risk to humans from placement of dredged sediments at LA-2.

Testing indicated that sediment contaminant levels from the dredge footprint were relatively low, with only a few minor exceedances of "Effects Range-Low" (ERL) levels, concentrations above which effects to biota could occasionally occur. No concentrations exceeded "Effects Range-Median" (ERM) levels that represent a probable effects range within which effects to biota could frequently occur. In addition to chemical analysis, toxicity testing on sediments from the two composites showed no statistically or ecologically significant effects, while tissue bioaccumulation results were well below U.S. Food and Drug Administration action levels and the levels of concern reported in the Environmental Residue Effects Database. On August 26, 2015 and in July 2016, members of the Los Angeles Regional Contaminated Sediments Task Force (CSTF) agreed with the results and conclusions of the sediment suitability study, and determined that all sediments dredged during the proposed Project would be suitable for ocean disposal at LA-2.

Project Area Habitats

The following sections describe the aquatic biological habitats and communities in the vicinity of the proposed Project. The habitats available for plants and animals within the Port have changed through time as a result of harbor modifications. Very little sandy beach and shallow subtidal habitats remain, and salt marsh habitat is essentially absent within the Harbor. Dredge and fill activities have resulted in ongoing changes to the seafloor throughout the Port Complex. During Biological Baseline Studies of the Port conducted in 2000, sediments in the channel adjacent to the Everport Container Terminal (near Berth 234) were primarily sand (75 percent) and silt (14 percent) with a mean grain size of 63 micrometer (μm) (MEC and Associates, 2002). Based on the 2015 sediment characterization study of Berths 226-232, sediments in Composite Area DDMU-1-A1 were mostly silt/clay (99 percent) (Ramboll Environ, 2015). Within DMMU-1, sediment grain size varied and became more sandy with distance along the wharf; sand contributed nearly 40 percent to the sediments at DDMU-1-A2 and increased to nearly 90 percent of the sediments at DDMU-1-A5

Giant kelp (*Macrocystis pyrifera*) distribution in the Port Complex is limited to the outer breakwaters, and riprap structures in the Outer Harbor that face harbor entrances (SAIC 2010). The placement of shoreline structures, such as bulkheads, riprap, and pier pilings, has greatly increased the hard substrate available for algae and sessile organisms, including mussels and barnacles. The construction of the breakwaters greatly affected water movement patterns within the Port Complex, which in turn affected overall circulation and water quality. Eelgrass (*Zostera marina*) occurs in a few places in Los Angeles Harbor. Surveys of the Port Complex in 2000, 2008 and 2013–2014 documented eelgrass beds along Cabrillo Beach and in two areas near Pier 300: the Seaplane Lagoon (a mitigation site at the Shallow Water Habitat), and on the northeastern side of Pier 300 (MEC and Associates, 2002; SAIC 2010; MBC, 2016). During the 2013–2014 survey eelgrass was also reported off the southern tip of Mormon Island, approximately 366 meters (1,200 feet) from the northern edge of the proposed Project site, at the Cerritos Channel East Basin Marina and in Consolidated Slip (MBC, 2016).

Pilings that support piers and wharves are prevalent along the edges of harbor channels. Many fish species are attracted to structures, such as surfperches and some rockfishes. Pier pilings support intertidal/subtidal invertebrate communities, such as algae, barnacles, and mussels that are fed upon by fishes and other invertebrates. Riprap provides similar habitat as natural reefs. As with pier pilings, riprap supports diverse invertebrate communities, but also provides habitat, shelter, and forage opportunities for fishes.

The role as a nursery grounds for juveniles of coastal fish species is probably the most widely recognized and accepted function of bays and estuaries (Allen et al. 2006). In southern California, harbors provide nearshore habitats that supplement, but do not adequately replace, the habitats of natural bays and estuaries (Cross and Allen 1993). The subtidal areas of the Port Complex provide several habitat types that support a diverse and abundant fish community. MEC and Associates (2002) found that juvenile White Croaker (*Genyonemus lineatus*) prefer deepwater basins and slips within the Port Complex, although a greater variety of fish, such as Bat Rays (*Myliobatis californica*), California Halibut (*Paralichthys californicus*), Diamond Turbot (*Pleuronichthys guttulatus*), Queenfish (*Seriphus politus*), and Topsmelt (*Atherinops affinis*) use the shallow waters of the harbors as nursery grounds.

Several features of bays and estuaries may be important to settling species, such as California Halibut, including warmer water temperatures, decreased turbulence, finer sediments, and different biological communities compared with those on the open coast. MBC (1991) determined densities of recently settled California Halibut in southern California increased with decreasing depth. The semi-protected waters of Queensway Bay and Outer Harbor are also important habitats for juvenile fishes and invertebrates. Recently transformed Cheekspot Goby (*Ilypnus gilberti*), California Tonguefish (*Symphurus atricaudus*), White Croaker, and Queenfish were the most abundant juvenile fishes collected in seasonal surveys of Queensway Bay using beam trawls in 1990, 1991 and 1994 (MBC 1994).

FISH AND INVERTEBRATE COMMUNITIES

Fish

In the harbor-wide studies, more than 130 fish species have been collected, 60 to 70 of which occur commonly. The results of those surveys are described in some detail in MBC (2016), which is summarized in the following sections.

Ichthyoplankton

Surveys of the ichthyoplankton (fish eggs and larvae) of the Port Complex were performed in summer 2013 and winter and spring of 2014 (MBC, 2016). Ichthyoplankton were sampled at the sea surface, near-bottom and through the water column at night at 26 stations in the Port Complex, including at Stations LA 4 and LA 15 (**Figure 1**).

During the 2013–2014 survey, 79 larval fish taxa were taken during the three surveys at the 26 stations, compared to 71 in similar sampling in 2008 and 44 in 2000 (MEC, 2002; SAIC, 2010; MBC, 2016), Ten species numerically dominated the larval fish assemblage in the Port Complex in 2013–2014. As in prior harbor-wide studies, CIQ gobies (which includes *Clevelandia ios*, *Ilypnus gilberti,* and *Quietula y-cauda*) were the most abundant larval fish taxon; the adults of all three species are present in the Port Complex. Unidentified anchovies were the second most abundant larva in the present study, but were ranked 35th in 2008 and were not reported at all in 2000. As in previous studies, Bay Goby (*Lepidogobius lepidus*), combtooth blennies (*Hypsoblennius* sp), White Croaker, and Yellowfin Goby (*Acanthogobius flavimanus*) were among the ten most common larval taxa. White Croaker, whose numbers have declined along the open coast of southern California, has nevertheless maintained a large population in the Port Complex. This abundance was reflected in the current study by high numbers of White Croaker larvae, suggesting local spawning and retention in the Port Complex.

During the 2013–2014 study, larval fish concentrations were consistently highest near the seafloor and lowest at the surface and more larval fish were collected in winter than in summer or spring (MBC, 2016). Highest densities (number per 100 m^2 of sea surface) occurred in the Outer Harbor and Los Angeles Main Channel Entrance. Seasonal patterns by species were generally similar to those documented since 2000: anchovies and Bay Goby were present throughout the year, but White Croaker larvae were most abundant in winter, and Queenfish larvae were most abundant in spring. In general, eggs were concentrated near the surface rather than in the midwater and epibenthos. Egg concentrations in the Port Complex during 2013–2014 survey were highest in winter and lowest in spring. Most fish eggs taken during the study were indistinguishable and were recorded as "unidentified fish eggs." Anchovy eggs accounted for 16% of all fish eggs reported during the winter survey, 3% of the spring count, and 1% of the summer count. *Pleuronichthys* (turbot and sole) eggs contributed 2% or less to the totals during all surveys.

At Station LA 4, larval abundances in the water column ranged from about 2,100 to nearly 18,900 individuals per 100 m^2 of sea surface and averaged 7,770/ 100 m^2 during the three surveys in 2013–2014 (MBC, 2016). At Station LA 15, abundances averaged 9,045/ 100 m^2 and ranged from about 2,450 to 14,700/ 100 m^2. Highest abundances at both stations were found during the winter survey. A total of 297 larval fishes representing 31 taxa were collected during the three surveys at Station LA 4, while 791 individuals of 31 taxa occurred at Station LA 15. Overall, White Croaker, unidentified anchovy (Engraulidae) and CIQ gobies were the three most abundant taxa at the two stations and together accounted for 60 of the specimens collected. Nearly 6,400 fish eggs were also collected during the three surveys at station LA 4, and 3,200 at Station LA 15. Ninety-two percent of the fish eggs could not be identified to species. Similar to larval abundance, egg abundance peaked during the winter survey.

Juvenile and Adult Fishes

Pelagic sampling in the Port Complex in spring and summer of 2014 collected a total of 747,465 pelagic fish weighing 2,718 kilograms (kg) and comprised of 36 species (MBC, 2016). Northern Anchovy (*Engraulis mordax*) was the most abundant species collected, representing approximately 97% of the total pelagic community catch. Other species present in moderate abundances—each less than 1.7% of the total catch—included California Grunion (*Leuresthes tenuis*), Pacific Mackerel (*Scomber japonicus*), Topsmelt, and Jacksmelt (*Atherinopsis californiensis*). The pelagic fish catch was ten times as large as the largest catch in previous studies using similar methods in 2000 and 2008 (MEC, 2002; SAIC 2010).

In demersal (near-bottom) trawl samples, 61 fish species represented by 19,655 individuals with a combined weight of 1,149 kg were collected throughout the Port Complex in 2013–2014 (MBC, 2016). White Croaker was the most abundant species collected, representing approximately 41% of the total trawl catch, and California Lizardfish (*Synodus lucioceps*) was the second most abundant species, accounting for 24% of the total catch. The abundance of California Lizardfish in the current study is a noteworthy change from the two previous harbor-wide studies in which California Lizardfish accounted for less than 1% of the total catch. Other abundant species included Queenfish, Northern Anchovy (a pelagic fish caught in bottom trawls because its schools often extend from surface to bottom), Speckled Sanddab (*Citharichthys stigmaeus*), California Tonguefish (*Symphurus atricaudus*), Pacific Staghorn Sculpin (*Leptocottus armatus*), Longspine Combfish (*Zaniolepis latipinnis*), Barred Sand Bass (*Paralabrax nebulifer*), and Specklefin Midshipman (*Porichthys myriaster*). All other species each accounted for 0.8% or less of the total catch.

A total of 4,377 individuals of nine species and weighing 11.9 kg were caught in day and night samples of the pelagic fish community in spring and summer of 2014 at Station LA 4 (**Figure 1**; MBC, 2016). Another 2,401 individuals of eleven species weighing 4.3 kg were caught at Station LA 15. Similar to results found at stations throughout the Port Complex during the study, the catches were heavily dominated by Northern Anchovy, which contributed 93% of the abundance at Station LA 4 and 86% of the catch at Station LA 15. Topsmelt was the second most abundant species, contributing another 5% to the abundance at Station LA 4 and 8% at Station LA 15. Jacksmelt was the third most abundant species at both stations, but it accounted for 4% of the abundance at Station LA 15 but less than one percent at Station LA 4.

During the 2013–2014 survey of the Port Complex, 426 individuals of 20 species and weighing 23.1 kg were caught in day and night trawls in summer and spring sampling at Station LA 4 (**Figure 1**; MBC, 2016). At Station LA 15, 238 individuals of 19 species weighing 13.4 kg were taken. California Lizardfish was the most abundant species at both stations and contributed 31% to the abundance at Station LA 4 and 42% of the abundance at Station LA 15. Speckled Sanddab was the second most abundant at Station LA 4 (24%) and White Croaker (11%) was the second at Station LA 15. California Tonguefish contributed another 19% of the abundance at Station LA 4, and Staghorn Sculpin and California Tonguefish each contributed about 8% to the abundance at Station LA 15.

With few exceptions (e.g., California Lizardfish), a consistent group of fish species has dominated the demersal fish community in the Port Complex since the 1970s, and generally the most abundant species have included White Croaker, and Queenfish, although relative numbers of these species have varied with time. Several of these species, most notably White Croaker and Queenfish, are characteristic of bays and harbors rather than offshore waters of the continental shelf and slope. For those species, regional studies suggest that the Port Complex represents an important habitat. In 2013–2014, as in previous harbor-wide surveys, highest abundance and biomass were collected in summer (when White Croaker and California Lizardfish were most common) and patterns of distribution were generally similar to those from previous surveys.

Invertebrates

The invertebrate fauna of the Port is important to managed species because invertebrates provide food for many, if not most, of them. Invertebrates include planktonic animals, epibenthic invertebrates that live on the sediment surface, infaunal invertebrates that live in the sediments, and riprap organisms that live on hard substrates.

Planktonic Invertebrates

Plankton invertebrates were not studied during the 2013–2014 Biological Survey of the Port Complex. However, during 26 bi-weekly plankton surveys conducted in the Port Complex in 2006, a total of 2,262 larval target shellfishes (late-stage larvae of crabs, spiny lobsters, and market squid) representing 16 taxa were collected at the HGS entrainment station (Station E1) (**Figure 4**; MBC et al. 2007). The highest concentrations were collected in May 2006. The megalops stage of kelp crabs (*Pugettia* spp.), spider crabs (Majidae), and pea crabs (*Pinnixa* spp.) comprised over 90 percent of all specimens collected. Advanced larvae of species with commercial fishery value (i.e., cancer crabs [Cancridae], California spiny lobster, and market squid) each comprised less than one percent of the target shellfish collection.

A total of 6,942 larval target shellfishes representing 20 taxa (combined species designations) were collected from the six source water stations (Stations H1-H6) in the Port Complex during 12 monthly surveys in 2006 (**Figure 4**; MBC et al. 2007). The highest concentrations were collected during the May 2006 survey. Megalops of kelp crabs, pea crabs, spider crabs, unidentified megalops, California spiny lobster, and cancer crabs were the most abundant taxa and comprised over 90 percent of all specimens collected.

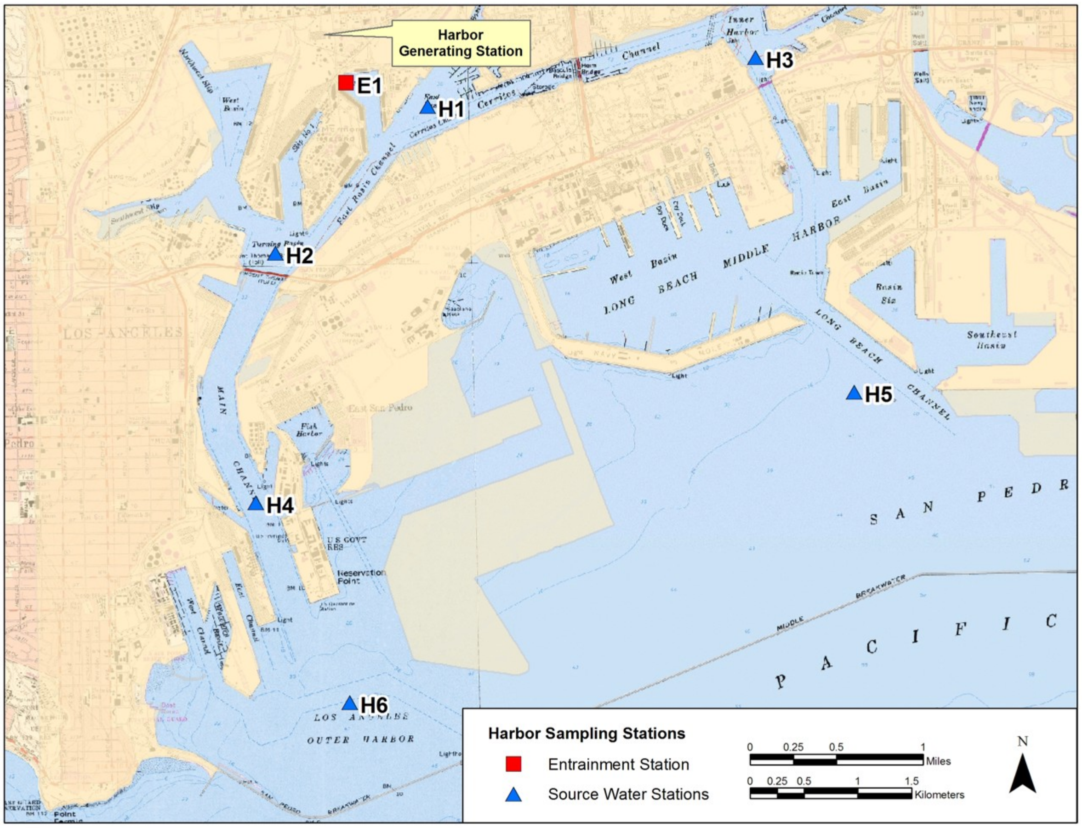

Figure 4. Entrainment and source water stations sampled January-December 2006. From: MBC et al. [2007]).

Juvenile/Adult Invertebrates

The total of 16,607 individuals of epibenthic invertebrates were taken in summer and spring trawl samples at 26 stations throughout the Port Complex during the 2013–2014 Biological Survey (MBC, 2016). This was considerably higher than the totals reported from the 2000 study, when 9,185 individuals were caught, and the 2008 study, when 7,043 individuals were reported (MEC, 2002; SAIC, 2010). The present 2013–2014 study collected 110 species, which was considerably higher than the 61 species caught during both of the previous harbor-wide surveys. As in the previous studies, the epifauna was dominated by arthropods, particularly several shrimp and crab species. Mean abundance was about one-third lower in summer than in spring, and during both seasons abundance was higher during night trawls. Slightly more individuals were taken at Inner Harbor stations than at stations and at non-mitigation shallow-water stations than at mitigation-area shallow-water stations.

Biomass of epibenthic fauna in 2013–2014 in the Port Complex was dominated by two taxa: unidentified sponge (Porifera), which accounted for 55% of summer biomass, 33% of spring biomass, and 46% overall (MBC, 2016). Target shrimp (*Sicyonia penicillata)*, contributed 12% to the summer biomass, 38% to spring biomass, and 23% overall, and were taken at all but three stations. Xantus swimming crab (*Portunus xantusii*) was also common in the Port Complex during that survey and was taken at 23 of the 26 stations. Mean biomass per trawl was much higher in 2013–2014 than in the previous harbor-wide surveys: seven times that in 2008, and three and one-half times higher than in 2000 (MEC, 2002; SAIC, 2010). In 2000, five species comprised 95% of total abundance: blackspotted bay shrimp (*Crangon nigromaculata*; 51%), tuberculate pear crab (*Pyromaia tuberculata*; 28%), Xantus swimming crab (10%), New Zealand bubble snail (*Philine auriformis*; 5%), and spotwrist hermit crab (*Pagurus spilocarpus*; 1%) (SAIC, 2010). Five species also accounted for 86 percent of total abundance in 2008: blackspotted bay shrimp (38%), ridgeback rock shrimp (*Sicyonia ingentis*; 16%), blacktail bay shrimp (*Crangon* *nigricauda*; 14%), Xantus swimming crab (11 %), and unidentified shrimp (*Heptacarpus* spp.; eight %) (SAIC, 2010). No apparent patterns in the spatial or depth distributions of invertebrates were identified during the study, although Xantus swimming crab was generally more abundant in shallower habitats. Three of the five most abundant taxa were collected at every station. Abundance was higher in the winter and spring surveys than in summer.

During the 2013–2014 Biological Survey, 19 macroinvertebrate species were represented by 821 individuals (not counting sponges) weighing 9.4 kg were collected in day and night trawls in summer and spring at Station LA 4 (MBC, 2016). Xantus swimming crab dominated both abundance (40% of the total) and biomass (44%) at the station. Target shrimp was second in booth abundance (26%) and biomass (41%). At Station LA 15, 25 macroinvertebrate species were represented by 520 individuals weighing 22.4 kg were collected. Sponge dominated the biomass catch at the station, accounting for 77% of the station weight, followed by Xantus swimming crab at 14%. By count, Xantus swimming crab contributed 40% of the station abundance followed by target shrimp (15%) and tuberculate pear crab (11%).

In West Basin of Los Angeles Harbor, trawl-caught invertebrate abundance since 1978 was dominated by bay shrimp (*Crangon* spp.; 53%), tuberculate pear crab (7%), Hemphill's kelp crab (*Podochaela hemphilli*; 7%), and Stimpson coastal shrimp (*Heptacarpus stimpsoni*; 4%). The most abundant macroinvertebrates collected in 2014 included Xantus swimming crab (Portunus xantusii; 36%), Alaska bay shrimp (*Crangon alaskensis*; 32%) and target shrimp (*Sicyonia penicillata*; 11%) (MBC, 2015b).

Protected Species

Some fish and invertebrate species in southern California are protected under California Department of Fish and Wildlife (CDFW) regulations, although few marine species are listed as either threatened or endangered by the federal government or the state of California. Special-status fish species that could occur in Los Angeles Harbor include Garibaldi (*Hypsypops rubicundus*) and California Grunion (*Leuresthes tenuis*); habitat in the Port Complex is unsuitable for the endangered Tidewater Goby (*Eucyclogobius newberryi*).

Garibaldi, designated as the California state marine fish, is a bright orange shallow-water species that is relatively common around natural and artificial rock reefs in southern California. Because of its territorial behavior it is an easy target for fishers and could be significantly depleted if not protected. Garibaldi spawn from March through October, and the female deposits demersal adhesive eggs in a nest that may contain up to 190,000 eggs deposited by several females (Fitch and Lavenberg 1975). Larval duration ranges 18–22 days (mean of 20 days) based on daily incremental marks on otoliths in recently settled individuals (Wellington and Victor 1989). Garibaldi larvae were collected in the Long Beach Outer Harbor and in Fish Harbor in 2008 (SAIC 2010).

California Grunion is a species with special status not because the population is threatened or endangered, but because their spring-summer spawning activities on southern California beaches put them at risk of overharvesting, and CDFW actively manages the fishery to ensure sustainability. Spawning occurs only three or four nights following each full or new moon, and then only for one to three hours immediately after the high tide, from late-February to early-September (Walker 1949). The female Grunion swims onto the beach, digs tail-first into the wet sand, and deposits her eggs, which are then fertilized by the male. Normally, the eggs are triggered to hatch at the high tide of the subsequent new or full moon by the waves that reach high enough on shore to wash out the sand and carry the eggs to the ocean, approximately 10 days after fertilization (Walker 1952). California Grunion were collected at all of pelagic fish stations during the 2013–2014 and most of the stations during the 2008 biological surveys of the Port Complex (SAIC, 2010; MBC, 2016). It was the second most abundant species collected by lampara in 2013–2014. No grunion were collected at the two lampara stations nearest to the Everport Container Terminal in spring. In summer,10 California grunion were collected at each of the two nearest stations during nighttime lampara surveys (out of a total of 9,053 fish collected at night during summer). No spawning is known to occur in the immediate vicinity of the proposed Project.

The Tidewater Goby is a fish species endemic to California and is listed as federally endangered. The tidewater Goby is threatened by modification and loss of habitat resulting primarily from coastal development. It appears to spend all life stages in lagoons, estuaries, and river mouths (Swift et al. 1989), but may enter marine environments when flushed out of these preferred habitats during storm events. Adults or larvae may not survive for long periods in the marine environment, but larval transport over short distances may be a natural mechanism for local dispersal. In Los Angeles County the only known location where a population is extant (by re-establishment) is Malibu Creek (Swift et al. 1993). Habitat near the proposed Project is not suitable for this species and this species has not been observed in any recent survey.

EFH AND MANAGED SPECIES

Off southern California, species managed by the Pacific Fishery Management Council (PFMC) under the Magnuson-Stevens Fishery Conservation and Management Act are included in the Coastal Pelagics FMP and the Pacific Groundfish FMP. The goals of the management plans include, but are not limited to: the promotion of efficient and profitable fisheries; achievement of optimal yield; provision of adequate forage for dependent species; prevention of overfishing; and development of long-term research plans (PFMC 2011a,b).

A description of the fish and invertebrate communities of the study area is provided in the previous section. Under the Magnuson-Stevens Act, the federal government has jurisdiction to manage fisheries in the U. S. Exclusive Economic Zone (EEZ), which extends from the outer boundary of state waters (3 nautical miles [5.6 km] from shore) to a distance of 200 nautical miles (370 km) from shore. Fishery Management Plans (FMPs) are extensive documents that are regularly revised and updated. The goals of the management plans include, but are not limited to: the promotion of efficient and profitable fisheries, achievement of optimal yield, provision of adequate forage for dependent species, prevention of overfishing, and development of long-term research plans (PFMC 2011, 2014). There are two FMPs that include waters adjacent to the Project site: the Coastal Pelagics FMP (6 groups [5 species plus Euphausiids]) and the Pacific Groundfish FMP (85 species) (see **Appendix**).

COASTAL PELAGICS FMP

EFH for Coastal Pelagics is defined as all marine and estuarine waters above the thermocline (the zone of the water column where water temperature changes rapidly between warmer surface waters and cold deep waters) from the shoreline of the coast of California offshore to the limits of the Exclusive Economic Zone. The Coastal Pelagics FMP (PFMC 2016) currently covers four managed fish species (**Table 1**) and two managed invertebrate species (market squid, *Doryteuthis opalescens*, and krill [small, planktonic shrimp-like crustaceans]), as well as a number of “Ecosystem Component Species” (ECS), including Pacific herring (*Clupea pallasii pallasii*) and several “silversides” species, which in the Port area comprise jacksmelt, topsmelt, and grunion (**Table 1**). The ECS, along with krill, were added to reflect their importance as forage for other managed species. The Port area is at the southern end of the Pacific herring’s range (Miller and Les (1972); krill, although abundant in offshore coastal waters, are not known from the Port; and squid, although occasionally collected as larvae in the Port, have not been collected as adults in recent port-wide surveys. Accordingly, those species are not considered further in this analysis.

Table 1. Managed fish species found in Los Angeles Harbor based on past occurrences.

Species	Potential Habitat Use	Larval[1,2,4,6]	Juvenile/Adult[2,3,4,5]
Coastal Pelagics			
Northern Anchovy (*Engraulis mordax*)	Open water.	Abundant	Abundant
Pacific Sardine (*Sardinops sagax*)	Open water.	Uncommon	Uncommon
Pacific (Chub) Mackerel (*Scomber japonicus*)	Open water, juveniles off sandy beaches and around kelp beds.	-	Uncommon

Jack Mackerel (*Trachurus symmetricus*)	Open water, young fish over shallow banks and juveniles around kelp beds.	Rare	Uncommon
Shared Ecosystem Component Species			
California Grunion (*Leuresthes tenuis*)	Open water over shallow bottoms, spawn on sandy beaches	-	Common
Topsmelt (*Atherinops affinis*)	Surface waters common in estuaries, kelp beds and along sandy shores	-	Common
Pacific Groundfish			
English Sole (*Parophrys vetulus*)	Soft bottom habitats.	Rare	Uncommon
Pacific Sanddab (*Citharichthys sordidus*)	Soft bottom habitats.	Rare	Uncommon
Black Rockfish (*Sebastes melanops*)	Along breakwater, near deep piers and pilings. Associated with kelp, eelgrass, high relief reefs.	-	Rare
Bocaccio (*Sebastes paucispinis*)	Multiple habitat associations, including soft and hard bottom, kelp, eelgrass, etc.	-	Rare
Brown Rockfish *(Sebastes auriculatus)*	Multiple habitat associations, including soft and hard bottom, near bottom	-	Rare
Calico Rockfish (*Sebastes dallii*)	Multiple habitat associations but prefer hard substrata and rocky interfaces.	-	Rare
California Scorpionfish (*Scorpaena guttata*)	Benthic, on soft and hard bottoms, as well as around structures.	-	Uncommon
Gopher rockfish (*Sebastes carnatus*)	Reef associated, near bottom.	-	Rare
Grass Rockfish (*Sebastes rastrelliger*)	Common on hard substrate, kelp, and eelgrass habitats.	-	Rare
Kelp Rockfish (*Sebastes atrovirens*	Common on hard substrate, kelp; reported along breakwater.	-	Rare
Olive Rockfish (*Sebastes serranoides*)	Common around hard substrate, kelp; reported along breakwater.	-	Rare
Vermilion Rockfish (*Sebastes miniatus*)	Juveniles over soft-bottom and kelp, adults associated with hard substrate.	-	Uncommon
Lingcod (*Ophiodon elongatus*)	Multiple habitat associations but prefer hard substrata and rocky interfaces.	-	Rare
Cabezon (*Scorpaenichthys marmoratus*)	Multiple habitat associations but prefer hard substrata and rocky interfaces.	Rare	Rare
Leopard Shark (*Triakis semifasciata*)	Multiple habitat associations, including soft bottoms, and near structure, kelp, and eelgrass.	N/A	Rare
Spiny Dogfish (*Squalus acanthias*)	Multiple habitat associations, generally near bottom.	N/A	Rare
Big Skate (*Raja binoculata*)	Soft bottom habitat.	N/A	-
California Skate (*Raja inornata*)	Soft bottom habitat.	N/A	Uncommon
Sources: 1 – MBC et al. (2007), 2 – MEC and Associates (2002), 3 – MBC (2013), 4 – SAIC (2010), 5 – MEC (1999). 6 – MBC (2016) N/A = Not applicable, internal fertilization. Abundant>Common>Uncommon>Rare. Note - Most rockfish larvae not identifiable to species.			

PACIFIC GROUNDFISH FMP

EFH for Pacific Groundfish includes all waters off southern California between Mean Higher High Water (MHHW) and depths less up to 11,500 ft (3,500 m), and the upriver extent of saltwater intrusion. Not including ECS, there are 85 fish species covered under the Pacific Groundfish FMP, most of them rockfish species that occur primarily in deep water well outside the Port. The FMP also includes 12 flatfish species, three shark species, and six other species. Specific Habitat Areas of Particular Concern (HAPCs) have been identified for Pacific Groundfish, including estuaries, canopy kelp, seagrass (i.e., eelgrass), rocky reefs, and other areas of interest.

In 2016, some species that were previously covered under the Pacific Groundfish FMP were removed from the list of managed species and designated as ECS. These included big skate (*Raja binoculata*) and California skate (*R. inornata*), both of which are common in southern California coastal waters. The ECS for the Pacific Groundfish FMP also includes a number of other skate species, a group of fish known as grenadiers, and several groups of forage fish, including silversides, which are shared with the Coastal Pelagics FMP. As with Coastal Pelagics, the development of commercial fisheries for the Pacific Groundfish ECS is prohibited at this time. Of the nearly 100 species in the Pacific Groundfish FMP, only 19 (including two ECS species) have been collected in the Port (**Table 2**).

Table 2. Occurrence of managed fish species near the proposed Project site and elsewhere in the Port Complex, 2008 and 2013–2014.

	Stations LA4 or LA15 (2013–2014)[3]	Stations LA4 or LA15 (2008)[1]	Port Complex (2008, 2013–2014)[1, 2]
		Coastal Pelagics	
Northern anchovy (*Engraulis mordax*)	X	X	X
Pacific Sardine (*Sardinops sagax*)	X	X	X
Pacific (Chub) Mackerel (*Scomber japonicus*)	X	-	X
Jack Mackerel (*Trachurus symmetricus*)	X	X	X
		Shared Ecosystem Component Species	
California Grunion (*Leuresthes tenuis*)	X	X	X
Topsmelt (*Atherinops affinis*)	X	X	X
		Pacific Groundfish	
English Sole (*Parophrys vetulus*)	-	X	X
Pacific Sanddab (*Citharichthys sordidus*)	-	X	X
Bocaccio (*Sebastes paucispinis*)	-	-	X
Brown Rockfish (*Sebastes auriculatus*)	-	-	X
Calico Rockfish (*Sebastes dallii*)	-	-	X

California Scorpionfish (*Scorpaena guttata*)	X	-	X
Gopher rockfish (*Sebastes carnatus*)	-	-	X
Vermilion Rockfish (*Sebastes miniatus*)	X	-	X
Cabezon (*Scorpaenichthys marmoratus*)	-	-	X
Leopard Shark (*Triakis semifasciata*)	-	-	X
Spiny Dogfish (*Squalus acanthias*)	-	-	X
California Skate (*Raja inornata*)	X	X	X
Sources: 1 –SAIC (2010), 2 – MBC (2016)			

OCCURRENCE OF MANAGED SPECIES AT THE PROJECT SITE

Although there are nearly 100 fish/invertebrate species covered under the Coastal Pelagics and Pacific Groundfish FMPs, not all occur near the Project site. **Table 1** lists species that have been collected or observed during studies in the Port Complex. **Table 2** summarizes the occurrence of these species near the proposed Project site in 2008 and 2013–2014, and in the Port Complex in 2008 and 2013–2014.

Coastal Pelagics

All of the Coastal Pelagics species could potentially occur at the site of the proposed Project. However, only one coastal pelagic fish—Northern Anchovy—is likely to occur in the Project vicinity. Northern Anchovy is among the most common and abundant fish species in the Port Complex. In 2006, anchovy larvae were present in the Port Complex during two seasonal periods: a greater peak in March–July and a lesser peak in October–December (MBC et al., 2007). Juvenile and adult anchovies have consistently been collected during fish sampling near the Project site (MEC and Associates, 2002; SAIC, 2010; MBC, 2016).

Pacific Sardine was collected in very small numbers in 2013–2014 (MBC, 2016). Pacific Sardine larvae were not abundant during the 2006 ichthyoplankton sampling throughout the Port Complex; two Pacific Sardine larvae were collected in the Outer Harbor in April 2006 (MBC et al., 2007). This epipelagic species (occurring in about the upper 200 meters of the ocean) occurs in loosely aggregated schools (Wolf et al., 2001) and is less common than Northern Anchovy near the Project site (MEC and Associates, 2002; SAIC, 2010; MBC, 2016). Jack Mackerel and Pacific Mackerel have been collected in the Harbor, but in much lower frequency than Northern Anchovy and Pacific Sardine.

Although no mature market squid have been reported in recent surveys near Berths 167–169, market squid paralarvae were collected in Inner and Outer Harbor areas in 2006 (MBC et al., 2007). All coastal pelagics are associated with the water column (as opposed to the seafloor like many of the groundfish); however, female squid also lay egg masses on sandy bottoms during spawning (at depths of about 16–180 feet, with most occurring between 66 and 115 feet) (PFMC, 2011). Silversides, including Topsmelt, Jacksmelt, and California Grunion, were abundant in pelagic fish surveys in 2014, but not adjacent to the proposed Project site (MBC, 2016).

In 2005, krill (Euphausiids) were added as a managed unit under the Coastal Pelagic Species FMP, and their harvest is prohibited in U.S. waters (PFMC, 2011). This is intended to ensure that, to the extent practicable, fisheries would not develop that could put krill stocks at risk and impact other marine resources that depend on krill. EFH for krill varies by species, but the waters of the Port are considered EFH. Due to their small size, they are not typically identified during biological surveys within the Ports.

Pacific Groundfish

None of the species covered under the Pacific Groundfish FMP are considered abundant in the proposed Project area. However, many are associated with hard substrate, kelp, and/or eelgrass, which are less frequently sampled habitats than soft bottoms. The only Pacific Groundfish species collected at Stations LA 4 or LA 15 (near the proposed Project site) in 2013-2014 were California Scorpionfish (*Scorpaena guttata*), Vermilion Rockfish (*Sebastes miniatus*) and California Skate.

A 2010 review of bycatch species in Coastal Pelagic fisheries confirmed that incidental catch and bycatch in these fisheries is dominated by other Coastal Pelagics and that bycatch/incidental catch of non-Coastal Pelagics is extremely low. However, Jacksmelt and Pacific Herring are infrequently caught, and therefore were added to the FMP under Amendment 13 to ensure continued monitoring of incidental catch and bycatch of these species (PFMC, 2011). The distribution of Pacific Herring does not normally extend southward beyond San Francisco Bay (Fitch and Lavenberg, 1975). Jacksmelt are common in nearshore waters of southern California (Miller and Lea, 1972), and they were collected by lampara near the proposed Project site in 2014 (MBC, 2016).

Ten California Skate were collected by trawl at Stations LA 4 and LA 15 in 2014 (MBC, 2016). Although they have been collected in other studies of the Port Complex, no Big Skate were collected in 2014 (MBC, 2016). California Skate has been collected in all four harbor-wide biological surveys, whereas Big Skate was collected in 2000 and in West Basin during annual trawl surveys. Both species have been collected at West Basin in the last seven years (**Table 2**). Both Skate species prefer soft bottom habitat, although California Skate occurs in much deeper waters (60 to 2,200 ft [18 to 671 m]) than Big Skate (10 to 360 ft [10 to 110 m]) (Miller and Lea, 1972). English Sole was collected in prior Port-wide studies, and in West Basin during annual trawl surveys, but only two individuals were collected in 2014 (MBC, 2016).

California Scorpionfish (*Scorpaena guttata*) is another species collected in all four harbor-wide surveys. Twenty-nine individuals were collected in 2014, but only one was collected at Stations LA 4 or LA 15. Nine Vermilion Rockfish were collected at Stations LA 4 and LA 15 in 2014 (MBC, 2016). Vermilion Rockfish occur between 20 and 1,440 ft (6 and 436 m), but are most common between 165 and 495 ft (50 and 50 m). Juveniles are common in shallower water (20 to 120 ft, or 6 to 36 m), where they hover over sand patches near alga or structures, including pier pilings (Love et al., 2002). The remaining species in **Table 1** have only been collected sporadically and in low numbers.

ASSESSMENT OF POTENTIAL IMPACTS

Potential effects on EFH from construction and operation of the proposed Project could result from:

- Dredging and disposal of approximately 38,000 cubic yards of sediment from Berths 226–232 to achieve the desired depths;
- Installation of sheet piles alongside Berths 230–232, and king and sheet piles alongside Berths 226–229;
- Construction and operational noise;
- Spills from shore or from vessels at the terminal; and
- Introduction of invasive species.

The assessment of impacts is based on the assumption that the proposed Project or alternative (as applicable) would adhere to the following:

- Coverage under the General Construction Activities Stormwater Permit (GCASP) for the onshore portions of the proposed Project, which would impose construction controls to limit spills and runoff to the marine environment.

- Coverage under the General Industrial Activities Stormwater Permit (GIASP), which would require adherence to a Stormwater Pollution Prevention Plan (SWPPP) and implementation of Best Management Practices (BMPs) during operation of the proposed Project.
- Implementation of City of Los Angeles MS4/LID construction and operational control measures into the project design.
- Characterization and remediation of contaminated upland soils in accordance with LAHD, Los Angeles Regional Water Quality Control Board (RWQCB), Department of Toxic Substances Control (DTSC), and Los Angeles County Fire Department protocol and cleanup standards.
- Management of dredged sediments consistent with a DMMP, USACE Section 10/Section 404 permit requirements, USACE MPRSA Section 103 permit requirements (if ocean disposal is employed), and RWQCB WDRs and CWA Section 401 Water Quality Certification, including dredge and disposal site monitoring and adaptive management.
- Preparation and implementation of a Debris Management Plan and Oil Spill Contingency Plan (OSCP) that identifies containment and spill management in the event of an accidental spill.

Construction Impacts

Construction duration of the project is expected to occur for 24 months. Over-water and in-water impacts on water quality could occur from dredging, installation of sheet piles and king piles, backland improvements, and potential construction-related spills. Impacts to water quality could result from the suspension of sediments and/or the introduction of contaminants to the water column. Suspension is the dislodgement and dispersal of sediment into the water column (where finer sediments are subject to transport and dispersion by currents). Sediment suspension can also result in the short-term release of contaminants in the water column through release of pore water (water between individual sediment particles) and by desorption, or separation, from suspended particles. The potential water quality effects from construction of each of the major Project components are described separately below.

The effects of these processes could include:

- Increased turbidity (reduced water clarity and light transmittance),
- Increased sediment suspension (or suspended solids),
- Increased dissolved or particulate contaminants (that were previously bound to dredged sediments or in pore water),

  Plankton blooms from suspension of nutrient-laden sediments,
- Reduced dissolved oxygen (from suspension of sediments with low oxygen), and
- Reduced pH.

Salinity and temperature would not be affected by construction of the proposed Project.

Construction would also produce underwater noise, principally from the installation of piles to support the new wharf, that could adversely affect managed fish species, and would involve over-water night lighting that could affect managed species.

Effects to Water Quality during Dredging and Pile Installation

In-Water Construction: Dredging and, to a lesser extent, pile installation and rock dike removal, would re-suspend bottom sediments to create localized and temporary turbidity plumes over a relatively small area. Suspension of sediments during clamshell dredging occurs during bucket impact, penetration, and removal of the bucket from the sediment, as well as during bucket retrieval through the water column. The dredge plume could cause elevated turbidity and reduced light transmittance, DO, and pH, and elevated contaminant concentrations, in the immediate vicinity of the dredge. With continuous dredging these effects could last for periods of days to several weeks.

During dredging, a water quality monitoring program would be implemented by LAHD's Construction Division in compliance with both USACE and RWQCB permit requirements, to achieve adaptive management of the dredging operation and control measures. As documented in Anchor Environmental (2003) and Jones & Stokes (2007a, 2007b), the dredge plume and its effects would be localized, would dissipate rapidly with distance from the dredge site, and would redistribute a negligible proportion (two percent or less) of the resuspended sediment. The majority of suspended sediments would settle within one hour of dredging (Palermo et al. 2008). Turbidity would not be expected to extend outside of the West Basin because of the slow circulation within the basin and the constricted entrance to the basin. Water quality monitoring, BMPs, and adaptive management of dredging operations in compliance with the construction management plan, 404 permit, and WDRs would ensure that turbidity did not extend outside the permitted impact area and that conditions at the edge of the dredge site (300 feet downcurrent of the dredge) would be similar to background (control) conditions.

Within the dredge plume, DO and pH could be slightly reduced. Reductions in DO concentrations, however, would be localized and brief, and would not be expected to persist or to cause detrimental effects to biological resources. For example, during dredging at Berths 212–215 in 2001, there was little difference in DO and pH between Station C (300 feet downcurrent of dredging) and the control station approximately 1000 feet away (MBC 2001).

As the majority of sediments in the dredge footprint has been found to be suitable for unconfined aquatic disposal, contaminants released from resuspended sediments would not result in elevated contaminant concentrations in the water column. In addition, long-term adverse effects on water quality would not be expected because the localized nature of the dredging and the BMPs employed during dredging would limit the amount of contaminants released and the extent of their spread.

Nutrients released into the water column during dredging and pile installation could promote nuisance growths of phytoplankton. As described in MBC (2014), however, the limited spatial and temporal extent of proposed project activities with the potential for releasing nutrients from bottom sediments mean that adverse effects on EFH in Harbor waters are not anticipated to occur in response to the proposed Project.

Spills and leaks of hydrocarbons (fuels and lubricants) from water-based construction equipment could adversely affect water quality in the West Basin. However, the history of construction activities in the Harbor indicates that the possibility of such an occurrence is remote, and the employment of standard spill prevention and countermeasures would limit the likelihood of substantial amounts of such materials from entering the water if a spill or leak did occur. Accordingly, spills and leaks from in-water construction of the proposed Project would be unlikely have a substantial adverse effect on EFH.

Backlands Construction: The proposed Project would involve the development of approximately 22 acres of unimproved backlands and construction would occur approximately 750 feet (~180 meters) from the water's edge. Backlands construction would be controlled by various construction permits and practices that would limit the likelihood and magnitude of runoff and spills. BMPs to reduce runoff would include measures such as berming around areas of disturbance, minimization of the area of excavation, temporary swales to pond water on site, and wheel washing for construction equipment. Accordingly, non-stormwater discharges and stormwater runoff from soil disturbance, asphalt leachate, concrete washwater, and other construction materials, as well as accidental spills from equipment and materials storage and handling, would be very unlikely to result in substantial impacts on West Basin water quality and EFH.

Underwater Sound

Sound pressure waves in the water from pile driving can affect fish, particularly those with a swim bladder, with the level of effect influenced by factors such as species, size of fish (smaller fish are affected more), physical condition of fish, peak sound pressure and frequency, shape of the sound wave, depth of water at the piles, location of fish in the water column, amount of air in the water, size and number of waves on the water surface, bottom substrate composition and texture, tidal currents, and presence of predators (NMFS 2004). Types of effects on fish can include mortality from swim bladder rupture or internal hemorrhaging, changes in behavior, and hearing loss (permanent or temporary) (Vagle 2003). The most common behavioral changes include temporary dispersal of fish schools.

The sound pressure waves from pile driving could result in temporary avoidance of the construction areas as well as cause mortality of some fish in the Coastal Pelagics FMP. Because smaller fish are more susceptible to acoustic injury, the species most likely to suffer mortality would be Northern Anchovy, Pacific Sardine, and Topsmelt. These species play important roles in the cycling of energy and nutrients in the Harbor, which has been designated as EFH for both Northern Anchovy and Pacific Sardine. However, these species are abundant in the Harbor and due to the limited area of potential effect, the numbers of fish exposed to harmful pressure waves would represent a very small proportion of the number of fish in the Port at any given time.

Although sound transmission impacts to fish populations during pile driving are not expected to be substantial, pile driving sound pressure would be minimized through measures to address potential impacts to marine mammals. Sound transmission in the underwater environment can be affected by local bathymetry, substrates, currents, and stratification of the water column. Based on underwater studies of gray whale behavior, a disturbance threshold (Level B harassment) of 160 decibels Root Mean Square (dB_{RMS}) has been identified for marine mammals based on previous research on cetaceans (NOAA Fisheries 2015). Exposure to sound at this level would likely cause avoidance, but not injury, for marine mammals. The current in-water Level A harassment (injury) threshold for non-explosive sounds is 180 dB_{RMS} for cetaceans and 190 dB_{RMS} for pinnipeds. The current in-water Level B threshold for behavioral disruption for non-pulse noise (e.g., vibratory pile driving) is 120 dB_{RMS}. However, as noted previously, recent baseline sound levels in Cerritos Channel were ranged from 120 to 132 dB (Tetra Tech 2011).

Acoustic data from several different projects (and pile sizes) was compiled to estimate the distance of the 160, 180, and 190 dB_{RMS} isopleths from installation of sheet piles and H-piles (also referred to as king piles). Exponential regression lines were calculated for each of the data sets, and the coefficients of determination (R^2) for each data set are presented below (**Table 3**). (An R^2 of 0.0 indicates that the model explains none of the variability of the response data around its mean, while an R^2 of 1.0 indicates that the model explains all the variability of the response data around its mean.)

Table 3. Acoustic data - sheet and H-pile driving projects using vibratory and impact hammers.

Project Location	Pile Type	Estimated Distance (m) to:			Coefficient of Determination (R^2)	Data Source
		160 dB_{RMS}	180 dB_{RMS}	190 dB_{RMS}		
Vibratory Hammer						
Port of Anchorage	14-in. H-pile	18	<10	<10	0.79	URS (2007)
Port of Oakland	24-in. sheet	22	<10	<10	0.64	ICF and I&R (2009)
Impact Hammer						
Elkhorn Slough	12-in. H-pile	78	<10	<10	0.88	ICF and I&R (2012)
Port of Oakland	24-in. sheet	167	28	11	0.74	ICF and I&R (2009)
Noyo River	12-in. H-pile	44	10	<10	0.62	ICF and I&R (2009)
Port of Anchorage	12-in. H-pile	244	13	<10	0.62	URS (2007)

The estimated distances to the 160 dB_{RMS} isopleth for each of the steel pile sizes were plotted to calculate the effective safe distance for the sheet and king piles included as part of the proposed Project. These distances were calculated based on acoustic data from sheet and king pile driving using impact and vibratory hammers. Based on the same exponential regression technique described previously, the estimated distance to the Level B harassment threshold (160 dB_{RMS}) ranged from 18 to 22 meters for vibratory hammer, and 44 to 244 for impact hammer. Estimated distances to the Level A injury threshold (180 dB_{RMS} for cetaceans and 190 dB_{RMS} for pinnipeds) were much shorter.

Sheet pile and king pile installation at the proposed Project site is anticipated to result in disturbance (Level B harassment) to marine mammals in the vicinity of construction operations, and could potentially result in Level A harassment during impact driving of sheet piles and king piles. As a result of this, mitigation measure MM BIO-1 has been proposed to reduce the potential for impacts to marine mammals.

Mitigation Measure BIO-1

Although it is expected that marine mammals will voluntarily move away from the area at the commencement of the vibratory or "soft start" of pile-driving activities, as a precautionary measure, pile-driving activities occurring as part of the sheet pile and king pile installation will include establishment of level B (harassment) and level A (injury) safety zones by a qualified marine mammal professional, and the area surrounding the operations (including the safety zones) will be monitored for marine mammals by a qualified marine mammal observer.[1]

The pile-driving site will move with each new pile; therefore, the safety zones will move accordingly.

[1] Marine mammal professional qualifications shall be identified based on criteria established by LAHD during the construction bid specification process. Upon selection as part of the construction award winning team, the qualified marine mammal professional shall develop site specific pile-driving safety zone requirements, which shall follow NOAA Fisheries Technical Guidance Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NOAA Fisheries 2016) in consultation with the Acoustic Threshold White Paper prepared for this purpose by LAHD (LAHD 2017). Final pile-driving safety zone requirements developed by the selected marine mammal professional shall be submitted to LAHD Construction and Environmental Management Divisions prior to commencement of pile-driving.

Habitat Loss

No permanent loss of marine habitat would occur because the proposed Project would not result in fill being discharged into the marine environment that could eliminate marine habitat functions. Dredging would temporarily impact benthic habitat within the Project area. In addition, sheet pile and king piles would be installed to stabilize the wharf. These structural elements would be installed within a few feet of the existing wharf. The sheet pile and king piles would protrude slightly above the seafloor, and would provide additional hard substrate usable as habitat by marine organisms.

Effects on Special Aquatic Habitats

There are no special aquatic habitats or other sensitive natural communities identified at the proposed Project site that would be affected by proposed Project construction. There are no wetlands, giant kelp beds, or eelgrass beds in the immediate vicinity of the Everport Container Terminal. Water quality effects are expected to be localized and transitory, and are not expected to significantly affect any wetlands, kelp beds, or eelgrass beds. There are no mudflats or marshes near the Project site that would be affected by proposed Project construction. Impacts on EFH during construction would be localized and temporary.

Effects of Backlands Improvements

Ground disturbances and construction activities related to backlands improvements could result in temporary impacts on surface water quality if uncontrolled runoff of exposed soils, asphalt leachate, concrete washwater, and other construction materials enter Harbor waters. No upland surface bodies of water currently exist within the proposed Project backlands. Thus, proposed Project-related impacts on surface water quality would be limited to potential non-stormwater discharges or discharges of stormwater runoff to Harbor waters that receive runoff from the proposed Project site. Runoff from the upland portions of the proposed Project site would flow into the Harbor, along with runoff from other adjacent areas of the Harbor's subwatershed. Runoff at the proposed Project site is collected by the on-site storm drain system and is managed in compliance with applicable permits and ordinances (including SUSMP requirements) prior to discharge to the Harbor (to the Main Channel). In addition to soils, runoff from a construction site could contain a variety of contaminants, including metals and PAHs associated with construction materials, and spills of oil or other petroleum products. Impacts on surface water quality from accidental spills are addressed below.

Backlands improvement would not directly introduce sediments to the waters off the Everport Container Terminal; however, stormwater runoff could carry sediments to the Harbor waters without intervention. Accidental spills could also introduce contaminants to Harbor waters.

Accidental Spills

Accidents resulting in spills of fuel, lubricants, or hydraulic fluid from equipment used during dredging, pile installation, backlands improvement, and/or disposal of dredged material, could occur during proposed Project construction. Based on the history for this type of work in the Harbor, accidental leaks and spills of large volumes of hazardous materials or wastes containing contaminants during onshore construction activities have a very low probability of occurring because large volumes of these materials typically are not used or stored at construction sites.

Shading and Nighttime Illumination

Lighting to support construction activities at night and shade from construction vessels and could have temporary influences on species in the Coastal Pelagics FMP. For example, zooplankton and small pelagic prey organisms are often attracted to night light, and those organisms may in turn attract managed species. Daytime shading from construction vessels or localized turbidity may reduce algal productivity. Certain fish species are attracted to shade and cover that construction vessels provide. However, because construction activities and locations would be constantly changing and because nighttime construction is not proposed for the in-water elements of the proposed Project, no substantial disruption of biological communities, including EFH, would occur.

Operational Impacts

Increased Vessel Activity

The proposed Project would increase the number of vessel calls at the Everport Container Terminal over time. However, the proposed Project would not substantially add to the overall underwater noise level. Schooling fish, such as Pacific Sardines and Northern Anchovy, likely would ignore the ship movements and sound, or temporarily move out of the way. Other federally managed species are rare in the harbor, and vessel noise would result in only temporary effects on their distribution in the Port. In recent history, the Port has witnessed an improvement in fish abundance and EFH for federally managed species (MEC and Associates 2002; SAIC 2010) even though there has been increased vessel traffic in the harbor. Therefore, it is unlikely that larger vessels or additional ship calls would affect federally managed species, and there would be no adverse effects on EFH for any species in the harbor.

Shading

The addition of five new post-Panamax cranes (for a total of 13 post-Panamax cranes) would also slightly increase the potential for shading in the waters off the terminal. However, there would be no additional wharf construction, Berths 226–236 are too deep to support eelgrass, and the unconsolidated sediments do not support giant kelp or macroalgae. Therefore, adverse effects to algae or eelgrass, or managed fish species due to shading are unlikely to occur.

Effects from Runoff and Spills

Runoff from the Project site would not substantially reduce or alter EFH in harbor waters because water quality standards for protection of marine life would not be exceeded. Operation of proposed Project facilities would have minimal effects on EFH. Accidents resulting in spills of fuel, lubricants, or hydraulic fluid could occur during proposed Project operation. Accidental leaks and spills of large volumes of hazardous materials or wastes containing contaminants during onshore construction activities have a very low probability of occurring because large volumes of these materials typically are not used or stored at the Everport Container Terminal.

No Significant Ecological Areas (SEAs) or natural plant communities are present that could be affected by operation of proposed Project facilities. No wetlands or mudflats are present at the proposed Project site, and those in other areas of the harbor are not located in or near the channels that would be used by vessels transiting to or from the Everport Container Terminal. The nearest giant kelp beds to the proposed Project site are near the Main Channel entrance (adjacent to the USCG Base and Berth 72) and are located more than 0.6 miles from the Everport Container Terminal. The nearest eelgrass bed is off the southern tip of Mormon Island, approximately 1,200 feet from the northern edge of the proposed Project site (MBC 2015a). These beds would not be affected by operations at the proposed Project site. Runoff from the re-paved areas of the proposed Project site would be routed to existing onsite storm drains, treated via BMP devices, and discharged to the Main Channel. The runoff is not expected to adversely affect eelgrass beds due to the large separation distance.

Nonnative/Invasive Species

Vessels calling at Berths 226-236 would come primarily from outside the U.S. EEZ and would be subject to regulations, such as the Vessel General Permit, that minimize the introduction of nonnative species in ballast water. Both the USCG and EPA regulate ballast water discharges, and both agencies currently require ballast water exchange for most vessels operating in U.S. waters. In addition, California requires ballast water exchange on coastwise voyages (e.g., between Los Angeles and Oakland). However, at present, the discharge standards in California are more stringent than federal regulations. In accordance with governing statutes and regulations, vessels have four options to comply with California's performance standards: (1) retention of all ballast water on board, (2) use of potable water as an alternative ballast water management method, (3) discharge to a shore-based ballast water receiving and treatment facility, and (4) treatment of all ballast prior to discharge by a shipboard ballast water treatment system.

The State Legislature delayed implementation of the State's performance standards in 2013 because the state lacks the scientific protocols and capacity to measure compliance (Scianni et al. 2013), and no shipboard ballast water treatment systems are currently available to meet all of California's performance standards for the discharge of ballast water (CSLC 2013). Thus, it is unlikely but possible that ballast water discharges during cargo transfers in the Port would contain nonnative species.

Nonnative invertebrate species can also be introduced via vessel hulls. The CSLC has issued a report on commercial vessel fouling in California (CSLC 2006), recommending that the state legislature broaden the state program and adopt regulations to prevent non-indigenous species introductions by ship fouling. Of particular concern is the introduction of the alga *Caulerpa taxifolia*. However, this species is most likely introduced from disposal of aquarium plants and water and is spread by fragmentation rather than from ship hulls or ballast water discharges. Therefore, risk of introduction is associated with movement of plant fragments from infected to uninfected areas through activities such as dredging and/or anchoring. The LAHD conducts surveys, consistent with the Caulerpa Control Protocol (NMFS and CDFG 2008) prior to water-related construction projects to verify that *Caulerpa* is not present. This species has not been detected in the Port Complex and has been eradicated from known areas of occurrence in southern California. Therefore, there is little potential for additional vessel operations from the proposed Project to introduce these species.

Undaria pinnatifida, which was discovered in the Port Complex in 2000 (MEC and Associates 2002), and *Sargassum filicinum* (or *S. horneri*), discovered in October 2003 (MBC 2004), may be introduced and/or spread as a result of hull fouling or ballast water and, therefore, might have the potential to increase in the harbor via vessels traveling between ports in the EEZ. Invertebrates that attach to vessel hulls could be introduced in a similar manner.

The proposed Project would result in an increase of an additional 42 vessels per year. Considering, the limited discharges of non-local water from container ships (see above) and the ballast water regulations currently in effect, the potential for introduction of additional exotic species via ballast water would be low from vessels entering from outside the EEZ. Vessel hulls are generally coated with antifouling paints and cleaned at intervals to reduce the frictional drag from growths of organisms on the hull (Global Security 2007), which would reduce the potential for transport of exotic species.

The Port of Los Angeles and Port of Long Beach, California State Lands Commission, and the University of Maryland are collaborating with American President Lines to test a shipboard ballast water treatment system designed to remove non-native species from ballast water, and prevent their introduction into Harbor waters. If methods become available in the future, they would be implemented as required at that time.

ASSESSMENT SUMMARY

Construction impacts would be localized and temporary. Potential impacts from dredging, pile installation, construction runoff, accidental spills, and shading would be less than significant. No habitat loss would occur. Acoustic impacts from pile driving could result in adverse effects to fish species in the immediate construction area. However, due to the limited potential impact area relative to the Harbor, this is not considered a substantial disruption of EFH. Avoidance of the area would be temporary as pile driving would occur intermittently over a period up to approximately 12-18 months (duration of in-and over water construction). There would be no physical barriers to movement, and the baseline condition for fish and wildlife access would be essentially unchanged. Due to the limited potential impact area, in- and overwater construction is not considered a substantial disruption of EFH for Coastal Pelagics or Pacific Groundfish.

Potential impacts resulting from operation of the Everport Container Terminal including effects to water quality resulting from accidental spills and runoff, and disturbance from vessel movements would be less than significant. There are currently no feasible mitigation measures to reduce the potential for introduction of invasive species via hull fouling. Impacts due to the introduction of invasive species are considered significant and unavoidable.

REFERENCES

Allen, L. G., M. M. Yoklavich, G. M. Cailliet, and M. H. Horn. 2006. Bays and estuaries. Pp. 119–148 *In* The Ecology of Marine Fishes: California and Adjacent Waters, L. G. Allen, D. J. Pondella II, and M. H. Horn (eds.). Univ. Calif. Press, Berkeley. 660 p.

Anchor Environmental. 2003. Literature review of effects of resuspended sediments due to dredging operations. Prepared for the Los Angeles Cont. Sed. Task Force, Los Angeles, CA. June 2003. 87 p. plus appendices.

California State Lands Commission (CSLC). 2006. California State Lands Commission Report on Performance Standards for Ballast Water Discharges in California Waters. Jan. 2006. 48 p. plus appendices.

California State Lands Commission (CSLC). 2013. California's Marine Invasive Species Program and the United States federal programs that manage vessels as vectors of nonindigenous species: A comparison of the relative effectiveness at reducing the risk of nonindigenous species introduction from maritime shipping activities. Produced for the Calif. State Legislature. Dec. 2013.

Cross, J. N. and L. G. Allen. 1993. Fishes. Pp. 459-540 *In:* Ecology of the Southern California Bight: A synthesis and interpretation. M. D. Dailey, D. J. Reish, and J. W. Anderson (eds.). Univ. Calif. Press, Los Angeles, CA. 926 p.

EPA. See U.S. Environmental Protection Agency.

Fitch, J. E. and R. J. Lavenberg. 1975. Marine food and game fishes of California. Univ. Calif. Press, Berkeley, CA. 179 p.

Global Security. 2007. Paint. Global Security Web Site: http://www.globalsecurity.org/ . Accessed 13 March 2015.

Hart Crowser, Pentec Environmental, and Ilingworth and Rodkin. 2009. Acoustic Monitoring and In-situ Exposures of Juvenile Coho Salmon to Pile Driving Noise at the Port of Anchorage Marine Terminal Redevelopment Project Knik Arm, Anchorage, Alaska. Prepared for URS Corp. 2009.

ICF Jones and Stokes and Illingworth & Rodkin. 2009. Final: Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. Prepared for Calif. Dept. of Transp., Sacramento, CA. 367 p.

ICF Jones and Stokes and Illingworth & Rodkin. 2012. Final: Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. Includes Oct. 2012 update to App. I. Prepared for Calif. Dept. of Transp., Sacramento, CA. 367 p.

Illingworth & Rodkin. 2007. Compendium of Pile Driving Sound Data. Prepared for Calif. Dept. of Transp., Sacramento, CA. 129 p.

Jones & Stokes. 2007a. Water Quality Monitoring Report, Snohomish River Dredging Project. March. Contract: W912DW-05-D 1001 Task Order No. 23. (J&S 00095.07) Bellevue, WA. Prepared for U.S. Army Corps of Engineers.

Jones & Stokes. 2007b . Water Quality Monitoring Report, Olympia Harbor Dredging Project. November (in-prep11/20/2007). Contract: W912DW-05-D 1001 Task Order No. 24. (J&S 00916.07) Bellevue, WA. Prepared for U.S. Army Corps of Engineers.

Jones & Stokes. 2008. Water Quality Monitoring Report. Snohomish River Dredging Project. March. Contract: W912DW-07-D 1002 Task Order No. 4. (J&S 00035.08) Bellevue, WA. Prepared for U.S. Army Corps of Engineers.

Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environmental Management, 19:81-97.

Los Angeles Harbor Department (LAHD). 2015. Unpublished water quality data for monthly Harbor-wide surveys, January through December 2013.

Los Angeles Regional Water Quality Control Board (LARWQCB). 1994. *Water Quality Control Plan Los Angeles Region Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties*. Available: http://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/. Last posted or revised: May 1, 2013.

Love, M.S., M. Yoklavich, and L. Thorsteinson. 2002. The rockfishes of the Northeast Pacific. (with contributions from J. Butler). Univ. Calif. Press, Los Angeles, CA. 405 p.

MBC Applied Environmental Sciences (MBC). 1991. Distribution of juvenile California halibut (*Paralichthys californicus*) in bay and coastal habitats of Los Angeles, Orange, and San Diego Counties in 1990. Final Report. Prepared for Southern Calif. Edison Co., Rosemead, CA. April 1991. 21 p. plus appendices.

MBC. 1994. Marine biological baseline study Queensway Bay, Long Beach Harbor. Prepared for City of Long Beach.

MBC. 2001. Summary Report: Berths 212-215 Maintenance Dredge Receiving Water Monitoring. Prepared for Port of Los Angeles. Dec. 2001. 6 p. plus appendices.

MBC. 2004. National Pollutant Discharge Elimination System 2004 Receiving Water Monitoring Report, Long Beach Generating Station, Los Angeles County, California. Prepared for Long Beach Generation L.L.C. 78 p. plus appendices.

MBC. 2013. National Pollutant Discharge Elimination System 2013 receiving water monitoring report, Harbor Generating Station, Los Angeles County, California. Prepared for Los Angeles Dept. of Water and Power.

MBC. 2015a. Unpublished data. Sidescan sonar data from eelgrass surveys in Los Angeles and Long Beach Harbors. September 2013.

MBC. 2015b. National Pollutant Discharge Elimination System 2014 receiving water monitoring report, Harbor Generating Station, Los Angeles County, California. Prepared for Los Angeles Dept. of Water and Power.

MBC. 2016. 2013–2014 Biological Surveys of Long Beach and Los Angeles Harbors. Prepared for the Ports of Long Beach and Los Angeles. In Association with Merkel & Associates and Thomas Johnson Consultant LLC. June 2016.

MBC, Tenera Environmental, Inc., and URS Corporation. 2007. Final Report: Harbor Generating Station Clean Water Act Section 316(b) Impingement Mortality and Entrainment Characterization Study. Prepared for the City of Los Angeles Dept. of Water and Power. Dec. 26, 2007.

MEC Analytical Systems (MEC). 1988. Biological baseline and ecological evaluation of existing habitats in Los Angeles Harbor and adjacent waters. Vol. I - Executive Summary. Vol. II - Final report. Vol. III - Appendices. Prepared for Port of Los Angeles. MEC05088001.

MEC Analytical Systems (MEC and Associates). 2002. Ports of Long Beach and Los Angeles: Year 2000 Biological Baseline Study of San Pedro Bay. June 2002. Submitted to Port of Long Beach, June 2002.

Miller, D. J. and R. N. Lea. 1972. Guide to the coastal marine fishes of California. Calif. Dept. Fish and Game Fish Bull. 157. 249 p.

National Marine Fisheries Service (NMFS). 2002. The final rule for essential fish habitat. Federal Register 67(12):2343-2383. http://www.nero.noaa.gov/hcd/efhfinalrule.pdf

National Marine Fisheries Service (NMFS). 2004. Final Report on the National Oceanic and Atmospheric Administration "Shipping Noise and Marine Mammals: A forum for science, management, and technology". Presented 18-19 May 2004. Arlington, Virginia. 40 p.

National Marine Fisheries Service (NMFS) and California Department of Fish and Game (CDFG). 2008. *Caulerpa* Control Protocol. Version 4. Feb. 25, 2008.

National Oceanographic and Atmospheric Administration (NOAA). 2015. NOAA Tides & Currents, online data for Station 9410660 (Los Angeles, CA). Web site: http://tidesandcurrents.noaa.gov/waterlevels.html?id=9410660&units=standard&bdate=20050201&edate=20150201&timezone=GMT&datum=MLLW&interval=m&action=data Accessed 13 February 2015.

NOAA Fisheries. 2015. Interim Sound Threshold Guidance. http://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/threshold_guidance.html

Pacific Fishery Management Council (PFMC). 2011a. Coastal Pelagic Species Fishery Management Plan as Amended through Amendment 13. Sept. 2011. 48 p. plus appendices.

Pacific Fishery Management Council (PFMC). 2011b. Pacific Coast Groundfish Fishery Management Plan: For the California, Oregon, and Washington Groundfish Fishery. Dec. 2011. 145 p. plus appendices.

Palermo, M.R., P.R. Schroeder, T.J. Estes, and N.R. Francingues. 2008. Technical Guidelines for Environmental Dredging of Contaminated Sediments. ERDC/EL TR-08-29. U.S. Army Engineer Research and Development Center, Vicksburg, MS. Sept. 2008.

Parish and Wiener. 1987. Preliminary Draft Environmental Impact Statement River Wall. Prepared for Related Properties Inc.

Port of Los Angeles (POLA). 2009a. Port of Los Angeles Receiving Water Monitoring Report: Berths 145-147 Wharf Improvements. Order No. R4-2008-0061, Program No. 9450, File No. 08-081. Pre-Dredge Survey: June 18, 2009. July 14, 2009.

Port of Los Angeles (POLA). 2009b. Port of Los Angeles Receiving Water Monitoring Report: Berths 145-147 Wharf Improvements. Order No. R4-2008-0061, Program No. 9450, File No. 08-081. Construction Dredge Survey #1, Week of July 13-18, 2009. July 31, 2009.

Port of Los Angeles (POLA). 2009c. Port of Los Angeles Receiving Water Monitoring Report: Berths 145-147 Wharf Improvements. Order No. R4-2008-0061, Program No. 9450, File No. 08-081. Construction Dredge Survey #2, Week of July 20-24, 2009. Aug. 12, 2009.

Port of Los Angeles (POLA). 2009d. Port of Los Angeles Receiving Water Monitoring Report: Berths 145-147 Wharf Improvements. Order No. R4-2008-0061, Program No. 9450, File No. 08-081. Construction Dredge Survey #3, Period of July 26-Aug. 7, 2009. Sept. 1, 2009.

Port of Los Angeles (POLA). 2009e. Port of Los Angeles Receiving Water Monitoring Report: Berths 145-147 Wharf Improvements. Order No. R4-2008-0061, Program No. 9450, File No. 08-081. Construction Dredge Survey #4, Period of Aug. 10-14, 2009. Sept. 1, 2009.

Port of Los Angeles (POLA). 2009f. Port of Los Angeles Receiving Water Monitoring Report: Berths 145-147 Wharf Improvements. Order No. R4-2008-0061, Program No. 9450, File No. 08-081. Construction Dredge Survey #5, Period of Aug. 17-21, 2009. Sept. 8, 2009.

Port of Los Angeles (POLA). 2009g Port of Los Angeles Receiving Water Monitoring Report: Berths 145-147 Wharf Improvements. Order No. R4-2008-0061, Program No. 9450, File No. 08-081. Construction Dredge Survey #6, Period of Aug. 24-28, 2009. Sept. 11, 2009.

Port of Los Angeles (POLA). 2009h. Port of Los Angeles Receiving Water Monitoring Report: Berths 145-147 Wharf Improvements. Order No. R4-2008-0061, Program No. 9450, File No. 08-081. Construction Dredge Survey #7, Period of Aug. 31 – Sept. 4, 2009. Sept. 25, 2009.

Port of Los Angeles (POLA). 2009i. Port of Los Angeles Receiving Water Monitoring Report: Berths 145-147 Wharf Improvements. Order No. R4-2008-0061, Program No. 9450, File No. 08-081. Construction Dredge Survey #8, Period of Sept.7-16, 2009. Oct. 1, 2009.

Port of Los Angeles (POLA). 2010a. Port of Los Angeles Receiving Water Monitoring Report: Berths 145-147 Wharf Improvements. Order No. R4-2008-0061, Program No. 9450, File No. 08-081. Construction Dredge Survey #9, Period of Sept.2-8, 2010. Sept. 15, 2010.

Port of Los Angeles (POLA). 2010b. Port of Los Angeles Receiving Water Monitoring Report: Berths 145-147 Wharf Improvements. Order No. R4-2008-0061, Program No. 9450, File No. 08-081. Construction Dredge Survey #10, Week of Oct. 4-10, 2010. Oct. 14, 2010.

Port of Los Angeles (POLA). 2010c. Port of Los Angeles Receiving Water Monitoring Report: Berths 145-147 Wharf Improvements. Order No. R4-2008-0061, Program No. 9450, File No. 08-081. Construction Dredge Survey #11, Week of Oct. 11-17, 2010. Oct. 29, 2010.

Port of Los Angeles (POLA). 2010d. Port of Los Angeles Receiving Water Monitoring Report: Berths 145-147 Wharf Improvements. Order No. R4-2008-0061, Program No. 9450, File No. 08-081. Post Dredge Survey Conducted Oct. 21, 2010. Nov. 3, 2010.

Port of Los Angeles and Port of Long Beach (POLA and POLB), 2009. Ports of Los Angeles and Long Beach Water Resources Action Plan. Final Report, August 2009.

Ramboll Environ. 2015. Sampling and Analysis Report for Berths 226–232 in Support of the Everport Container Terminal Improvements Project, Los Angeles Harbor. Prepared for the Port of Los Angeles.

Science Applications International Corporation (SAIC). 2010. 2008 Biological Surveys of Los Angeles and Long Beach Harbors. In Association with Seaventures, Keane Biological Consulting, Tenera Environmental, ECORP Consulting Inc., and Tierra Data Inc. Apr. 2010.

Scianni, C., C. Brown, A. Newsom, R. Nedelcheva, M. Falkner, and N. Dobroski. 2013 Biennial Report on the California Marine Invasive Species Program. Prepared for the Calif. State Legislature. Feb. 2013.

Swift, C. C., J. L. Nelson, C. Maslow, and T. Stein. 1989. Biology and distribution of the tidewater goby, *Eucyclogobius newberryi* (Pisces: Gobiidae) in California. Contrib. in Science 404:1–19.

Swift, C.C., T.R. Haglund, M. Ruiz, and R.N. Fisher. 1993. The status and distribution of the freshwater fishes of southern California. Bull. So. Calif. Acad. Sci. 92(3):101-172.

Tetra Tech. 2011. Final Baseline Hydroacoustic Survey Report: Commodore Schuyler F. Heim Bridge Demolition and Replacement Project, Long Beach, California. Prepared for Alameda Corridor Transportation Authority, Carson, CA. April 2011. 9 p. plus tables, figures, and appendices.

URS. 2007. Port of Anchorage Marine Terminal Development Project, Underwater Noise Survey Test Pile Noise Program, Anchorage, Alaska. Prepared for U.S. Dept. of Transp., the Port of Anchorage, and Integrated Concepts and Research Corp. 60 p.

U.S. Army Corps of Engineers (USACE) and Los Angeles Harbor Department (LAHD). 1992. Final EIS/EIR for Deep Draft Navigation Improvements, Los Angeles and Long Beach Harbors, San Pedro Bay, CA. Sept. 1992.

U.S. Army Corp of Engineers (USACE) and Los Angeles Harbor District (LAHD). 2008. Re-circulated Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for Berth 97-109 (China Shipping) Container Terminal Project.

U.S. Environmental Protection Agency. 1988. Final Environmental Impact Statement for the Los Angeles/Long Beach (LA-2) Ocean Dredged Material Disposal Site Designation. July 1988. 173 p. plus appendices.

U.S. Environmental Protection Agency and U.S. Army Corps of Engineers. 2005. Final Environmental Impact Statement for the Site Designation of the LA-3 Ocean Dredged Material Disposal Site off Newport Bay, Orange County, California. July 2005.

Vagle, S. 2003. On the impact of underwater pile-driving noise on marine life. Report prepared for the Canadian Coast Guard, Department of Fisheries and Oceans, Canada (unpublished). 41 p.

Walker, B.W. 1949. The periodicity of spawning by the grunion, *Leuresthes tenuis*, an atherine fish. Ph.D. Thesis, Scripps Inst. Oceanogr., La Jolla, CA. 166 p.

Walker, B.W. 1952. A guide to the grunion. Calif. Fish & Game 38(3):411-420.

Wellington, G. M. and B. C. Victor. 1989. Planktonic duration of one hundred species of Pacific and Atlantic damselfishes (Pomacentridae). Mar. Biol. 101:557–567.

Wolf, P., P.E. Smith, and D.R. Bergen. 2001. Pacific sardine. Pp. 299-302 *In:* California’s Living Marine Resources: A status report. W.S. Leet, C.M, DeWees, R. Klingbeil, and E.J. Larson, eds. Calif. Dept. of Fish and Game Publ. SG01-11.

APPENDIX

Coastal Pelagic Species

Pacific Groundfish Species

Coastal Pelagic Species

Common Name	Category
Managed Species	
Northern Anchovy	Fish
Pacific Sardine	Fish
Pacific (chub) Mackerel	Fish
Jack Mackerel	Fish
Market Squid	Invertebrate
Krill (euphausiids)	Invertebrate
Ecosystem Component Species	
Jacksmelt	Fish
Pacific Herring	Fish

Shared Ecosystem Component Species
(Coastal Pelagics and Pacific Groundfish)

Common Name	Category
Round Herring	Fish
Thread Herring	Fish
Mesopelagic Fishes	Fish
Pacific Sand Lance	Fish
Pacific Saury	Fish
Silversides (Atherinopsidae)	Fish
Smelts (Osmeridae)	Fish
Pelagic Squids	Invertebrate

Pacific Groundfish Ecosystem Component Species

Common Name	Category
Aleutian Skate	Fish
Bering/Sandpaper Skate	Fish
Big Skate	Fish
California Skate	Fish
Roughtail/Black Skate	Fish
Other Skates	Fish
Pacific Grenadier	Fish
Giant Grenadier	Fish
Other Grenadiers	Fish
Finescale Codling	Fish
Ratfish	Fish
Soupfin Shark	Fish

Pacific Groundfish Species

Common Name	Category		Common Name	Category
Leopard Shark	Sharks		Olive Rockfish	Rockfish
Spiny Dogfish	Sharks		Pacific Ocean Perch	Rockfish
Longnose Skate	Sharks		Pink Rockfish	Rockfish
Lingcod	Roundfish		Pinkrose Rockfish	Rockfish
Cabezon	Roundfish		Pygmy rockfish	Rockfish
Kelp Greenling	Roundfish		Quillback Rockfish	Rockfish
Pacific Cod	Roundfish		Redbanded Rockfish	Rockfish
Pacific Hake	Roundfish		Redstripe Rockfish	Rockfish
Sablefish	Roundfish		Rosethorn Rockfish	Rockfish
Aurora Rockfish	Rockfish		Rosy Rockfish	Rockfish
Bank Rockfish	Rockfish		Rougheye Rockfish	Rockfish
Black Rockfish	Rockfish		Sharpchin Rockfish	Rockfish
Black-and-Yellow Rockfish	Rockfish		Shortbelly Rockfish	Rockfish
Blackgill Rockfish	Rockfish		Shortraker Rockfish	Rockfish
Blackspotted Rockfish	Rockfish		Shortspine Thornyhead	Rockfish
Blue Rockfish	Rockfish		Silverygray Rockfish	Rockfish
Bocaccio	Rockfish		Speckled Rockfish	Rockfish
Bronzespotted Rockfish	Rockfish		Splitnose Rockfish	Rockfish
Brown Rockfish	Rockfish		Squarespot Rockfish	Rockfish
Calico Rockfish	Rockfish		Starry Rockfish	Rockfish
California Scorpionfish	Rockfish		Stripetail Rockfish	Rockfish
Canary Rockfish	Rockfish		Sunset Rockfish	Rockfish
Chameleon Rockfish	Rockfish		Swordspine Rockfish	Rockfish
Chilipepper	Rockfish		Tiger Rockfish	Rockfish
China Rockfish	Rockfish		Treefish	Rockfish
Copper Rockfish	Rockfish		Vermilion Rockfish	Rockfish
Cowcod	Rockfish		Widow Rockfish	Rockfish
Darkblotched Rockfish	Rockfish		Yelloweye Rockfish	Rockfish
Dusky Rockfish	Rockfish		Yellowmouth Rockfish	Rockfish
Dwarf-red Rockfish	Rockfish		Yellowtail Rockfish	Rockfish
Flag Rockfish	Rockfish		Arrowtooth Flounder	Flatfish
Freckled Rockfish	Rockfish		Butter Sole	Flatfish
Gopher Rockfish	Rockfish		Curlfin Sole	Flatfish
Grass Rockfish	Rockfish		Dover Sole	Flatfish
Greenblotched Rockfish	Rockfish		English Sole	Flatfish
Greenspotted Rockfish	Rockfish		Flathead Sole	Flatfish
Greenstriped Rockfish	Rockfish		Pacific Sanddab	Flatfish
Halfbanded Rockfish	Rockfish		Petrale Sole	Flatfish
Harlequin Rockfish	Rockfish		Rex Sole	Flatfish
Honeycomb Rockfish	Rockfish		Rock Sole	Flatfish
Kelp Rockfish	Rockfish		Sand Sole	Flatfish
Longspine Thornyhead	Rockfish		Starry Flounder	Flatfish
Mexican Rockfish	Rockfish			