DRAFT
ENVIRONMENTAL ASSESSMENT
FOR

SOUTH SAN DIEGO HARBOR MAINTENANCE DREGING PROJECT
San Diego County, California

PREPARED BY

U.S. ARMY CORPS OF ENGINEERS
SOUTH PACIFIC DIVISION
LOS ANGELES DISTRICT

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SECTION 1 - INTRODUCTION

1.1 PROPOSED PROJECT

Location & Description. The proposed dredge footprint is a portion of the Federal Channel of San Diego Harbor, San Diego County, California, which is situated approximately 100 nautical miles southeast of the City of Los Angeles and 17 statute miles north of the United States/Mexico International Border. The Los Angeles District of the U.S. Army Corps of Engineers (Corps), as part of its Operations and Maintenance Program, is proposing to perform maintenance dredging in South San Diego Harbor Federal Channel to re-establish authorized channel depths (-35 ft MLLW, with a 2 ft allowable overdepth to -37 ft MLLW). The portion of the South San Diego Harbor Federal Channel requiring dredging spans approximately 5,700 linear feet and approximate 96 acres adjacent to the National City Marine Terminal and Sweetwater Channel (Figure 2). The estimated volume of sediments to be dredged from the South San Diego Federal Channel could reach 300,000 cubic yards (cy), which includes the two-foot overdepth allowance. Approximately 225,000cy will be disposed at LA-5 Ocean Dredge Material Disposal Site (ODMDS) and approximately 75,000cy will be placed in the Coronado Nearshore Placement Site to nourish adjacent Silver Strand State Beach. LA-5 ODMDS is located approximately five nautical miles southwest of the entrance of San Diego Harbor. The Coronado Nearshore Placement Site is a part of the Strand littoral cell, located on the Pacific Ocean side of the Coronado Peninsula in the nearshore environment approximately 1,300 to 2,300 feet offshore in waters -20 to -30 feet Mean Lower Low Water (MLLW) (Figure 2). The footprint of the nearshore placement site is 5,300 ft x 1,200 ft, totaling 146 acres. Dredging of South San Diego Harbor would be performed by a clamshell dredge, over a period of approximately 3 - 4 months.

The Corps last conducted maintenance dredging of this portion of the South San Diego Harbor federal channel in 1976. Based on an August 2018 hydrographic survey and assuming minimal shoaling has occurred, the estimated volume of sediments requiring dredging from the approximately 96 acres of the South San Diego Federal Channel could reach 300,000 cubic yards (cy), which includes the two-foot overdepth allowance. The Sediment Analysis Plan Report (SAPR) has been reviewed by the Dredge Materials Management Team (DMMT). Approximately 225,000cy has been deemed suitable for disposal at LA-5 Ocean Dredge Material Disposal Site (ODMDS) and approximately 75,000cy has been deemed suitable for nearshore placement to nourish Silver Strand State Beach adjacent to the Coronado Nearshore Placement Site.

Timing of Project. Construction is currently expected to occur between November 2019 and March 2020, although the schedule is subject to change based on availability of funding, equipment and supplies, weather, and other issues. Maintenance dredging activities are not anticipated to have an effect on navigation into South San Diego Harbor. The dredge will coordinate with the cargo vessels transporting motor vehicles to the National City Marine Terminal as to not interfere with the navigation traffic.

Staging Areas. The contractor will require approximately a 250 ft x 100 ft area within the harbor to secure the derrick barge and tug when not in use, this will likely be along the northern wharf of the National City Marine Terminal. In addition, the contractor may set up a trailer to be utilized as office space on land, approximately a 30 x 10 ft footprint, likely on the wharf adjacent to the berth space.

Construction Equipment. The maintenance dredging would be accomplished using a clamshell dredge. This method consists of a derrick mounted on a barge outfitted with a clamshell bucket. Dredged materials are placed on a separate barge for transport to the disposal site. Approximately 3,000 to 10,000 cubic yards of sediment can be removed and transported to the disposal site per day using a clamshell dredge. Additional construction equipment typically required to support dredging activities are: four support boats (two tugboats to move the barge and/or reposition the dredge, a crew boat, and a survey boat).

1.2 ENVIRONMENTAL ASSESSMENT PROCESS

This Environmental Assessment (EA) addresses potential impacts associated with implementing the proposed project.

The Corps is the lead agency for this project. This EA complies with the National Environmental Policy Act (NEPA) of 1969, as amended, (42 U.S.C. 4321). The NEPA requires federal agencies to consider and disclose the environmental effects of their actions.

The EA process follows a series of prescribed steps. The draft EA will be sent out for public review during which written and verbal comments on the EA and, or the proposed project will be received. Review, concurrence or permissions from other Regulatory agencies will also be sought during this time, as necessary. The next step requires preparation of a Final EA (FEA) that incorporates and responds to comments received, along with a Finding of No Significant Impact (FONSI) if appropriate. The FEA/FONSI will be furnished to all who commented on the Draft and will be made available upon request.

If it is determined the project will have a significant impact upon the existing environment or the quality of the human environment, an Environmental Impact Statement (EIS) would be required.

1.3 RELATIONSHIP TO ENVIRONMENTAL PROTECTION STATUTES, PLANS, AND OTHER REQUIREMENTS

The Corps is required to comply with all pertinent federal laws and regulations; project compliance is summarized in Section 5.1.

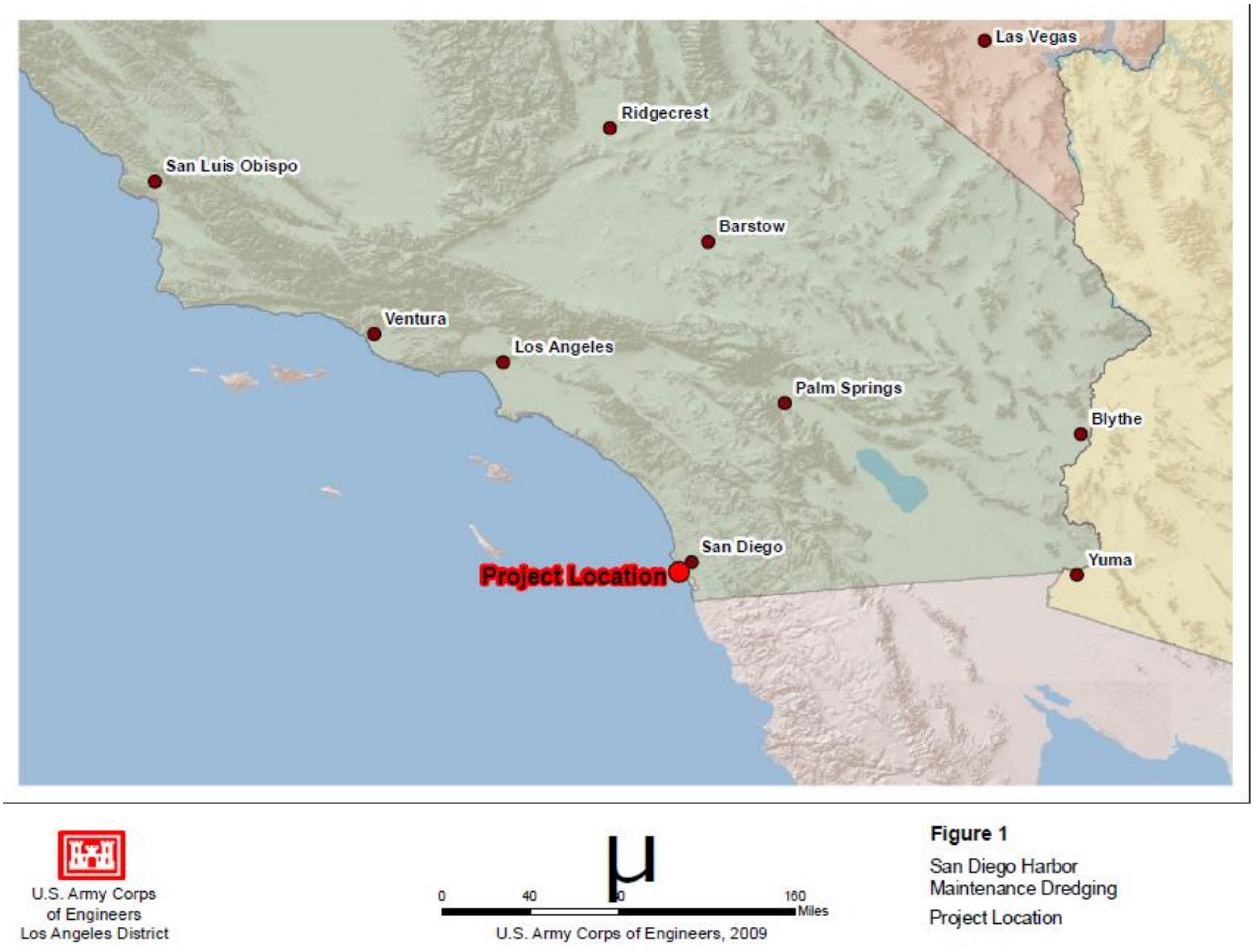

Figure 1. Project Location

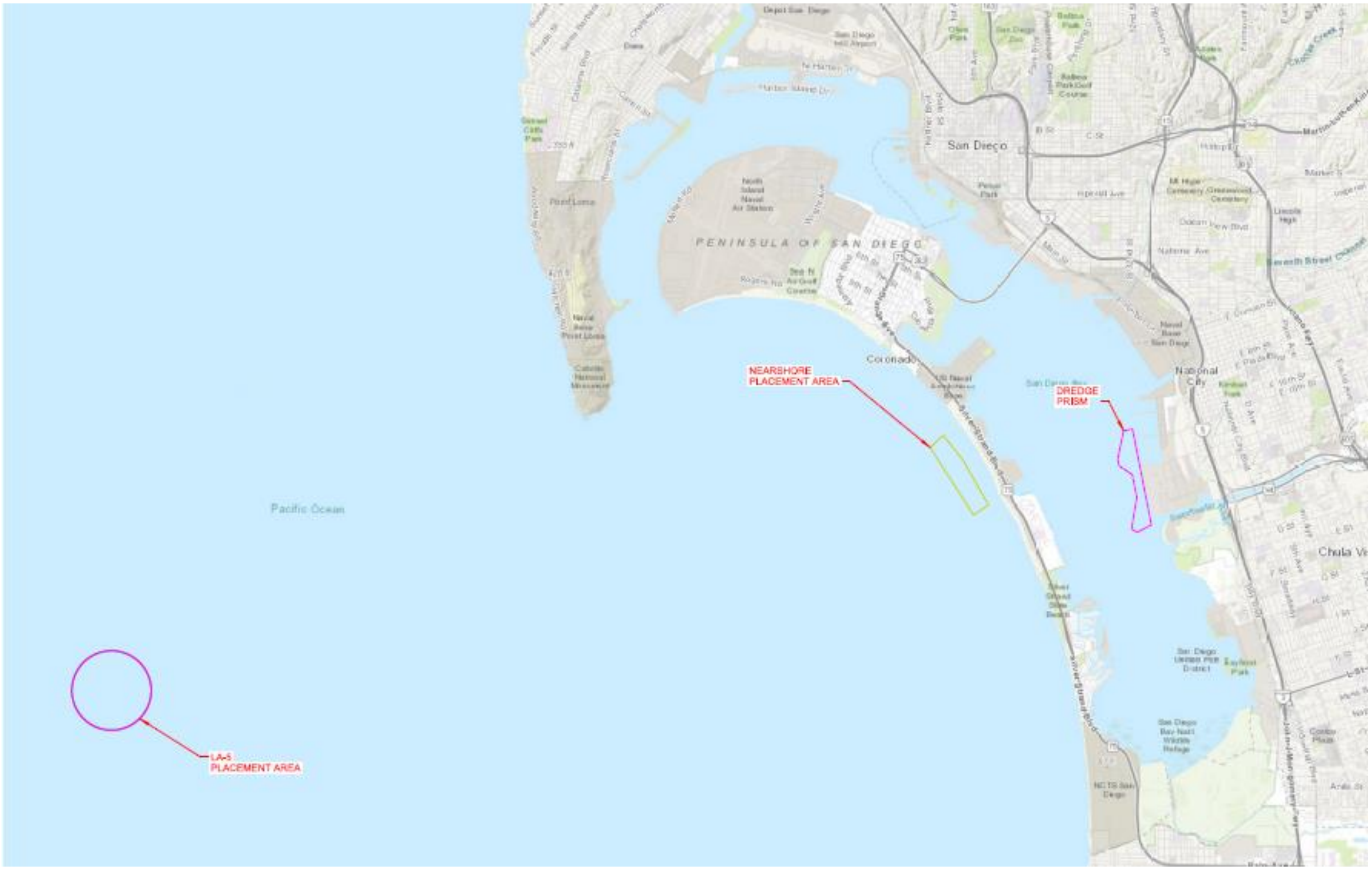

Figure 2. Proposed Project Area

SECTION 2 – PROJECT PURPOSE

2.1 PROJECT PURPOSE AND NEED

Long shore transport of sand from the ocean has shoaled the sides and bed of the approach/entrance channel, and other areas of the Federal Channel have developed shoals due to propeller wash from passing ships and sediment deposition from Sweetwater Channel. The San Diego Harbor maintenance dredging project is important for the continued and safe navigation of the channel by deep draft vessels using the Harbor.

The proposed project would serve the following purposes: (1) restore the channel that is subject to continual shoaling to design depths; (2) assure the continued navigation for marine traffic within the harbor; and (3) provide beach nourishment material for beaches severely eroded by littoral processes.

SECTION 3 – PROJECT ALTERNATIVES

3.1 ALTERNATIVES CONSIDERED

Two alternatives will be considered in this document - the “No Action Alternative” under which no repair would be conducted, and the “Preferred Alternative,” which is the proposed action.

No Action Alternative. This alternative assumes the dredging project does not occur, and the controlling depth remains above -35 ft MLLW; this depth would eventually limit and eliminate transit for commercial, military, and recreational craft. This alternative would lead to economic losses and national security would be negatively impacted by the limitations on vessels associated with the operations of the US Navy. As the harbor fills, commercial/recreational opportunities may be limited and forced to relocate to other harbors. Deeper draft vessels loaded to full capacity would not be able to call on the Port of San Diego without partially unloading at other ports first. This inefficiency would cause additional traffic and ship calls to transport the same amount of cargo. The “No Action” alternative would not meet Federal planning objectives for San Diego Harbor; therefore this alternative is not acceptable.

Preferred alternative. The proposed action is to perform maintenance dredging with a clamshell dredge in South San Diego Harbor Federal Channel to re-establish authorized channel depths (-35 ft MLLW, with a 2 ft allowable overdepth to -37 ft MLLW). The portion of the South San Diego Harbor Federal Channel requiring dredging spans approximately 5,700 linear feet and approximate 96 acres adjacent to the National City Marine Terminal and Sweetwater Channel (Figure 2). The estimated volume of sediments to be dredged from the South San Diego Federal Channel could reach 300,000 cubic yards (cy), which includes the two-foot overdepth allowance. Approximately 225,000cy will be disposed at LA-5 Ocean Dredge Material Disposal Site and approximately 75,000cy will be placed in the Coronado Nearshore Placement Site to nourish adjacent Silver Strand State Beach. The Coronado Nearshore Placement Site is located in the nearshore environment approximately 1,300 to 2,300 feet offshore in waters -20 to -30 feet Mean Lower Low Water (MLLW) (Figure 2). The footprint of the nearshore placement site is 5,300 ft x 1,200 ft, totaling 146 acres.

See Section 1.1 for additional detail about the proposed project, including a listing of equipment and staging areas that may be used, the project schedule and other information. Minimization measures, best management practices and other environmental commitments have been incorporated in the project description to avoid or minimize adverse impacts. These measures are listed in Section 5.2.

SECTION 4 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section summarizes the existing condition of the physical and human environment within the area of potential effects surrounding the project area, and also provides an assessment of potential impacts for the proposed project. Best management practices and other environmental commitments have been incorporated in the project description to avoid or minimize adverse impacts (see Section 5.2). The finding or conclusion of level of significance following each resource category assumes that these measures will be applied.

4.1 Oceanography and Water Quality

4.1.1 Affected Environment. The tides in southern California are mixed, semi-diurnal tides with two unequal high tides and low tides roughly per day. Tidal variations are caused by the passage of two harmonic tidal waves; one with a period of 12.5 hours and one with a period of 25 hours. This causes a difference in height between successive high and low waters. The result is two high waters and two low waters each day, consisting of a higher high water and a lower high water, and a higher low water and a lower low water; respectively referred to as HHW, LHW, HLW, and LLW.

A greater than average range between HHW and LLW occurs when the moon, sun, and earth are aligned with each other to create a large gravitational effect. This spring tide corresponds to the phenomenon of a new or full moon. Neap tides, which occur during the first and third quarters of the moon, have a narrower range between HHW and LLW. In this situation, the moon, sun, and earth are perpendicular to each other, thereby reducing the gravitational effects on water levels.

The tide data from waters in the vicinity of San Diego Harbor range from a lowest observed tide of -2.88 ft, to a highest observed tide of +8.35 ft. Tidal current velocities are greatest at the entrance and north San Diego Harbor estimated at 2.9 knots, tidal current velocities are greatly reduced in central and southern San Diego Harbor where the bay starts to widen.
Water quality in San Diego Harbor varies, primarily due to tidal flushing and currents within the Bay. Water quality can also be influenced locally by freshwater inputs, including urban runoff from storm drains. Commonly measured water quality parameters (e.g., salinity, temperature, and dissolved oxygen) may vary throughout the Bay, forming a gradient with waters in the North
Bay being similar to ocean conditions, waters in the South Bay being more affected by shallow depths and insolation, and waters in the Central Bay being intermediate in character.

Water quality is typically characterized by salinity, pH, temperature, clarity, and dissolved oxygen (DO). Table 1 characterizes the overall water quality parameters for the project site (per communication with Keith Merkel, Merkel & Assoc.):

Table 1	
Average Water Quality Characteristics	
Parameters	**Project Site**
Salinity (ppt)	*33 to 37
Surface Temperature (F)	59 to 74
pH	7.8 to 8.2
Clarity (ft.)	5 to 15
D.O. (mg/l)	6 to 9

San Diego Harbor is on the 303(d) list of water quality limited water bodies for mercury, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs).
*Brief salinity depression occurs in surface waters around the mouth of the Sweetwater Channel during large freshwater discharges.

4.1.2 Environmental Consequences.

Significance Criteria: An impact to Oceanography and Water Quality will be considered significant if:

- The project results in the release of toxic substances that would be deleterious to human, fish, or plant life;
- The project results in substantial impairment of beneficial recreational use of the project site; or
- Discharges create a pollution, contamination, or nuisance as defined in Section 13050 of the California Water Code that is not contained and fully mitigated in a timely manner.

Preferred alternative.

Dredge Impacts. Chemical properties such as dissolved oxygen, temperature, pH, salinity, and nutrients are not expected to be altered by the proposed project. Dredging and discharge activities would cause temporary water quality (i.e., turbidity) impacts. Increases in turbidity detectable above background levels are usually confined from 100 to 500 feet from the dredge depending on sediment character and tidal current conditions. A clamshell dredge has impacts across the entire water column as sediments are carried up to the surface in the clamshell. It is expected that plumes would remain in the harbor area and not migrate into the open ocean environment. The duration of the plume is expected to be short; suspended solid concentrations would likely return to background levels within a few hours to 24 hours after dredging ceases, dependent on sediment character and tidal current conditions.

Water quality monitoring will be performed during dredging. Weekly monitoring will be conducted for salinity, pH, temperature, dissolved oxygen, turbidity and light transmissivity. Monthly water samples will be taken and analyzed for total dissolved solids. Dredging will be controlled to keep water quality impacts to acceptable levels. Controls include modifying the dredging operation and the use of silt curtains (if warranted). Turbidity will be limited to a 20%

decrease in light transmittance, turbidity, and dissolved oxygen between the control station and 300 ft downstream station. Dissolved oxygen will be maintained at a minimum of 5 mg/l at all times and pH will be limited to a 0.2 unit change from measured natural levels.

Proposed dredge materials have been sampled and were tested in accordance with USACE/EPA regulations. Sampling methods were the following; sample dredge sediments were taken to design depth plus allowable overdepth, composite individual samples together to form two composite samples, and subject the composite samples to chemical and biological testing to determine if the South San Diego Harbor Channel maintenance dredging sediments were suitable for nearshore area placement and/or placement at the LA-5 ODMDS. The testing approach also included determining the physical properties of the sediments at each location and at different depths. Testing conducted followed the requirements and procedures detailed in the OTM (USACE/USEPA, 1991), ITM (USEPA/USACE, 1998) with further guidance from Los Angeles District USACE guidelines (CESPL, undated) and from SCDMMT draft guidelines. Acceptability guidelines published in these documents were used to evaluate the suitability of South San Diego Harbor Channel dredged sediments for open water placement. Results of the current test program have been coordinated with members of the Southern California Dredged Material Management Team (SC-DMMT) and a suitability determination made. Those data are included in Appendix C. The Sediment Analysis Plan Report (SAPR) has been reviewed by the SC-DMMT, approximately 225,000cy has been deemed suitable for disposal at LA-5 Ocean Dredge Material Disposal Site and approximately 75,000cy has been deemed suitable for nearshore placement to nourish Silver Strand State Beach adjacent to the Coronado Nearshore Placement Site.

Near Shore Placement Impacts. The discharge would create local turbidity impacts during discharge operations. Material to be discharged at this site is compatible with beach sediments; materials consist mainly of silty-sands. Turbidity plumes would be expected to migrate up to 100 yards down coast. Approximately 40,000 to 75,000cy of dredge material will be allocated for beneficial reuse by placing it in the designated Coronado Nearshore Placement Site. Materials are expected to remain in the Silver Strand littoral cell. The materials of concern are sandy, and have been determined to be clean (i.e., non-carriers of contaminants) and suitable for near shore placement. As the sediments have been found to be clean, contaminants would not be introduced or biologically available for consumption. All sediments have been determined to be physically and chemically compatible with the Coronado Nearshore Placement Site by the Corps in coordination with the Southern California Dredged Material Management Team (SC-DMMT).

LA-5 Ocean Dredge Material Disposal Impacts. The discharge would create local turbidity impacts during discharge operations. Material to be discharged at this site is not compatible with beach sediments; materials consist mainly of fines. Turbidity plumes would be expected to migrate up to 500 ft down current. As the sediments have been found to be clean, contaminants would not be introduced or biologically available for consumption. Impacts were addressed in the USEPA authorization of the LA-5 ODMDS and are hereby incorporated by reference. Disposal limitations and control measures specified in the USEPA documents will be adhered to during disposal operations.

Accidents resulting in spills of fuel, lubricants, or hydraulic fluid from the equipment used during dredging and placement could occur during the project and adversely affect water quality. Impacts would depend on the amount and type of material spilled as well as specific conditions (i.e. currents, wind, temperature, waves, tidal stage, and vessel activity). In such cases, spills would be cleaned up immediately, causing less than significant impacts. Based on the above analysis, the project would not result in the release of toxic substances, impair beneficial recreational uses, or result in discharges that result in unmitigated or uncontained pollution, contamination, or nuisance as defined in the California Water Code. Standard dredge specifications include a Spill Prevention Plan and Cleanup Plan that includes measures to prevent spills, employee training, the staging of materials on site to clean up accidental spills, and a list of appropriate agencies to call in the event of a spill. A larger spill that could have significant impacts on water quality is not expected to occur, even under reasonable worst-case conditions.

Conclusion: Based on the above analysis, the project would not result in the release of toxic substances, impair beneficial recreational uses, or result in discharges that result in unmitigated or uncontained pollution, contamination, or nuisance as defined in the California Water Code. Oceanographic and water quality impacts are considered **less than significant**, therefore, mitigation measures are not required. However, water quality monitoring will take place during all dredging events at the dredge site and the nearshore placement site, and LA-5 disposal site.

No action alternative. Construction impacts would not occur. The federal navigation channels would continue to fill with sediments eventually resulting in impacts to military, recreational, and commercial boating and the creation of unsafe conditions that could lead to boat groundings.

4.2 Marine Resources

4.2.1 Affected Environment. The following paragraphs provide discussion of existing environmental resources for the dredging, nearshore placement site, and disposal site.

San Diego Harbor Maintenance Dredging Site. San Diego Bay is a closed embayment which is influenced primarily by marine waters, tides, and currents, and to a lesser degree by surface freshwater drainages and groundwater.

Two major and three minor freshwater watersheds drain to San Diego Bay. The major watersheds include the Sweetwater River, which drains to the south-central portion of the Bay, and the Otay River, which drains to the South Bay. Other sources of freshwater to San Diego Bay during storm events include minor drainages, sheetflow, flood control channels, and storm drains (U.S. Navy 1992).

The narrow entrance to San Diego Bay shelters the inner harbor from ocean waves. The inner Bay is generally calm. Waves that do occur are generated by wind, primarily from the west and northwest, and generally do not exceed 2 feet in height (MBA 1990).

Marine Vegetation. The proposed dredging would occur in the navigation channels of San Diego Bay (where design depths are at least -33 feet MLLW). Eelgrass (*Zostera marina*) exists in the shallow areas of San Diego Harbor, with larger patches occurring in the shallow South Bay (Figure 3). Eelgrass is a marine flowering plant which occurs in many intertidal to

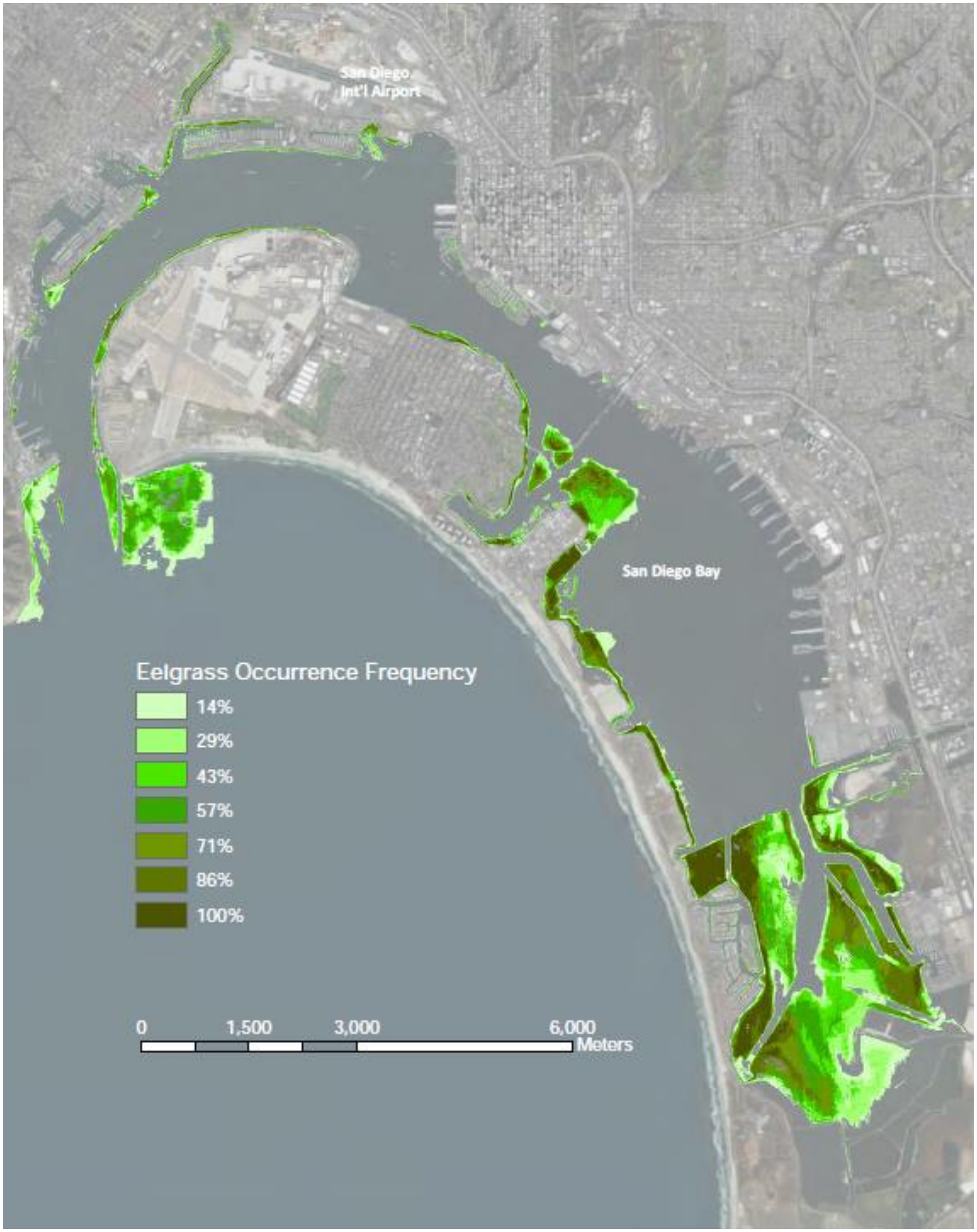

Figure 3. Eelgrass occurrence frequency for the baywide eelgrass survey years 1993, 1999, 2004, 2008, 2011, 2014, and 2017 (Merkel & Associates).

moderately deep subtidal areas (generally 0 to -23 feet MLLW) of San Diego Bay. Eelgrass beds provide high quality habitat for fish and other water-oriented fauna. Eelgrass provides an important foraging and nursery area for many fish species and generally supports higher diversity and abundance of fish than non-vegetated areas of similar depth (Hoffman 1986). Eelgrass beds also provide foraging habitat for a number of avian species, including the federally endangered California least tern (*Sterna amtillauim browni*). In addition, eelgrass beds are a vital foraging habitat for the federally endangered Green Sea Turtle (*Chelonia mydas*). In San Diego Bay, macroalagae belong to three different phyla. Close to 50 native macroalgal species are present in the Bay, nine of which belong to the phyla Chlorophyta. Twelve species of brown algae in the phyla Phaeophyta are found in the Bay. The largest phyla represented in the Bay, Rhodophyta (red algae), is represented by 25 species. Many of these species are small and may only be found attached to structures or living atop other plant or algal organisms (SDUPD 2008). San Diego Harbor is not known to harbor the invasive alga *Caulerpa taxifolia*. The majority of dredging would occur in areas deeper than -35 feet MLLW, that are mostly absent of marine vegetation, including eelgrass.

Invertebrates. Invertebrate populations are expected to be similar to those in the adjacent open coast, shallow, soft bottom, subtidal habitats. Infaunal benthic invertebrates dominate the majority of invertebrates found in the soft bottom sediment of San Diego Bay, dominate groups include polychaete worms, crustaceans, molluscs, and unidentified species of oligochaete and nematode worms (SDUPD 2008 & US Navy 2013). Over 640 species of marine invertebrates have been documented in the Port of San Diego Natural Resources Management Report. Members of twelve Phyla were present in San Diego Bay during the benthic infaunal invertebrate surveys conducted by Merkel & Associates from 2004 to 2007. During the Bight '98 survey (Bay *et al*. 2000), a total of 1,172 megabenthic invertebrates, representing 43 taxa, were collected in San Diego Bay. The nonindigenous bivalve *Musculista senhousia* was present in more than 70% of the samples, making it the most widely distributed trawl caught invertebrate in the Bay. Other common invertebrates that were present in at least one third of the samples included two undescribed species of sponge, *Porifiera* sp. SD4 and *Porifera* sp SD5, the ascidian *Microcosmus squamiger,* the bivalve *Argopecten ventricosus*, and the gastropod *Crepidula onyx. Musculista senhousia* together with another nonindigenous species *Microcosmus squamiger,* accounted for over 50% of the total catch (SDUPD 2008).

Fish and Essential Fish Habitat. San Diego Bay is an important nursery and rearing area for several fish species. Fish surveys have confirmed the majority of individual fish utilizing the harbor are juveniles (Allen et al 2002, Martinez-Takeshita 2015). Over 100 species of fish have been documented in the San Diego Bay by the Port of San Diego Natural Resources Management Report. Fish fauna in the Bay vary seasonally, with numerical abundance being greatest in the spring and summer (Allen 1997). The following are members of the twenty most abundant species in San Diego Bay from 2005 – 2015 and accounted for more than 95% of the sampled organisms during the ten year sampling period: topsmelt (*Atherinops affinis*), round stingray (*Urobatis halleri*), slough anchovy (*Anchoa delicatissima*), Spotted sand bass (*Paralabrax maculatofasciatus*), Northern anchovy (*Engraulis mordax*), shiner surfperch (*Cymatogaster aggregata*), barred sand bass (*Paralabrax nebulifer*), giant kelpfish (*Heterostichus rostratus*), California halibut (*Paralichthys californicus*), bay pipefish (*Syngnathus leptorhynchus*), Pacific sardine (*Sardinops sagax*), arrow goby (*Clevelandia ios*), bat eagle ray (*Myliobatis californica*) (Graham & Froeschke 2017). Topsmelt has consistently ranked amongst the top five most abundant species in San Diego Bay since the commencement of the surveys in 1994, furthermore, many years topsmelt have ranked number one indicating topsmelt are often the primary species contributing to energy flow in San Diego Bay based on Ecological Importance of Species calculations (Martinez-Takeshita et al. 2015). Mean abundance of pelagic fish species is greater in North and North-Central eco-regions than in South-Central and South eco-regions, while benthic species abundance is similar across eco-regions (Graham & Froeschke 2017). For benthic species, the North ecoregion has the greatest mean biomass, there do not appear to be large differences in benthic biomass between other ecoregions. Pelagic species have the greatest biomass in the South ecoregion, however, there does not appear to be a substantial difference between pelagic biomass across all ecoregions (Graham & Froeschke 2017).

The project area is located within an area designated as Essential Fish Habitat (EFH) for the Coastal Pelagics and Pacific Groundfish Management Plans. The EFH for these are to include all marine and estuarine waters from the shoreline to 200 nautical miles offshore (i.e., the Exclusive Economic Zone [EEZ]). For the Pacific and Western regions, EFH has been identified for over 90 species covered by three Fishery Management Plans (FMPs) under the auspices of the Pacific Fishery Management Council (NMFS 1998a). Several of these managed species are known to occur in San Diego Harbor (e.g., Northern anchovy, Pacific sardine, Pacific mackerel, jack mackerel, Dover sole, Pacific sanddab, rockfish species, California scorpionfish, grass rockfish, and English sole). In addition, many species identified as Ecosystem Component Species under the Pacific Groundfish Management Plan are present in the San Diego Bay (e.g., skate species, silversides, and smelts). Furthermore, many other native marine fish in the study area undoubtedly serve as prey for many of the managed species.

Birds. San Diego Bay provides breeding, wintering, foraging, and/or stopover habitat for more than 300 avian species of shorebirds, seabirds, waterbirds, and terrestrial birds (US Navy & Port of San Diego 2006-2007). Of these avian species utilizing the bay's habitats and resources, 136 directly depend upon the bay. The majority of the avian species utilizing San Diego Bay are migratory. The majority of the project footprint is located in the South-Central ecoregion with a small portion extending into the South eco-region of San Diego Bay. Based on the 2006-2007 San Diego Bay Avian Species Survey Report the density of birds utilizing the majority of the project footprint area is low when compared to other areas of the bay, especially those areas associated with the San Diego Bay National Wildlife Refuge located in the South eco-region. Within the San Diego Bay National Wildlife Refuge there is an established California least tern nesting colony. The California least tern forage in the open water above deep subtidal habitat within close proximity to the nesting colony, especially along the Bay margins where schooling fish concentrate. The bay's rankings for most abundant avian species by category (waterfowl, shorebirds, seabirds, and marshbirds) include the surf scoter, eared grebe, brant, western sandpiper, peep sp., willet, western gull, California gull, elegant tern, great blue heron, snowy egret, and Belding's Savannah sparrow (US Navy & Port of San Diego 2016-2017)

Marine Mammals. The Southern California Bight supports a great abundance and diversity of marine mammals, although of the 39 species present in the Bight, only a handful are expected to be present in San Diego Bay. Species known to be regularly encountered within San Diego Bay include the California sea lion (*Zalophus californicanus*), Pacific harbor seal (*Phoca vitulina*), common dolphins (*Delphinus* sp.), coastal bottlenose dolphin (*Tursiops truncatus*), and occasionally the gray whale (*Eschrichtius robustus*). However, occurrence of marine mammals decreases further south into the channel, with greater likelihood of occurrence for many of the marine mammal species occurring in the entrance, north, and north-central eco-regions of San Diego Bay. Marine mammal surveys conducted by the US Navy from 2016 to 2018 observed the majority of the marine mammals in the San Diego Bay were California sea lions, Pacific harbor seals, and coastal bottlenose dolphins. Species found within the Southern California Bight, with the potential for rare occurrences within the Bay and the immediate vicinity include the northern elephant seal *(Mirounga angustirostris),* Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), short-finned pilot whale (*Globicephala macrorhynchus*), minke whale (*Balaenoptera acutorostrata*), Risso's dolphin (*Grampus griseus*), false killer whale (*Pseudorca crassidens*), and finback whale (*Balaenoptera physalus*) (SDUPD 2008, NAVFAC SW 2017, US NAVY 2018 unpublished Marine Mammal Surveys). Marine mammals are protected by the Marine Mammal Protection Act (MMPA).

Marine Reptiles. San Diego Bay provides a vital year-round coastal foraging habitat for the green sea turtle (*Chelonia mydas*). Foraging habitat for the green sea turtle is primarily located in the southern portion of the bay, south of Sweetwater Channel, where eelgrass densities are the greatest. San Diego Bay is one of two established long-term foraging grounds along the California coast, with the current northern range extend terminating near Long Beach, California (Eguchi et al., 2010). On going genetic studies and satellite telemetry data show that the San Diego Bay green sea turtles are part of the Mexican breeding stock, most likely originating from nesting beaches in the Revillagigedo and Tres Marias Archipelagos and Michoacan, Mexico (Dutton et al. 2019). It is estimated that approximately 60 to 100 resident green sea turtles utilize South San Diego Bay as a year-round foraging site, where they forage on eelgrass, algal species, and invertebrates (personal communication with Jeff Seminoff & Tomo Eguchi, NMFS). An undetermined number of green sea turtles utilize North San Diego Bay, however, due to heavy ship traffic in this area it has not been feasible to accurately asses the population size in the northern eco-regions of the bay. Current research has documented new green sea turtles, especially young juveniles, come in annually to San Diego Bay during the late spring and summer months. Green sea turtles, in general, establish and stay in the same foraging grounds for the entirety of their life, often these foraging grounds are located great distances from nesting beaches. Mature adults will go to their nesting beaches once they accumulate sufficient energy (every couple to few years), mate, and lay eggs. Telemetry and long-term capture-recapture data confirmed the resident green sea turtles do return to San Diego Bay after nesting in Mexico.

Coronado Nearshore Placement Site. The beach receiver site is located within the Silver Strand Littoral Cell. The sources of sand for beaches within the littoral cell are Tijuana River Delta, erosion of the Playas de Tijuana sea cliffs, and beach nourishment projects. The primary sink for beach sands is the shoal off the southern Zuniga Jetty at the entrance to San Diego Harbor. Nearshore currents move sand into and out of the beach receiver site, while longshore currents move sands along the shoreline. Waves and wave driven currents are responsible for eroding the shoreline in the vicinity of the beach receiver site.

LA-5 Ocean Dredge Material Disposal Site. The LA-5 disposal site is located on the continental shelf approximately 5 nautical miles southwest of the entrance of San Diego Harbor, at a depth of 460-660 ft (145-200 m). The site is centered at 27 32º36.83' N and 117º20.67' W with an overall radius of 3000 ft (915 meters).

Marine Vegetation. Most recent data available from the 2016 California Department of Fish and Wildlife kelp canopy aerial surveys did not observe giant or bull kelp within two miles of the Coronado Nearshore Placement Site or adjacent beach where the dredge material is expected to contribute to beach nourishment. Given the depth and wave action at the nearshore placement site it is not expected to be suitable habitat for eelgrass species. The LA-5 ODMDS's depth are too deep to support giant kelp, bull kelp, and eelgrass species.

Invertebrates. The invertebrates at the nearshore placement site are expected to be characteristic of open coast nearshore invertebrate populations. Common invertebrates include polychaete, clam, and amphipod species. The LA-5 ODMDS is expected to consist of deeper water benthic invertebrates, although, due to the nature of the site the population likely experiences frequent disturbances.

Pismo clam (*Tivela stultorum*) is an important invertebrate species that once supported a significant commercial fishery. Pismo clam has been surveyed by the California Department of Fish and Wildlife since 1948 at several California beaches including those at Pismo Beach, Morro Bay, Cayucos, Monterey County, and from Santa Barbara County to San Diego County. From 2000 to 2005 only Coronado Beach has undergone an annual survey by CDFG. These surveys indicated that the Pismo clam population was relatively stable in the 2006 CDFW Annual Status Report. Current data regarding the Pismo clam population off Coronado and Silver Strand Beaches has been requested from CDFW.

Fish and Essential Fish Habitat. Commonly collected species in the nearshore environment collected via trawl included barred sand bass (*Paralabrax nebulifer*), yellowchin sculpin (*Icelinus quadriseriatus*), speckled sanddab (*Citharichthys stigmaeus*), Pacific sanddab (*Citharichthys sordidus*), and California halibut (*Paralichthys californicus*). Similarly, the City of San Diego collected 25 demersal fish species at trawl stations along the 100-foot isobath near the receiver site (San Diego 1996). Flatfishes predominated trawl samples, including Pacific sanddab, longfin sanddab (*C. xanthostigma*), English sole (Pleuronectes vetulus), and California tonguefish (*Symphurus atricauda*). Pelagic fishes are species that spend little or no time in contact with the bottom. Common pelagic species likely to occur in the vicinity of the beach receiver sites include schooling fishes such as northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax*), Pacific mackerel (*Scomber japonicus*), topsmelt (*Atherinops affinis*), jacksmelt (*Atherinopsis californiensis*), and Pacific butterfish (*Peprilus simillimus*) (USIBWC 1998; SANDAG and U.S. Navy 2000). Other species include blue sharks (Prionace glauca), Pacific barracuda (Sphyraena argentea), white seabass (Atractoscion nobilis) and several rockfish species (Sebastes spp.). Some species may move in and out of the beach receiver sites such as yellowtail (*Seriola lalandi*), yellowfin tuna (*Thunnus albacares*), and Pacific bonito (*Sarda chiliensis*) (USIBWC 1998).

The beach adjacent to the nearshore receiver site is located within an area designated as EFH for two Fishery Management Plans (FMP): Pacific Groundfish and Coastal Pelagics FMPs (NMFS 1998). Over 90 fish species are Federally managed under these two plans, approximately 32 likely occur in the vicinity of the receiver sites.

The California grunion (*Leutesthes tenuis*) is common in Southern California in nearshore waters from the surf to a depth of -60 feet MLLW. Grunion travel from their habitat in nearshore waters to sandy beaches following full and new moons in conjunction with their spawning, which occurs from March to August. Grunion in San Diego beaches are typically found on the long, gently sloping beaches with moderately fine grain size. Grunion are managed as a game species by the California Department of Fish and Game (SANDAG and U.S. Navy 2000).

Birds. Birds that commonly forage in nearshore waters near the discharge areas include California brown pelicans, numerous species of gulls, terns, loons, and grebes (U.S. Navy 1992b, 1995a; USFWS 1994). The gulls, including western, ring-billed, California, and Heermann's, are generalist feeders taking a variety of prey items at the water surface. Brown pelicans and Forster's, Caspian, royal, common, elegant, and California least terns are all common in the region. These birds forage aerially, diving for fishes. Several species of loons and grebes also occur; these birds dive from the surface to pursue fish and crustaceans underwater.

Marine Mammals. Mammals most likely to be observed in the vicinity of the beach receiver sites include two pinniped species California sea lion (*Zalophus californianus*) and Pacific harbor seal (*Phoca vitulina*); dolphins, including common dolphin species (*Delphinus* spp.), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), coastal bottlenose dolphin (*Tursiops truncatus*) and Risso's dolphin (*Grampus griseus*); and during seasonal migrations, California gray whales (*Eschrichtius robustus*) (Bonnell and Dailey 1993). Other species that may occur uncommonly in offshore areas of the general project region include northern elephant seals *(Mirounga angustirostris)*, Guadalupe fur seals (*Arctocephalus townsendi*), minke whales (*Balaenoptera acutotostrata*), short-finned pilot whales (*Globicephala macrorhynchus*), killer whales (*Orcinus orca*), false killer whales (*Pseudorca crassidens*), finback whales (*Balaenoptera physalus*), blue whales (*Balaenoptera musculus*), sperm whale (*Physeter macrocephalus*), humpback whale (*Megaptera novaeangliae*) and beaked whales (*Mesoplodon* spp.). The San Diego Basin is used as a foraging area by pinniped species associated with the Los Coronados Islands rookery and may be part of their migratory route from Mexican colonies moving to and from the islands of the Southern California Bight (USIBWC 1998). However, with the exception of some pinnipeds, most marine mammal species are commonly observed further offshore (e.g., deeper than 100 feet) and are not expected to be resident in the Coronado Nearshore Placement Site. The LA-5 disposal area is not located in or near any important marine mammal feeding or breeding areas, therefore all ESA species listed above, if present, would likely only be transiting through the project footprints. Marine mammals are protected by the Marine Mammal Protection Act (MMPA).

Marine Reptiles. Green sea turtles can be present transiting through the placement sites, extensive research on the South San Diego Bay green sea turtle population has revealed resident individuals leave the foraging grounds in San Diego Bay and migrate south to nesting beaches along the Mexican coast, returning once nesting activities have completed. In addition, new juvenile individuals have been documented transiting the area and entering San Diego Bay in search of foraging grounds annually during the late spring and summer months.

Threatened and Endangered Species. Three species protected under the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. § 1531 *et seq.*), may occur near the project area. Federally-listed species which may occur at the project site include: the California Least Tern

(*Sterna antillarum browni*), Western Snowy Plover (*Charadrius nivosus nivosus*), and Green Sea Turtle (*Chelonia mydas*).

California least tern. The federally listed endangered California least tern is present during their nesting season in California from April 1st to Septemper 15th. They inhabit coastal areas and seasonally migrate to nest on sandy beaches from Baja California, Mexico to San Francisco, California. An established California least tern nesting colony is located within the San Diego Bay National Wildlife Refuge, within a quarter mile of the project footprint. Additional nesting sites have been reported on the beaches adjacent to San Diego Bay. The California least tern primarily forage on small fish in the bay waters generally within two miles of the nesting site.

Western Snowy Plover. The federally listed threatened Western snowy plover is present year round in California, nesting season is March 1st to September 15th. Western snowy plover are known to be present year round and nest at beaches in Coronado and Silver Strand State Beach. Snowy plovers forage on invertebrates in the wet sand and cast-off kelp found in the intertidal zone, in dry sandy areas above high tide, on salt pans, and along the edges of salt marshes and salt ponds. Critical habitat was designated in 1999 by the USFWS and includeds several areas in the greater San Diego area, with the closest to the proposed dredging project located at Silver Strand State Beach. At Silver Strand, snowy plovers nest in the dunes south of parking lot 1. The dunes and adjacent beach comprise the Silver Strand Natural Preserve, a subunit of Silver Strand SB designated specifically to protect the snowy plovers. Plover nesting areas are delineated with twine and fiber glass poles to protect plovers from people, kites and dogs. This fencing is a symbolic barrier that allow plovers to pass freely between the nesting area and wrack line where they feed. The nesting area is closed to the public year-round for the safety and protection of the snowy plover.

Green Sea Turtle. The federally listed endangered green sea turtle is present year round in San Diego Bay, foraging on eelgrass, algal species, and invertebrates. The South San Diego eco-region harbors the greatest density of resident green sea turtles, population size estimated to be between 60-100 individuals. The resident population of the Northern bay has not been estimated due to heavy ship traffic. In summer months green sea turtles are more active within San Diego Bay as water temperatures increase, in addition, during late spring and early summer new individuals (often juveniles) enter San Diego Bay in search of foraging grounds. During winter months turtles are less active within the bay, not migrating to nesting beaches, and new juvenile individuals are not entering the system.

4.2.2 Environmental Consequences

Significance Criteria. An impact to Marine Resources will be considered significant if:

- Unmitigated effects occur to a threatened, endangered, or candidate species such that the local population size or capacity is permanently reduced, or its designated critical habitat is permanently, adversely modified;
- There is an unmitigated, net loss in value of a sensitive biological habitat including a marine mammal haul out site or breeding area, seabird rookery, or Area of Special Biological Significance (ASBS);
- The movement or migration of fish is permanently impeded; and/or
- There is a substantial loss in the population or habitat of any native fish, wildlife, or

vegetation (a substantial loss is defined as any change in a population which is detectable over natural variability for a period of 5 years or longer).

Preferred Alternative

Dredging Impacts. Temporary increases in turbidity and suspended solids may occur during dredging which could decrease the amount of dissolved oxygen near the dredge site, thus temporarily affecting fish and other marine life within the immediate area. Organisms may be exposed to suspended sediment concentrations during dredging and up to 24 hours later for a distance generally 100 to 500 feet. Mobile species are expected to relocate out of the area until dredging activities are finished. Some marine populations, particularly benthic organisms, will be destroyed by dredging, but are expected to recolonize the area once dredging has ceased. Effects of a clamshell dredge project in San Diego Bay on demersal fish, epibenthic invertebrate, and benthic infaunal invertebrate communities have previously been studied. Data were analyzed with regards to biomass, density, species richness, community similarity, and infaunal community indices. Results indicated that demersal fish took between 14 and 22 months to recover. Benthic infauna recovered within 5 months relative to density and biomass, but examination of community indices indicated that full recovery of community structure may have taken 17 to 24 months. Epibenthic invertebrates recovered within 29 to 35 months in terms of density and biomass. However, the epibenthic invertebrate community composition was still changing or had achieved an alternate stable state near the end of the study (Merkel & Associates 2010). This area of San Diego Harbors' federal channel does not experience a rapid influx of sand and would not expect to require dredging for several decades, thus allowing the area to recolonize and recover. Dredging is expected to take approximately three to four months. To ensure turbidity and other water quality impacts are negligible, a water quality program will be implemented to observe environmental changes and modify construction processes, if warranted.

Considering the dredge material has been deemed suitable for nearshore placement and ocean disposal, oxygen depletion, eutrophication, and resuspension of contaminants would not be likely to result in significant adverse biological impacts. Water column effects would be largely limited to turbidity impacts. Turbidity can impact plankton populations by lowering the light available for phytoplankton photosynthesis and by clogging the filter feeding mechanisms of zooplankton. Very little turbidity would be expected and would be mostly confined to the local disturbance area. Because turbidity effects would be localized and short-term, with respect to ambient conditions, and the marine plankton are transitory in nature, impacts on phytoplankton and zooplankton would not be significant.

Environmental effects from turbidity and sediment fallout would primarily impact intertidal and subtidal macroalgae and eelgrass species. Prolonged light limitation negatively effects photosynthesis, growth, and recruitment of algal and eelgrass species. Any benthic flora within the immediate project area would be eliminated by the dredging activities because of site excavation and substrate removal. Given the depths of dredging, minimal vegetation is expected to occur within the project footprint; therefore, the proposed dredging project would not cause any adverse impacts to marine vegetation. The dredging impacts, are expected to be temporary and should not affect the overall growth and recruitment of algae and eelgrass species. Extensive eelgrass beds are present in South San Diego Bay, south of the project footprint. Past eelgrass mapping observed eelgrass present along the National City Marine Terminal adjacent to the project footprint. Therefore, pre-construction eelgrass and *Caulerpa taxifolia* presence surveys will be conducted prior to the commencement of dredging and best management practices implemented to ensure the protection of eelgrass beds in the area. In addition, post-construction eelgrass surveys will be conducted once dredging has completed to investigate any impacts to eelgrass within the vicinity of dredging activities.

The most direct impact of dredging would be the elimination of benthic organisms from the immediate dredging areas. A secondary impact would be the redisposition of suspended sediments on adjacent areas. After the rain of fines are settled in adjacent areas from dredging, organisms would likely migrate up through the sediment. Benthic organisms are more susceptible to turbidity. Mechanical or abrasive action of suspended silt and detritus can negatively impact filter-feeding organisms by clogging their gills and impairing proper respiratory and excretory functioning and feeding activity. After dredging terminates, the affected area would be recolonized. Field studies indicate that recolonization initiates immediately and lost productivity rates are re-established in 2 to 3 years.

Local fishes would likely avoid disturbance areas, thus lethal effects of suspended sediment on fishes are not anticipated to be great. Turbidity would likely be localized in time and space. As presented above, the project area supports soft bottom habitat; this habitat is likely to support some flatfishes and other common species typical of the southern California Bight. As construction occurs, it is expected that demersal and pelagic fishes will temporarily relocate to avoid potential water quality impacts (i.e., turbidity plumes). While colonization of fishes may occur quickly in the dredged areas by local fishes temporarily displaced due to construction activities, complete recovery of the demersal fish community is expected to take 1 to 2 years. Although, the demersal fish community may not experience significant direct mortality due to dredging there is likely a dependent correlation between the recovery of the benthic infauna and epibenthic invertebrate community recovery rates and that of the fish communities.

Noise from operations may also impact marine life. The noise associated with dredging activities may disturb fishes, seabirds, green sea turtles and marine mammals. Although data on effects of noise on fishes are limited, the data suggest that fish would be more likely to be startled by sudden staccato noises than by steady noises (i.e. engine noise). Moreover, the noise of the proposed operations would occur against a background area with large amounts of vessel traffic. The sudden staccato noises of the bucket coming into contact with the sediment will likely deter many organisms from entering the dredging areas.

Local and migratory birds could experience disturbances due to water quality impacts and increases in ambient noise levels. These disturbances may directly and/or indirectly impact avian resting, foraging, nesting, nest incubation, and rearing of chicks. The area to be dredged is a small portion of the local habitat, thus the loss of food for bird populations is judged adverse, but not significant. Turbidity can also impact visually foraging piscivorous seabirds by making it difficult for them to see their prey. Thus, it is likely that visual feeders may avoid foraging near the immediate vicinity of the dredge. As it is likely that forage fish would avoid direct disturbance areas, these species would be available for capture elsewhere. Given that dredging will take place outside of the California least tern nesting season and the pelagic fish community they forage on is expected to quickly move back into the area once dredging has completed, the Corps has determined that the proposed action would have “no effect” on the California least tern. Birds would be expected to return after dredging activities cease. A reduction in overall prey availability will be experienced in the dredge areas until recolonization and recovery of the community has occurred.

Marine mammals such as harbor seals and sea lions are expected to avoid dredging activity and seek food sources elsewhere. These marine mammals are often observed within the vicinity of the harbor, and are expected to follow forage fishes to undisturbed locations away from the dredge plume. No direct impacts from turbidity or sediment deposition are expected in regards to marine mammals.

Green sea turtles transit the project area and could potentially forage within the immediate vicinity. Foraging opportunities within the immediate vicinity of dredging operations may be temporarily limited due to the presence of a turbidity plume, but sufficient suitable habitat would remain available. Furthermore, NMFS has indicated the South San Diego Bay population spends the majority of their time foraging south of Sweetwater Channel. Dredging during the fall/winter season, as proposed, reduces the risk of ship strikes and entrapment in the dredge bucket. During the fall/winter season green sea turtles are less active within the bay and less likely to be transiting the project site area, in addition, during these months it is unlikely new juvenile green sea turtles will be entering the bay to investigate foraging grounds (personal communication with Jeffrey Seminoff, Tomo Eguchi, and Dan Lawson of NMFS). The clamshell dredge poses significantly less risk of accidental entrapment of green sea turtles when compared to other dredge types. The proposed project will take place during the fall/winter season by a clamshell dredge, thus the Corps has been determined that the proposed San Diego Harbor maintenance dredging project “may affect, but would not likely adversely affect” the green sea turtle.

Dredging impacts, are considered to be localized to the area and expected to be adverse but not significant.

Nearshore Placement and LA-5 Impacts. Most of the nearshore placement material would consist of sand fraction, which sink rapidly. The ocean disposal material would consist mainly of fines, which remain suspended longer than the sand material. Sediments would be expected to remain in suspension approximately 15 minutes to a few hours, dissipating within 24 hours. The fine fractions discharged at LA-5 would remain in suspension longer and some may drift as far as 1,000 yards from the discharge site. As discussed above, there may be some minor turbidity impacts from this discharge on planktonic organisms, benthic organisms, and fishes. These impacts would be very localized to the area and expected to be adverse but not significant.

Due to high wave action and a sandy substrate, the Coronado Nearshore Placement Site location contains few, if any, macroalgal species. The LA-5 discharge site is at depths that would not support macroalgal species. As stated above, the impacts will likely be temporary, and currents would dissipate the turbidity. Minor turbidity impacts would be very localized to the area and expected to be adverse but less than significant.

The potential biological and physical effects of using dredged material for beach replenishment include coverage and disturbance of benthic and epibenthic infauna by dredged material, and temporary turbidity increase within the beach replenishment areas which can cause clogged gills and breathing apparatuses. The turbidity levels are expected to be low because the dredged material would be composed of predominantly sandy material with particle sizes larger than silts or clays; impacts to turbidity may be adverse but short term in nature. The benthic community would be expected to recolonize the area. Pismo clams may be present at the discharge beaches, however, since sediment would be discharged in the nearshore and would replenish the beach over a long period of time, impacts to Pismo clam are expected to be negligible and therefore not significant. Due to LA-5's designation as an ODMDS frequent disruptions occur to the benthic communities likely prohibiting recolonization and well established community structure.

Impacts to fishes are expected to be similar to the dredge site. Harbor seals and sea lions would not be expected in high densities in the nearshore placement site due to recreational use of the adjacent beach. It is likely marine mammals would avoid the nearshore placement site until turbidity and vessel activity has dissipated. The footprint of the nearshore placement site is relatively small when compared to the entire coastline along Silver Strand State Beach. Nearshore placement of dredged sands would not have significant impacts on marine mammals.

Dredging activities in South San Diego Harbor and placement of suitable dredge materials at the Coronado Nearshore Placement Site will entirely occur sea side, the Corps has determined that the proposed project would have "no effect" on the Western snowy plover.

To ensure turbidity and other water quality impacts are minimal, a water quality program would be implemented to observe environmental changes and modify construction processes, if warranted.

Nearshore placement of dredged sands would not result in a net loss in value of a sensitive biological habitat including a marine mammal haul out site or breeding area, seabird rookery, or Area of Special Biological Significance (ASBS); and/or result in a substantial loss in the population or habitat of any native fish, wildlife, or vegetation. Nearshore placement, therefore would not result in significant impacts.

Threatened and Endangered Species.

California least tern: California least terns will not be affected by the proposed action given that work will be conducted outside of the established California least tern nesting season.

Western snowy plover: Dredge materials will not be placed directly on the beach and all construction activities will take place sea side, thus western snowy plover foraging habitat, nesting habitat, and western snowy plovers would not be affected by the proposed project.

Green sea turtle: This species has the potential to occur (forage or transit) within the proposed dredging footprint. Dredging during the fall/winter season, as proposed, reduces the risk of ship strikes and entrapment in the dredge bucket. During the fall/winter season green sea turtles are less active within the bay and less likely to be transiting the project site area, in addition, during these months it is unlikely new juvenile green sea turtles will be entering the bay to investigate foraging grounds (personal communication with Jeffrey Seminoff, Tomo Eguchi, and Dan Lawson of NMFS). The clamshell dredge poses significantly less risk of accidental entrapment of green sea turtles when compared to other dredge types. The proposed project will take place during the fall/winter season by a clamshell dredge, thus the Corps has been determined that the proposed San Diego Harbor maintenance dredging project "may affect, but would not likely adversely affect" the green sea turtle. Coordination pursuant to Section 7 of the Endangered Species Act has been initiated with the National Marine Fisheries Service regarding the green sea turtle.

Marine Mammals. The MMPA prohibits the taking of marine mammals without prior approval from the National Marine Fisheries Service (NMFS). The regulatory definition of "take" includes harassing or attempting to harass any marine mammal.

Ambient noise levels in in San Diego Harbor are elevated due to commercial and recreational ship traffic. Dredging associated noise would be somewhat elevated and distinguishable from background noise levels in the immediate vicinity of the dredge template, but would quickly dissipate with distance from the dredge or disposal site.

Dredging and disposal activities would be temporary in nature and localized to a small area within the dredge template that the dredge will be digging at a given time. California sea lions and Pacific harbor seals are the marine mammal species likely to be present in the South San Diego Harbor. Pinniped species such as the harbor seal and the sea lion would likely not experience any displacement from dredge work given that neither species is recorded as utilizing structures in the immediate vicinity of the dredge template for hauling out, mating, or breeding. Foraging seals and sea lions are, furthermore, are not expected to be affected by the presence and operation of the dredge and support equipment given the amount of surrounding area available for foraging, and the existing environmental baseline of almost constant human presence and commercial activity that already occurs in the area. Startle reactions from sea lions or harbor seals that are in close proximity to the dredge could occur as the result of start-up operation, or from noises associated with the dropping of the bucket into the water and benthic sediments. These responses are temporary, however, and prone to habituation (Schakner et al 2017). Proposed project activities, therefore are not likely to result in a take, as defined in the MMPA. Further coordination and/or authorization for take is not required for this project.

Essential Fish Habitat (EFH). The Corps has determined that the proposed project may adversely affect EFH, but would not result in a substantial, adverse impact to any species on the Fishery Management Plan or to their habitat. The following is a discussion of potential effects to EFH:

Proposed dredging and disposal activities would be short-term in duration. Potential impacts to surrounding EFH could result from turbidity plumes extending great distances past the immediate dredging area and unexpected slope failures. Impacts to EFH within the project footprint may include direct removal/burial/crushing of organisms, temporary turbidity plumes and suspension of sediments from propeller wash, release of contaminants from equipment, entrainment, and noise. Direct removal/burial/crushing of organisms and water quality impacts would be considered potential adverse impacts to EFH. Turbidity caused by dredging activities would subside within an hour to 24 hours after dredging has completed as suspended sediments begin to settle. Displaced organisms from dredging and disposal activities would likely begin to quickly recolonize the areas impacted by dredging, although, a previous study investigating dredge scar recovery rates within San Diego Bay have shown the demersal fish communities took between 14 and 22 months to recover. In addition, the study indicated full recovery of benthic infauna within 5 months relative to density and biomass, but examination of community indices indicated that full recovery of community structure may have taken 17 to 24 months. Epibenthic invertebrates recovered within

29 to 35 months in terms of density and biomass (Merkel & Associates 2010). It is very likely the recovery rate of the demersal fish community is tightly correlated to the recovery rates of the benthic infauna and epibenthic invertebrate communities that are prey items for foraging fish in these areas, as well as providing other ecosystem services.

Conclusion: In conclusion, the Corps has determined that the proposed San Diego Harbor maintenance dredging work would have **no effect** on the California least tern or Western snowy plover. The proposed project **may affect, but is not likely to adversely affect** the green sea turtle and will have no effect on any other federally ESA listed species. Proposed project activities, are not expected to result in a take, as defined in the MMPA. The Corps has determined that the proposed project may adversely affect EFH, but would not result in a substantial, adverse impact to any species on the Fishery Management Plan or to their habitat.

Avoidance and Minimization Measures: The following measures would be implemented as part of the project description to further avoid and minimize potential effects to the marine environment:

- The limits of the dredge activities shall be clearly marked to prevent heavy equipment from entering areas beyond the footprint needed to complete the project.
- Vehicles and all repair activities shall remain within the defined activity area and use only designated access points and staging areas.
- The work area shall be kept clean to avoid attracting predators. All food and trash shall be disposed of in closed containers and removed from the project site.
- No pets shall be allowed on the construction site.
- The Contractor will keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters.
- All dredging and fill activities will remain within the boundaries specified in the plans. There will be no dumping of fill or material outside of the project area or within any adjacent aquatic community.
- The Contractor will be required to have in place a Spill Prevention and Cleanup Plan that includes measures to prevent spills and to cleanup any spills that could occur. This plan shall include employee training and the staging of materials on site to clean up accidental spills.
- The Contractor will keep construction activities under surveillance, management, and control to minimize interference with, disturbance to, and damage of fish and wildlife, including marine mammals.
- The contractor shall implement a Water Quality Monitoring Plan at the dredge and nearshore placement site. The Water Quality Monitoring Plan will include weekly monitoring at the dredge site for salinity, pH, temperature, dissolved oxygen, turbidity, and light transmissivity; monthly water samples will be taken and analyzed for total dissolved solids. Dredging will be controlled to keep water quality impacts to acceptable levels, controls will include modifying the dredging operation and the use of silt curtains (if feasible). Turbidity (NTUs), light transmittance and dissolved oxygen will limited to a 20% maximum change between the control station and 300 ft downstream station. Dissolved oxygen will be maintained at a minimum of 5mg/l, and pH will be limited to a 0.2 unit change from measured natural levels.
- The contractor will implement an Environmental Protection Plan which will include eelgrass protection measures, a Green Sea Turtle Monitoring and Avoidance Plan, and a

Marine Mammal Monitoring and Avoidance Plan, including employee training.

- Training shall be provided to the Contractor personnel to review and ensure full understanding of all project environmental protection requirements prior to work commencing. Training shall include, but not be limited to, methods of detecting and avoiding pollution, identification and avoidance measures for endangered species and marine mammals, eelgrass, and Caulerpa taxifolia identification and notification requirements.
- The contractor will adhere to the following measures to reduce the risk of potential harm to federally listed endangered green sea turtles.
    - Only a clamshell dredge will be used.
    - Dredging will only occur during November, December, January, Febuary, and March. During these colder water months NMFS has recorded less turtle movements and activity.
    - Green sea turtle monitoring will be performed by a qualified biologist during all dredging activities.
    - Dredging area will be well lit during nighttime dredging activities.
- Contractor will not work during the federally listed endangered California least tern nesting season (April 1st – September 15th).
- Marine mammal monitoring will be performed by a qualified biologist during dredging activities to ensure the project is in compliance with the MMPA.
- Pre-construction eelgrass and Caulerpa taxifolia will be performed, and appropriate protection measures will be implemented. Post-construction eelgrass surveys will be performed to assess any impacts to eelgrass.
- Retesting of dredged sediments will be coordinated with the SC-DMMT should any events occur (i.e. oil spill) that could contaminate harbor sediments thus rendering them unsuitable for nearshore placement or ocean disposal.

No action alternative. Construction impacts would not occur. The federal navigation channels would continue to fill with sediments eventually resulting in impacts to military, recreational, and commercial boating and the creation of unsafe conditions that could lead to boat groundings. Emergency or future (deferred) dredging would have similar impacts to those described for the preferred alternative.

4.3 Air Quality

4.3.1 Affected Environment. The project is located within the San Diego Air Basin (SDAB) under the jurisdiction of the San Diego County Air Pollution District (SDCAPD).

National Ambient Air Quality Standards. The Clean Air Act identified and established the National Ambient Air Quality Standards (NAAQS) for a number of criteria pollutants in order to protect the public health and welfare. The criteria pollutants include ozone (O3), carbon monoxide (CO), suspended particulate matter (PM), sulfur dioxide (SO2), nitrogen dioxide (NO2), and lead (Pb). PM emissions are regulated in two size classes: Particulates up to 10 microns in diameter (PM10) and particulates up to 2.5 microns in diameter (PM2.5).

A region is given the status of “attainment” or “unclassified” if the NAAQS have not been exceeded. A status of "nonattainment" for particular criteria pollutants is assigned if the

NAAQS have been exceeded. Once designated as nonattainment, attainment status may be achieved after three years of data showing non-exceedance of the standard. When an area is reclassified from nonattainment to attainment, it is designated as a “maintenance area,” indicating the requirement to establish and enforce a plan to maintain attainment of the standard.

General Conformity Rule. A conformity determination is required for each criteria pollutant or precursor where the total of direct and indirect emissions of the criteria pollutant or precursor in a nonattainment or maintenance area caused by a Federal action would equal or exceed any of the rates specified in 40 CFR 93.153(b)(1). Total of direct and indirect emissions means the sum of direct and indirect emissions increases and decreases caused by the Federal action; i.e., the “net” emissions considering all direct and indirect emissions. The portion of emissions which are exempt or presumed to conform under § 93.153 (c), (d), (e), or (f) are not included in the “total of direct and indirect emissions.” The “total of direct and indirect emissions” includes emissions of criteria pollutants and emissions of precursors of criteria pollutants.

Direct emissions include construction emissions. Indirect emissions means those emissions of a criteria pollutant or its precursors:
1. That are caused or initiated by the Federal action and originate in the same nonattainment or maintenance area but occur at a different time or place as the action;
2. That are reasonably foreseeable;
3. That the agency can practically control; and
4. For which the agency has continuing program responsibility.

Attainment Designations. The SDAB is non-attainment for the federal 8-hour ozone but is in attainment for the remaining pollutants regulated under the NAAQS. PM10 is unclassified since the available data does not support a designation of attainment or nonattainment. Within the SDAB, a federal action would conform to the State Implementation Plan if its annual emissions remain below 10 tons of volatile organic compounds (VOC).

Table 2. Attainment Status of NAAQS Criteria Pollutants in the SDAB

Pollutant	**Attainment Status**
Ozone - 8-hour (ROG)[1]	Nonattainment
Nitrogen Dioxide	Attainment
Carbon Monoxide	Attainment
Sulfur Dioxide	Attainment
PM10	Unclassifiable
PM2.5	Attainment

Lead	Attainment

Source: CARB 2018 and USEPA 2018

1. The emission estimate for ROGs is used as a surrogate for reporting ozone.
2. Estimates of lead emissions were not calculated. Little to no quantifiable and foreseeable lead emissions would be generated. Thus, no emission factors for lead are available.

Gases that trap heat in the atmosphere are often called greenhouse gases (GHG). GHGs are emitted by natural processes and human activities. Examples of GHGs that are produced both by natural processes and industry include carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O). Currently, there are no Federal standards for GHG emissions and no Federal regulations have been set at this time.

4.3.2 Environmental Consequences

Significance Criterion. An impact to Air Quality will be considered significant if the proposed project would exceed the applicability rates specified in 40 CFR 93.153.

Preferred Alternative. Emissions for the proposed activities would come from one small harbor craft, one barge-mounted crane, and one tugboat. The barge-mounted crane would place dredged materials into a dump scow. Dredged materials deemed suitable for ocean disposal would be transported by a tug boat to the San Diego Ocean Dredged Material Disposal Site (LA-5), located approximately 20 miles from the harbor. Likewise, dredged materials deemed suitable for discharge at the Coronado Nearshore Placement Site, located approximately 16 miles from the harbor, would be transported by tug. Both the clamshell dredge and tug would be operating approximately 22 hours per day for approximately 100 days. A small harbor craft would be used to shuttle crews to the clamshell dredge during crew changes. This craft would be in operation for approximately 8 hours per day for the duration of the project. Estimated emissions are shown in Table 3 below.

Table 3 Emission Estimates for Construction (Tons/Year)

	ROG	**CO**	**NOx**	**SOx**	**PM10**	**PM2.5**
Estimated Emissions	1.31	5.94	21.46	0.82	0.69	0.64
Applicable General Conformity Rates	**10**	n/a	n/a	n/a	n/a	n/a

GHG emissions. Calculations of potential GHG emissions (CO2) from breakwater and jetty repair activities are disclosed in Table 4

Table 4 Emission Estimates for GHGs (Tons/Year)

Estimated GHG Emissions	1729

Estimated emission of NAAQS criteria pollutants would be below the General Conformity Rates specified at 40 CFR 93.153. Thus, air quality impacts would be less than significant.

No Action Alternative. Emissions associated with the maintenance dredging project would not occur. However, future shoaling of the federal channel could result in emergency dredging operations to relieve shoaled conditions that could result in unsafe navigation. It is likely that any emergency dredging operations would be limited in scope and duration. Emergency dredging operations would likely involve maintenance dredging of the federal dredge areas that require immediate removal of severely shoaled areas that prevent safe navigation. If emergency dredging is necessary, there would be temporary increases in emissions from the dredge equipment and ancillary vessels. However, the impacts would be short term. It is unlikely that air quality impacts associated with emergency repairs would exceed federal General Conformity Rates.

4.4 Noise

Noise is defined as unwanted sound. Noise disrupts normal activities and diminishes the quality of the environment. There are two types of noise sources: stationary sources which are typically related to specific land uses, and transient sources which move through the environment. A locale's total acoustical environment is the blend of the background or ambient acoustics with unwanted noise. Human response to noise is diverse and varies with the type of noise, the time of day, and the sensitivity of the receptor. The decibel (dB) is the accepted standard unit for measuring the level of noise, which is generally adjusted to the A scale (dBA) to correspond to the range of normal human hearing.

Slight changes in loudness are difficult to detect. A 3-dBA change is considered a just perceivable difference. A change of at least 5-dBA is required before any noticeable change in community response would be expected. A 10-dBA change is subjectively heard as approximately a doubling in loudness. Exterior noise becomes increasingly noticeable at night and most people are very sensitive to nighttime noise intrusion.

Affected Environment. The project area is located within a relatively high noise area typical of port and industrial areas. The noise levels are further increased by aircraft operating both out of NASNI and San Diego International Airport Lindbergh Field. Vehicular traffic in the area also contributes to the overall noise environment. Automobiles, recreational boats and vehicles, commercial fishing boats, Navy vessels, and large commercial ships are the major contributors to the ambient noise environment at San Diego Harbor and nearby beaches. Noise studies conducted for the Navy homeporting project (U.S. Navy 1995) indicate that community noise equivalency levels (CNEL) in the harbor (on the water) range between 60 and 67 dBA. These levels would be generally consistent with the activities on the surrounding beaches, including the Coronado Nearshore Placement Site. Increases in ambient noise levels would be expected on the wharf areas, especially when the off loading of commercial commerce is being conducted.

There are no federal or state standards limiting construction noise. Many cities and counties have provision in their noise ordinance that addresses construction noise levels and time of operation. San Diego Municipal Code Article 9.5 discusses noise abatement and control. Section 59.5.0404 addresses construction noise specifically, stating that "It shall be unlawful for any person, between the hours of 7:00 p.m. of any day and 7:00 a.m. of the following day, or on legal holidays… or Sundays, to erect, construct, demolish, excavate for, alter or repair any building or structure in such a manner as to create disturbing, excessive or offensive noise unless a permit has been applied for and granted beforehand by the Noise Abatement and Control Administrator."

Any impacts from the noise generated by the dredging equipment are dependent upon the distance from the equipment. Noise levels from a point source decrease in inverse proportion to the square of the distance from the sound source (e.g., at distances greater than 50 feet from the source, every doubling of the distance decreases the noise by approximately 6 dB).

Dredge equipment may generate noise up to approximately 80 to 90 decibels at 50 feet. Dredge activities will take place in the federal channel closest to the National City Marine Terminal wharf (approximately 100 ft), other areas within the immediate vicinity include industrial and Navy use areas. The closest residential and recreational use areas are approximately 1 mile from the project site in Coronado, and the closest California least tern nesting colony is 1,600 ft from the dredge site. Nearshore placement activities would be located approximately 1,300 to 2,300 feet offshore of sensitive land uses. Since sound is dampened over distance, dredging equipment is expected to generate noise on the beach at approximately 50 to 60 decibels, which is noted in the "quiet" range. Noise at the nearshore disposal sites would be intermittent, occurring only when the scow and tug transit to the nearshore to dispose sediment. LA-5 ODMDS is located 5 nautical mile southwest of the entrance to San Diego Harbor in the offshore environment.

Any permits required by the City of San Diego, and the City of Coronado Beach to dredge and dispose during nighttime hours and meet noise ordinances would be obtained by the selected Contractor.

Ambient noise levels on the beach and within the Harbor are such that the dredge would not be a significant new noise source. Dredge equipment would only be present in the nearshore and LA-5 area for short periods of time during nearshore placement and offshore disposal activities. After which, the scow would be transported back to the dredge area until the next placement/disposal cycle. Noise levels at the beach adjacent to the nearshore placement site would be in the "quiet" range and will not have an adverse effect on surrounding land uses.

Dredging and disposal would occur for approximately three to four months, and noise levels would return to ambient conditions upon project completion; impacts would be temporary and not significant.

4.4.1 Environmental Consequences

Significance Criteria. Project noise impacts would be considered significant if the project is not in compliance with local noise ordinances for daytime construction. This is a short-term project and a perceived daytime doubling of noise levels is considered significant. A lower threshold is used for nighttime noise to reflect the increased sensitivity of people to nighttime sources of noise.

Dredge Impacts. Noise impacts would occur over the duration of project construction, approximately three to four months. Due to the temporary nature of the dredging, the offshore location of the dredge operation, and the absence of any sensitive receptors in the immediate area, the proposed project is not expected to have a significant impact on the noise environment.

Near Shore Placement and LA-5 Disposal Impacts. All construction activities would take place off shore. Noise from placement and disposal operations would not be discernible from the beach.

Noise impacts are considered less than significant; therefore, mitigation measures are not required.

No action alternative. The No Action Alternative will avoid noise impacts, unless shoaling impacts resulted in frequent emergency dredging operations to relieve dangerously shoaled conditions, which has occurred in the past. If emergency dredging were necessary, temporary increases in noise from the dredge equipment, ancillary vessels, and laborers' vehicles would be expected as well as temporary increases in noise levels. This increase would be short term and less than significant.

4.5 Cultural Resources

Cultural resources are locations of past human activities on the landscape. The term generally includes any material remains that are at least 50 years old and are of archaeological or historical interest. Examples include archaeological sites such as lithic scatters, villages, procurement areas, resource extractions sites, rock shelters, rock art, shell middens; and historic era sites such as trash scatters, homesteads, railroads, ranches, and any structures that are over 50 years old. Under the National Historic Preservation Act (NHPA), federal agencies must consider the effects of federally regulated undertakings on cultural resources that are listed or eligible for listing in the National Register of Historic Places (NRHP). Cultural resources that are listed or eligible for listing in the NRHP are referred to as historic properties.

4.5.1 Affected Environment.

San Diego Harbor

Site records regarding archaeological resources for the project area are maintained at the San Diego Museum of Man and the South Coastal Information Center at San Diego State University. Based on a previous records search at these institutions and archival research, four prehistoric archaeological sites and seven historic period sites were identified within one mile of the proposed dredge footprint. All of the resources are onshore archeological sites, except the sailing ship Star of India which is the oldest sailing ship still in operation.

Maintenance dredging of San Diego Harbor was authorized by the 1852 Rivers and Harbors Act and has occurred in some capacity by the Corps since 1890. As part of an archaeological sensitivity study of the harbor, Pettus (1996) found that the probability of a prehistoric site or a shipwreck of potential historical significance existing within the project area is considered extremely remote. Shipwrecks are routinely removed by the San Diego Harbor Patrol. The potential for encountering other deposits of *in situ* cultural materials is considered highly unlikely.

Beach Receiver Sites: LA-5 and Coronado

LA-5 is one of the EPA's designated and managed regional ocean dredged material disposal sites. It is a major disposal area for the region and its impacts have previously been analyzed in various environmental documents (EPA 1988). No cultural resources are known to exist within the LA-5 disposal footprint and the potential for cultural materials to be present at the site is incredibly low.

One site is known to exist adjacent to the Coronado Beach Disposal area, the shipwreck commonly known as the *Monte Carlo* or *McKittrick.* Built in 1921, this vessel was originally used as a tanker and later used for gambling. Since 1985 the Corps has been placing sand on top of the shipwreck in order to prevent site disturbance (Dolan 2008). The Corps conducted a cultural resources remote sensing survey of the northern Coronado Beach disposal area in July 2009. Results of the survey indicated that there are several small magnetometer anomalies scattered in the Coronado Beach disposal area, but they do not appear to relate to a cultural resources (e.g., shipwreck or other historic debris). Therefore, there are no known cultural resources or historic properties within the northern Coronado Beach discharge area. The Monte Carlo is located outside of the disposal area. The southern Coronado Beach disposal area was previously used as a borrow site for the Shore Protection Improvement Project at the U.S. Naval Amphibious Base in 1985 and consequently was not included in the survey. Due to the extensive disturbance associated with the borrow area, historic properties are unlikely to exist.

4.5.2 Environmental Consequences Significance Threshold: Preferred Alternative.

Significance Criteria. Under NEPA, significance is determined based on 'context' and 'intensity'. For cultural resources, context is often viewed in terms of how important the resource may or may not be, while intensity is viewed in terms of the severity of the impacts to the resource. While cultural resources that are not eligible for the NRHP are still considered as part of the NEPA review, once that resource fails to meet the criteria for eligibility for inclusion on the NRHP its 'context' is found to be lacking. The phrase "adverse effect" (used in the NHPA) and "significant impact" (used in NEPA) are not equivalent terms but are similar in concept. Under the NHPA, impacts to cultural resources are typically examined in terms of how the project would affect the characteristics that make the property eligible for the National Register. Such impacts are referred to as adverse effects in the NHPA's implementing regulations (36 CFR 800.5).
Impacts to cultural resources would be considered significant if the Proposed Action would:

- result in an substantial adverse effect to a historic property such that the implementation of the alternative would result in the destruction of a historic property or the loss of a property's eligibility.

Dredge Impacts.
No historic properties are known to exist within the federal channel. Background research for the proposed action has demonstrated that for the majority of the proposed action's length, the bayfloor (and in many areas, the sub-floor) has been massively impacted. The probability of a prehistoric site or a shipwreck of potential significance to exist and be preserved within the project footprint is considered extremely remote. The Corps has previously consulted with the California State Historic Preservation Office (SHPO) regarding dredging of the federal navigation channel and use of the identified disposal area and the parties have concurred that the dredging would result in no

historic properties affected.

Near Shore Placement and LA-5 Disposal Impacts. All construction activities would take place off shore. Impacts to cultural resources are not anticipated because there are no known historic properties within either the offshore disposal area LA-5 or Coronado Beach discharge area. The *Monte Carlo* shipwreck (CA-SDI-011,069) is located outside of but near the southern boundary of the Coronado Beach disposal site. The shipwreck would be avoided by all disposal activities. LA-5 has been used as a dredge material disposal site for over 30 years. The Coronado Beach nearshore site was also used by the Corps in 2012. The Corps has previously consulted with the SHPO regarding use of these disposal areas and the parties have concurred that there would be no historic properties affected.

Conclusion The Corps has previously consulted with the SHPO and found that the undertaking would result in no historic properties affected and therefore the undertaking would be less than significant under NEPA. Mitigation measures are not required.

No action alternative. Under the no action alternative, the Corps would not complete routine maintenance dredging of the harbor and there would be no impacts to cultural resources. Impacts would be less than significant.

4.6 Vessel Transportation and Safety

Affected Environment. San Diego Harbor is a heavily used commercial, military, and recreational vessel waterbody. Boat traffic, including commercial vessels, fishing vessels, and recreational vessels, often traverse the proposed project site. The military vessels are concentrated in regions north of the project site within San Diego Harbor. It is estimated that naval/military vessels account for approximately two to three times the amount of commercial traffic within the deep water channel main shipping lane, especially with major berthing facilities at NASNI and Naval Station San Diego (NAVSTA). Safe navigation is maintained by well-marked channels and the presence and activity of various law enforcement agencies (i.e. County Lifeguards, U.S. Coast Guard, San Diego Harbor Police).

4.6.1 Environmental Consequences

Significance Criteria. A significant impact would occur if the proposed project:

- Results in a substantial reduction of current safety levels for vessels in the Harbor.
- Presents a navigational hazard to boat traffic, or interferes with any emergency response or evacuation plans.

Preferred Alternative. Project impacts are not expected to significantly increase vessel traffic levels. All construction vessels would be marked and lighted in accordance with U.S. Coast Guard regulations, and notices would be published in Local Notice to Mariners warning boat users about times, durations, and locations of construction activities. Vessel traffic should be able to easily navigate around any short-term obstacles created by construction traffic. If vessels associated with the dredging activities would be moored it would be done so with sufficient room left in the main navigation channels for other vessels to pass. In addition, the dredge contractor will coordinate with the cargo vessels transporting motor vehicles to the National City Marine Terminal as to not interfere with the navigation traffic. Construction will not impede access to any channels or entrance ways. Minimal marine traffic is anticipated in the nearshore placement site and LA-5 ODMDS.

Conclusion: Impacts to vessel traffic are considered less than significant.

No action alternative. Additional vessel traffic associated with the project would not occur. The federal navigation channels would continue to fill with sediments eventually resulting in impacts to military, recreational, and commercial boating and the creation of unsafe conditions that could lead to boat groundings. Emergency or future (deferred) dredging would have similar impacts to those described for the preferred alternative.

4.7 Recreational Uses

4.7.1 Affected Environment. The project area is a mix of military, commercial, public and private recreational boating and commercial uses. The coastal waters provide for recreational boating and fishing. Water contact recreation (swimming/wading/surfing) occurs at beaches located along the coast, primarily south of the harbor entrance.

4.7.2 Environmental Consequences

Significance Criteria. Impacts will be considered significant if the project results in a permanent loss of existing recreational uses.

Preferred Alternative. Impacts to recreational boaters will be negligible (see Section 4.6 above). Long-term impacts will be beneficial. The dredging will maintain, sustain, and support recreational and commercial boating by keeping the approaches and entrance channels open and reducing potential navigational hazards. Dredging activities will be physically separated from the water contact recreational uses. These activities take place primarily along the edges and remain outside the federal navigational channels. The proposed project will not result in any impediments to bay use. Silver Strand State Beach, adjacent to the Coronado Nearshore Placement site will not be impacted as all activities will take place sea side. Furthermore, the beaches within the Silver Strand littoral cell will benefit from the increase in sediment available to nourish the surrounding beaches.

Conclusion. Recreational impacts are considered less than significant.

No action alternative. The federal navigation channels would continue to fill with sediments eventually resulting in impacts to military, recreational, and commercial boating and the creation of unsafe conditions that could lead to boat groundings, which may require the closing of the harbor to recreational and commercial use over safety concerns. The additional recreational benefits to boating and beach use would not occur.

4.8 Aesthetics

4.8.1 Affected Environment. The overall aesthetic character of the project area is composed of a mix of commercial, military, residential and water-oriented facilities. The beaches further add to the overall impression of a recreational-oriented visual setting. The area is well maintained. The natural resources in the area provide a visually attractive setting and relaxing atmosphere for residents and tourists.

4.8.2 Environmental Consequences

Significance Criteria. The project would significantly impact the aesthetics if a landscape is changed in a manner that permanently and significantly degrades an existing viewshed or alters the character of a viewshed by adding incompatible structures.

Preferred Alternative. The presence of construction equipment for dredging would result in mixed impacts depending on the opinion of the viewer. Many viewers will consider the presence of the construction equipment to be an adverse impact, interrupting viewpoints from local land points and from boats. Other viewers may consider the presence of construction equipment and construction activity to be beneficial impacts, providing an interesting feature to watch from a safe distance (construction activity of this type often attracts curious onlookers). Given that the crane-equipped barge and support vessels for the proposed dredging activities would not be present during the peak tourist season, in nearshore and offshore areas away from beaches, and construction activity would be short-term, aesthetic impacts would be less than significant. Long-term aesthetic impacts would be beneficial, beach nourishment provides wide, sandy beaches, considered by many as enhancing the aesthetic character of the area.

Conclusion. Aesthetically, the viewshed would not change from the current baseline. Because impacts to aesthetics are temporarily adverse or neutral, and would be less than significant, no mitigation measures would be required.

No action alternative. Beneficial impacts discussed above would not be attained. Aesthetics of the area would remain unchanged.

4.9 Ground Transportation

4.9.1 Affected Environment. San Diego Harbor and the adjacent beaches are accessed by several major routes. Seasonal variations can result in large differences in road use. Summer is the peak season and it is the basis for design of road capacity.

4.9.2 Environmental Consequences

Significance Criteria. A significant impact would occur if the proposed project results in:

- Inadequate parking facilities;
- An inadequate access or on-site circulation system; or
- The creation of hazardous traffic conditions.

Preferred Alternative. Construction will require the use of marine equipment with no impacts to ground transportation. Traffic will be generated by crews associated with operations of dredge and support equipment. The equipment crew is anticipated at approximately 20 people day shift and 12 people night shift. This small staff will not significantly add to the local traffic levels. The proposed project will not take place during the peak tourist season. The proposed project is, therefore, expected to have minor adverse impacts to ground transportation which are not considered significant. Mitigation measures are not proposed.

No action alternative. Construction activities associated with the project would not occur, no impact to ground transportation would occur. The project's beneficial effects to San Diego Harbor use would be lost and navigational safety would be diminished.

4.10 Growth Inducement

The proposed project is located at San Diego Harbor in San Diego County. The proposed project is a routine maintenance program plan, dredging of a portion of the federal channel for continued safe operation of Harbor facilities being the objective purpose. The proposed project is not in support of planned infrastructure improvements that would result in additional growth. The proposed project would not require additional employees other than temporary contractor employees to perform the dredging construction operations. The proposed project would not induce growth within the project area.

4.11 Cumulative Impacts

NEPA requires that cumulative impacts of the proposed action be analyzed and disclosed. Cumulative impacts are impacts on the environment that will result from the incremental effect of the proposed action when combined with other past, present, and reasonably foreseeable planned and proposed actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

The Corps, as part of its Operations and Maintenance Program, performed maintenance dredging on this portion of the federal channel in 1976. The 441,000 cubic yards of sediment was dredged from the federal navigation channel seaward of Ballast Point to the approach by the Army Corps during the 2012 maintenance dredging. The USCG dredges at Ballast Point approximately every seven years. Ship building facilities within San Diego Harbor dredge approximately every five to ten years. The US Navy performs maintenance dredging of the Navy berth areas as needed. The majority of the upcoming Navy dredging is planned for other regions of the Bay, not within the immediate vicinity of the Corps' South San Diego maintenance dredging. The closest Navy dredging project to the proposed Corps dredging is north of Mole Pier, approximately one mile from the proposed Corps dredging site. Minor maintenance dredging of individual boat docks can be assumed to continue. This work is generally authorized by dredging permits issued by the USACE for individual boat docks in San Diego Harbor. There may be a few such projects ongoing during the proposed project. Generally, however, these projects are conducted using the same piece of equipment and only take place a single site at a time. For purposes of this assessment, it is assumed that the proposed project overlaps with single dredge boat dock projects, and that the total dredging for these projects is not expected to exceed 5,000 cubic yards. The footprint of individual docks and Navy berths dredged each year is relatively small when compared to the total available soft bottom substrate available in San Diego Harbor. No significant or long-term adverse impacts occurred from the past dredging actions, and it is assumed that temporarily affected substrate would have recolonized with benthic organisms and other wildlife within 1 to 3 years. Given the time that has lapsed since the last maintenance dredging of the federal channel in San Diego Harbor the previous dredging projects would not contribute to significant ongoing or cumulative effects.

Past activities, such as dredging, placement of fill material, and construction of Harbor and marina facilities, have reduced the physical and biological aquatic resource functions present in this area, as compared to natural undisturbed areas. Elevated noise levels and vessel traffic cause ongoing disturbances in the project vicinity. Past impacts within and adjacent to the Harbor also include negative impacts to air quality. Thus, the project area has been affected by past marina activities and continues to be similarly disturbed. Due to the relatively small scale and temporal nature of the Corps' proposed maintenance dredging project, it would not result in significant cumulative impacts of these resources.

The USACE has concluded that the cumulative impacts of projects, including maintenance, reconstruction, and upgrades, from current project and forecasted (i.e., future) actions in the proximity of the San Diego Harbor federal navigational channels will be highly localized and will not significantly affect the quality of the existing natural or built environments.

Potential impacts to all other environmental resources including noise, cultural resources, vessel transportation and safety, recreational uses, aesthetics, land/water uses, and ground transportation would be minimal and less than significant. The proposed project would result in an overall beneficial impact as the harbors' authorized depths and widths would be maintained for safe navigation. Potential impacts to these resources from the proposed project, when analyzed in combination with other past, present and reasonably foreseeable projects or uses of San Diego Harbor, are not expected to result in significant cumulative impacts.

SECTION 5 - ENVIRONMENTAL COMPLIANCE AND COMMITMENTS

5.1 COMPLIANCE

5.1.1 National Environmental Compliance Act of 1969 (Public Law (PL) 91-190); National Environmental Policy Act (NEPA) of 1969 (42USC4321 et seq., PL 91-190); Council on Environmental Quality Regulations for Implementing NEPA, 40 CFR Parts 1500 to 1508; USACE Regulations for Implementing NEPA, 33 CFR Part 220.

The National Environmental Compliance Act includes the improvement and coordination of Federal plans to attain the widest range of beneficial uses of the environment and to achieve a balance between population and resource use permitting high standards of living and a wide sharing of life's amenities. The NEPA was established to ensure that environmental consequences of federal actions are incorporated into Agency decision making processes. It establishes a process whereby parties most affected by impacts of a proposed action are identified and opinions solicited. The proposed action and several alternatives are evaluated in relation to their environmental impacts, and a tentative selection of the most appropriate alternative is made.

This EA has been prepared to address impacts associated with the proposed project. The Draft EA is being circulated for public review and to appropriate resource agencies, environmental groups and other interested parties. Upon completion of a Final EA and FONSI, the project will be in full compliance with the National Environmental Policy Act and implementing regulations.

5.1.2 Clean Water Act of 1972 (33 USC 1251 et seq.)

The Clean Water Act (CWA) was passed to restore and maintain chemical, physical, and biological integrity of the Nation's waters. Specific sections of the CWA control the discharge of pollutants and wastes into aquatic and marine environments. The major section of the CWA that applies to the proposed project is Section 401, which requires certification that the permitted project complies with the State Water Quality Standards for actions within state waters, and Section 404(b)(1), which establishes guidelines for discharge of dredged or fill materials into an aquatic ecosystem.

The Corps applied for a Section 401 Water Quality Certification from the San Diego Regional Water Quality Control Board (SDRWQCB) on April 4, 2019. This EA provides additional information to support that application. If no response is forthcoming from the SDRWQCB within 60 days of receipt of this EA per 33 CFR 336.1(b)(8)(iii), the Corps would notify the SDRWQCB of its intension to assume a waiver of water quality certification.

While the Corps does not permit itself under Section 404 of the Act, a 404(b)(1) analysis (see Appendix A) has been prepared to demonstrate substantive compliance with Section 404.

Upon receipt of a 401 Certification or waiver, the project will be in full compliance with the Clean Water Act.

5.1.3 Endangered Species Act of 1973 (16 USC 1531 et seq.)

The Endangered Species Act (ESA) protects threatened and endangered species by prohibiting federal actions that would jeopardize continued existence of such species or result in destruction or adverse modification of any critical habitat of such species. Section 7 of the ESA requires consultation regarding protection of such species be conducted with the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) prior to project implementation if adverse impacts to protected species, or their respective critical habitat, is anticipated to occur.

Per Section 7 of the ESA, the Corps has determined that the proposed project would have "no effect" on the California least tern and Western snowy plover. The proposed project "may affect, but is not likely to adversely affect" the green sea turtle. Coordination has occurred with NMFS and avoidance/minimization measures have been incorporated into this environmental assessment (refer to section 5.2 Environmental Commitments). Upon receipt of concurrence from NMFS on the "not likely to adversely affect" determination, the project will be in full compliance with the Endangered Species Act.

5.1.4 Coastal Zone Management Act of 1976 (PL 92-583; 16 USC 1456 et seq.)

Under the Coastal Zone Management Act (CZMA), any federal agency conducting or supporting activities directly affecting the coastal zone must demonstrate that the activity is, and proceed in a manner, consistent with approved State's Coastal Zone Management Program, to the maximum extent practicable. As no federal agency activities are categorically exempt from this requirement, the Corps is requesting concurrence from the California Coastal Commission (CCC) staff on a Negative Determination (ND). Federal consistency regulations allow a ND to be submitted for an activity "which is the same as or similar to activities for which consistency determinations have been prepared in the past." The proposed dredge work is an extension of routine maintenance work. The Corps has determined that an ND is appropriate for the proposed project, and shall request concurrence from the CCC before implementing the proposed project. Upon receipt of that concurrence, the project will be in full compliance with the Coastal Zone Management Act.

5.1.5 Clean Air Act of 1969 (42USC7401 et seq.); CAA Amendments of 1990 (PL101-549)

Air quality regulations were first promulgated with the Clean Air Act (CAA). The CAA is intended to protect the Nation's air quality by regulating emissions of air pollutants. Section 118 of the CAA requires that all Federal agencies engaged in activities that may result in the discharge of air pollutants comply with state and local air pollution control requirements. Section 176 of the CAA prohibits federal agencies from engaging in any activity that does not conform to an approved State Implementation Plan.

The CAA established the NAAQS and delegated enforcement of air pollution control to the states. In California, the Air Resources Board (ARB) has been designated as the state agency responsible for regulating air pollution sources at the state level. The ARB, in turn, has delegated the responsibility of regulating stationary emission sources to local air pollution control or management districts which, for the proposed project, is the San Diego Air Pollution

Control District (SDAPCD).

The CAA states that all applicable federal and state ambient air quality standards must be maintained during the operation of any emission source. The CAA also delegates to each state the authority to establish their own air quality rules and regulations. State adopted rules and regulations must be at least as stringent as the mandated federal requirements. In states where the NAAQS are exceeded, the CAA requires preparation of a State Implementation Plan (SIP) that identifies how the state will meet standards within timeframes mandated by the CAA. The 1990 CAA established new nonattainment classifications, new emission control requirements, and new compliance dates for areas presently in nonattainment of the NAAQS, based on the design day value. The design day value is the fourth highest pollutant concentration recorded in a 3-year period. The requirements and compliance dates for reaching attainment are based on the nonattainment classification.

One of the requirements established by the 1990 CAA was an emission reduction amount, which is used to judge how progress toward attainment of the ozone standards is measured. The 1990 CAA requires areas in nonattainment of the NAAQS for ozone to reduce basin wide VOC emissions by 15 percent for the first 6 years and by an average 3 percent per year thereafter until attainment is reached. Control measures must be identified in the SIP, which facilitates reduction in emissions and show progress toward attainment of ozone standards.

The 1990 CAA states that a federal agency cannot support an activity in any way unless it determines the activity will conform to the most recent EPA-approved SIP. This means that Federally supported or funded activities will not: (1) cause or contribute to any new violation of any air quality standard; (2) increase the frequency or severity of any existing violation of any standard; or (3) delay the timely attainment of any standard or any required interim emission reductions or other milestones in any area. In accordance with Section 176 of the 1990 CAA, the EPA promulgated the final conformity rule for general Federal actions in the November 30, 1993 *Federal Register*.

Project emissions are not expected to exceed "de minimis" levels established as a criteria for a finding of conformity. Therefore, the project is consistent with the SIP and meets the requirements of Section 176(c). The project is in compliance with the Act.

5.1.6 National Historic Preservation Act of 1966 (16 USC 470 et seq.)

Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations 36 CFR §800 provide a regulatory framework for the identification, documentation, and evaluation of cultural resources that may be affected by Federal undertakings. Under the Act, Federal agencies must take into account the effects of their undertakings on historic properties (cultural resources that have been found to be eligible for listing or which are listed in the National Register of Historic Places) and afford the Advisory Council on Historic Properties a reasonable opportunity to comment on such undertaking.

The Corps has previously consulted with the SHPO regarding the proposed dredge depths in 1999 and 2004 and has separately consulted with the SHPO regarding use of the Coronado Beach nearshore disposal area. The Corps has determined the undertaking would result in *no historic* *properties affected* and the SHPO has concurred. The current dredging is part of the ongoing maintenance of the channel and does not trigger a separate consideration under Section 106 of the NHPA. The project is in compliance with the Act.

5.1.7 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) requires the Corps to coordinate with the U.S. Fish and Wildlife Service on certain proposed activities. As this is not a new Water Resources Development Act Project, a Coordination Act Report is not required. However, coordination with the USFWS has occurred and will continue. The project is in compliance with the Fish and Wildlife Coordination Act.

5.1.8 Magnuson-Stevens Fishery Management and Conservation Act, as amended.

This Draft EA is subject to an EFH Assessment as required by the Magnuson-Stevens Act. Although construction activities will occur within Essential Fish Habitat, the USACE has determined that the proposed project may adversely affect EFH, but would not result in a significant, adverse impact. In compliance with the coordination and consultation requirements of the Act, the Draft EA will be sent to the NMFS for review and comment. Upon receipt of their comments, or upon completion of the public review period if no comments are received, the project will be in full compliance with this Act.

5.1.9 Executive Order 12898, Environmental Justice in Minority and Low-Income Populations

President Clinton signed Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority and Low-Income Populations,” on February 11, 1994. It requires, to the greatest extent practicable, each Federal agency to “make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.”

The construction activities associated with the South San Diego Harbor Maintenance Dredging Project would not result in disproportionate impacts to minority populations. The proposed project is in compliance with this Executive Order.

5.2 ENVIRONMENTAL COMMITMENTS

Following is a proposed summary of future commitments:

1. It is the Contractor’s responsibility to obtain all applicable air permits and comply with federal, state, and local air and noise regulations.

2. The contractor will use ARB reformulated diesel fuel in off-road equipment during construction.

3. In the event that previously unknown cultural resources are discovered during the project, all ground disturbing activities shall immediately cease within 200 feet of the discovery until the Corps has met the requirement of 36 CFR 800.13 regarding post-review discoveries. The Corps will evaluate the eligibility of such resources for listing on the National Register of Historic Places and propose actions to resolve any anticipated adverse effects. Work will not resume in the area surrounding the potential historic property until the Corps re-authorizes project construction.

4. The Contractor will keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters.

5. The Contractor will be required to have in place a Spill Prevention and Cleanup Plan that includes measures to prevent spills and to cleanup any spills that could occur. This plan shall include employee training and the staging of materials on site to clean up accidental spills.

6. The Contractor shall properly maintain all construction equipment.

7. The Contractor will keep construction activities under surveillance, management, and control to minimize interference with, disturbance to, and damage of fish and wildlife, including marine mammals.

8. The Contractor will mark their vessels, and all associated equipment, in accordance with U.S. Coast Guard regulations. The contractor must contact the U.S. Coast Guard two weeks prior to the commencement of construction and repair activities. The following information shall be provided: the size and type of equipment to be used; names and radio call signs for all working vessels; telephone number for on-site contact with the project engineer; the schedule for completing the project; and any hazards to navigation. Notices would be published in Local Notice to Mariners warning boat users about times, durations, and locations of construction activities.

9. The contractor will move equipment upon request by the U.S. Coast guard and Harbor patrol law enforcement and rescue vessels.

10. All dredging and fill activities will remain within the boundaries specified in the plans. There will be no dumping of fill or material outside of the project area or within any adjacent aquatic community.

11. The contractor shall implement a Water Quality Monitoring Plan at the dredge and nearshore placement site. The Water Quality Monitoring Plan will include weekly monitoring at the dredge site for salinity, pH, temperature, dissolved oxygen, turbidity, and light transmissivity; monthly water samples will be taken and analyzed for total dissolved solids. Dredging will be controlled to keep water quality impacts to acceptable levels, controls will include modifying the dredging operation and the use of silt curtains (if feasible). Turbidity (NTUs), light transmittance and dissolved oxygen will limited to a 20% maximum change between the control station and 300 ft downstream station.

Dissolved oxygen will be maintained at a minimum of 5mg/l, and pH will be limited to a 0.2 unit change from measured natural levels.

12. The contractor will implement an Environmental Protection Plan which will include eelgrass protection measures, a Green Sea Turtle Monitoring and Avoidance Plan, and a Marine Mammal Monitoring and Avoidance Plan, including employee training.

13. The contractor will adhere to the following measures to reduce the risk of potential harm to federally listed endangered green sea turtles.

    - Only a clamshell dredge will be used.
    - Dredging will only occur during November, December, January, Febuary, and March. During these colder water months NMFS has recorded less turtle movements and activity.
    - Green sea turtle monitoring will be performed by a qualified biologist during all dredging activities.
    - Dredging area will be well lit during nighttime dredging activities.

14. Contractor will not work during the federally listed endangered California least tern nesting season (April 1st – September 15th).

15. Pre-construction eelgrass and *Caulerpa taxifolia* will be performed, and appropriate protection measures will be implemented. Post-construction eelgrass surveys will be performed to assess any impacts to eelgrass.

16. Marine mammal monitoring will be performed by a qualified biologist during dredging activities to ensure the project is in compliance with the MMPA.

17. Contractor will coordinate with the cargo vessels transporting motor vehicles to the National City Marine Terminal as to not interfere with the navigation traffic.

18. Retesting of dredged sediments will be coordinated with the SC-DMMT should any events occur (i.e. oil spill) that could contaminate harbor sediments thus rendering them unsuitable for nearshore placement or ocean disposal.

19. The following best management practices would be implemented to ameliorate potential impacts from construction and repair activities in the proposed action area:
    - The limits of construction and repair activities shall be clearly marked to prevent heavy equipment from entering areas beyond the footprint needed to complete the project.
    - Vehicles and all construction-related activities shall remain within the defined activity area and use only designated access points and staging areas.
    - The work area shall be kept clean to avoid attracting predators. All food and trash shall be disposed of in closed containers and removed from the project site.
    - No pets shall be allowed on the construction site.

20. Training shall be provided to the Contractor personnel to review and ensure full understanding of all project environmental protection requirements prior to work commencing. Training shall include, but not be limited to, methods of detecting and avoiding pollution, identification and avoidance measures for endangered species and marine mammals, eelgrass, and *Caulerpa taxifolia* identification and notification requirements.

5.3 CONCLUSION

The proposed project is a navigation maintenance project designed and scheduled to avoid and/or minimize probable effects on the environment. The proposed project will not have a significant impact upon the existing environment or the quality of the human environment, as documented in this EA. As a result, preparation of an EIS is not required.

SECTION 6 – REFERENCES

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1992b *Draft Programmatic Environmental Impact Statement for Dredged Material Discharge Related to Navy Dredging Projects in San Diego Bay.* Prepared by NAVFACENGCOM, Southwest Division, San Diego, CA.

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SECTION 7 - DISTRIBUTION LIST

Federal Agencies:	U.S. Environmental Protection Agency, Region IX U.S. Fish and Wildlife Service National Marine Fisheries Service U.S. Coast Guard
State/Local Agencies:	California Coastal Commission California Department of Fish and Wildlife City of San Diego Regional Water Quality Control Board, San Diego San Diego Air Pollution Control District Department of Boating and Waterways

SECTION 8 - ACRONYMS

ACHP.....................................Advisory Council on Historic Preservation
APE.......................................Area of Potential Effects
ARB ....Air Resources Board
ASBS.....................................Area of Special Biological Significance
CAA ....Clean Air Act
CDFW...................................California Department of Fish and Wildlife
CEQ.......................................Council on Environmental Quality
CNEL....................................Community Noise Equivalency Levels
CO...Carbon monoxide
Corps .....................................U.S. Army Corps of Engineers
CWA ....Clean Water Act
DO...Dissolved oxygen
EA ....Environmental Assessment
EFH.......................................Essential Fish Habitat
ESA.......................................Endangered Species Act
FEA.......................................Final Environmental Assessment
FMP.......................................Fishery Management Plan
FONSI...................................Finding of No Significant Impact
FWCA...................................Fish and Wildlife Coordination Act
LAD ....Los Angeles District
MLLW ....Mean Lower Low Water
NEPA ....National Environmental Policy Act
NHPA....................................National Historic Preservation Act
NMFS....................................National Marine Fisheries Service
NO2.......................................Nitrogen dioxide
PL..Public Law
SHPO ....State Historic Preservation Officer
SIP...State Implementation Plan
USFWS .................................U.S. Fish and Wildlife Service
SDAPCD ....San Diego County Air Pollution Control District

SECTION 9 - PREPARERS/REVIEWERS

9.1 Preparers

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APPENDIX A

404(b)(1) EVALUATION

THE EVALUATION OF THE EFFECTS
OF THE DISCHARGE OF DREDGED OR FILL MATERIAL INTO
THE WATERS OF THE UNITED STATES
IN SUPPORT OF THE ENVIRONMENTAL ASSESSMENT FOR THE
SOUTH SAN DIEGO MAINTENANCE DREDGING PROJECT
LOCATED IN
SAN DIEGO COUNTY, CALIFORNIA

I. **INTRODUCTION.** The following evaluation is provided in accordance with Section 404(b)(1) of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) as amended by the Clean Water Act of 1977 (Public Law 95-217). Its intent is to succinctly state and evaluate information regarding the effects of discharge of dredged or fill material into the waters of the U.S. As such, it is not meant to stand alone and relies heavily upon information provided in the environmental document to which it is attached. Citation in brackets [] refer to expanded discussion found in the Environmental Assessment (EA), to which the reader should refer for details.

II. **PROJECT DESCRIPTION.** [1.1]

a. Location. The proposed project area is the southern extent of the San Diego Harbor Federal Navigation Channel, San Diego County, California.

b. General Description. The Los Angeles District of the U. S. Army Corps of Engineers, as part of its Operations and Maintenance Program, is proposing to perform maintenance dredging in South San Diego Harbor Federal Channel to re-establish authorized channel depths (-35 ft MLLW, with a 2 ft allowable overdepth to -37 ft MLLW). The portion of the South San Diego Harbor Federal Channel requiring dredging spans approximately 5,700 linear feet and approximate 96 acres adjacent to the National City Marine Terminal and Sweetwater Channel. The estimated volume of sediments to be dredged from the South San Diego Federal Channel could reach 300,000 cubic yards (cy), which includes the two-foot overdepth allowance. Approximately 225,000cy will be disposed at LA-5 Ocean Dredge Material Disposal Site (ODMDS) and approximately 75,000cy will be placed in the Coronado Nearshore Placement Site to nourish adjacent Silver Strand State Beach. LA-5 ODMDS is located approximately five nautical miles southwest of the entrance of San Diego Harbor. The Coronado Nearshore Placement Site is a part of the Strand littoral cell, located on the Pacific Ocean side of the Coronado Peninsula in the nearshore environment approximately 1,300 to 2,300 feet offshore in waters -20 to -30 feet Mean Lower Low Water (MLLW). The footprint of the nearshore placement site is 5,300 ft x 1,200 ft, totaling 146 acres.

c. Authority and Purpose. This evaluation has been prepared pursuant to Section 404(b)(1) of the Clean Water Act of 1977 (38 USC 1344) which applies to the discharge of dredged or fill materials into waters of the United States. In order to provide for the safety of vessels transiting the harbor, the USACE proposes to conduct routine maintenance efforts in Oceanside Harbor to reestablish authorized channel depths in Oceanside Harbor to support safe commercial, recreational, and military navigation operations in this harbor. The Rivers and Harbors Act of 1899, as amended in 1965 (House Document 76, PL 89-298) authorized the U.S. Army Corps of Engineers

(USACE) to maintain channel depths in Oceanside Harbor.

d. General Description of Dredged or Fill Material. The areas to be dredged contain mainly of sand/silty sands and fines that have been determined to be physically and chemically compatible with the placement sites discussed in the EA. The proposed project is the dredging of up to approximately 300,000 cubic yards (cy) of sediment. Approximately 225,000cy will be disposed at LA-5 Ocean Dredge Material Disposal Site (ODMDS) and approximately 75,000cy will be placed in the Coronado Nearshore Placement Site to nourish adjacent Silver Strand State Beach.

e. Description of the Proposed Discharge Site. Dredge material would be placed at the Coronado Nearshore Placement Site and LA-5 ODMDS. LA-5 ODMDS is located approximately five nautical miles southwest of the entrance of San Diego Harbor. The Coronado Nearshore Placement Site is a part of the Strand littoral cell, located on the Pacific Ocean side of the Coronado Peninsula in the nearshore environment approximately 1,300 to 2,300 feet offshore in waters -20 to -30 feet Mean Lower Low Water (MLLW) (Figure tbd). The footprint of the nearshore placement site is 5,300 ft x 1,200 ft, totaling 146 acres.

f. Timing and duration of Discharge. The dredging is expected to commence in 2019 and complete in 2020, taking approximately 3 – 4 months. Work will only be conducted in the following months: November, December, January, Febuary, and March.

III. FACTUAL DETERMINATIONS.

a. Disposal Site Physical Substrate Determinations:

b. Substrate Elevation and Slope.

Impact: ____ N/A __X_ INSIGNIFICANT ____ SIGNIFICNT

The proposed project is not expected to result in significant substrate impacts.

c. Sediment type.

Impact: ____ N/A __X_ INSIGNIFICANT ____ SIGNIFICNT

The proposed project would not modify sediment types in the action area. Geotechnical studies indicate that the sediment proposed for nearshore placement consist primarily of silty-sands and LA-5 ODMDS material consist of fines. Dredged sediments are to be compatible with existing materials.

d. Dredged/Fill Material Movement.

Impact: ____ N/A __X_ INSIGNIFICANT ____ SIGNIFICNT

Dredged material will be placed nearshore. Sands are expected to move within the Silver Strand Littoral Cell nourishing those beaches as well mimicking the natural process. Materials disposed at LA-5 ODMDS will remain at the disposal site.

e. Physical Effects on Benthos (burial, changes in sediment type, composition, etc.).

Impact: ____ N/A __X_ INSIGNIFICANT ____ SIGNIFICNT

Temporary, short-term impacts would occur from removal and burial of benthic organisms due to dredging impacts. However, no long-term adverse significant impacts are expected. Organisms are expected to recolonize the area once construction and repair activities cease (within 1 – 3 years).

f. Other Effects.

Impact: _X___ N/A ___ INSIGNIFICANT ____ SIGNIFICNT

g. Actions Taken to Minimize Impacts.

Needed: __X__ YES ___ NO

If needed, Taken: ___X_ YES ____ NO

Dredging and placement operations will be monitored for effects on water quality. Best management practices will be implemented if turbidity exceeds water quality criteria.

h. Effect on Water Circulation, Fluctuation, and Salinity Determinations:

(1) Water. The following potential impacts were considered:

Salinity	____N/A	__X_ INSIGNIFICANT	____ SIGNIFICANT
Water Chemistry	____N/A	__X_ INSIGNIFICANT	____ SIGNIFICANT
Clarity	____N/A	__X_ INSIGNIFICANT	____ SIGNIFICANT
Odor	____N/A	__X_ INSIGNIFICANT	____ SIGNIFICANT
Taste	__X_N/A	____ INSIGNIFICANT	____ SIGNIFICANT
Dissolved gas levels	____N/A	__X_ INSIGNIFICANT	____ SIGNIFICANT
Nutrients	____N/A	__X_ INSIGNIFICANT	____ SIGNIFICANT
Eutrophication	____N/A	__X_ INSIGNIFICANT	____ SIGNIFICANT
Others	__X_N/A	____ INSIGNIFICANT	____ SIGNIFICANT

The proposed project is not expected to significantly effect water circulation, fluctuation, and/or salinity.

(2) Current Patterns and Circulation. The potential of discharge on the following conditions were evaluated:

Current Pattern and Flow	____N/A	__X_ INSIGNIFICANT	____ SIGNIFICANT
Velocity	____N/A	__X_ INSIGNIFICANT	____ SIGNIFICANT
Stratification	____N/A	__X_ INSIGNIFICANT	____ SIGNIFICANT
Hydrology Regime	____N/A	__X_ INSIGNIFICANT	____ SIGNIFICANT

The proposed project is not expected to significantly affect current patterns or circulation.

(3) Normal Water Level Fluctuations. The potential of discharge on the following were evaluated:

Tide	____N/A	__X_ INSIGNIFICANT	____ SIGNIFICANT
River Stage	__X__N/A	___ INSIGNIFICANT	____ SIGNIFICANT

The proposed project is not expected to have a significant impact on normal water level fluctuations.

i. Suspended Particulate/Turbidity Determinations.

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site.

Impact: ____N/A __X_ INSIGNIFICANT ____ SIGNIFICANT

Impacts would be temporary and adverse within the vicinity of the construction area, but not significant.

(2) Effects on Chemical and Physical Properties of the Water Column.

Light Penetration	____N/A	__X_ INSIGNIFICANT	____ SIGNIFICANT
Dissolved Oxygen	____N/A	__X_ INSIGNIFICANT	____ SIGNIFICANT
Toxic Metals & Organic	____N/A	__X_ INSIGNIFICANT	____ SIGNIFICANT
Pathogen	____N/A	__X_ INSIGNIFICANT	____ SIGNIFICANT
Aesthetics	____N/A	__X_ INSIGNIFICANT	____ SIGNIFICANT
Others	__X_N/A	____ INSIGNIFICANT	____ SIGNIFICANT

Impacts will be temporary and adverse within the vicinity of the construction area, but not significant.

(3) Effects of Turbidity on Biota.
Primary Productivity ____N/A __X_ INSIGNIFICANT ____ SIGNIFICANT
Suspension/Filter Feeders ____N/A __X_ INSIGNIFICANT ____ SIGNIFICANT
Sight feeders ____N/A __X_ INSIGNIFICANT ____ SIGNIFICANT
Impacts will be temporary and adverse within the vicinity of the construction area, but not significant.

(4) Actions Taken to Minimize Impacts.
Needed: __X__ YES ___ NO
If needed, Taken: __X__ YES ____ NO
Dredging and placement operations will be monitored for effects on water quality. Best management practices will be implemented if exceedances of water quality criteria occur.

j. Contaminant Determination. The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material. (Check only those appropriate.

(1) Physical characteristics .... _X_
(2) Hydrography in relation to known or anticipated sources of contaminants .... _X_
(3) Results from previous testing of the material or similar material in the vicinity of the proposed project .... _X_
(4) Known, significant sources of contaminants (e.g. pesticides) from land runoff or percolation .... ___
(5) Spill records for petroleum products or designated (Section 311 of the CWA) hazardous substances .... ___
(6) Other public records of significant introduction of contaminants from industries, municipalities, or other sources .... ___
(7) Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities .... ___
(8) Other sources (specify) .... ___

An evaluation of the Geotechnical Report indicates that the proposed dredge material is not a carrier of contaminants and physical characteristics are substantively similar in the extraction and placement site.
YES ___ NO _X__Presence of contaminants.
Impact: ____N/A __X_ INSIGNIFICANT ____ SIGNIFICANT
If the material does not meet the testing exclusion criteria above, describe what testing was performed and results: N/A

k. Effect on aquatic Ecosystem and Organism Determinations.
Plankton ____N/A __X_ INSIGNIFICANT ____ SIGNIFICANT
Benthos ____N/A __X_ INSIGNIFICANT ____ SIGNIFICANT
Nekton ____N/A __X_ INSIGNIFICANT ____ SIGNIFICANT
Food Web ____N/A __X_ INSIGNIFICANT ____ SIGNIFICANT
Sensitive Habitats
Sanctuaries, refuges ___X_N/A ___ INSIGNIFICANT ____ SIGNIFICANT
Wetlands _X___N/A ___ INSIGNIFICANT ____ SIGNIFICANT
Mudflats __X__N/A ___ INSIGNIFICANT ____ SIGNIFICANT
Eelgrass beds ____N/A __X_ INSIGNIFICANT ____ SIGNIFICANT
Riffle & pool complexes ___X_N/A ___ INSIGNIFICANT ____ SIGNIFICANT

Threatened & endangered species__N/A __X_ INSIGNIFICANT ____SIGNIFICANT
Other wildlife _N/A __X_ INSIGNIFICANT ____ SIGNIFICANT

l. Actions Taken to Minimize Impacts.

Three Federally listed species utilize the near shore environment adjacent to the proposed project area(s), but would not be affected by the project: federally listed threatened Western snowy plover, federally listed endangered California least tern, and federally listed endangered green sea turtle.

Western snowy plover. The proposed South San Diego Harbor dredging activities have been determined to have "no effect" on the Western snowy plover. Placement of suitable dredge materials will be done in the nearshore environment.

California least tern. The proposed South San Diego Harbor dredging activities have been determined to have "no effect" on the California least tern. Dredging will not occur during California least tern nesting season.

Green sea turtle. It has been determined the South San Diego Harbor dredging activities "may affect, but are not likely to adversely affect" the green sea turtle. The following minimization/avoidance measures will be implemented to reduce the risk of potential harm to federally listed endangered green sea turtles.

- Only a clamshell dredge will be used.
- Dredging will only occur during November, December, January, Febuary, and March. During these colder water months NMFS has recorded less turtle movements and activity.
- Green sea turtle monitoring will be performed by a qualified biologist during all dredging activities.
- Dredging area will be well lit during nighttime dredging activities.

m. Proposed Disposal Site Determinations. Are construction and repair activities confined to the smallest practicable zone? __X_ YES ____ NO

n. Determination of Cumulative Effects of Disposal or Fill on the Aquatic Ecosystem.
Impacts: ____N/A __X_ INSIGNIFICANT ____ SIGNIFICANT

o. Determination of Indirect Effects of Disposal or Fill on the Aquatic Ecosystem.
Impacts: ____N/A __X_ INSIGNIFICANT ____ SIGNIFICANT

IV. FINDING OF COMPLIANCE

a. Adaptation of the Section 404 (b)(1) Guidelines to this Evaluation. No significant adaptations of the guidelines were made relative to this evaluation.

b. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem. All practicable alternatives for dredging/placement were evaluated. The proposed project is the most cost effective and least environmentally damaging.

c. Compliance with Applicable State Water Quality Standards: The proposed project will comply with State water quality standards promulgated by the California Regional Water Quality Control Board, Central Coast Region.

d. Compliance with Applicable Toxic Effluent Standard or Prohibition under Section 307 of the Clean Water Act: No toxic materials/wastes are expected to be produced or introduced into the environment by this project.

e. Compliance with the Endangered Species Act of 1973: As discussed in the attached EA, the Corps has determined the proposed project would not have significant impacts upon the continued existence of any species Federally-listed as threatened or endangered. The Corps has made a determination of "no effect" to California least tern and Western snowy plover; a determination of "may affect, not likely to adversely affect" green sea turtles provided monitoring and avoidance measures are fully implemented. Formal consultation pursuant to Section 7(c) of this act is not required for this project.

f. Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972: No sanctuaries as designated by the Marine Protection, Research and Sanctuaries Act of 1972 will be affected by the proposed project.

g. Evaluation of Extent of Degradation of the Waters of the United States: No significant degradation of municipal or private water supplies, special aquatic sites, or plankton resources will occur. The project will have a short-term effect upon fish and invertebrates due to project-related turbidity and/or the burial of organisms.

h. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem: Specific environmental commitments are outlined in the attached EA.

i. On the Basis of the Guidelines, the Proposed Disposal Site(s) for the Discharge of Dredged or Fill Material is:

____ (1) Specified as complying with the requirements of these guidelines; or,

_X_ (2) Specified as complying with the requirements of these guidelines, with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects on the aquatic ecosystem; or,

____ (3) Specified as failing to comply with the requirements of these guidelines.

Prepared by: Natalie Martinez-Takeshita Date: 3 July 2019

APPENDIX B

AIR QUALITY CALCULATIONS

San Diego Harbor Dredging Air Quality Calculations

Project Data

(1) Equipment: clamshell dredge, tug boat, work boat
(2) Total work days: 100 days
(3) Production rate: 3000 cy/day
(4) total sediment volume: 300,000 cy
(5) tug trips per day: 2-3 trips either to LA-5 or nearshore disposal site
(6) distance to nearshore site: 16 mi
(7) distance to LA-5: 20 mi

Engine Data

Equipment Type	Power Rating	Load Factor	# Active	Hourly Hp-Hrs	Hours Per Day	Daily Hp-Hrs	Work Days	Annual Hp-Hrs	Ref. Notes
Main Hoist - Clamshell Dredge	1,200	0.50	1	600	22	13,200	100	1,320,000	(1)
Main Generator - Clamshell Dredge	900	0.50	1	450	22	9,900	100	990,000	(1)
Deck Generator - Clamshell Dredge	240	0.60	1	144	22	3,168	100	316,800	(1)
Small Harbor Craft	465	0.38	1	177	8	1,414	100	141,360	(2)
Tug Boat	800	0.20	1	160	22	3,520	100	352,000	(1)

(1) Hp and Load Factor data from POLA Channel Deepening Project AQ Appendix
(2) Hp and Load Factor data from POLB 2011   Air Emissions Inventory

Emission Factors

Emission Factors (Gm/Hp-Hr)		ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4	N2O	Ref. Notes
Off-Road Equipment - 25-50 Hp		2.06	5.92	5.94	0.18	0.70	0.64	568	0.11	0.01	
Off-Road Equipment - 51-120 Hp		1.11	3.77	7.56	0.18	0.77	0.71	568	0.1	0.01	
Off-Road Equipment - 121-175 Hp		0.71	3.04	6.94	0.18	0.42	0.38	568	0.09	0.01	
Off-Road Equipment - 176-250 Hp		0.46	1.48	6.66	0.18	0.23	0.21	568	0.09	0.01	
Off-Road Equipment - 251-500 Hp		0.37	1.73	5.51	0.18	0.20	0.18	568	0.08	0.01	
Off-Road Equipment - 501-750 Hp		0.46	1.99	6.66	0.18	0.24	0.22	568	0.08	0.01	
Off-Road Equipment >750 Hp		0.47	2.02	6.48	0.18	0.20	0.18	568	0.08	0.01	
Small Harbor Craft		0.16	1.27	7.46	0.47	0.30	0.28	481.34	0.07	0.00	(1)
Tugboat		0.20	1.87	8.94	0.81	0.22	0.21	481.34	0.07	0.01	(1)

APPENDIX C

SEDIMENT SAMPLE AND ANALYSIS PLAN REPORT

SAMPLING AND ANALYSIS PLAN REPORT

San Diego Harbor 2017 Maintenance Dredging Geotechnical and Environmental Investigation Project

Task Order No. 0015, USACE Contract No. W912PL-11-D-0015

Prepared for:
U.S. Army Corps of Engineers
Los Angeles District
Los Angeles, California

SM

Prepared by:

Diaz•Yourman – GeoPentech – Kinnetic Laboratories/ Joint Venture
1616 E. 17th Street
Santa Ana, CA 92705

February 2019

DIAZ•YOURMAN & ASSOCIATES Geotechnical Services

GeoPentech

KINNETIC LABORATORIES INCORPORATED

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SAMPLING AND ANALYSIS PLAN REPORT

San Diego Harbor 2017 Maintenance Dredging Geotechnical and Environmental Investigation Project

Task Order No.0015, USACE, Contract No. W912PL-11-D-0015

February 2019

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ASTM	American Society for Testing and Materials	**NOEC**	No Observable Effects Concentration
ANOVA	Analysis of Variance	**NOED**	No Observed Effects Dose
BLK	Method or Procedural Blank	**NMFS**	National Marine Fishery Service
CDFW	California Department of Fish and Wildlife	**ODMDS**	Ocean Dredge Material Disposal Site
CESPD	Corps of Engineers South Pacific Division	**OEHHA**	Office of Environment Health Assoc.
CHHSL	California Human Health Screening Level	**OTM**	Ocean Testing Manual
COC	Chain of Custody	**PAH**	Polycyclic Aromatic Hydrocarbon
CSLC	California State Lands Commission	**PCB**	Polychlorinated biphenyl
CV	Coefficient of Variation	**PDS**	Post Digestion Spike
CWA	Clean Water Act	**PPB**	Parts Per Billion
CY	Cubic Yards	**PPM**	Parts per Million
DDD	Dichlorodiphenyldichloroethane	**PPT**	Parts per Trillion
DDE	Dichlorodiphenyldichloroethylene	**PRG**	Preliminary Remediation Goals
DDT	Dichlorodiphenyltrichloroethane	**PVC**	Polyvinyl Chloride
DGPS	Differential Global Positioning Satellite	**RBC**	Risk Based Concentrations
DMMT	Dredge Materials Management Team	**RL**	Reporting Limit
DUP	Laboratory Replicates	**RPD**	Relative Percent Difference
EC_{50}	50% of the Time Effects Concentration	**RSL**	Regional Screening Levels
ERED	Environmental Residue-Effects Database	**RWQCB**	Regional Water Quality Control Board
ERL	Effects Range-Low	**SAP**	Sampling and Analysis Plan
ERM	Effects Range-Medium	**SAR**	Sampling and Analysis Report
ERMq	Effects Range-Medium Quotient	**SC-DMMT**	Southern California Dredge Material Management Team
HDPE	High Density Polyethylene	**SDRWQCB**	San Diego Regional Water Quality Control Board
HHMSSL	Human Health Medium Specific Screening Levels	**SET**	Standard Elutriate Test
ITM	Inland Testing Manual	**SOP**	Standard Operating Procedure
KCL	Potassium Chloride	**SP**	Solid Phase
LC_{50}	50% of the Time Lethal Concentration	**SPP**	Suspended Particulate Phase
LCL	Lower Control Limit	**SURR**	Surrogate Analysis
LCS	Laboratory Control Spike	**SWAMP**	Surface Water Ambient Monitoring Program
LCSD	Laboratory Control Spike Duplicate	**TAC**	Test Acceptability Criteria
LDPE	Low Density Polyethylene	**TOC**	Total Organic Carbon
LOED	Lowest Observed Effects Dose	**TRPH**	Total Recoverable Hydrocarbons
LPC	Limiting Permissible Concentration	**TRV**	Toxicity Reference Value
LSD	Least Significant Difference	**TSS**	Total Suspended Solids
MDL	Method Detection Limit	**UCL**	Upper Control Limit
MET	Modified Elutriate Extract	**UCL**	Upper Confidence Limit
MLLW	Mean Lower Low Water	**USACE**	U.S. Army Corps of Engineers
MS	Matrix Spike	**USCG**	U.S. Coast Guard
MSD	Matrix Spike Duplicate	**USCS**	Unified Soil Classification System
NAD	North American Datum	**USEPA**	U.S. Environmental Protection Agency
NA	Not Applicable	**USFWS**	U.S. Fish and Wildlife Service
ND	Not Detected	**QA**	Quality Assurance
NOAA	National Oceanic and Atmospheric Administration	**QC**	Quality Control

SAMPLING AND ANALYSIS PLAN REPORT

San Diego Harbor 2017 Maintenance Dredging Geotechnical and Environmental Investigation Project

February 2019

1.0 INTRODUCTION

Maintenance dredging is required in the South Bay Channel of San Diego Harbor, California (Figure 1) in order to restore the channel to its design depth. Sediments to be dredged require an environmental and physical evaluation of sediment quality in order to support planning and permitting for dredging and reuse/placement. This project is authorized by 1958 Rivers and Harbors Act (H. DOC. 356, 83rd CONG. 2nd SESS), pursuant to Section 404 of the Clean Water Act.

This Sampling and Analysis Plan Report (SAPR) has been prepared on behalf of the U.S. Army Corps of Engineers, Los Angeles District to detail procedures and results, including quality assurance/quality control (QA/QC) results, from the sampling and testing of sediments from San Diego Harbor identified for reuse at potential beach nearshore sites and/or placement at the LA-5 Ocean Dredge Material Disposal Site (ODMDS). This work is being performed under Task Order No. 0015, USACE Contract No. W912PL-11-D-0015.

1.1 Project Summary

The purpose of this project was to sample and test sediments from within the South Bay Federal Channel proposed for maintenance dredging to provide sediment quality data for evaluation of dredging and open water placement. This SAPR is to fulfill requirements of CESPD Regulation No. 1110-1-8 (CESPD, 2000), the Inland Testing Manual (ITM) (USACE and USEPA, 1998), the Ocean Testing Manual (OTM) (USACE and USEPA, 1991), the Clean Water Act (CWA), and Southern California Dredge Material Management Team (SC-DMMT) draft guidelines. Sampling and testing of this project was conducted according to the project Sampling and Analysis Plan (SAP) (Diaz Yourman, GeoPentech and Kinnetic Laboratories JV, 2017) finalized in October 2017.

The portion of the San Diego Harbor Federal Channel requiring dredging spans 5,600 feet from stations 627+00 to 683+00. It is represented by two dredge units/composite areas for the purpose of testing. These areas are identified as Area A and Area B of the South Bay Channel on Figure 3. The design depth for the South Bay Channel is -35 feet MLLW. Based on a July/August 2017 hydrographic survey and assuming no sediment removal or shoaling has occurred, the estimated volume of sediments requiring dredging from the approximately 20.3 acres of the South Bay Channel at the time of the survey was 77,900 cubic yards (cy). With a two-foot overdepth allowance, the total volume could reach **254,650 cy**. Bathymetric data for the South Bay Channel are shown on Figure 3.

The preferred placement alternative is to beneficially reuse the dredge material by placing the material at potential nearshore placement sites off Coronado Beach/Silver Strand located west of the project area on the ocean side of Coronado as shown on Figures 1 and 2. However, it is likely that some or all sediments are physically incompatible with the nearshore sites. Therefore, a suitability determination is also being sought for placing incompatible material at the LA-5 ODMDS.

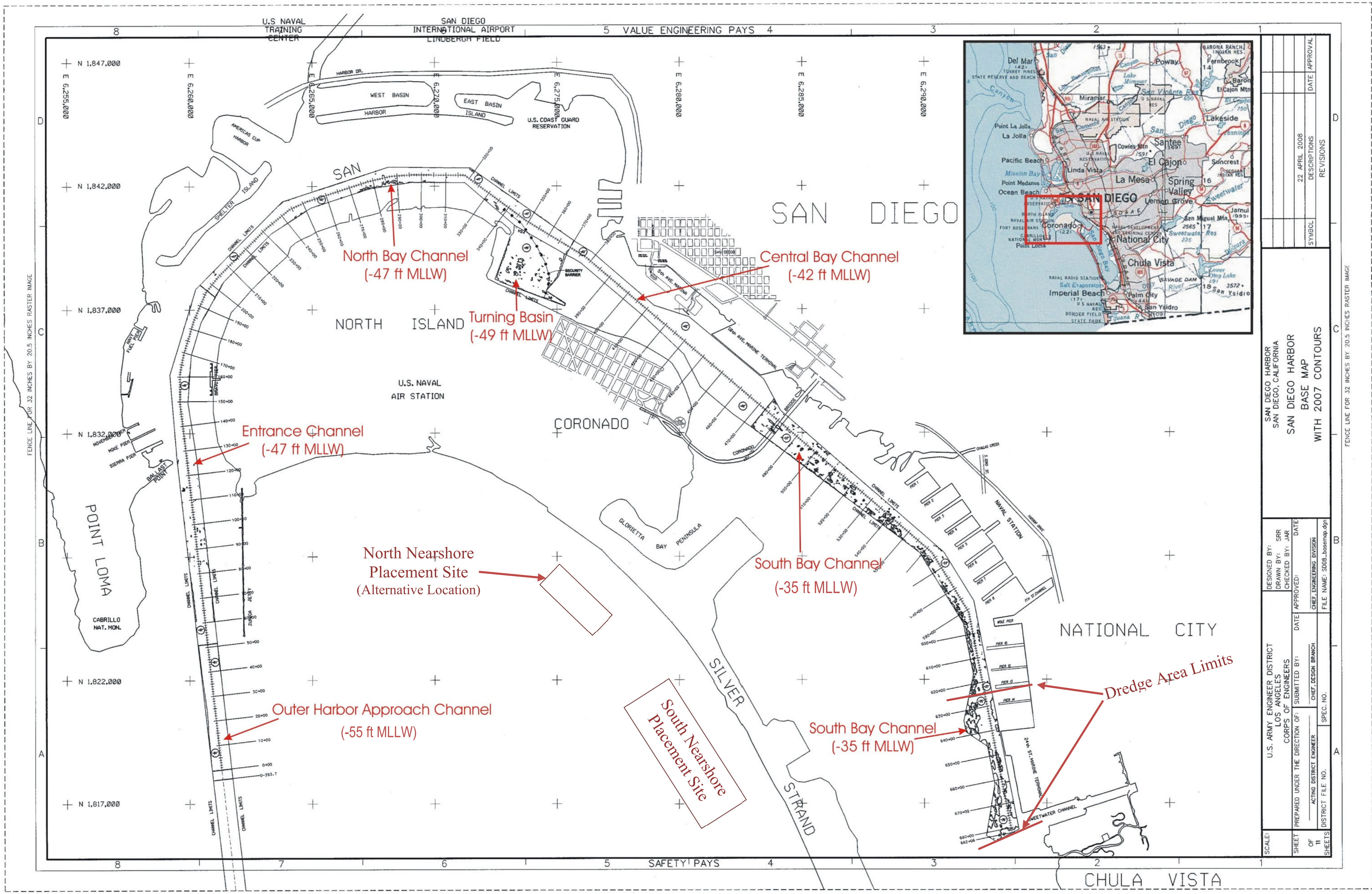
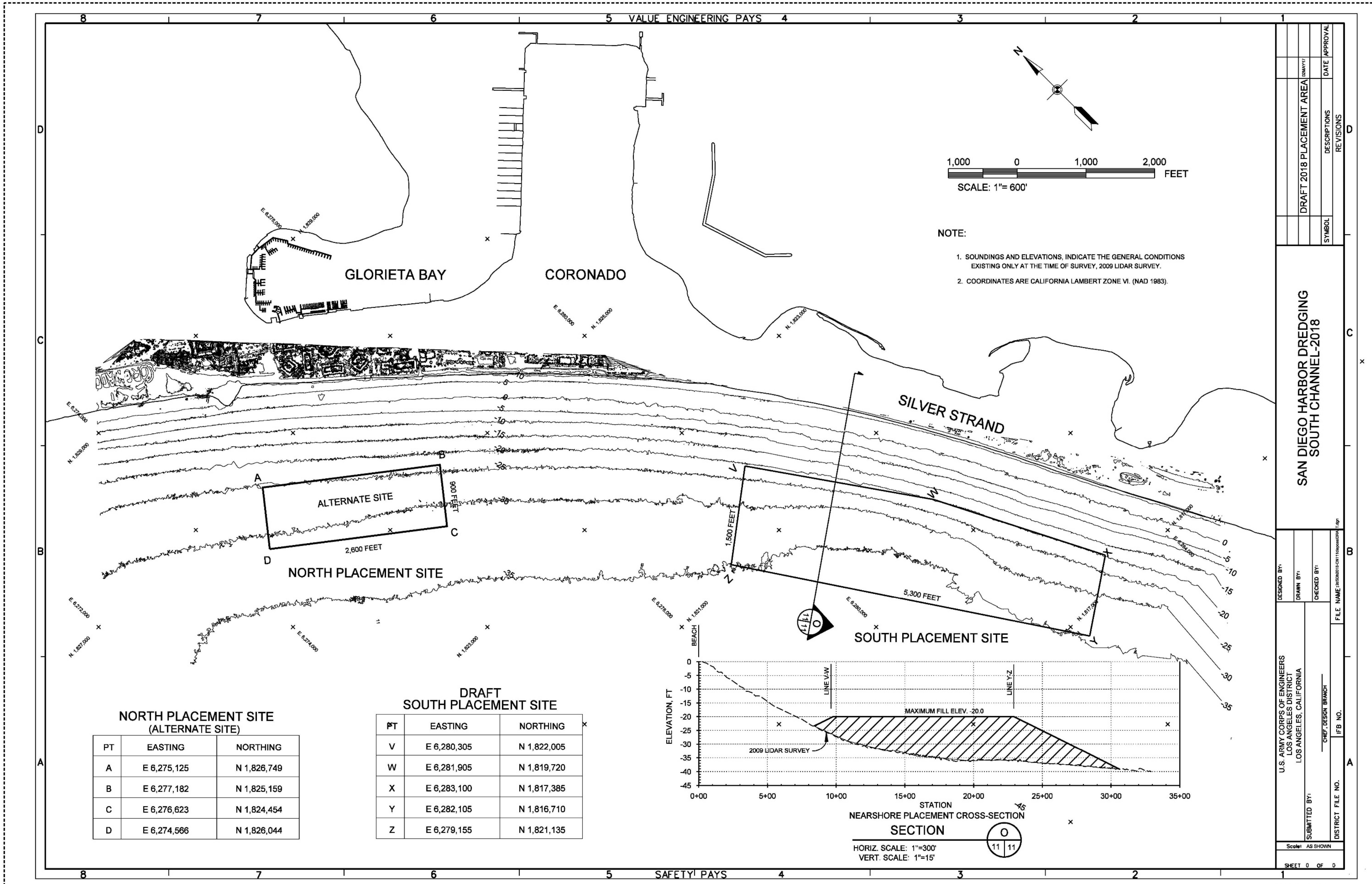


Figure 1. Location of San Diego Harbor and Federal Channels and approximate Locations of the Coronado Beach/Silver Strand Nearshore Placement Sites.



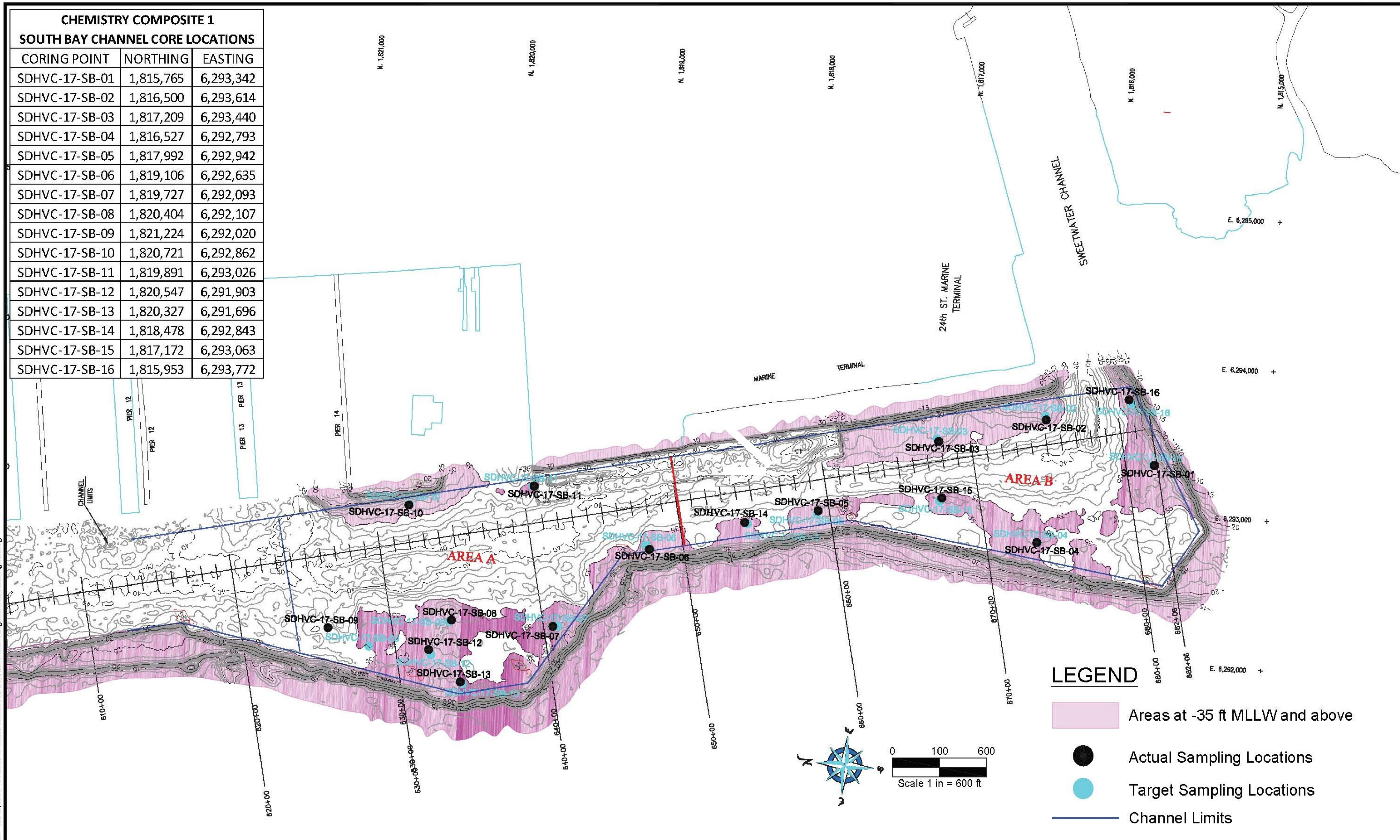
NORTH PLACEMENT SITE
(ALTERNATE SITE)

PT	EASTING	NORTHING
A	E 6,275,125	N 1,826,749
B	E 6,277,182	N 1,825,159
C	E 6,276,623	N 1,824,454
D	E 6,274,566	N 1,826,044

DRAFT
SOUTH PLACEMENT SITE

PT	EASTING	NORTHING
V	E 6,280,305	N 1,822,005
W	E 6,281,905	N 1,819,720
X	E 6,283,100	N 1,817,385
Y	E 6,282,105	N 1,816,710
Z	E 6,279,155	N 1,821,135

Figure 2. Coronado Beach/Silver Strand Nearshore Placement Sites.



CHEMISTRY COMPOSITE 1		
SOUTH BAY CHANNEL CORE LOCATIONS		
CORING POINT	NORTHING	EASTING
SDHVC-17-SB-01	1,815,765	6,293,342
SDHVC-17-SB-02	1,816,500	6,293,614
SDHVC-17-SB-03	1,817,209	6,293,440
SDHVC-17-SB-04	1,816,527	6,292,793
SDHVC-17-SB-05	1,817,992	6,292,942
SDHVC-17-SB-06	1,819,106	6,292,635
SDHVC-17-SB-07	1,819,727	6,292,093
SDHVC-17-SB-08	1,820,404	6,292,107
SDHVC-17-SB-09	1,821,224	6,292,020
SDHVC-17-SB-10	1,820,721	6,292,862
SDHVC-17-SB-11	1,819,891	6,293,026
SDHVC-17-SB-12	1,820,547	6,291,903
SDHVC-17-SB-13	1,820,327	6,291,696
SDHVC-17-SB-14	1,818,478	6,292,843
SDHVC-17-SB-15	1,817,172	6,293,063
SDHVC-17-SB-16	1,815,953	6,293,772

Figure 3. 2017 Bathymetric Data and Target Sampling Locations for the South Bay Channel Composite Areas.

1.2 Site Location

San Diego Harbor is located in San Diego County, California (Figure 1). Geographic coordinates (NAD 83) for both ends of the channel areas to be dredged are 32° 41.5' N and 117° 79.3' W and 32° 38.8' N and 117° 7.3' W. The Coronado Beach/Silver Strand placement sites are to the west of South Bay Channel, on the Pacific Ocean side of the Coronado Peninsula. Geographic coordinates of the approximate center of the northern Coronado Beach/Silver Strand nearshore site are 32° 40.3' N and 117° 10.7' W. Geographic coordinates of the approximate center of the southern nearshore site are 32° 39.3' N and 117° 9.7' W. State Plane coordinates for the corners of the nearshore areas are provided on Figure 2.

1.3 Roles and Responsibilities

Project responsibilities and key contacts for this sediment characterization program are listed in Tables 1 and 2. Kinnetic Laboratories Inc. has provided sampling and reporting services. Diaz Yourman and Associates was responsible for core logging and geotechnical testing. Analytical chemical testing of sediments for this project was primarily carried out by Eurofins Calscience (Cal-ELAP No. 2944). Tier III biological testing was carried out by Pacific EcoRisk (NELAP No. 04225CA).

Principal users of the data provided in this report are the following Southern California Dredge Material Management Team (DMMT) regulating agencies:

1. Los Angeles District, U.S. Army Corps of Engineers (USACE);
2. San Diego Regional Water Quality Control Board (RWQCB)—Region 9;
3. U.S. Environmental Protection Agency (USEPA) - Region IX; and
4. California Coastal Commission.

Other users of the data may include the following agencies:

1. California Department of Fish and Wildlife (CDFW);
2. U.S. Fish and Wildlife Service (USFWS);
3. U.S. National Marine Fisheries Service (USNMFS); and
4. California State Lands Commission (CSLC).

Coordination of field operations, security requirements, and berthing options were made with the following contacts:

U.S. Coast Guard
Notice to Mariners
D11LNM@uscg.mil.

CDR Gamez
U.S. Navy Port Operations, San Diego Public Works Officer
(619) 556-1332;
joshua.gamez@navy.mil

George Baldwin
U.S. Navy Port Operations, San Diego Port Operations
(619) 556-4468;
george.d.baldwin@navy.mil

Prior to sampling, the schedule and approximate locations were emailed to cnrsw_port_ops@navy.mil>, and Naval Base San Diego Port Ops published it in the daily Harbor movement MSG.

There was also coordination with the National City Marine Terminal at (619) 683-8963, as they have large car carriers transiting the channel in the project area as well.

Table 1. Project Team and Responsibilities

Responsibility	Name	Affiliation
Project Planning and Coordination	Jim Fields Jeffrey Devine Lawrence Smith Ken Kronschnabl	USACE USACE USACE Kinnetic Laboratories
Sampling and Analysis Plan (SAP) Preparation	Ken Kronschnabl Christopher Diaz	Kinnetic Laboratories Diaz-Yourman
Field Sample Collection and Transport	Spencer Johnson Dale Parent	Kinnetic Laboratories Kinnetic Laboratories
Geotechnical Investigation	Chris Diaz Kelly Shaw	Diaz-Yourman Diaz-Yourman
Health and Safety Officer and Site Safety Plan	Jon Toal	Kinnetic Laboratories
Laboratory Chemical Analyses	Carla Hollowell Katie Scott	Eurofins Kinnetic Laboratories
Biological Testing	Jeffrey Cotsifas	Pacific EcoRisk
QA/QC Management Analytical Laboratory QA/QC	Danielle Gonsman Amy Howk Carla Hollowell	Kinnetic Laboratories Kinnetic Laboratories Eurofins
Technical Review	Pat Kinney Jeffrey Devine Christopher Diaz Larry Smith Joe Ryan Kirk Brus	Kinnetic Laboratories USACE Diaz-Yourman USACE USACE USACE
Final Report	Ken Kronschnabl Kelly Shaw Amy Howk	Kinnetic Laboratories Diaz-Yourman Kinnetic Laboratories
Agency Coordination	Jeffrey Devine Lawrence Smith	USACE USCAE

Table 2. Key Project Contacts

Jim Fields USACE Project Manager PPMD Navigation and Coastal Projects Branch U. S. Army Corps of Engineers, Los Angeles District 915 Wilshire Blvd. Los Angeles, Ca. 90017 Tel. (213) 452-3403 james.a.fields@usace.army.mil	Jeffrey Devine USACE Project Technical Manager Geology and Investigations Section U. S. Army Corps of Engineers, Los Angeles District 915 Wilshire Blvd. Los Angeles, Ca. 90017 Tel. (213) 452-3579 Jeffrey.D.Devine@usace.army.mil
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Chris Diaz Project Manager - Geotechnical Investigations Diaz.Yourman & Associates 1616 East 17th Street Santa Ana, CA 92705-8509 Tel. (714) 245-2920 chris@diazyourman.com	Michele Castro Business development Manager Eurofins Calscience, Inc. 7440 Lincoln Way Garden Grove, CA 92841-1427 Tel.: (949) 870-8766 MicheleCastro@eurofinsUS.com
Spencer Johnson Field Operations Mgr. Kinnetic Laboratories, Inc. (KLI) 307 Washington St. Santa Cruz, CA 95060 Tel. (831) 457-3950 sjohnson@kinneticlabs.com	Allen Yourman Joint Venture Project Manager Diaz Yourman Associates, Geopentech, and Kinnetic Laboratories Joint Venture 1616 East 17th Street Santa Ana, CA 92705-8509 Tel. (714) 245-2920 Allen@diazyourman.com
Amy Howk KLI QA/QC Management Kinnetic Laboratories, Inc. 307 Washington St. Santa Cruz, CA 95060 Tel. (831) 457-3950 ahowk@kinneticlabs.net	

2.0 SITE HISTORY AND HISTORICAL DATA REVIEW

This section provides a brief history of San Diego Harbor, potential sources of contamination, dredging history, and most recent testing and sampling results.

2.1 Port Construction, Site Setting and Potential Sources of Contamination

San Diego Harbor is the southernmost port on the west coast of the United States. The Harbor is within San Diego Bay, a crescent shaped body of water about 14 miles long. San Diego Harbor contains numerous facilities for commercial, military and pleasure watercraft. The Federal Channel begins in the Outer Harbor to the southeast of Point Loma (Figure 1). It bends around Naval Air Station North Island on Coronado Island, passes under the Coronado Bridge, and terminates near Chula Vista. The Outer Harbor Approach Channel has an authorized dredge depth of –55 feet Mean Lower Low Water (MLLW). The Entrance Channel and North Bay Channel are authorized to –47 feet MLLW. The Central Bay Channel and Turning Basin have an authorized dredge depth of –42 feet MLLW, and the South Bay Channel dredge depth is –35 ft MLLW. The focus of this study is the area south of Navy Pier 13, Station 627+00 to 683+00.

2.2 Previous San Diego Harbor Dredging and Testing Episodes

The South Bay Channel of San Diego Harbor was last dredged in 1976 when it was deepened to -35 feet MLLW.

Physical and chemical sampling and testing of the South Bay Channel most recently occurred in 2008, though the channel was not dredge after this study. A total of 12 core samples were collected in 2008 to the project depth (-35 feet MLLW) plus two feet for overdepth allowance and analyzed for grain size distribution. Data from these analyses were compared to the grain size distribution of sediments from Coronado Beach and Silver Strand collected along three transects at each beach. In addition, representative portions of the 12 cores were combined into three composite samples for bulk sediment chemical analyses and Tier III ocean disposal testing to determine if the sediments were environmentally suitable for beach nourishment and placement at the LA-5 ODMDS. Results of this study are summarized in a report by Kinnetic Laboratories and Diaz Yourman and Associates (2009). Summary sampling and testing data from this 2008 study are provided in Appendix A.

Physical data from 2008 revealed that all three South Bay Channel composite areas were deemed physically unsuitable for beach nourishment. This was based on weighted average fines contents that ranged from 49% to 71%.

Chemically, most constituents in the three 2008 composite samples were either not detected or they were below NOAA Effects Range Low (ERL) values (Long et al., 1995). The only constituents to exceed ERL values were copper in all three composite samples and mercury and total PCBs in one of the three composite samples. No concentrations exceeded Effects Range Median (ERM) values. No LA-5 reference concentrations exceeded ERL values.

Tier III toxicity testing of the 2008 South Bay Channel composite samples showed no significant solid phase or suspended particulate phase toxicity. All No Observable Effects Concentrations

(NOEC) values were 100% and all LC_{50} and EC_{50} concentrations were greater than 100% elutriate. Amphipod survival in all three sediment samples ranged from 84% to 90% compared to 90% for the LA-5 reference sediments. Polychaete survival for all three samples was greater than 96%. Polychaete survival in the LA-5 reference sample was 96%.

Tissues of clams and worms exposed to the 2008 South Bay Channel sediments were analyzed for the full suite of inorganic and organic constituents. Most constituents were either not detected in the tissues or they were not statistically elevated over LA-5 reference tissue concentrations. Total PCBs in the South Bay Channel tissues were statistically elevated over total PCBs in the LA-5 reference tissues. However, the report concluded that the PCB bioaccumulation was not biologically relevant after comparing tissue burdens to effects concentrations in the U.S. Army Corps of Engineers/U.S. Environmental Protection Agency Environmental Residue-Effects on-line Database (ERED, http://el.erdc.usace.army.mil/ered/).

The preponderance of evidence for all Tier II and III analyses suggested that the 2008 South Bay Channel sediments were acceptable for placement at LA-5 ODMDS though these sediments were never dredged and placed at LA-5.

3.0 METHODS

This section describes the dredging design, study design and field and analytical methods for this testing program.

3.1 Dredge Design

Bathymetric data from July 2017 in relationship to target sampling locations are shown on Figure 3. Figures 4 and 5 are close-ups of Figure 3 that better show the bathymetric contours. These figures also define the limits of dredging and separate the dredge area into two composite areas (A and B). The design depth for the South Bay Channel is -35 feet MLLW. Total volume of material that may be dredged from Composite Area A is 104,600, and the total volume of material that may be dredged for Composite Area B is 150,050 for a total of 254,650 cy. These estimates include a two foot overdepth allowance.

3.2 Sampling and Testing Design

The sampling and testing design in the project SAP and reiterated below covered data collection tasks for the San Diego Harbor South Bay federal channel sediment collection and testing, Coronado Beach/Silver Strand nearshore site sampling and testing, and the LA-5 reference area sampling and testing. Evaluation guidelines discussed in the SAP are also discussed below.

3.2.1 Sampling and Testing Approach

The main approach was to sample dredge sediments to design depth plus allowable overdepth, composite individual samples together to form two composite samples, and subject the composite samples to chemical and biological testing to determine if the South Bay Channel maintenance dredging sediments are suitable for nearshore area placement and/or placement at the LA-5 ODMDS. The testing approach also included determining the physical properties of the sediments at each location and at different depths. Testing conducted followed the requirements and procedures detailed in the OTM (USACE/USEPA, 1991), ITM (USEPA/USACE, 1998) with further guidance from Los Angeles District USACE guidelines (CESPL, undated) and from SC-DMMT draft guidelines. Acceptability guidelines published in these documents were used to evaluate the suitability of San Diego Harbor South Bay Channel dredged sediments for open water placement.

3.2.2 Sample Identification, Composite Areas, Sediment Collection and Testing

Vibracore sampling, as described in Section 3.3.2 (Vibracore Sampling Methods), was carried out to collect subsurface sediment data from 16 locations in the South Bay Channel. The prefix for all vibracore locations is “SDHVC-17-#-##.” Approximate sampling locations for each composite area sampled are shown on Figures 4 and 5. All cores were advanced to up to five feet below overdepth (sampling) elevations. Geographic coordinates, approximate seafloor elevations, and target elevations for the sample locations are listed in Table 3. Note that sample locations may have changed to target more shoaled areas or for safety reasons.

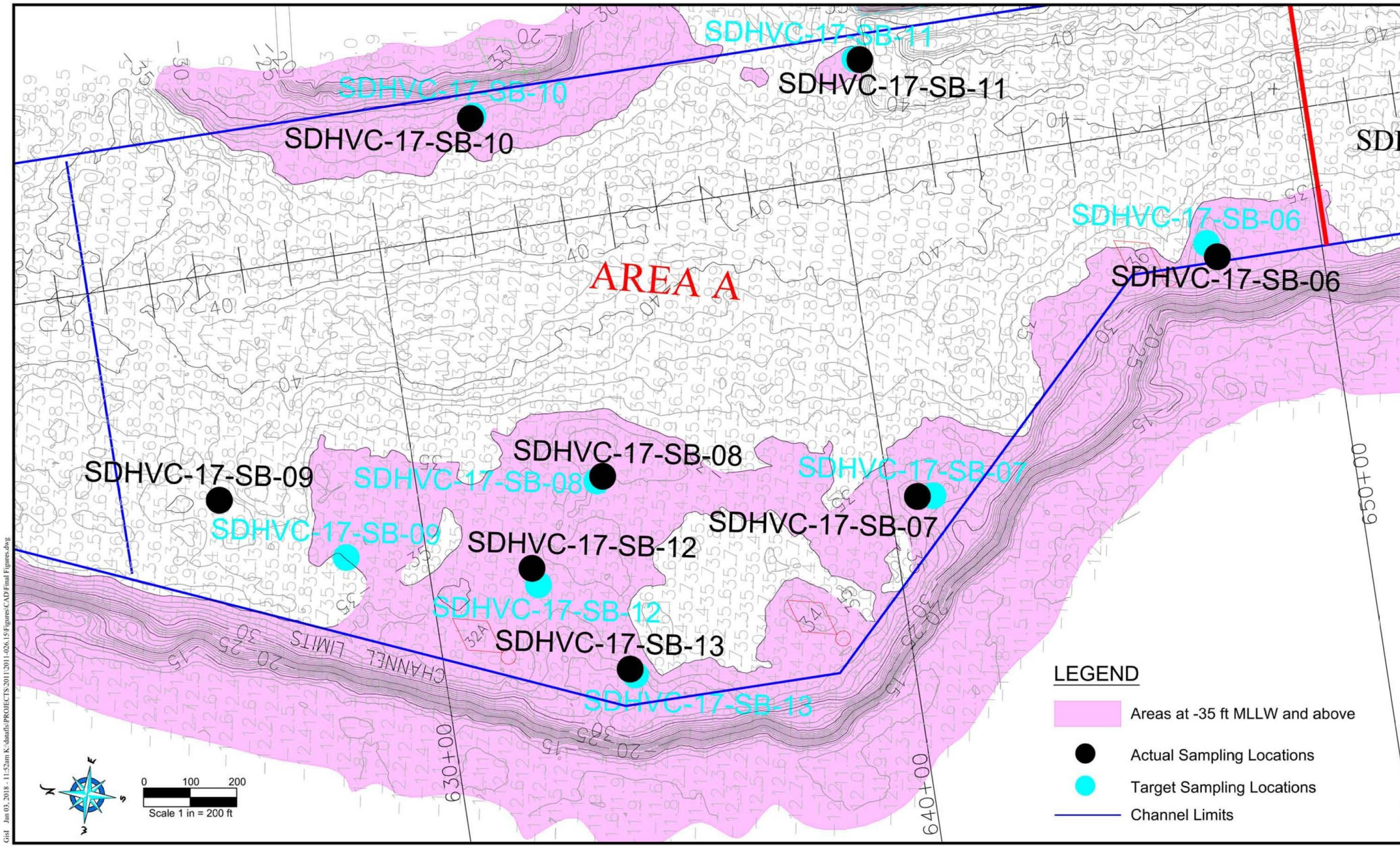

Figure 4. Close-up of the South Bay Channel Composite Area A Showing 2017 Bathymetric Data and Target and Actual Sampling Locations.

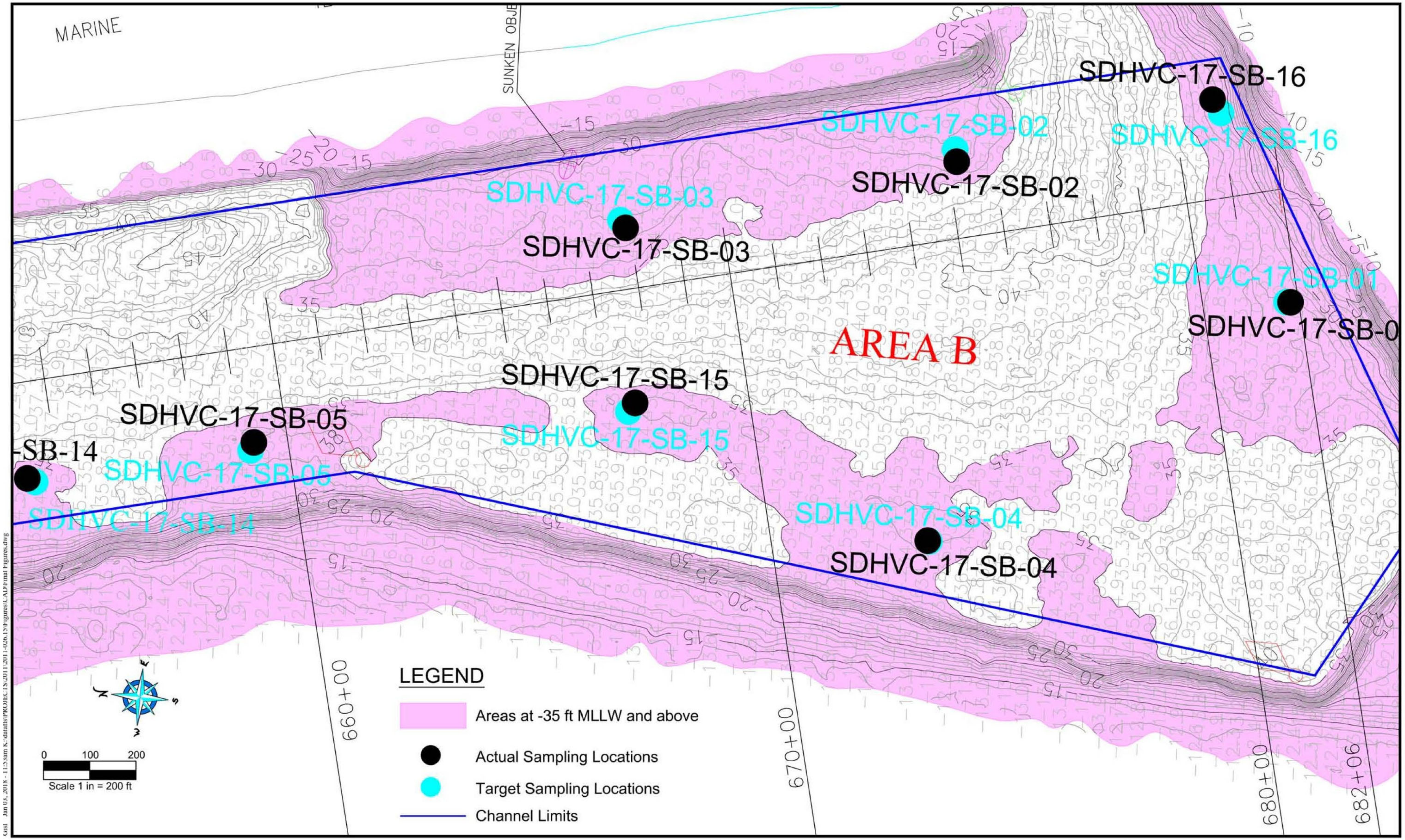

Figure 5. Close-up of the South Bay Channel Composite Area B Showing 2017 Bathymetric Data and Target and Actual Sampling Locations.

Table 3. Actual Sampling Location Coordinates, Date and Time of Sampling, Core Depths, Mudline Elevations, and Sampling Elevations for the San Diego Harbor South Bay Channel.

Area & Comp. ID	Core Designation	Date Sampled	Time Sampled	California Lambert Zone 6 (NAD 83)		Geographic Coordinates (NAD 83)		Mudline Elevation (ft., MLLW)	Design Depth + Overdepth (ft., MLLW)[1]	Core Recovery (Sampled) Length (ft.)[2]	Core Interval Sampled (ft., MLLW)
				Northing (feet)	Easting (feet)	Latitude North	Longitude West				
Area A	SDHVC-17-SB-06	11/8/2017	12:45	1,819,106	6,292,635	32° 39.280’	117° 07.443’	-31.3	-37	7.8 (5.7)	-31.3 to -37
	SDHVC-17-SB-07	11/8/2017	13:25	1,819,727	6,292,093	32° 39.382’	117° 07.550’	-31	-37	10.1 (6.0)	-31.0 to -37
	SDHVC-17-SB-08	11/8/2017	11:00	1,820,404	6,292,107	32° 39.493’	117° 07.548’	-33.4	-37	7.6 (3.6)	-33.4 to -37
	SDHVC-17-SB-09	11/8/2017	9:50	1,821,224	6,292,020	32° 39.628’	117° 07.567’	-34.8	-37	6.5 (2.2)	-34.8 to -37
	SDHVC-17-SB-10	11/8/2017	8:55	1,820,721	6,292,862	32° 39.547’	117° 07.402’	-32.4	-37	8 (4.6)	-32.4 to -37
	SDHVC-17-SB-11	11/8/2017	7:52	1,819,891	6,293,026	32° 39.410’	117° 07.368’	-35.2	-37	5.9 (1.8)	-35.2 to -37
	SDHVC-17-SB-12	11/8/2017	10:25	1,820,547	6,291,903	32° 39.517’	117° 07.588’	-33.6	-37	8.1 (3.4)	-33.6 to -37
	SDHVC-17-SB-13	11/8/2017	11:30	1,820,327	6,291,696	32° 39.480’	117° 07.628’	-33.2	-37	7.5 (3.8)	-33.2 to -37
Area B	SDHVC-17-SB-01	11/9/2017	6:40	1,815,765	6,293,342	32° 38.730’	117° 07.300’	-31	-37	8.8 (6.0)	-31.0 to -37
	SDHVC-17-SB-02	11/8/2017	16:30	1,816,500	6,293,614	32° 38.852’	117° 07.248’	-32.6	-37	8.5 (4.4)	-32.6 to -37
	SDHVC-17-SB-03	11/8/2017	16:00	1,817,209	6,293,440	32° 38.968’	117° 07.283’	-31.8	-37	7.3 (5.2)	-31.8 to -37
	SDHVC-17-SB-04	11/9/2017	7:20	1,816,527	6,292,793	32° 38.855’	117° 07.408’	-33.7	-37	7 (3.3)	-33.7 to -37
	SDHVC-17-SB-05	11/8/2017	14:45	1,817,992	6,292,942	32° 39.097’	117° 07.382’	-33.6	-37	10 (3.4)	-33.6 to -37
	SDHVC-17-SB-14	11/8/2017	14:10	1,818,478	6,292,843	32° 39.177’	117° 07.402’	-33.9	-37	7 (3.1)	-31.3 to -37
	SDHVC-17-SB-15	11/8/2017	15:20	1,817,172	6,293,063	32° 38.962’	117° 07.345’	-33.9	-37	10.9 (3.1)	-31.3 to -37
	SDHVC-17-SB-16	11/8/2017	17:05	1,815,953	6,293,772	32° 38.762’	117° 07.217’	-30.6	-37	8.5 (6.4)	-31.3 to -37

1 Design depth plus overdepth is the environmental sampling depth. Overdepth is two feet for Areas A and B and there are three feet of advanced maintenance for Area C.

2 (The bracketed depth is the depth of material included in the composite samples and depth of material used for physical compatibility analyses). All material below the bracketed depth was not used for suitability estimations.

Two composite samples were created from the 16 South Bay Channel core locations. Continuous samples from the mudline to the project depth (-35 feet MLLW) plus two feet for overdepth testing (-37 feet MLLW) were collected from all core locations. These primary core intervals were homogenized and combined with the primary core intervals from all other cores within a composite area to form the area composite samples. The basic approach for overdepth sampling and testing is consistent with the US Army Corps of Engineers' draft guidance document on "overdepth" allowance (USACE, 2005) and with a memorandum from the Director of Civil Works for the USACE to USACE Commanders of Major Subordinate Commands on assuring the adequacy of environmental documentation for the maintenance dredging of federal navigation projects (USACE, 2006). Sediments below overdepth (sampling) elevations were not included in the sediment composite sample.

In addition to the composite samples, at least one archive bulk sediment chemistry sample was collected from each core location. These archive samples represent the entire primary core interval (mudline to overdepth elevations). Further archiving was performed if any other suspicious potential contaminated layer existed, or if there was a significant change in the stratigraphy greater than two feet. All chemistry archive samples are being stored frozen. Any excess sediment for Tier III testing was archived until holding times expired.

In order to determine if nearshore compatible material is not carrying significant contamination, USACE, Los Angeles District requested that bulk sediment chemistry be run on four individual core samples (SDHVC-17-SB-06, 07, 04) that were physically suitable for nearshore reuse.

Core subsamples for geotechnical testing were from any geologically distinct layer between the mudline and overdepth elevations that was eight inches or greater in length.

3.2.3 Reference Sediment Collection

A series of eleven (11) random surface grabs were collected within each of two nearshore areas off Coronado Beach/Silver Strand identified on Figures 1 and 2. Individual geotechnical grain size testing was performed on all grab samples collected within the nearshore placement areas. These samples are identified as SSBNSN-17-01 through SSBNS-17-11for the north placement area and SSBNSS-17-01 through SSBNSS-17-11 for the south placement area. Final coordinates, sampling times and water depths for each nearshore location are provided in Table 4.

Surface sediments were also collected from the LA-5 reference area that were used as reference material for the OTM Tier II and III analyses required to assess suitability for open water placement of the dredged materials. The sample was collected on the 6th of November at 13:00 in 598 feet of water. Sampling took place in the vicinity of 32º 46.002' N and 117º 22.767' W.

3.2.4 Inner Harbor Grab Sample

At the direct of USACE, Los Angeles District a single grab sample was collected at a slightly shoaled Central Bay Channel location and submitted for grain size testing. This sample was collected at 32º 41.633' N and 117º 09.584′ W on November 7, 2017.

Table 4. Date, Times and Sampling Coordinates for Samples Collected from the Coronado Beach/Silver Strand North and South Placement Sites

Area	Site Designations	Date	Time	Approx. Sampling Elevations (feet, MLLW)	Geographic Coordinates (NAD 83)	
					Latitude North	Longitude West
Coronado Beach/Silver Strand North Nearshore Placement Site	SSBNSN-17-01	11/7/2017	08:37	-29.9	32º 40.296'	11 º 10.983'
	SSBNSN-17-02	11/7/2017	08:46	-28.8	32º 40.243'	117º 10.831'
	SSBNSN-17-03	11/7/2017	08:54	-28.6	32º 40.123'	117º 10.655'
	SSBNSN-17-04	11/7/2017	09:00	-26.6	32º 40.193'	117º 10.611'
	SSBNSN-17-05	11/7/2017	09:06	-26.0	32º 40.237'	117º 10.701'
	SSBNSN-17-06	11/7/2017	09:13	-26.5	32º 40.279'	117º 10.745'
	SSBNSN-17-07	11/7/2017	09:18	-26.5	32º 40.345'	117º 10.808'
	SSBNSN-17-08	11/7/2017	09:26	-26.4	32º 40.412'	117º 10.809'
	SSBNSN-17-09	11/7/2017	09:33	-25.3	32º 40.353'	117º 10.731'
	SSBNSN-17-10	11/7/2017	09:41	-24.3	32º 40.294'	117º 10.633'
	SSBNSN-17-11	11/7/2017	09:49	-24.2	32º 40.520'	117º 10.543'
Coronado Beach/Silver Strand South Nearshore Placement Site	SSBNSS-17-01	11/7/2017	10:12	-32.1	32º 39.552'	117º 10.063'
	SSBNSS-17-02	11/7/2017	10:27	-33.1	32º 39.269'	117º 09.815'
	SSBNSS-17-03	11/7/2017	10:37	-31.1	32º 39.001'	117º 09.576
	SSBNSS-17-04	11/7/2017	10:45	-32.1	32º 38.832'	117º 09.482'
	SSBNSS-17-05	11/7/2017	10:54	-29.1	32º 38.982'	117º 09.534'
	SSBNSS-17-06	11/7/2017	11:01	-29.1	32º 39.272'	117º 09.715'
	SSBNSS-17-07	11/7/2017	11:08	-26.2	32º 39.534'	117º 09.858'
	SSBNSS-17-08	11/7/2017	11:15	-16.2	32º 39.708'	117º 09.821'
	SSBNSS-17-09	11/7/2017	11:24	-14.4	32º 39.467'	117º 09.610'
	SSBNSS-17-10	11/7/2017	11:31	-17.4	32º 39.205'	117º 09.461'
	SSBNSS-17-11	11/7/2017	11:39	-20.4	32º 38.964'	117º 09.348'

3.2.5 Environmental Testing

Bulk sediment analyses that were performed on the South Bay Channel composite samples, four individual core samples, and the LA-5 reference sample are as follows:

- Metals including mercury (10 total)
- Percent solids
- Total ammonia
- Total volatile solids (TVS)
- Oil and grease
- Total recoverable petroleum hydrocarbons (TRPH)
- TOC
- Butyltins
- Chlorinated pesticides
- Pyrethroid Pesticides
- Polychlorinated biphenyl (PCB) congeners (41 total)
- Phenols
- Phthalate esters
- Polycyclic aromatic hydrocarbons (PAHs)

To fully evaluate sediments for open water placement, the composite samples required the following additional testing:

- Whole sediment bioassays using amphipods and polychaete worms.
- Water column suspended particulate phase (SPP) bioassays using mysids, juvenile teleost fish, and bivalve larvae.
- Bioaccumulation exposures using clams and polychaete worms.
- Tissue analyses for copper, mercury, butyltins, DDT compounds and PCB congeners.

Except for the SPP bioassays, these same tests were performed on a sample collected from the LA-5 reference area.

3.2.6 Geotechnical Samples and Testing

A sufficient quantity of sediment was collected from each location within the San Diego Harbor South Bay Channel so that a representative amount of sediment was included in each geotechnical sample. At least one primary grain size sample was formed and analyzed from each core representing the mudline to the overdepth elevation if the sediment grain size was homogenous throughout the core. Otherwise each grain size sample collected represented each layer of physically different material greater than eight inches thick. Grain size analyses were also run on each of the 22 sampling locations within the nearshore areas off Coronado Beach/Silver Strand.

USACE, Los Angeles District requested that one additional sample from each core that represented material up to the five feet below the overdepth elevation be collected and tested for grain size. Data from these samples are for informational and internal purposes only and were not used for suitability determinations and were not incorporated into this report.

In addition to the mechanical grain size samples, ten (10) hydrometer tests and ten (10) Atterberg Limits tests were run. The hydrometer and Atterberg tests were run on representative samples of fine grained material collected from the sediment cores.

All geotechnical data gathered was used to do physical beach compatibility analyses between the dredged sediments and the nearshore areas. This task was accomplished by USACE-Los Angeles District and is included as Appendix B to this report.

3.2.7 Summary of San Diego Harbor South Bay Channel Testing and Evaluation Sequence

The testing and evaluation sequence for the San Diego Harbor South Bay Channel composite samples is described in detail in the next subsection and is outlined as follows:

1) Bulk sediment chemical analyses was conducted on the composite samples and select individual cors.
2) Grain size physical compatibility analyses was conducted by the Los Angeles District U.S. Army Corps of Engineers Geotechnical Branch.
3) Analytical results were evaluated using the sediment quality guidelines consisting of Effects Range Low (ERL) and Effects Range Medium (ERM) values developed by Long,

et al. (1995) that correlate concentrations of selected contaminants with likelihood of adverse biological effects. Please note that ERLs and ERMs have not been developed for all analytes.

4) Analytical results were also evaluated using the USEPA's RSL (Regional Screening Levels) (USEPA Region 9, updated 2017) and the State of California's CHHSL (California Human Health Screening Levels) for potential effects to humans (Cal/EPA, 2005 – updated 2010).
5) Since early grain size results indicated that at least some sediments appeared to be poor candidates for nearshore reuse, Tier III testing under the OTM for ocean placement was conducted. Tier III testing consisted of elutriate bioassays with three water column species, benthic bioassays with two infaunal species, and evaluation of bioaccumulation potential using two sediment-dwelling organisms. After bioassays and tissue analyses were complete, results were evaluated to determine if the sediments exceeded OTM and USEPA Region 9 criteria for open water placement.
6) Initial Tier III testing was limited to the SP and SPP toxicity and bioaccumulation exposures. Tissue analyses only began after sediments passed the initial toxicity tests.

In summary, if grain size characteristics are compatible with the beach nearshore areas, contaminant levels are low compared to lower effects based screening levels and human health screening levels, and the sediments are not toxic to benthic organisms, then the sediments are suitable for nearshore placement. However, this was not the case, so additional toxicity and bioaccumulation testing took place. If the sediments are not physically compatible with the receiving beach, contaminant levels are low, the test sediments are not toxic to benthic and water column species compared to reference sediment, and the bioaccumulation potential of contaminants of concern from the test sediments is low compared to bioaccumulation potential of the reference sediments and to tissue residue biological effects, then the sediments are suitable for open water placement at the LA-5 ODMDS.

3.2.8 Evaluation Guidelines

As mentioned above, to aid in the evaluation of sediment test data, chemical concentrations of contaminants found within the sediments were compared to sediment quality guidelines (Long et. al., 1995) developed by NOAA. These guidelines were used to screen sediments for contaminant concentrations that might cause biological effects. For any given contaminant, ERL guidelines represent the 10th percentile concentration value in the NOAA database that might be expected to cause adverse biological effects and ERM guidelines reflect the 50th percentile value in the database. Note that ERLs and ERMs were only used as a screening tool. They were not used to determine suitability.

As an additional measure of potential toxicity, the mean ERM quotient (ERMq) for the composite samples was calculated according to Long et al. (1998a) and Hyland et al. (1999). ERMq is calculated by dividing each contaminant concentration by its respective ERM value and then summing the results and dividing through by the number of contaminants as shown in the following equation:

$$ERMQuotient = \frac{1}{24}\sum \frac{SampleConcentration}{ERM}$$

In cases where concentrations of measured contaminants were below the method detection limit (MDL), a value of ½ the MDL was used for the ERMq calculations. For a general overall indication of toxicity, a quotient less than 0.1 is indicative of a low probability (<12%) of a highly toxic response to marine amphipods (Long and MacDonald, 1998b). If there are no ERL exceedances in a sample, there is less than a 10% probability of a highly toxic response to marine amphipods. The probability of a highly toxic response increases to 71% for quotients greater than 1.0.

The dredge material was also assessed to whether or not it is suitable for human contact after reuse in the nearshore areas. To do so, the chemical results were compared to "Regional Screening Levels for Chemical Contaminants at Superfund Sites" (RSLs) (USEPA Region 9, updated 2017), formerly known as Preliminary Remediation Goals (PRGs), and to California Human Health Screening Levels (CHHSLs) (Cal/EPA, updated 2010). RSLs were developed for Superfund/RCRA programs and are a consortium of USEPA Region 9 Preliminary Remediation Goals (PRGs), USEPA Region 3 Risked-Based Concentrations (RBCs) and EPA Region 6 Human Health Medium – Specific Screening Levels (HHMSSLs). RSLs are risk-based concentrations derived from standardized equations combining exposure information assumptions with EPA toxicity data. RSLs that were used were based on a target hazard quotient of 0.1. CHHSLs are concentrations of 54 hazardous chemicals in soil or soil gas that are considered to be protective of human health. The CHHSLs were developed by the Office of Environmental Health Hazard Assessment (OEHHA) on behalf of California Environmental Protection Agency (Cal/EPA). CHHSLs were developed using standard exposure assumptions and chemical toxicity values published by the USEPA and Cal/EPA. CHHSLs used were developed separately for industrial/commercial settings and for residential settings.

SPP bioassays using mysids, fish and the larvae of mussels were conducted on the sediment composite samples in order to evaluate water quality effects due to dumping of the sediments through the water column at the LA-5 ODMDS. Standard elutriates were prepared with site water, and water used to make the dilutions was from a clean open-coast source. Concurrent bioassays were performed on 100%, 50%, 10% and 1% elutriate concentrations and laboratory control water. Results of elutriate bioassays were statistically compared with control water bioassays. Elutriate extracts that produced significantly greater toxicity than control water, if any, were identified. OTM guidelines for interpretation of suspended particulate-phase bioassays require that initial mixing calculations be performed to determine the concentration of liquid and suspended particulate material at the edge of the mixing zone after dumping and within the mixing zone four hours after dumping for any sample producing toxicity sufficient to generate an LC50 or EC50. The statistical calculations to determine LC50s and EC50s are through interpolations. If the concentration at the edge of the mixing zone or within the mixing zone four hours after dumping does not exceed 1% of the LC50 or EC50, the sediment is judged to comply with water column toxicity criteria.

Solid phase (SP or benthic) bioassays were also conducted for ocean placement using polychaete worms and amphipods. Benthic bioassay results were statistically compared with bioassay results from reference sediments collected in the vicinity of LA-5 ODMDS and with control sediments collected from the organisms' home environment. Guidelines for interpretation of benthic bioassay results are published in the OTM. If survival responses in test sediment are statistically lower than those in reference sediment and if the difference in mean survival between groups is greater than

10% (20% for amphipods), then the test sediment is considered to have the potential to significantly degrade the marine environment.

Twenty-eight-day bioaccumulation exposures were performed on the composite samples. Composite sediment exposures were run concurrently with exposures to LA-5 reference and control sediments.

The final phase of testing for open water placement was accomplished by analyzing the tissues of organisms that have completed 28-day exposure to test sediments along with baseline, control and reference sediments. After consultation with the SC-DMMT, the USEPA, through an Email to the project team (January 4, 2018), recommended that the tissues be analyzed for copper, mercury, butyltins, DDT compounds and PCB congeners. Concentrations of these contaminants in the tissues of organisms exposed to reference sediments were compared with concentrations in organisms exposed to test sediments. Statistically elevated concentrations in test tissues are considered to be potentially bioaccumulative. If this was the case for any given contaminant, then tissue residue data were evaluated to determine if these levels are important in terms of biological effects and human health concerns. These included comparisons to relevant (lowest or no observable effects concentrations for whole body effects) Toxicity Reference Values (TRVs) from USACE's Environmental Residue-Effects Database (ERED) (https://ered.el.erdc.dren.mil/).

3.3 Field Sampling Protocols

The field effort for this project took place from November 6 to November 9, 2017. Vibracore sampling, grab sampling, decontamination, sample processing and documentation procedures are discussed in this section.

3.3.1 Positioning and Depth Measurements

Positioning at sampling locations was accomplished using a differential GPS (DGPS) navigation system referenced to a local geodetic benchmark with positioning accuracies of 3 to 10 feet. The locations were recorded in both Geographic coordinates (NAD 83) and State Plane Coordinates (CA Zone VI, NAD 83). Water depths were measured with a graduated lead line and corrected to mean lower low water (MLLW). Tidal stage was determined using NOAA real-time tidal stage data. These tide data were used to calculate the seafloor elevation/mudline for each site.

All sampling locations were located within Federal Channel limits and all but one location was generally within 50 feet of project SAP target coordinates. Location SB-09 was inadvertently moved about 300 feet to the north to a location that was still slightly shoaled above the design depth.

Records were maintained during fieldwork to confirm the accuracy of the DGPS. The DGPS was checked against a known location prior to leaving the dock at the beginning of the day and upon return to the dock at the end of the day. Measurements are included in Appendix C.

3.3.2 Vibracore Sampling Methods

All sediment samples were collected on November 8 and 9, 2017 using an electric vibracore that penetrated and obtained samples below the project sample elevations. The cores were taken to the target sampling elevations (project elevations plus two feet for overdepth allowance) plus additional depth for geotechnical purposes. Refusal above the overdepth location was not encountered at any sampling location. At the conclusion of a successful vibracore, the core liner was removed and split open for inspection and sampling. Extrusion of the core was not allowed. Processing took place onboard the sampling vessel.

Vibracore sampling was conducted from the 35-foot Research Vessel ***DW Hood***. This vessel, with a Uniflite hull, is outfitted with a 14-foot tall A-frame and 4-ton winch, suitable for handling the coring equipment. This vessel is fully equipped with all the necessary navigation, safety, and lifesaving devices per Coast Guard requirements. Three-point anchoring was conducted at each location with the assistance of a 17-foot Boston Whaler.

Kinnetic Laboratories' vibracore consists of a 4-inch diameter aluminum coring tube, a stainless steel cutting tip, and a stainless-steel core catcher. Inserted into the core tubes was food-grade clean polyethylene liners. The vibrating unit contains two counter-rotating motors encased in a waterproof aluminum housing. The motors are powered by a three-phase, 240-volt generator. The vibracore head and tube were lowered overboard with the A-frame and winch and then lowered to the mudline. The unit was then vibrated until it reached the target sampling elevation.

When penetration of the vibracore was complete, power was shut off to the vibra-head and the vibracore was brought aboard the ***DW Hood***. A check valve, located on top of the core tube, reduced or prevented sediment loss during pull-out. The length of sediment recovered was noted by measuring down the interior of the core tube to the top of the sediment. The core tube was then detached from the vibra-head, and the core cutting tip and catcher were removed. Afterwards, the core liners were removed and sealed on both ends and kept sealed until processed, which occurred shortly after collection.

3.3.3 Vibracore Decontamination

All sample contact surfaces were stainless-steel or food-grade clean polyethylene. Compositing tools were stainless steel. Except for the core liners, all contact surfaces of the sampling devices and the coring tubes were cleaned for each sampling area. The cleaning protocol consisted of a site water rinse, a Micro-90® soap wash, and then finished with deionized water rinses. The polyethylene core liners were new for each core. All rinseate was collected in containers and disposed of properly.

3.3.4 Core Processing

Whole cores were processed on deck. Cores were placed in a PVC core rack that was cleaned between cores. After placement in the core rack, core liners were split lengthwise to expose the recovered sediment. Once exposed, sediment that came in contact with the core liner was removed by scraping with a pre-cleaned stainless steel spoon. Each core was then photographed, measured, and lithologically logged in accordance with the Unified Soil Classification System (USCS) as outlined in ASTM Standards D-2488 (2006) and D-2487 (2006). A geologist from Diaz Yourman and Associates conducted the lithologic logging along with the collection of sample splits for geotechnical testing.

Photographs were taken of each core (each photograph covered a maximum two-foot interval), and of sampling equipment and procedures. These pictures are provided in Appendix D and visually include the date and time of sampling and the core interval.

Following logging, vertical composite subsamples for archiving and horizontal composite formation along with samples for grain size analyses were then formed by combining and homogenizing a representative sample from the mudline to two feet below the design depth from each sampling interval, as described in Section 3.2.2, in a pre-cleaned stainless steel or Teflon®-coated tray. A 0.5-liter portion of each vertical composite subsample and (core stratum for grain size) was placed in a pre-cleaned and certified glass jar with a Teflon®-lined lid for archived material, and sufficient material from each core stratum was placed in Ziploc bags for the geotechnical samples. An additional representative portion of each vertical composite subsample was placed in a large pre-cleaned mixing bowl for area compositing with all other cores from an area. These composited sediments were placed in two 1-liter pre-cleaned and certified glass jars with a Teflon®-lined lids. All remaining material from each core after subsample formation and composite chemistry sample formation was placed in a food-grade clean 5-gallon LPDE bucket liners for the Tier III biological analyses. This material was later composited at Kinnetic Laboratories' facility in Santa Cruz on November 12, 2017 using a large commercial bread mixer and stainless-steel bowl and delivered to Pacific EcoRisk on November 13, 2017. All samples for grain size analyses were transferred to pre-labeled sample containers (sealed plastic bags) and stored appropriately until they are ultimately transferred to Hushmand Associates for analysis.

Except for chemistry archival material, containers were completely filled to minimize air bubbles being trapped in the sample container. A small amount of headspace was allowed for archived chemistry samples to prevent container breakage during freezing. For the preservation of all sediment composite chemistry samples, filled containers were placed on ice immediately following sampling and maintained at 2 to 4°C until analyzed. Archived samples for chemistry were placed on ice initially and then frozen as soon as possible. The sample containers, both jars and bags, were sealed to prevent any moisture loss and possible contamination.

3.3.5 Beach NearshoreSites Grab Samples

The top six inches of sand or sediment was collected at each Coronado Beach/Silver Strand nearshore area sampling location. Sampling took place on November 7, 2018 and was conducted from the ***DW Hood*** using a Smith-McIntyre Grab. Positioning was accomplished using a DGPS navigation system. Water depths were measured with a graduated lead line and corrected to MLLW. The grab sampler was deployed at each location, and upon retrieval, each grab was visually inspected to ensure the sample was acceptable according to SOPs. One sample from each successful grab was collected for grain size analyses using a plastic sampling scoop. These samples were transferred to pre-labeled sample containers (sealed plastic bags) and stored appropriately until they were ultimately transferred to Hushmand Associates for analysis.

3.3.6 LA-5 Reference and Control Sediments

The LA-5 reference site sample for Tier II and Tier III testing was obtained on November 6, 2018 using a chain-rigged, pipe dredge deployed from the ***DW Hood***. Sampling took place in the vicinity of 32º 46.002' N and 117º 22.767' W in 598 feet of water (Figure 6). Navigation, sample compositing, recording, and preservation procedures followed those described for vibracore sampling.

Samples of control sediment were collected for biological testing by the laboratory. Control sediment for the solid phase bioassays and bioaccumulation exposures were the "home sediment" from the areas where the animals were collected.

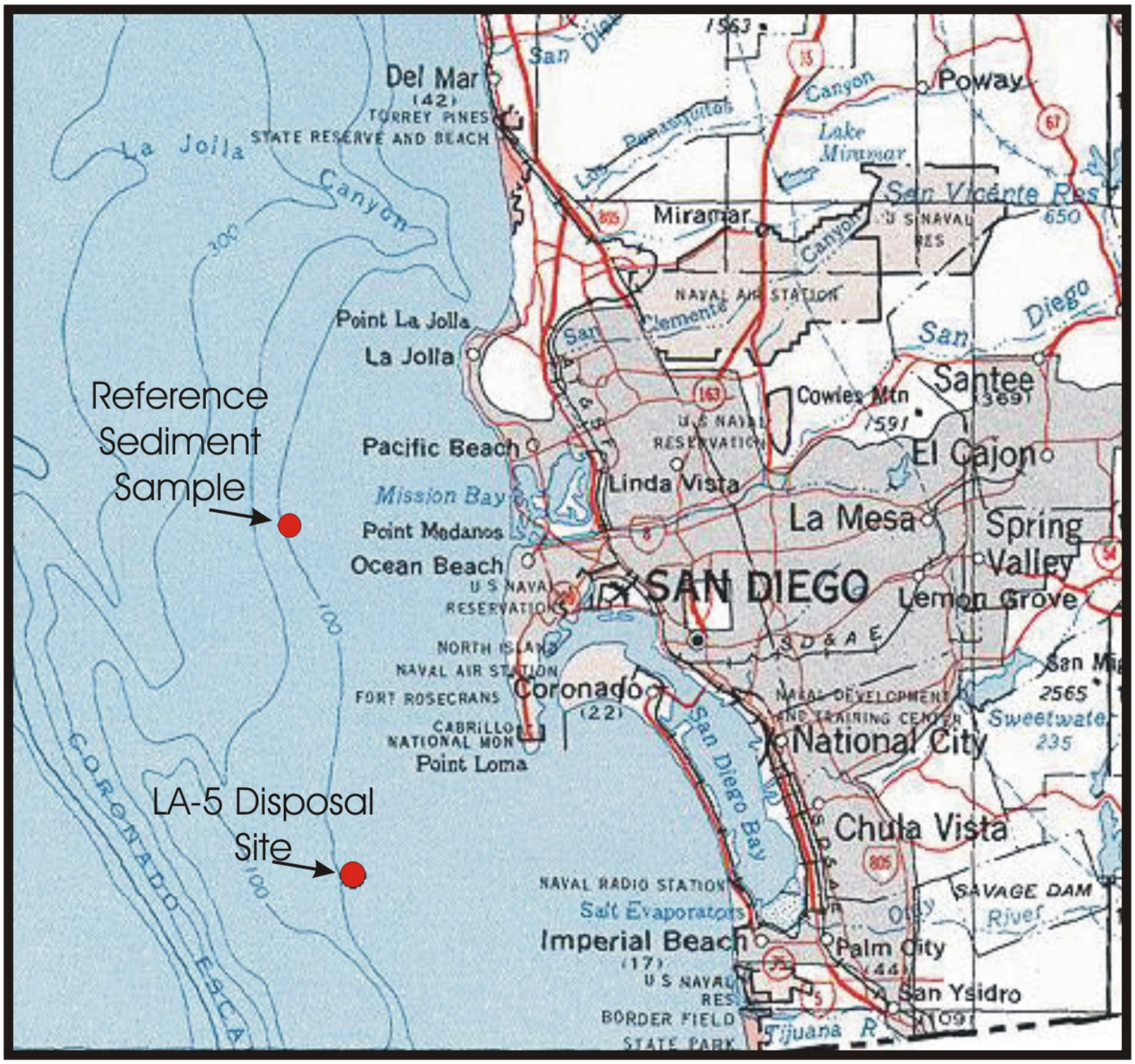

Figure 6. Locations of LA-5 ODMDS and Offshore Reference Site.

3.3.7 Water Collection

Water was collected from the South Bay Channel on November 9, 2017 for use in preparing elutriates for the SPP bioassays. Water was pumped from mid-depth using protocol cleaned hose and placed into QC grade cubitainers. Water samples were iced and delivered to the bioassay laboratory with the sediment samples, where they were held at 4ºC until used.

3.3.8 Detailed Sediment Log

A detailed sediment log was prepared for each sampling location, including the beach nearshore placement area locations and the LA-5 reference location. These logs include the project name, hole or transect number or designation, date, time, location, water depth, estimated tide, mudline elevation, type and size of sampling device used, depth of penetration, length of recovery, name of person(s) taking samples, depths below mudline of samples, and a description and condition of the sediment. Sediment descriptions were made in accordance with ASTM D 2488 (2006), and included: grain size, color, maximum particle size, estimation of density (sand) or consistency (silts and clays), odor (if present), and description of amount and types of organics and trash present. In cohesive soils, a pocket penetrometer and miniature vane shear device (torvane) was used to collect estimated strength/consistency data.

3.3.9 Documentation and Sample Custody

All samples had their containers physically marked as to sample location, date, time and analyses. All samples were handled under Chain of Custody (COC) protocols beginning at the time of collection. Redundant sampling data was also recorded on field data log sheets. Copies of the field data logs are included in Appendix C.

Samples were considered to be "in custody" if they were (1) in the custodian's possession or view, (2) in a secured place (locked) with restricted access, or (3) in a secure container. Standard COC procedures were used for all samples collected, transferred, and analyzed as part of this project. COC forms were used to identify the samples, custodians, and dates of transfer. Except for the shipping company, each person who had custody of the samples signed the COC form and ensured samples were stored properly and not left unattended unless properly secured.

Standard information on Chain of Custody forms included:

- Sample Identification
- Sample Collection Date and Time
- Sample Matrices (e.g., marine sediment)
- Analyses to be Performed
- Container Types
- Preservation Method
- Sampler Identification
- Dates of Transfer
- Names of Persons with Custody

The completed COC form were placed in a sealable plastic bag and taped to the inside of one or more coolers. COC records are included with the laboratory reports in Appendix D for the chemistry samples and Appendix E for the biological samples.

A daily field activity log was maintained listing the beginning and ending time for every and all phases of operation, the names and responsibilities of all field personnel present, description and length of any delays, and weather and sea conditions. This log (Appendix C) includes DGPS calibration/verification notes.

As described in Sections 3.3.8, detailed sediment logs were prepared from each sampling location, including reference locations. These sediment logs are included as Appendix F.

3.4 Laboratory Testing Methods

Physical and analytical chemical testing of sediments for this project used USEPA and USACE approved methodologies.

3.4.1 Geotechnical Testing

Sieve analyses and hydrometer testing was performed according to ASTM D 422 (1963), and Atterberg Limits were determined according to ASTM D 4318 (2005). Required U.S. standard sieve sizes included No. 4, 7, 10, 14, 18, 25, 35, 45, 60, 80, 120, 170, 200, and 230 sieves. All sediment samples were classified in accordance with the Unified Soil Classification System (ASTM D 2487-06 and ASTM D 2488-06). Grain size compatibility of the proposed dredge material with the reuse areas was evaluated by the Los Angeles District USACE (Appendix B).

3.4.2 Bulk Sediment Chemical Analyses

The composite samples collected from the San Diego Harbor South Bay Channel and the LA-5 reference sample were analyzed for the parameters and quantification limits summarized in Table 5. Similar parameters and quantification limits were used for the individual core samples. The exact quantification limits for the individual cores are provided in the QA/QC report (Appendix H). All results are reported in dry weight unless noted otherwise. All analyses were conducted in a manner consistent with guidelines for dredge material testing methods in the USEPA/USACE ITM and OTM. Samples were extracted and analyzed within specified USEPA holding times, and all analyses will be accomplished with appropriate quality control measures.

Discrete chemistry samples from each location not already analyzed are still being archived frozen. If required, additional direction will be provided for analysis of these archives.

Table 5. Sediment and Tissue Analytical Methods and Target Quantitation Limits Achieved.

Analyte	Method	Method Detection Limits (Dry Weight)	Laboratory Reporting Limits (Dry Weight)	USACE Target Detection Limits
CONVENTIONALS (mg/kg dry except where noted)				
Ammonia	SM 4500-NH3 B/C (M)	0.15 - 0.19	0.27 - 0.34	0.2
Percent Solids (%)	SM 2540 B	0.100	0.100	0.1
Total Organic Carbon (%)	EPA 9060A	0.024 – 0.030	0.068 – 0.085	0.05
Total Volatile Solids (%)	EPA 160.4M	0.10	0.10	0.1
Oil & Grease	EPA 1664A (M) HEM	11 - 13	14 - 17	10
TRPH	EPA 1664A (M) HEM-SGT	11 - 13	14 - 17	10
Lipids (% wet weight)[1]	$MeCl_2$ Extraction	--	--	0.1
METALS (mg/kg dry)				
Arsenic	EPA 6020	0.119 – 0.149	0.136 – 0.170	0.1
Cadmium	EPA 6020	0.0778 – 0.0975	0.136 – 0.170	0.1
Chromium	EPA 6020	0.0843 – 0.106	0.136 – 0.170	0.1
Copper	EPA 6020	0.0569 – 0.0714	0.136 – 0.170	0.1
Lead	EPA 6020	0.0895 – 0.112	0.136 – 0.170	0.1
Mercury	EPA 7471A	0.00811 – 0.0102	0.0276 – 0.0346	0.02
Nickel	EPA 6020	0.0688 – 0.0862	0.136 – 0.170	0.1
Selenium	EPA 6020	0.0993 – 0.124	0.136 – 0.170	0.1
Silver	EPA 6020	0.0425 – 0.0533	0.136 – 0.170	0.1
Zinc	EPA 6020	1.08 – 1.35	1.36 – 1.70	1.0
ORGANICS-CHLORINATED PESTICIDES (µg/kg dry)				
2,4' DDD	EPA 8270C PEST-SIM	0.10 – 0.13	0.27 – 0.34	0.2
2,4' DDE	EPA 8270C PEST-SIM	0.047 – 0.059	0.27 – 0.34	0.2
2,4' DDT	EPA 8270C PEST-SIM	0.083 – 0.10	0.27 – 0.34	0.2
4,4' DDD	EPA 8270C PEST-SIM	0.053 – 0.067	0.27 – 0.34	0.2
4,4' DDE	EPA 8270C PEST-SIM	0.054 – 0.068	0.27 – 0.34	0.2
4,4' DDT	EPA 8270C PEST-SIM	0.070 – 0.088	0.27 - 0.34	0.2
Total DDT	EPA 8270C PEST-SIM	--	--	0.2
Aldrin	EPA 8270C PEST-SIM	0.051 – 0.064	0.27 – 0.34	0.2
BHC-alpha	EPA 8270C PEST-SIM	0.077 – 0.097	0.27 – 0.34	0.2
BHC-beta	EPA 8270C PEST-SIM	0.090 – 0.11	0.27 – 0.34	0.2
BHC-delta	EPA 8270C PEST-SIM	0.12 – 0.16	0.27 – 0.34	0.2
BHC-gamma (Lindane)	EPA 8270C PEST-SIM	0.046 – 0.058	0.27 – 0.34	0.2
Chlordane-alpha	EPA 8270C PEST-SIM	0.089 – 0.11	0.27 – 0.34	0.2
Chlordane-gamma	EPA 8270C PEST-SIM	0.072 – 0.90	0.27 – 0.34	0.2
Chlordane (Technical)	EPA 8081A	7.0 – 8.7	13 - 17	10
Oxychlordane	EPA 8270C PEST-SIM	0.098 – 0.12	0.27 – 0.34	0.2
Cis-Nonachlor	EPA 8270C PEST-SIM	0.068 – 0.085	0.27 – 0.34	0.2
Total Chlordane	EPA 8270C PEST-SIM	--	--	0.2
Dieldrin	EPA 8270C PEST-SIM	0.14 – 0.18	0.27 – 0.34	0.2
Endosulfan sulfate	EPA 8270C PEST-SIM	0.14 – 0.17	0.27 – 0.34	0.2
Endosulfan I	EPA 8270C PEST-SIM	0.077 – 0.097	0.27 – 0.34	0.2
Endosulfan II	EPA 8270C PEST-SIM	0.12 – 0.15	0.27 – 0.34	0.2
Endrin	EPA 8270C PEST-SIM	0.076 – 0.095	0.27 – 0.34	0.2
Endrin aldehyde	EPA 8270C PEST-SIM	0.13 – 0.17	0.27 – 0.34	0.2
Endrin ketone	EPA 8270C PEST-SIM	0.074 – 0.093	0.27 – 0.34	0.2
Heptachlor	EPA 8270C PEST-SIM	0.069 – 0.086	0.27 – 0.34	0.2
Heptachlor epoxide	EPA 8270C PEST-SIM	0.059 – 0.074	0.27 – 0.34	0.2
Methoxychlor	EPA 8270C PEST-SIM	0.090 – 0.11	0.27 – 0.34	0.2
Mirex	EPA 8270C PEST-SIM	0.053 – 0.066	0.27 – 0.34	0.2

Table 5 (Continued). Sediment and Tissue Analytical Methods and Target Quantitation Limits Achieved.

Analyte	Method	Method Detection Limits (Dry Weight)	Laboratory Reporting Limits (Dry Weight)	USACE Target Detection Limits
Toxaphene	EPA 8081A	12 - 15	27 - 34	25
trans-Nonachlor	EPA 8270C PEST-SIM	0.058 – 0.072	0.27 – 0.34	0.2
ORGANICS-Pyrethroid Pesticides (µg/kg dry)				
Allethrin (Bioallethrin)	EPA 8270D (M)/TQ/EI	0.33 – 0.42	0.67 – 0.84	0.5
Bifenthrin	EPA 8270D (M)/TQ/EI	0.40 – 0.51	0.67 – 0.84	0.5
Cyfluthrin-beta (Baythroid)	EPA 8270D (M)/TQ/EI	0.33 – 0.42	0.67 – 0.84	0.5
Cyhalothrin-Lamba	EPA 8270D (M)/TQ/EI	0.33 – 0.42	0.67 – 0.84	0.5
Cypermethrin	EPA 8270D (M)/TQ/EI	0.33 – 0.42	0.67 – 0.84	0.5
Deltamethrin (Decamethrin)	EPA 8270D (M)/TQ/EI	0.33 – 0.42	0.67 – 0.84	0.5
Esfenvalerate	EPA 8270D (M)/TQ/EI	0.33 – 0.42	0.67 – 0.84	0.5
Fenpropathrin (Danitol)	EPA 8270D (M)/TQ/EI	0.33 – 0.42	0.67 – 0.84	0.5
Fenvalerate (sanmarton)	EPA 8270D (M)/TQ/EI	0.33 – 0.42	0.67 - 0.84	0.5
Fluvalinate	EPA 8270D (M)/TQ/EI	0.33 – 0.42	0.67 – 0.84	0.5
Permethrin (cis and trans)	EPA 8270D (M)/TQ/EI	0.67 – 0.84	1.3 – 1.7	1.0
Resmethrin/Bioresmethrin	EPA 8270D (M)/TQ/EI	0.57 – 0.72	0.67 - 0.84	0.5
Sumithrin (Phenothrin)	EPA 8270D (M)/TQ/EI	0.33 – 0.42	0.67 – 0.84	0.5
Tetramethrin	EPA 8270D (M)/TQ/EI	0.40 – 0.51	0.67 – 0.84	0.5
Tralomethrin	EPA 8270D (M)/TQ/EI	0.33 – 0.42	0.67 – 0.84	0.5
ORGANICS-BUTYLTINS (µg/kg dry)				
Monbutyltin	Krone et al., 1989	1.8 – 2.3	4.0 – 5.0	3.0
Dibutyltin	Krone et al., 1989	0.96 – 1.2	4.0 – 5.0	3.0
Tributyltin	Krone et al., 1989	2.0 – 2.5	4.0 – 5.0	3.0
Tetrabutyltin	Krone et al., 1989	0.98 – 1.2	4.0 – 5.0	3.0
ORGANICS-PHTHALATES (µg/kg dry)				
bis(2-ethylhexyl) phthalate	EPA 8270C (SIM)	2.1 – 2.6	68 - 84	50
Butyl benzyl phthalate	EPA 8270C (SIM)	2.7 – 3.3	68 - 84	50
Diethyl Phthalate	EPA 8270C (SIM)	2.2 – 2.7	68 - 84	50
Dimethyl Phthalate	EPA 8270C (SIM)	2.7 – 3.3	68 - 84	50
Di-n-butyl Phthalate	EPA 8270C (SIM)	2.6 – 3.2	68 - 84	50
Di-n-octyl Phthalate	EPA 8270C (SIM)	2.6 – 3.2	68 - 84	50
ORGANICS-PHENOLS (µg/kg dry)				
2,3,4,6-Tetrachlorophenol	EPA 8270C (SIM)	5.3 – 6.6	14 - 17	10
2,4,5-Trichlorophenol	EPA 8270C (SIM)	1.6 – 2.0	14 - 17	10
2,4,6-Trichlorophenol	EPA 8270C (SIM)	1.8 – 2.2	14 - 17	10
2,4-Dichlorophenol	EPA 8270C (SIM)	2.3 – 2.9	14 – 17	10
2,4-Dimethylphenol	EPA 8270C (SIM)	3.5 – 4.4	680 - 840	500
2,4-Dinitrophenol	EPA 8270C (SIM)	81 - 100	680 - 840	500
2,6-Dichlorophenol	EPA 8270C (SIM)	2.9 – 3.6	14 - 17	10
2-Chlorophenol	EPA 8270C (SIM)	2.5 – 3.1	14 - 17	10
2-Methyl-4,6-dinitrophenol	EPA 8270C (SIM)	90 - 110	680 - 840	500
2-Methylphenol	EPA 8270C (SIM)	2.7 – 3.3	14 - 17	10
2-Nitrophenol	EPA 8270C (SIM)	2.3 – 2.8	680 - 840	500
3+4-Methylphenol	EPA 8270C (SIM)	4.9 – 6.1	14 - 17	10
4-Chloro-3-methylphenol	EPA 8270C (SIM)	2.8 – 3.5	14 - 17	10
4-Nitrophenol	EPA 8270C (SIM)	110 - 140	680 - 840	500
Bisphenol A	EPA 8270C Bisphenol	2.8 – 3.5	13 - 17	10
Pentachlorophenol	EPA 8270C (SIM)	1.8 – 2.2	680 - 840	500
Phenol	EPA 8270C (SIM)	3.1 – 3.9	14 - 17	10

Table 5 (Continued). Sediment and Tissue Analytical Methods and Target Quantitation Limits Achieved.

Analyte	Method	Method Detection Limits (Dry Weight)	Laboratory Reporting Limits (Dry Weight)	USACE Target Detection Limits
ORGANICS-PCBs (µg/kg dry)				
PCB congeners of: 018, 028, 037, 044, 049, 052, 066, 070, 074, 077, 081, 087, 099, 101, 105, 110, 114, 118, 119, 123, 126, 128, 138/158, 149, 151, 153, 156, 157, 167, 168, 169, 170, 177, 180, 183, 187	EPA 8270C (SIM)	0.045 – 0.59	0.27 - 0.67	0.2 – 0.4
Total PCBs as sum of all individual PCB congeners	EPA 8270C (SIM)	--	--	0.5
ORGANICS-PAHs (µg/kg dry)				
1-Methylnaphthalene	EPA 8270C (SIM)	1.5 – 1.8	14 - 17	10
1-Methylphenanthrene	EPA 8270C (SIM)	2.7 – 3.3	14 - 17	10
1,6,7-Trimethylnaphthalene	EPA 8270C (SIM)	2.4 – 3.0	14 - 17	10
2,6-Dimethylnaphthalene	EPA 8270C (SIM)	2.8 – 3.5	14 - 17	10
2-Methylnaphthalene	EPA 8270C (SIM)	2.2 – 2.8	14 – 17	10
Acenaphthene	EPA 8270C (SIM)	2.1 – 2.6	14 - 17	10
Acenaphthylene	EPA 8270C (SIM)	2.3 – 2.8	14 - 17	10
Anthracene	EPA 8270C (SIM)	2.6 – 3.3	14 - 17	10
Benzo[a]anthracene	EPA 8270C (SIM)	1.9 – 2.4	14 - 17	10
Benzo[a]pyrene	EPA 8270C (SIM)	1.9 – 2.3	14 - 17	10
Benzo[b]fluoranthene	EPA 8270C (SIM)	1.9 – 2.4	14 - 17	10
Benzo[e]pyrene	EPA 8270C (SIM)	2.3 – 2.8	14 - 17	10
Benzo[g,h,i]perylene	EPA 8270C (SIM)	2.1 – 2.6	14 - 17	10
Benzo[k]fluoranthene	EPA 8270C (SIM)	2.0 – 2.5	14 - 17	10
Biphenyl	EPA 8270C (SIM)	2.6 – 3.2	14 - 17	10
Chrysene	EPA 8270C (SIM)	1.8 – 2.3	14 - 17	10
Dibenzo[a,h]anthracene	EPA 8270C (SIM)	2.0 – 2.4	14 - 17	10
Dibenzothiophene	EPA 8270C (SIM)	1.8 – 2.3	14 - 17	10
Fluoranthene	EPA 8270C (SIM)	2.4 – 3.0	14 - 17	10
Fluorene	EPA 8270C (SIM)	2.2 – 2.8	14 - 17	10
Indeno[1,2,3-c,d]pyrene	EPA 8270C (SIM)	1.8 – 2.2	14 - 17	10
Naphthalene	EPA 8270C (SIM)	2.1 – 2.6	14 - 17	10
Perylene	EPA 8270C (SIM)	1.6 – 2.0	14 - 17	10
Phenanthrene	EPA 8270C (SIM)	2.4 – 2.9	14 - 17	10
Pyrene	EPA 8270C (SIM)	2.2 – 2.8	14 - 17	10

1. Tissues only.

3.4.3 Elutriate Preparation Methods and Chemical Analysis

Standard elutriate test (SET) samples were prepared according to OTM methods. Sediment were mixed with dredge site water in a 4:1 volumetric ratio. Vigorous mixing proceeded for 30 minutes, and the mixture was allowed to settle undisturbed for one hour. The supernatant (100% elutriate) was then siphoned off for bioassay testing without disturbing the settled material.

3.4.4 Tier III Biological Testing

The South Bay Channel composite samples along with LA-5 reference and control sediments were tested for toxicity and used for bioaccumulation exposures. Bioassay testing protocols followed the OTM for both SPP and SP bioassays and for the bioaccumulation exposures. Species, methods and endpoints used for the bioassays and bioaccumulation exposures are listed in Table 6. All bioassay species used in this testing program complied with OTM and ITM recommendations and guidelines for bioassay tests. Note though that the project SAP stated that *Ampelisca abdita* was to be used for the SP amphipod test. Pacific EcoRisk could not locate a viable population of *A. abdita* at the time of testing. Therefore, the test species was changed to *Leptocheirus plumulosus.* The USEPA agreed to the change in species in a Nov 30, 2017 Email.

Upon arrival at Pacific EcoRisk on November 13, 2017, the temperatures of the sediments and routine water quality parameters (i.e. temperature, dissolved oxygen, salinity, and pH) of the waters were measured. Sediment porewater for total ammonia analysis was collected by centrifuging samples at 2,500g for 15 minutes. All samples were stored at 4° Celsius (C) prior to use.

Water used for bioassay dilutions and bioaccumulation exposures was filtered natural seawater obtained from UC Davis Granite Canyon Marine Laboratory. Dilution water used for the water column bioassays was diluted to 30 ppt, and overlying water for the benthic bioassays was diluted to 20 ppt for the amphipod test and 30 ppt for the polychaete test using deionized water.

<u>Bioassays</u>

Multiple dilutions of elutriates for the SPP bioassays was prepared for testing. Testing was initiated on November 30, 2017 for *M. galloprovincialis* and *M. beryllina* and December 8 for *A. bahia*. All three species used were exposed to 100%, 50%, 10%, and 1% elutriate concentrations along with a 0% control concentration.

The SP bioassays were initiated on November 19, 2017 for *Neanthes arenaceodentata* and December 9, 2017 for *Leptocheirus plumulosus.*

For all tests, water quality parameters (pH, temperature, salinity and dissolved oxygen) were monitored on a daily basis. Water samples from test chambers were also collected at specified intervals to monitor ammonia concentrations. For the 48- and 96-hr SPP tests, water samples for ammonia analysis were collected at test initiation and termination. For the 10-day solid-phase sediment tests, porewater samples were collected through centrifugation and tested for ammonia and sulfides before test initiation and at test termination. Overlying water was analyzed for ammonia at test initiation and termination. All water quality monitoring data are provided in the bioassay laboratory report included as Appendix E.

Table 6. Species, Methods, and End-Points for Biological Testing.

Test Type	Species	Method	End Points
SPP Bioassays:			
Bivalve Larvae	*Mytilus galloprovincialis*	EPA-600-R-95/136 (1995) ASTM E724-98 (2013a)	48 hr. survival and normal embryonic development
Mysid	*Americamysis bahia*	EPA-821-R-02-012 (2002)	96-hour survival
Teleost Fish	*Menidia beryllina*	EPA/600/R-94/025 (1991)	96-hour survival
SP Bioassays:			
Amphipod	*Leptocheirus plumulosus*	ASTM E 1367-99 (2013b) USEPA 1994	10-day survival
Polychaete worm	*Neanthes arenaceodentata*	ASTM E 1611-00 (2013c)	10d-day survival
BIOACCUMULATION EXPOSURES:			
Clam	*Macoma nasuta*	ASTM E-1688-00a (2013d)	28-day benthic exposure
Worm	*Nereis virens*	ASTM E-1688-00a (2013d)	28-day benthic exposure

<u>Bioaccumulation Exposures</u>

Prior to tissue analyses, the OTM and ITM requires a 28-day exposure period of two benthic species to test, reference, and control sediments following the method listed in Table 6. Test species used, which conform to OTM and ITM recommendations, were as follows:

Nereis virens (worm) *Macoma nasuta* (clam)

These tests were initiated on November 15 and 16, 2017.

Water quality parameters (pH, temperature, salinity, dissolved oxygen, and ammonia) were monitored on overlying composite water samples each day of the 28 days of exposures. The animals were added to the test tanks and day zero began approximately 24 hours after the sediments and water were allowed to equilibrate. Water changes in the test aquaria were conducted approximately three times a week.

Following exposure of the organisms to the test sediments, they were placed in a clean, non-stressful environment to purge their systems of sediment. The purge time was sufficiently long enough to purge sediment, but not long enough to allow them to depurate accumulated toxicants. Generally, 24 hours is deemed to be sufficient. Once purging of the sediment was complete, whole animals were triple wrapped according to composite and replicate IDs and frozen. The frozen animals were delivered overnight to Eurofins Calscience Laboratories on January 8, 2018 on dry ice where they were placed in the freezer until analyzed. These animals were later shucked (clams only) and homogenized in a clean laboratory at Eurofins Calscience Laboratories.

Tissue Chemistry

Methods and reporting limits used for the tissue analyses are provided in Table 5. The tissues were extracted and analyzed between January 16 and January 24, 2018. The results were reported in wet weight unless noted otherwise.

Statistical Evaluations

Statistical analysis of experimental data was performed for each of the bioassay and bioaccumulation assessments. Tests of fundamental data assumptions (e.g., normality and variance homogeneity) were performed followed by the appropriate parametric or non-parametric analyses in accordance with the ITM and OTM.

Experiment-wide survival data from species bioassays were analyzed using one-way analysis of variance (ANOVA). Multiple comparison t-tests were then used to compare survival in each of the test sediments against survival in control sediment and reference sediment for normally distributed data. Wilcoxon Rank Sum Two Samples tests were run on non-normally distributed data. Prior to analyses, normality was evaluated with the Shapiro-Wilk test and homogeneity of variance was assessed with either Bartlett's Test or the F-Test. When necessary to satisfy these assumptions, proportional survival data were arcsine square-root transformed. Solid-phase statistical analyses were performed with CETIS® Version 1.9.2 statistical software.

Statistical analyses of all bioassay species and reference toxicant data were also performed using CETIS® Version 1.9.2 software. Comparisons between the dilution water and each test concentration were performed using either the equal variance two sample t-test or the Dunnett's Multiple Comparison test if data displayed homogenous variance and a normal distribution. Data with heterogeneous variance, or non-normal distributions were analyzed using Steel's Many-One Rank Sum test. Normality was evaluated with the Shapiro-Wilk test and homogeneity of variance was assessed with the Bartlett test, the F-Test or the Levene test.

Bioaccumulation assessment of tissues for two species and the three analytes detected in the tissues were analyzed statistically. Copper, mercury, and total PCBs were analyzed for *Nereis* and just copper and total PCBs were analyzed for *Macoma*. The Area A and Area B composite samples were analyzed against the LA-5 reference sediments and a control sediments when the composite means were higher than the reference means.

Analysis of the bioaccumulation from this set of tissue data generally followed the recommendations outlined in the OTM Section 13, Statistical Analysis for the 28-day dredged sediments vs. "reference" scenario. The statistical program NCSS version 12 (http://www.ncss.com) was used to find test site vs. reference differences. The procedure for Two-Sample T-Tests was used on data without non-detected (ND) concentrations. This NCSS module produces both parametric and non-parametric output that includes normality, variance homogeneity, and distribution testing along with the hypothesis results in a single report. The null hypothesis in this case assumes that the test sites are not significantly greater than the reference category, so it is a one-way probability layout ($p \leq 0.05$). In cases where non-detected data occurred in 50% or less of the samples, the logrank test with equal weighing can be used. Where more than 50% of the samples were NDs, hypothesis testing would not be performed because results are considered to be unreliable. The logrank test compares parametrically or by randomization techniques two survival curves generated by nonparametric Kaplan-Meier methods.

When NDs were absent, the reported results were used, this also includes J flagged values. Non-detected or left-censored tissue data occurred only for *Macoma* total PCBs. The reference site LA-5 contained 80% NDs (one detected value) while the control data contained 60% (two detected values). Dealing with left-censored values in a tissue data set requires special handling procedures (see: Helsel, 2005, 2006, 2009, 2012, Singh et al., 2006). Initially, the detection limits (MDLs) are applied to all data marked as NDs. The goal with censored data analysis is to avoid analyzing substituted data with the applied MDLs. To do this, a new variable is created where data are separately coded with a detection indicator value of ones and zeros so that detected data (1s) can be clearly distinguished from NDs (0s). Hypothesis testing of censored data is based on the use of the new indicator variable and the Kaplan-Meier cumulative proportion data that are created. However, because the logrank test is only valid for data with NDs less than or equal to 50%, no hypothesis testing on *Macoma* tissues for total PCBs was conducted.

The USEPA-sponsored statistical software package, ProUCL Version 5.2 for Environmental Applications for Datasets with and without ND observations (https://www.epa.gov/land-research/proucl-software) was used to generate the 95% confidence limits (LCLs & UCLs) for each parameter mean for all sites. ProUCL also derived estimated total PCB confidence limits for the *Macoma* control tissue with 60% NDs present but these limits are questionable due to only two detected values being present. Confidence limits for the *Macoma* reference data could not be estimated because only one valid data point existed. Determining 95% confidence limits allows the LCLs of the test sites to be statistically compared with the UCL of the reference and control for overlap or to an Action Level (as suggested by the OTM).

4.0 RESULTS

Physical, chemical and biological testing results of the South Bay Channel sediments are summarized in Tables 7 through 22 below. Tables do not include analytical quality assurance/quality control (QA/QC) data. Complete analytical results including all associated QA/QC data are provided in Appendix D. All biological QA/QC data are provided in Appendix E, and a complete set of physical results with grain size plots are included in Appendix G.

4.1 Sediment Physical Results

Grain Size analyses were performed on multiple layers from each of the 16 cores collected. The laboratory physical grain size testing results for each core and each individual layer are provided in Table 7. The laboratory sieve analysis results for the nearshore placement area samples are provided in Table 8. Table 9 provides a summary of calculated weighted averages for all 18 vibratory boreholes as well as for each of the two chemical composite areas as provided by USACE, Los Angeles District as part of their beach compatibility analysis (appendix B). The two composite averages provided represent the average overall physical gradation size for all eight vibracore borehole locations from amongst each of the two chemical composite areas. Due to an oversight, there are no grain size data for the LA-5 reference site. Individual grain size distribution curves for each individual grain size sample are provided in Appendix G along with plasticity index plots and hydrometer data for a select number of samples.

4.2 Sediment Chemistry Results

A summary of the sediment chemical testing results for the South Bay Channel composite samples and LA-5 reference sample are provided in Table 10. A summary of the individual core analyses from four locations are provided in Table 11. Included in Tables 10 and 11 are screening values consisting of NOAA ERL and ERM values and human health criteria for residential and industrial settings consisting of RSLs and CHHSLs. Any testing values that exceed any of these screening values are highlighted. Concentrations that exceed ERL values are bolded red. There were no concentrations that exceeded an ERM value. Table cells shaded in blue are for data that exceed the LA-5 reference concentration or the method detection limit by a factor of 1.2. Table cells shaded in orange are for data that exceed one or more human health screening values. Estimated values between the method detection limits and reporting limits were considered real values for the purpose of these comparisons.

Data contained in Tables 10 and 11 are often coded. Values that were not detected above the method detection limit were assigned a "<" prefix symbol. Values estimated between the MDL and RL were tagged with a "J". A "J" code may also indicate an estimated value due to QC data for that value being outside of certain QC objectives. Definitions of all other symbols are described in the QA/QC report in Appendix H and in table footnotes.

4.3 Solid Phase Bioassay Results

Replicate and mean survival for the 10-day acute solid phase bioassays conducted on the South Bay Channel composite samples as well as the LA-5 reference sample are provided in Table 12 for *Leptochirus plumulosus* and Table 13 for *Neanthes arenaceodentata.* Initial sediment porewater measurements for the reference and composite samples are provided in Table 14. Initial ammonia and sulfide levels were below levels expected to cause toxicity.

4.4 Suspended Particulate Phase (SPP) Bioassay Results

Standard elutriate SPP bioassay results for the South Bay Channel composite samples are summarized in Tables 15 through 17. Mean percent survival and normal development data and supporting replicate data for the 48-hour bivalve larvae SPP bioassays using the larvae of *Mytilus galloprovincialis* are provided in Table 15 along with estimated EC_{50} and LC_{50} values. Mean survival results and supporting replicate data for the mysid shrimp (*Americamysis bahia*) 96-hour acute SPP bioassays along with calculated LC_{50} values are presented in Table 16. Mean survival results and supporting replicate data for the juvenile fish (*Menidia beryllina)* 96-hour acute SPP bioassays along with calculated LC_{50} values are presented in Table 17. All tables for all three species include results for each replicate exposure to 100%, 50%, 10%, and 1% elutriate concentrations along with a 0% site water concentration.

4.5 Bioaccumulation Results

Survival data for the 28-day bioaccumulation exposures are presented in Table 18. Results of the *Macoma nasuta* tissue analyses are presented in Table 19, and the results of the *Nereis virens* tissue analyses are presented in Table 20. Mean values were determined by substituting non-detected values according to the Kaplan-Meier cumulative proportion method. Tissue qualification codes are the same as those for the sediment samples.

Tissue burden statistical results are provided in Table 21 for *Macoma* and and Table 22 for *Nereis* for those analytes detected in the tissues. Lipid normalized results were used in statistical testing if a positive relationship could be found beween lipid and contaminant concentration. This was only evident for total PCBs in *Nereis* tissues. Mean concentrations in cells shaded green indicate statistically significant differences with mean reference tissue concentrations. Mean concentrations in cells shaded blue indicate statistically significant differences with mean reference and control tissue concentrations.

Table 7. San Diego Harbor South Bay Channel Sieve Analysis Data and Atterberg Limits.

Core Designation	Elevation (ft. MLLW)		Gravel*				Coarse Sand			Medium Sand			Fine Sand			Silt/Clay			Atterberg Limits		Classification
			Sieve No. / Sieve Size / % Passing																		
			3/4*	3/8	4	7	10	14	18	25	35	45	60	80	120	170	200	230	LL	PI	
	Top	Bottom	19mm	9.5mm	4.75mm	2.80mm	2.00mm	1.40mm	1.00mm	0.71mm	0.50mm	0.355mm	0.250mm	0.180mm	0.125mm	0.090mm	0.075mm	0.063mm			
										Area A											
SDHVC-17-SB-06	-31.3	-33.7	100	100	100	100	100	100	100	100	100	99	99	95	80	61	57	54	46	16	SANDY LEAN CLAY (CL)
SDHVC-17-SB-06	-33.7	-37	100	100	100	100	100	100	100	99	99	98	95	80	38	10	7	5			POORLY GRADED SAND WITH SILT (SP-SM)
SDHVC-17-SB-07	-31	-34.2	100	100	100	100	100	100	100	100	100	100	99	97	87	72	68	64	52	19	SANDY FAT CLAY (CH)
SDHVC-17-SB-07	-34.2	-37	100	100	100	100	99	99	99	99	99	98	93	73	27	6	4	3			POORLY GRADED SAND (SP)
SDHVC-17-SB-08	-33.4	-37	100	100	100	100	100	100	100	100	100	100	98	93	78	65	62	60	50	19	SANDY FAT CLAY (CH)
SDHVC-17-SB-09	-34.8	-37	100	100	100	99	99	99	99	98	98	97	94	88	71	60	58	56	52	18	SANDY FAT CLAY (CH)
SDHVC-17-SB-10	-32.4	-35.4	100	100	100	100	100	100	100	100	100	99	98	94	81	68	65	62	51	18	SANDY FAT CLAY (CH)
SDHVC-17-SB-10	-35.4	-37	100	100	100	100	100	100	99	99	98	96	90	69	30	16	14	13			SILTY SAND (SM)
SDHVC-17-SB-11	-35.2	-37	100	100	100	99	99	99	99	99	98	96	94	86	59	46	44	42	41	16	CLAYEY SAND (SC)
SDHVC-17-SB-12	-33.6	-37	100	100	100	100	100	100	100	100	100	100	99	96	82	71	68	66	60	21	SANDY FAT CLAY (CH)
SDHVC-17-SB-13	-33.2	-36	100	100	100	100	100	100	100	100	100	99	99	98	95	90	88	87	63	23	FAT CLAY (CH)
SDHVC-17-SB-13	-36	-37	100	100	100	100	100	100	100	99	99	99	99	94	50	23	19	16			SILTY SAND (SM)
										Area B											
SDHVC-17-SB-01	-31	-34.6	100	100	100	100	100	100	100	99	99	98	96	92	84	77	75	72	56	19	FAT CLAY WITH SAND (CH)
SDHVC-17-SB-01	-34.6	-35.6	100	100	100	100	100	100	99	99	97	93	87	74	43	22	18	15			SILTY SAND (SM)
SDHVC-17-SB-01	-35.6	-37	100	100	100	100	99	97	94	89	82	70	57	41	23	13	10	8			POORLY GRADED SAND WITH SILT (SP-SM)
SDHVC-17-SB-02	-32.6	-35.1	100	100	100	100	100	100	100	100	100	100	99	97	94	88	86	83	67	21	FAT CLAY (CH)
SDHVC-17-SB-02	-35.1	-37	100	100	100	100	100	100	100	100	100	99	98	89	52	22	14	9			SILTY SAND (SM)
SDHVC-17-SB-03	-31.8	-35.3	100	100	100	100	100	100	100	100	100	100	100	99	96	91	88	85	62	22	FAT CLAY (CH)
SDHVC-17-SB-03	-35.3	-37	100	100	100	100	100	99	99	99	99	98	95	78	31	12	8	6			POORLY GRADED SAND WITH SILT (SP-SM)
SDHVC-17-SB-04	-33.7	-35	100	100	100	100	100	100	100	100	100	100	99	95	84	70	66	62	51	17	SANDY FAT CLAY (CH)
SDHVC-17-SB-04	-35	-37	100	100	100	100	100	100	100	100	99	96	93	76	28	12	10	8			POORLY GRADED SAND WITH SILT (SP-SM)
SDHVC-17-SB-05	-33.6	-36.1	100	100	100	100	100	100	100	100	100	100	99	98	93	84	81	78	54	19	FAT CLAY WITH SAND (CH)
SDHVC-17-SB-05	-36.1	-37	100	100	100	100	100	100	99	99	99	97	96	92	52	28	25	23			SILTY SAND (SM)
SDHVC-17-SB-14	-33.9	-35.9	100	100	100	100	100	100	100	100	99	98	97	93	75	60	57	54	55	20	SANDY FAT CLAY (CH)
SDHVC-17-SB-14	-35.9	-37	100	100	100	99	99	99	99	99	99	98	97	87	36	13	11	10			POORLY GRADED SAND WITH SILT (SP-SM)
SDHVC-17-SB-15	-33.9	-37	100	100	99	99	98	98	97	95	92	83	72	58	25	16	15	14			SILTY SAND (SM)
SDHVC-17-SB-16	-30.6	-35.6	100	99	98	97	97	96	96	94	93	87	82	73	61	53	51	49	43	17	SANDY LEAN CLAY (CL)
SDHVC-17-SB-16	-35.6	-36.8	100	100	100	100	100	100	99	99	97	91	78	52	22	10	8	6			POORLY GRADED SAND WITH SILT (SP-SM)
SDHVC-17-SB-16	-36.8	-37	98	96	93	89	85	80	74	67	59	50	43	36	29	23	21	19			SILTY SAND (SM)

*All material passed through sieve sizes greater than 19 mm.

Table 8. Coronado Beach/Silver Strand Nearshore Sites Sieve Analysis Data.

Grab ID	Water Depth (ft)	Fine Gravel*					Coarse Sand		Medium Sand				Fine Sand						Silt	Atterberg Limits		Soil Classification
		Sieve No./Sieve Size/% Passing																				
		1.5"	1"	3/4"	3/8"	4	7	10	14	18	25	35	45	60	80	120	170	200	230			
		38.1 mm	25.4 mm	19 mm	9.5 mm	4.75 mm	2.38 mm	2 mm	1.41 mm	1.0 mm	0.71 mm	0.50 mm	0.35 mm	0.25 mm	0.18 mm	0.125 mm	0.09 mm	0.075 mm	0.063 mm	LL	PL	
North Nearshore Area Reference Samples																						
SSBNSN-17-01	-29.9	100	100	100	100	100	100	100	99	99	98	96	92	90	87	74	45	30	18			SILTY SAND (SM)
SSBNSN-17-02	-28.8	100	100	100	100	100	100	100	100	100	100	100	100	99	97	80	46	35	28			SILTY SAND (SM)
SSBNSN-17-03	-28.7	100	100	100	100	100	100	100	100	100	99	98	95	90	81	45	18	12	7			POORLY GRADED SAND WITH SILT (SP-SM)
SSBNSN-17-04	-26.6	100	100	100	100	100	100	100	100	100	100	100	99	97	94	84	61	51	42			SANDY SILT (ML)
SSBNSN-17-05	-26.6	100	100	100	100	100	100	100	100	100	100	99	98	94	84	53	26	19	12			SILTY SAND (SM)
SSBNSN-17-06	-26.5	100	100	100	100	100	100	100	100	100	100	99	98	92	75	40	15	11	9			SILTY SAND (SM)
SSBNSN-17-07	-26.5	100	100	100	100	100	100	100	100	99	99	98	95	90	76	39	13	8	5			POORLY GRADED SAND WITH SILT (SP-SM)
SSBNSN-17-08	-26.4	100	100	100	100	100	100	100	100	100	99	99	97	92	73	21	5	5	4			SILTY SAND (SM)
SSBNSN-17-09	-25.3	100	100	100	100	100	100	100	100	100	100	99	98	95	70	19	4	3	2			POORLY GRADED SAND (SP)
SSBNSN-17-10	-24.3	100	100	100	100	100	100	100	100	100	99	99	98	95	80	26	5	3	2			POORLY GRADED SAND (SP)
SSBNSN-17-11	-24.2	100	100	100	100	100	100	100	100	100	100	99	99	96	75	25	6	4	3			POORLY GRADED SAND (SP)
South Nearshore Area Reference Samples																						
SSBNSS-17-01	-32.1	100	100	100	100	100	100	100	100	100	100	100	99	98	94	47	26	21	15			SILTY SAND (SM)
SSBNSS-17-02	-33.1	100	100	100	100	100	100	100	100	100	100	100	99	99	96	54	29	21	15			SILTY SAND (SM)
SSBNSS-17-03	-31.1	100	100	100	100	100	100	100	100	99	99	99	98	98	96	61	35	25	16			SILTY SAND (SM)
SSBNSS-17-04	-32.1	100	100	100	100	100	100	100	100	100	100	99	99	99	97	62	27	18	14			SILTY SAND (SM)
SSBNSS-17-05	-29.1	100	100	100	100	100	100	100	100	100	100	99	99	99	97	66	36	26	15			SILTY SAND (SM)
SSBNSS-17-06	-29.1	100	100	100	100	100	100	100	100	100	100	99	99	98	96	54	28	20	15			SILTY SAND (SM)
SSBNSS-17-07	-26.2	100	100	100	100	100	100	100	100	100	100	100	99	99	96	55	34	26	19			SILTY SAND (SM)
SSBNSS-17-08	-16.2	100	100	100	100	100	100	100	100	100	100	99	99	98	95	53	26	18	14			SILTY SAND (SM)
SSBNSS-17-09	-14.4	100	100	100	100	100	100	100	100	100	100	100	99	99	96	54	25	17	10			SILTY SAND (SM)
SSBNSS-17-10	-17.4	100	100	100	100	100	100	100	100	100	100	99	99	99	97	61	22	15	12			SILTY SAND (SM)
SSBNSS-17-11	-20.4	100	100	100	100	99	99	99	99	98	98	98	97	97	94	57	23	16	12			SILTY SAND (SM)

Table 9. San Diego Harbor South Bay Channel Composite and Individual Vibracore Physical Beach Compatibility Calculations/Results for Placement at Coronado Beach/Silver Strand North and South Placement Sites.

Vibracore ID	Composite Area/Dredge Footprint	Fine Gravel*					Coarse Sand		Medium Sand				Fine Sand							Silt
		Sieve No./Sieve Size/% Passing																		
		1.5"	1"	3/4"	3/8"	4	7	10	14	18	25	35	45	60	80	120	170	200	230
		38.1 mm	25.4 mm	19 mm	9.5 mm	4.75 mm	2.38 mm	2 mm	1.41 mm	1.0 mm	0.71 mm	0.50 mm	0.35 mm	0.25 mm	0.18 mm	0.125 mm	0.09 mm	0.075 mm	0.063 mm
Individual Grain Size Weighted Average for SDHVC-17-SB-01	Area B	100	100	100	100	100	100	100	99	98	97	94	91	85	77	63	53	50	48
Individual Grain Size Weighted Average for SDHVC-17-SB-02		100	100	100	100	100	100	100	100	100	100	100	99	98	94	76	59	55	51
Individual Grain Size Weighted Average for SDHVC-17-SB-03		100	100	100	100	100	100	100	100	100	100	100	99	98	92	75	65	62	59
Individual Grain Size Weighted Average for SDHVC-17-SB-04		100	100	100	100	100	100	100	100	100	100	99	98	95	84	50	34	32	30
Individual Grain Size Weighted Average for SDHVC-17-SB-05		100	100	100	100	100	100	100	100	100	100	99	99	98	96	82	69	66	63
Individual Grain Size Weighted Average for SDHVC-17-SB-14		100	100	100	100	100	100	100	99	99	99	99	98	97	91	61	43	44	39
Individual Grain Size Weighted Average for SDHVC-17-SB-15		100	100	100	100	99	99	98	98	97	96	92	83	72	58	25	16	15	14
Individual Grain Size Weighted Average for SDHVC-17-SB-16		100	99	100	99	98	98	97	96	96	94	92	87	80	68	52	44	42	40
Composite Area B Weighted Average Grain Size for Locations SDHVC-17-SB-01 to SDHVC-17S-SB-05 and SDHVC-17-SB-14 to SDHVC-17-SB-16		100	100	100	100	100	100	100	100	100	99	99	99	97	89	67	52	49	47
Individual Grain Size Weighted Average for SDHVC-17-SB-06	Area A	100	100	100	100	100	100	100	100	100	100	99	99	97	87	56	32	28	26
Individual Grain Size Weighted Average for SDHVC-17-SB-07		100	100	100	100	100	100	100	100	100	100	99	99	96	85	59	41	38	36
Individual Grain Size Weighted Average for SDHVC-17-SB-08		100	100	100	100	100	100	100	100	100	100	100	100	98	93	78	65	62	60
Individual Grain Size Weighted Average for SDHVC-17-SB-09		100	100	100	100	100	99	99	99	99	98	98	97	94	88	71	60	58	56
Individual Grain Size Weighted Average for SDHVC-17-SB-10		100	100	100	100	100	100	100	100	100	99	99	98	95	85	63	50	47	45
Individual Grain Size Weighted Average for SDHVC-17-SB-11		100	100	100	100	100	100	100	100	100	100	99	96	94	86	59	46	44	42
Individual Grain Size Weighted Average for SDHVC-17-SB-12		100	100	100	100	100	100	100	100	100	100	100	100	99	96	82	71	68	66
Individual Grain Size Weighted Average for SDHVC-17-SB-13		100	100	100	100	100	100	100	100	100	100	99	99	99	97	83	73	70	68
Composite Area A Weighted Average Grain Size for Locations SDHVC-17-SB-06 to SDHV-17-SB-13		100	100	100	100	100	99	99	99	98	98	97	94	90	82	62	50	47	44

Table 10. 2017 San Diego Harbor South Bay Channel Composite Bulk Sediment Chemistry Results.

Valid Analyte Name	Units	South Bay Channel Composite Samples (SDHVC-17-SB-)		LA-5 Ref.	NOAA Screening		Human RSLs[2] (HQ = 0.1)		Human CHHSLs[3]	
		A	B		Salt ERL[1]	Salt ERM[1]	Residential	Industrial	Residential	Commercial Industrial
CONVENTIONAL CONSTITUENTS										
Percent Solids	%	58.7	61.5	73.6						
Total Volatile Solids	%	2.1	1.9	1.7						
Total Organic Carbon	%	0.38	0.052J	1.2						
Oil and Grease	mg/kg dry	45	43	<11						
TRPH	mg/kg dry	34	16	<11						
Total Ammonia	mg/kg dry	1.4	1.8	0.38						
METALS										
Arsenic	mg/kg dry	6.13	4.61	4.38	8.2	70	0.68	3.0	0.07	0.24
Cadmium	mg/kg dry	0.286	0.229	0.184	1.2	9.6	7.1	98	1.7	7.5
Chromium	mg/kg dry	35.8	46.1	27.3	81	370			100,000	1,000,000
Copper	mg/kg dry	**123**	**113**	4.38	34	270	310	4,700	3,000	38,000
Lead	mg/kg dry	27.4	17.9	3.63	46.7	218	400	800	150	3,500
Mercury	mg/kg dry	**0.249**	0.125	0.012J	0.15	0.71	1.1	4.6	18	180
Nickel	mg/kg dry	9.41	17.5	8.16	20.9	51.6	150	2,200	1,600	16,000
Selenium	mg/kg dry	0.638	0.295	0.412			39	580	380	4,800
Silver	mg/kg dry	0.757	0.451	<0.0425	1	3.7	39	580	380	4,800
Zinc	mg/kg dry	**164J+**	124J+	40.8J+	150	410	2,300	35,000	23,000	100,000
BUTYLTINS										
Monobutyltin	µg/kg dry	<2.3	<2.2	<1.8						
Dibutyltin	µg/kg dry	24	8.9	<0.96			1,900	25,000		
Tributyltin	µg/kg dry	<2.5	<2.3	<2			1,900	25,000		
Tetrabutyltin	µg/kg dry	<1.2	<1.2	<0.98						
PAH's										
1-Methylnaphthalene	µg/kg dry	<1.8	<1.7	<1.5			18,000	73,000		
1-Methylphenanthrene	µg/kg dry	<3.3	<3.1	<2.7						
1,6,7-Trimethylnaphthalene	µg/kg dry	<3	<2.8	<2.4						
2,6-Dimethylnaphthalene	µg/kg dry	6.3J	4.1J	3J						
2-Methylnaphthalene	µg/kg dry	<2.8	<2.6	<2.2	70	670	24,000	300,000		
Acenaphthene	µg/kg dry	<2.6	<2.4	<2.1	16	500	360,000	4,500,000		
Acenaphthylene	µg/kg dry	14J	4.4J	<2.3	44	640				
Anthracene	µg/kg dry	23	9.7J	<2.6	85.3	1100	1,800,000	23,000,000		

Table 10 Continued. 2017 San Diego Harbor South Bay Channel Composite Bulk Sediment Chemistry Results.

Valid Analyte Name	Units	South Bay Channel Composite Samples (SDHVC-17-SB-)		LA-5 Ref.	NOAA Screening		Human RSLs[2] (HQ = 0.1)		Human CHHSLs[3]	
		A	B		Salt ERL[1]	Salt ERM[1]	Residential	Industrial	Residential	Commercial Industrial
Benzo (a) Anthracene	µg/kg dry	25	13J	<1.9	261	1600	1,100	21,000		
Benzo (a) Pyrene	µg/kg dry	120	46	<1.9	430	1600	110	2,100	38	130
Benzo (b) Fluoranthene	µg/kg dry	140	50	<1.9			1,100	21,000		
Benzo (e) Pyrene	µg/kg dry	64	29	<2.3						
Benzo (g,h,i) Perylene	µg/kg dry	63	27	<2.1						
Benzo (k) Fluoranthene	µg/kg dry	120	45	<2			11,000	210,000		
Biphenyl	µg/kg dry	<3.2	<3	<2.6						
Chrysene	µg/kg dry	39	19	<1.8	384	2800	110,000	2,100,000		
Dibenz (a,h) Anthracene	µg/kg dry	13J	<2.3	<2	63.4	260	110	2,100		
Dibenzothiophene	µg/kg dry	<2.3	<2.2	<1.8			78,000	1,200,000		
Fluoranthene	µg/kg dry	31	18	4.2J	600	5100	240,000	3,000,000		
Fluorene	µg/kg dry	<2.8	<2.6	<2.2	19	540	240,000	3,000,000		
Indeno (1,2,3-c,d) Pyrene	µg/kg dry	75	29	<1.8			1,100	21,000		
Naphthalene	µg/kg dry	<2.6	<2.5	<2.1	160	2100	3,800	17,000		
Perylene	µg/kg dry	15J	9.1J	<1.6						
Phenanthrene	µg/kg dry	18	9.1J	<2.4	240	1500				
Pyrene	µg/kg dry	48	28	3.7J	665	2600	180,000	2,300,000		
Total Low Weight PAHs	µg/kg dry	61.3	27.3	3	552	3160				
Total High Weight PAHs	µg/kg dry	753	313	7.9	1700	9600				
Total PAHs	µg/kg dry	814	340	10.9	4022	44792				
PHTHALATES										
Benzyl butyl phthalate	µg/kg dry	39J	24J	15J			290,000	1,200,000		
bis-(2-Ethylhexyl)phthalate	µg/kg dry	140	55J	26J			39,000	160,000		
Diethyl phthalate	µg/kg dry	<2.7	<2.6	3.9J			5,100,000	66,000,000		
Dimethyl phthalate	µg/kg dry	<3.4	<3.2	<2.7			780,000	12,000,000		
Di-n-butyl phthalate	µg/kg dry	160	47J	32J			630,000	8,200,000		
Di-n-octyl phthalate	µg/kg dry	<3.2	<3	<2.6			63,000	820,000		
PHENOLS										
2,3,4,6-Tetrachlorophenol	µg/kg dry	<6.6	<6.2	<5.3			190,000	2,500,000		
2,4,5-Trichlorophenol	µg/kg dry	<2	<1.9	<1.6			630,000	8,200,000		
2,4,6-Trichlorophenol	µg/kg dry	<2.2	<2.1	<1.8			6,300	82,000		

Table 10 Continued. 2017 San Diego Harbor South Bay Channel Composite Bulk Sediment Chemistry Results.

Valid Analyte Name	Units	South Bay Channel Composite Samples (SDHVC-17-SB-)		LA-5 Ref.	NOAA Screening		Human RSLs[2] (HQ = 0.1)		Human CHHSLs[3]	
		A	B		Salt ERL[1]	Salt ERM[1]	Residential	Industrial	Residential	Commercial Industrial
2,4-Dichlorophenol	µg/kg dry	<2.9	<2.7	<2.3			19,000	250,000		
2,4-Dimethylphenol	µg/kg dry	<4.4	<4.1	<3.5			130,000	1,600,000		
2,4-Dinitrophenol	µg/kg dry	<100	<96	<81			13,000	160,000		
2,6-Dichlorophenol	µg/kg dry	<3.6	<3.4	<2.9						
2-Chlorophenol	µg/kg dry	<3.1	<3	<2.5			39,000	580,000		
2-Methylphenol	µg/kg dry	<3.3	<3.1	<2.7						
2-Nitrophenol	µg/kg dry	<2.8	<2.7	<2.3						
3/4-Methylphenol	µg/kg dry	<6.1	<5.8	<4.9						
4,6-Dinitro-2-Methylphenol	µg/kg dry	<110	<110	<90						
4-Chloro-3-Methylphenol	µg/kg dry	<3.5	<3.3	<2.8						
4-Nitrophenol	µg/kg dry	<140	<130	<110						
Bisphenol A	µg/kg dry	<3.5	<3.3	<2.8			320,000	4,100,000		
Pentachlorophenol	µg/kg dry	<2.2	<2.1	<1.8			1,000	4,000	4,400	13,000
Phenol	µg/kg dry	<3.9	<3.7	<3.1			1,900,000	25,000,000		
ORGANOCHLORINE PESTICIDES										
2,4'-DDD	µg/kg dry	<0.13	<0.12	<0.1						
2,4'-DDE	µg/kg dry	<0.059	<0.057	<0.047						
2,4'-DDT	µg/kg dry	<0.1	<0.1	<0.083						
4,4'-DDD	µg/kg dry	**4.9**	**2.9**	2.0	2	20	2,300	9,600	2,300	9,000
4,4'-DDE	µg/kg dry	<0.068	<0.065	<0.054	2.2	27	2,000	9,300	1,600	6,300
4,4'-DDT	µg/kg dry	**2.1**	**3.1**	**2.4**	1	7	1,900	8,500	1,600	6,300
Total DDT	µg/kg dry	**7.0**	**6.0**	**4.4**	1.58	46.1				
Aldrin	µg/kg dry	<0.064	<0.061	<0.051			39	180	33	130
BHC-alpha	µg/kg dry	<0.097	<0.093	<0.077			86	360		
BHC-beta	µg/kg dry	<0.11	<0.11	<0.09			300	1,300		
BHC-delta	µg/kg dry	<0.16	<0.15	<0.12						
BHC-gamma	µg/kg dry	<0.064	<0.061	<0.051			570	2,500		
Chlordane-alpha	µg/kg dry	<0.11	<0.11	<0.089						
Chlordane-gamma	µg/kg dry	<0.09	<0.086	<0.072						
Chlordane (Technical)	µg/kg dry	<8.7	<8.4	<7			1,700	7,700	430	1,700
Dieldrin	µg/kg dry	<0.18	<0.17	<0.14			34	140	35	130
Endosulfan Sulfate	µg/kg dry	<0.17	<0.17	<0.14						

Table 10 Continued. 2017 San Diego Harbor South Bay Channel Composite Bulk Sediment Chemistry Results.

Valid Analyte Name	Units	South Bay Channel Composite Samples (SDHVC-17-SB-)		LA-5 Ref.	NOAA Screening		Human RSLs[2] (HQ = 0.1)		Human CHHSLs[3]	
		A	B		Salt ERL[1]	Salt ERM[1]	Residential	Industrial	Residential	Commercial Industrial
Endosulfan I	µg/kg dry	<0.097	<0.093	<0.077			47,000	700,000		
Endosulfan II	µg/kg dry	<0.15	<0.15	<0.12						
Endrin	µg/kg dry	<0.095	<0.091	<0.076			1,900	25,000	21,000	230,000
Endrin Aldehyde	µg/kg dry	<0.17	<0.16	<0.13						
Endrin Ketone	µg/kg dry	<0.093	<0.090	<0.074						
Heptachlor	µg/kg dry	<0.086	<0.083	<0.069			130	630	130	520
Heptachlor Epoxide	µg/kg dry	<0.074	<0.071	<0.059			70	330		
Methoxychlor	µg/kg dry	<0.11	<0.11	<0.090			32,000	410,000	340,000	3,800,000
Mirex	µg/kg dry	<0.066	<0.063	<0.053			36	170	31	120
Toxaphene	µg/kg dry	<15	<14	<12			490	2,100	460	1,800
Trans-nonachlor	µg/kg dry	<0.072	<0.069	<0.058						
Total Chlordane	µg/kg dry	ND	ND	ND	0.5	6	1,700	7,700		
PCB CONGENERS										
PCB018	µg/kg dry	<0.11	<0.1	<0.087						
PCB028	µg/kg dry	<0.12	<0.11	<0.093						
PCB037	µg/kg dry	<0.1	<0.098	<0.081						
PCB044	µg/kg dry	<0.26	<0.25	<0.2						
PCB049	µg/kg dry	1.1	0.56	<0.066						
PCB052	µg/kg dry	1.5	0.56	<0.25						
PCB066	µg/kg dry	1.6	0.87	<0.17						
PCB070	µg/kg dry	0.8	0.5	<0.096						
PCB074	µg/kg dry	<0.15	<0.15	<0.12						
PCB077	µg/kg dry	<0.19	<0.19	<0.15			38	160		
PCB081	µg/kg dry	<0.15	<0.15	<0.12			12	48		
PCB087	µg/kg dry	<0.19	<0.18	<0.15						
PCB099	µg/kg dry	3.9	2.2	<0.063						
PCB101	µg/kg dry	4.7	2.0	<0.059						
PCB105	µg/kg dry	<0.09	<0.086	<0.072			120	490		
PCB110	µg/kg dry	3.7	1.8	<0.045						
PCB114	µg/kg dry	<0.12	<0.12	<0.099			120	500		
PCB118	µg/kg dry	4.0	1.5	<0.046			120	490		
PCB119	µg/kg dry	<0.1	<0.1	<0.084						

Table 10 Continued. 2017 San Diego Harbor South Bay Channel Composite Bulk Sediment Chemistry Results.

Valid Analyte Name	Units	South Bay Channel Composite Samples (SDHVC-17-SB-)		LA-5 Ref.	NOAA Screening		Human RSLs[2] (HQ = 0.1)		Human CHHSLs[3]	
		A	B		Salt ERL[1]	Salt ERM[1]	Residential	Industrial	Residential	Commercial Industrial
PCB123	µg/kg dry	<0.12	<0.12	<0.098			120	490		
PCB126	µg/kg dry	<0.092	<0.088	<0.074			0.036	0.15		
PCB128	µg/kg dry	<0.2	<0.19	<0.16						
PCB132/153	µg/kg dry	8.3	3.7	<0.22						
PCB138/158	µg/kg dry	6.3	2.3	<0.47						
PCB149	µg/kg dry	5.4	2.1	<0.16						
PCB151	µg/kg dry	1.6	<0.14	<0.12						
PCB156	µg/kg dry	<0.13	<0.12	<0.1			120	500		
PCB157	µg/kg dry	1.5	<0.14	<0.11			120	500		
PCB167	µg/kg dry	<0.22	<0.21	<0.18			120	510		
PCB168	µg/kg dry	<0.24	<0.23	<0.19						
PCB169	µg/kg dry	<0.11	<0.1	<0.087			0.12	0.51		
PCB170	µg/kg dry	2.1	0.85	<0.15						
PCB177	µg/kg dry	1.5	0.69	<0.16						
PCB180	µg/kg dry	3.7	1.2	<0.12						
PCB183	µg/kg dry	1.1	0.36	<0.13						
PCB187	µg/kg dry	3.2	1.3	<0.14						
PCB189	µg/kg dry	<0.11	<0.1	<0.086			130	520		
PCB194	µg/kg dry	<0.12	<0.12	<0.099						
PCB201	µg/kg dry	<0.057	<0.055	<0.046						
PCB206	µg/kg dry	<0.19	<0.19	<0.16						
Total PCB Congeners	µg/kg dry	**56**	22.5	ND	22.7	180	230	940	89	300
PYRETHROIDS										
Allethrin	µg/kg dry	<0.42	<0.41	<0.33						
Bifenthrin	µg/kg dry	<0.51	<0.49	<0.4						
cis-/trans-Permethrin	µg/kg dry	<0.84	<0.81	<0.67						
Cyfluthrin	µg/kg dry	<0.42	<0.41	<0.33						
Cypermethrin	µg/kg dry	<0.42	<0.41	<0.33						
Deltamethrin:Tralomethrin	µg/kg dry	<0.42	<0.41	<0.33						
Esfenvalerate:Fenvalerate	µg/kg dry	<0.42	<0.41	<0.33						
Fenpropathrin	µg/kg dry	<0.42	<0.41	<0.33						
Fluvalinate	µg/kg dry	<0.42	<0.41	<0.33						

Table 10 Continued. 2017 San Diego Harbor South Bay Channel Composite Bulk Sediment Chemistry Results.

Valid Analyte Name	Units	South Bay Channel Composite Samples (SDHVC-17-SB-)		LA-5 Ref.	NOAA Screening		Human RSLs[2] (HQ = 0.1)		Human CHHSLs[3]	
		A	B		Salt ERL[1]	Salt ERM[1]	Residential	Industrial	Residential	Commercial Industrial
Lambda-Cyhalothrin	µg/kg dry	<0.42	<0.41	<0.33						
Phenothrin	µg/kg dry	<0.42	<0.41	<0.33						
Resmethrin:Bioresmethrin	µg/kg dry	<0.72	<0.69	<0.57						
Tetramethrin	µg/kg dry	<0.51	<0.49	<0.4						
ERM Quotient		0.10	0.07	0.01						

1. Effects Range Low (ERL) and Effects Range Median (ERM) sediment quality objectives from Long *et al.* (1995).
2. Regional Screening Levels for Chemical Contaminants at Superfund Sites" (USEPA Region 9, updated 2017).
3. California Human Health Screening Levels for Soil (Cal/EPA, 2005).

Bolded values exceed ERL values.
Bolded and underlined values exceed ERM values.
Orange shaded values exceed one or more of the corresponding human health values.
Blue shaded values are > 1.2 times LA-2 reference concentrations.

< = Not detected at the corresponding Method Detection Limit.
ND= Not Detected
J = Estimated between the Reporting Limit and the Method Detection Limit.
J- = Possible underestimation of a value.

Table 11. 2017 San Diego Harbor Individual Core Sediment Chemistry Results.

Valid Analyte Name	Units	SDHVC-16-SB-				LA-5 Ref.	NOAA Screening		Human RSLs[2]		Human CHHSLs[3]	
		04	06	07	15		Salt ERL[1]	Salt ERM[1]	Residential	Industrial	Residential	Commercial Industrial
SEDIMENT CONVENTIONALS												
Percent Solids	%	62.2	67.5	56.9	70.8	73.6						
Total Volatile Solids	%	10	14	11	10	1.7						
Total Organic Carbon	%	0.47	0.3	0.72	0.22	1.2						
Oil and Grease	mg/kg dry	75	120	140	99	<11						
TRPH	mg/kg dry	21	49	82	47	<11						
Total Ammonia	mg/kg dry	0.9	1.5	2	0.79	0.38						
METALS												
Arsenic	mg/kg dry	4.7	2.09	7.38	3.09	4.38	8.2	70	0.68	3.0	0.07	0.24
Cadmium	mg/kg dry	0.129J	0.103J	0.22	0.0904J	0.184	1.2	9.6	7.1	98	1.7	7.5
Chromium	mg/kg dry	25.9	9.46	41.9	14.6	27.3	81	370			100,000	100,000
Copper	mg/kg dry	**65.3**	13.2	**123**	**43.2**	4.38	34	270	310	4,700	3,000	38,000
Lead	mg/kg dry	17.7	4.12	36.2	9.83	3.63	46.7	218	400	800	80	320
Mercury	mg/kg dry	0.113	0.115	**0.338**	0.114	0.012J	0.15	0.71	1.1	4.6	18	180
Nickel	mg/kg dry	7.69	2.98	11.2	4.48	8.16	20.9	51.6	150	2,200	1,600	16,000
Selenium	mg/kg dry	0.314	0.39	0.541	0.263	0.412			39	580	380	4,800
Silver	mg/kg dry	0.537	0.207	**1.16**	0.35	<0.0425	1	3.7	39	580	380	4,800
Zinc	mg/kg dry	99.7	25.5	**161**	55.8	40.8J+	150	410	2,300	35,000	23,000	100,000
BUTYLTINS												
Monobutyltin	µg/kg dry	<2.2	<2	<2.4	<1.9	<1.8						
Dibutyltin	µg/kg dry	6.1	10	12	2.4J	<0.96			1,900	25,000		
Tributyltin	µg/kg dry	<2.3	<2.2	<2.6	<2	<2			1,900	25,000		
Tetrabutyltin	µg/kg dry	<1.2	<1.1	<1.3	<1	<0.98						
PAH's												
1-Methylnaphthalene	µg/kg dry	<1.7	<1.6	<1.8	<1.5	<1.5			18,000	73,000		
1-Methylphenanthrene	µg/kg dry	<3.1	<2.9	<3.4	<2.7	<2.7						
2,3,5-Trimethylnaphthalene	µg/kg dry	<2.8	<2.6	<3	<2.4	<2.4						
2,6-Dimethylnaphthalene	µg/kg dry	<3.4	<3.1	5.2J	3.1J	3J						
2-Methylnaphthalene	µg/kg dry	<2.6	<2.4	3.2J	<2.3	<2.2	70	670	24,000	300,000		
Acenaphthene	µg/kg dry	<2.4	<2.2	<2.6	<2.1	<2.1	16	500	360,000	4,500,000		
Acenaphthylene	µg/kg dry	3J	4.4J	11J	5.1J	<2.3	44	640				
Anthracene	µg/kg dry	4.1J	5.1J	15J	7.1J	<2.6	85.3	1100	1,800,000	23,000,000		
Benzo (a) Anthracene	µg/kg dry	11J	11J	25	14	<1.9	261	1600	1,100	21,000		
Benzo (a) Pyrene	µg/kg dry	31	37	93	46	<1.9	430	1600	110	2,100	38	130

Table 11 Continued. 2017 San Diego Harbor Individual Core Sediment Chemistry Results

Valid Analyte Name	Units	SDHVC-16-SB-				LA-5 Ref.	NOAA Screening		Human RSLs[2]		Human CHHSLs[3]	
		04	06	07	15		Salt ERL[1]	Salt ERM[1]	Residential	Industrial	Residential	Commercial Industrial
Benzo (b) Fluoranthene	µg/kg dry	43	43	110	55	<1.9			1,100	21,000		
Benzo (e) Pyrene	µg/kg dry	21	20	47	28	<2.3						
Benzo (g,h,i) Perylene	µg/kg dry	22	31	62	28	<2.1						
Benzo (k) Fluoranthene	µg/kg dry	30	38	87	45	<2			11,000	210,000		
Biphenyl	µg/kg dry	<3	<2.8	<3.3	<2.6	<2.6			4,700	20,000		
Chrysene	µg/kg dry	11J	16	39	18	<1.8	384	2800	110,000	2,100,000		
Dibenz (a,h) Anthracene	µg/kg dry	4.9J	5.9J	27	12J	<2	63.4	260	110	2,100		
Dibenzothiophene	µg/kg dry	<2.2	<2	<2.3	<1.9	<1.8			78,000	1,200,000		
Fluoranthene	µg/kg dry	15J	13J	30	20	4.2J	600	5100	240,000	3,000,000		
Fluorene	µg/kg dry	<2.6	<2.4	<2.8	<2.3	<2.2	19	540	240,000	3,000,000		
Indeno (1,2,3-c,d) Pyrene	µg/kg dry	24	30	68	33	<1.8			1,100	21,000		
Naphthalene	µg/kg dry	<2.5	<2.3	4.3J	2.2J	<2.1	160	2100	3,800	17,000		
Perylene	µg/kg dry	5.5J	4.8J	13J	8.1J	<1.6						
Phenanthrene	µg/kg dry	4.8J	4.8J	13J	5.9J	<2.4	240	1500				
Pyrene	µg/kg dry	17	15J	38	24	3.7J	665	2600	180,000	2,300,000		
Total Low Weight PAHs	µg/kg dry	12	14.3	43.3	20.3	3	552	3160				
Total High Weight PAHs	µg/kg dry	235	265	639	331	7.9	1700	9600				
Total PAHs	µg/kg dry	247	279	682	351	10.9	4022	44792				
PHTHALATES												
Bis(2-Ethylhexyl) Phthalate	µg/kg dry	80U	73U	87U	69U	26J			39,000	160,000		
Butyl Benzyl Phthalate	µg/kg dry	80U	73U	87U	69U	15J			290,000	1,200,000		
Diethyl Phthalate	µg/kg dry	<2.6	<2.4	<2.8	<2.2	3.9J			5,100,000	66,000,000		
Dimethyl Phthalate	µg/kg dry	<3.2	<2.9	<3.5	<2.8	<2.7			780,000	12,000,000		
Di-n-Butyl Phthalate	µg/kg dry	80U	73U	87U	69U	32J			630,000	8,200,000		
Di-n-Octyl Phthalate	µg/kg dry	<3	<2.8	<3.3	<2.6	<2.6			63,000	820,000		
PHENOLS												
2,3,4,6-Tetrachlorophenol	µg/kg dry	<6.3	<5.7	<6.7	<5.4	<5.3			190,000	2,500,000		
2,4,5-Trichlorophenol	µg/kg dry	<2	<1.8	<2.1	<1.7	<1.6			630,000	8,200,000		
2,4,6-Trichlorophenol	µg/kg dry	<2.1	<1.9	<2.3	<1.8	<1.8			6,300	82,000		
2,4-Dichlorophenol	µg/kg dry	<2.7	<2.5	<2.9	<2.4	<2.3			19,000	250,000		
2,4-Dimethylphenol	µg/kg dry	<4.2	<3.8	<4.5	<3.6	<3.5			130,000	1,600,000		
2,4-Dinitrophenol	µg/kg dry	<96	<88	<100	<83	<81			13,000	160,000		
2,6-Dichlorophenol	µg/kg dry	<3.4	<3.1	<3.7	<3	<2.9						
2-Chlorophenol	µg/kg dry	<3	<2.7	<3.2	<2.6	<2.5			39,000	580,000		
2-Methyl-4,6-Dinitrophenol	µg/kg dry	<110	<97	<110	<92	<90						

Table 11 Continued. 2017 San Diego Harbor Individual Core Sediment Chemistry Results

Valid Analyte Name	Units	SDHVC-16-SB-				LA-5 Ref.	NOAA Screening		Human RSLs[2]		Human CHHSLs[3]	
		04	06	07	15		Salt ERL[1]	Salt ERM[1]	Residential	Industrial	Residential	Commercial Industrial
2-Methylphenol	µg/kg dry	<3.2	<2.9	<3.4	<2.7	<2.7			320,000	4,100,000		
2-Nitrophenol	µg/kg dry	<2.7	<2.5	<2.9	<2.3	<2.3						
3/4-Methylphenol	µg/kg dry	<5.8	<5.3	<6.3	<5	<4.9						
4-Chloro-3-Methylphenol	µg/kg dry	<3.3	<3	<3.6	<2.9	<2.8						
4-Nitrophenol	µg/kg dry	<130	<120	<140	<110	<110						
Bisphenol A	µg/kg dry	16U	15U	17U	14U	<2.8			320,000	4,100,000		
Pentachlorophenol	µg/kg dry	<2.1	<1.9	<2.3	<1.8	<1.8			1,000	4,000	4,400	13,000
Phenol	µg/kg dry	<3.7	<3.4	<4	<3.2	<3.1			1,900,000	25,000,000		
CHLORINATED PESTICIDES												
2,4'-DDD	µg/kg dry	<0.12	<0.11	<0.13	<0.11	<0.1						
2,4'-DDE	µg/kg dry	<0.055	<0.052	<0.061	<0.049	<0.047						
2,4'-DDT	µg/kg dry	<0.098	<0.092	<0.11	<0.087	<0.083						
4,4'-DDD	µg/kg dry	<0.063	<0.059	<0.07	<0.056	**2.0**	2	20	190	2,500	2,300	9,000
4,4'-DDE	µg/kg dry	<0.064	<0.06	<0.071	<0.057	<0.054	2.2	27	2,000	9,300	1,600	6,300
4,4'-DDT	µg/kg dry	<0.083	<0.078	<0.092	<0.074	**2.4**	1	7	1,900	8,500	1,600	6,300
Total DDT	µg/kg dry	ND	ND	ND	ND	**4.4**	1.58	46.1				
Aldrin	µg/kg dry	<0.06	<0.056	<0.066	<0.053	<0.051			39	180	33	130
BHC-alpha	µg/kg dry	<0.091	<0.085	<0.1	<0.081	<0.077			86	360		
BHC-beta	µg/kg dry	<0.11	<0.099	<0.12	<0.095	<0.09			300	1,300		
BHC-delta	µg/kg dry	<0.15	<0.14	<0.16	<0.13	<0.12						
BHC-gamma (Lindane)	µg/kg dry	<0.054	<0.051	<0.06	<0.048	<0.046			570	2,500		
Chlordane-alpha	µg/kg dry	<0.11	<0.099	<0.12	<0.094	<0.089						
Chlordane-gamma	µg/kg dry	<0.084	<0.079	<0.093	<0.075	<0.072						
Chlordane (Technical)	µg/kg dry	<8.5	<7.7	<9.1	<7.3	<7			1,700	7,700	430	1,700
Cis-nonachlor	µg/kg dry	<0.08	<0.075	<0.089	<0.071	<0.068						
Dieldrin	µg/kg dry	<0.17	<0.16	<0.19	<0.15	<0.14	0.02	8	34	140	35	130
Endosulfan Sulfate	µg/kg dry	<0.16	<0.15	<0.18	<0.15	<0.14						
Endosulfan I	µg/kg dry	<0.091	<0.085	<0.1	<0.081	<0.077			47,000	700,000		
Endosulfan II	µg/kg dry	<0.14	<0.13	<0.16	<0.13	<0.12						
Endrin	µg/kg dry	<0.089	<0.083	<0.099	<0.079	<0.076		45	1,900	25,000	21,000	230,000
Endrin Aldehyde	µg/kg dry	<0.16	<0.15	<0.17	<0.14	<0.13						
Endrin Ketone	µg/kg dry	<0.087	<0.082	<0.097	<0.078	<0.074						
Heptachlor	µg/kg dry	<0.081	<0.076	<0.09	<0.072	<0.069			130	630	130	520
Heptachlor Epoxide	µg/kg dry	<0.07	<0.065	<0.078	<0.062	<0.059			70	330		
Methoxychlor	µg/kg dry	<0.11	<0.099	<0.12	<0.095	<0.090			32,000	410,000	340,000	3,800,000

Table 11 Continued. 2017 San Diego Harbor Individual Core Sediment Chemistry Results

Valid Analyte Name	Units	SDHVC-16-SB-				LA-5 Ref.	NOAA Screening		Human RSLs[2]		Human CHHSLs[3]	
		04	06	07	15		Salt ERL[1]	Salt ERM[1]	Residential	Industrial	Residential	Commercial Industrial
Mirex	ug/kg dry	<0.062	<0.058	<0.069	<0.055	<0.053			36	170	31	120
Oxychlordane	ug/kg dry	<0.11	<0.11	<0.13	<0.1	<0.098						
Toxaphene	ug/kg dry	<14	<13	<16	<12	<12			490	2,100	460	1,800
Trans-nonachlor	ug/kg dry	<0.068	<0.063	<0.075	<0.06	<0.058						
Total Chlordane	ug/kg dry	ND	ND	ND	ND	ND	0.5	6	1,700	7,700	430	1,700
PCB CONGENERS												
PCB018	µg/kg dry	<0.1	<0.096	<0.11	<0.091	<0.087						
PCB028	µg/kg dry	<0.11	<0.1	<0.12	<0.098	<0.093						
PCB037	µg/kg dry	<0.096	<0.089	<0.11	<0.085	<0.081						
PCB044	µg/kg dry	<0.24	<0.22	0.76	<0.21	<0.2						
PCB049	µg/kg dry	0.62	0.62	0.93	0.23J	<0.066						
PCB052	µg/kg dry	0.49	0.47	0.95	0.31	<0.25						
PCB066	µg/kg dry	0.63	0.68	1.5	0.43	<0.17						
PCB070	µg/kg dry	<0.11	0.4	0.97	0.23J	<0.096						
PCB074	µg/kg dry	<0.14	<0.13	<0.16	0.29	<0.12						
PCB077	µg/kg dry	<0.18	<0.17	0.78	<0.16	<0.15			38	160		
PCB081	µg/kg dry	<0.14	<0.13	<0.16	<0.13	<0.12			12	48		
PCB087	µg/kg dry	<0.18	0.59	<0.2	<0.16	<0.15						
PCB099	µg/kg dry	1.3	1.4	3.2	1	<0.063						
PCB101	µg/kg dry	1.6	1.8	3.8	1.1	<0.059						
PCB105	µg/kg dry	<0.084	0.34	1.7	<0.075	<0.072			120	490		
PCB110	µg/kg dry	1.1	1	2.5	0.72	<0.045						
PCB114	µg/kg dry	<0.12	<0.11	<0.13	<0.1	<0.099			120	500		
PCB118	µg/kg dry	1.2	1.7	3.3	0.85	<0.046			120	490		
PCB119	µg/kg dry	<0.099	<0.092	<0.11	<0.088	<0.084						
PCB123	µg/kg dry	<0.11	<0.11	0.64	<0.1	<0.098			120	490		
PCB126	µg/kg dry	<0.087	<0.081	<0.096	<0.077	<0.074			0.036	0.15		
PCB128	µg/kg dry	<0.19	0.51	0.94	<0.17	<0.16						
PCB132/153	µg/kg dry	2.9	4.2	8.2	2.3	<0.22						
PCB138/158	µg/kg dry	1.9	2.6	4.7	0.97	<0.47						
PCB149	µg/kg dry	1.5	2.3	4.3	1.1	<0.16						
PCB151	µg/kg dry	<0.14	0.71	1.2	<0.12	<0.12						
PCB156	µg/kg dry	<0.12	<0.11	<0.14	<0.11	<0.1			120	500		
PCB157	µg/kg dry	<0.13	<0.13	<0.15	<0.12	<0.11			120	500		
PCB167	µg/kg dry	<0.21	<0.2	<0.23	<0.19	<0.18			120	510		

Table 11 Continued. 2017 San Diego Harbor Individual Core Sediment Chemistry Results

Valid Analyte Name	Units	SDHVC-16-SB-				LA-5 Ref.	NOAA Screening		Human RSLs[2]		Human CHHSLs[3]	
		04	06	07	15		Salt ERL[1]	Salt ERM[1]	Residential	Industrial	Residential	Commercial Industrial
PCB168	µg/kg dry	<0.22	<0.21	<0.25	<0.2	<0.19						
PCB169	µg/kg dry	<0.1	<0.096	<0.11	<0.092	<0.087			0.12	0.51		
PCB170	µg/kg dry	<0.17	0.7	1.6	<0.16	<0.15						
PCB177	µg/kg dry	<0.19	0.6	1.1	<0.16	<0.16						
PCB180	µg/kg dry	1	1.7	3.6	<0.13	<0.12						
PCB183	µg/kg dry	<0.15	0.51	0.81	<0.13	<0.13						
PCB187	µg/kg dry	0.8	1.6	2.6	0.61	<0.14						
PCB189	µg/kg dry	<0.1	<0.095	<0.11	<0.09	<0.086			130	520		
PCB194	µg/kg dry	<0.12	0.86	1.2	<0.1	<0.099						
PCB201	µg/kg dry	<0.054	<0.05	<0.06	<0.048	<0.046						
PCB206	µg/kg dry	<0.18	<0.17	<0.2	<0.16	<0.16						
Total PCB Congeners	µg/kg dry	15.0	**25.3**	**51.3**	10.1	ND	22.7	180	230	940	89	300
PYRETHROIDS												
Allethrin	µg/kg dry	<0.39	<0.37	<0.44	<0.35	<0.33						
Bifenthrin	µg/kg dry	<0.47	<0.44	<0.52	<0.42	<0.4			95,000	1,200,000		
Cyfluthrin	µg/kg dry	<0.39	<0.37	<0.44	<0.35	<0.33			160,000	2,100,000		
Cyhalothrin-lambda	µg/kg dry	<0.39	<0.37	<0.44	<0.35	<0.33			6,300	82,000		
Cypermethrin	µg/kg dry	<0.39	<0.37	<0.44	<0.35	<0.33			380,000	4,900,000		
Deltamethrin/Tralomethrin	µg/kg dry	<0.39	<0.37	<0.44	<0.35	<0.33			47,000	620,000		
Esfenvalerate/Fenvalerate	µg/kg dry	<0.39	<0.37	<0.44	<0.35	<0.33			160,000	2,100,000		
Fenpropathrin	µg/kg dry	<0.39	<0.37	<0.44	<0.35	<0.33			160,000	2,100,000		
Fluvalinate	µg/kg dry	<0.39	<0.37	<0.44	<0.35	<0.33			63,000	820,000		
Phenothrin (Sumithrin)	µg/kg dry	<0.39	<0.37	<0.44	<0.35	<0.33						
Permethrin (cis/trans)	µg/kg dry	<0.79	<0.74	<0.87	<0.7	<0.67			320,000	4,100,000		
Resmethrin/Bioresmethrin	µg/kg dry	<0.67	<0.63	<0.74	<0.6	<0.57			190,000	2,500,000		
Tetramethrin	µg/kg dry	<0.47	<0.44	<0.52	<0.42	<0.4						
ERM Quotient		0.05	0.03	0.1	0.04	0.01						

1. Effects Range Low (ERL) and Effects Range Median (ERM) sediment quality objectives from Buchman (2008) and Long *et al.* (1995).
2. Regional Screening Levels for Chemical Contaminants at Superfund Sites" (USEPA Region 9, updated 2016).
3. California Human Health Screening Levels for Soil (Cal/EPA, 2005).

Red values exceed ERL values.
Red underlined values exceed ERM values.
Green shaded values exceeds one or more of the corresponding human health values.
ND = Not Detected
< = Not detected at the corresponding Method Detection Limit.
J = Estimated between the Reporting Limit and the Method Detection Limit.
U = Sample is ND at the RL due to a method blank detection.

Table 12. Survival Results for the 10-day *Leptochirus plumulosus* Bioassays.

Sample ID	Rep	# Alive Out of 20	% Survival	Mean % Survival
Lab Control	A	20	100	97
	B	20	100	
	C	19	95	
	D	20	100	
	E	18	90	
LA5	A	19	95	94
	B	20	100	
	C	18	90	
	D	18	90	
	E	19	95	
SDHVC-17-A	A	20	100	100
	B	20	100	
	C	20	100	
	D	20	100	
	E	20	100	
SDHVC-17-B	A	19	95	98
	B	20	100	
	C	20	100	
	D	20	100	
	E	19	95	

Reference toxicant bioassay results show that the test organisms responded to toxic stress in a typical fashion (see Section 6.3).

Table 13. Survival Results for the 10-day *Neanthes arenaceodentata* Bioassays.

Sample ID	Rep	# Alive Out of 10	% Survival	Mean % Survival
Lab Control	A	10	100	100
	B	10	100	
	C	10	100	
	D	10	100	
	E	10	100	
LA5	A	10	100	100
	B	10	100	
	C	10	100	
	D	10	100	
	E	10	100	
SDHVC-17-A	A	10	100	100
	B	10	100	
	C	10	100	
	D	10	100	
	E	10	100	
SDHVC-17-B	A	10	100	100
	B	10	100	
	C	10	100	
	D	10	100	
	E	10	100	

Reference toxicant bioassay results show that the test organisms responded to toxic stress in a typical fashion (see Section 6.3).

Table 14. Sediment Porewater Initial Water Quality Characteristics for the Bioassay Test Sediments.

Sample ID	pH	Salinity (ppt)	Total Ammonia (mg/L N)	Total Sulfide (mg/L)
LA5	7.74	33.5	2.64	0.34
SDHVC-17-A	7.71	35.3	9.32	0.03
SDHVC-17-B	7.68	35.3	9.84	0.04

NM = Measurements not made due to lack of porewater volume.

Table 15. Replicate and Mean Survival and Normal Development Results and Median Effective and Lethal Concentrations for the Suspended Particulate-Phase 48-Hour Toxicity Tests Using *Mytilus galloprovincialis* Larvae.

Elutriate Concentrations	Percent Survival at 48 Hours						LC_{50} (%)	Percent Normal Development at 48 Hours						EC_{50} (%)
	Rep A	Rep B	Rep C	Rep D	Rep E	Mean		Rep A	Rep B	Rep C	Rep D	Rep E	Mean	
SDHVC-17-A														
Lab Control	91.6	94.7	84.2	90.0	92.1	87.2	>100[1]	97.2	98.4	98.8	98.8	98.9	98.2	>100[1]
Salt Control	86.0	100	82.1	95.8	98.9	92.7		98.2	100	99.4	97.8	98.4	98.8	
Site Water	84.7	93.2	80.0	94.7	100	90.5		90.8	99.4	98.1	93.3	96.7	97.2	
1%	91.6	100	100	90.5	95.3	95.5		99.4	99.5	99.0	100	98.9	99.4	
10%	85.3	81.1	83.7	78.9	94.7	84.7		98.8	97.5	98.8	98.7	98.9	98.5	
50%	84.7	89.5	87.9	94.2	93.2	89.9		98.8	100	97.1	98.4	98.3	98.5	
100%	84.7	84.7	91.1	85.8	95.3	88.3		97.6	98.2	98.3	98.0	97.8	98.1	
SDHVC-17-B														
Lab Control	86.8	100	77.4	82.1	100	89.3	>100[1]	98.2	97.9	99.3	99.4	90.0	98.6	>100[1]
Salt Control	86.0	100	82.1	95.8	98.9	92.7		98.2	100	99.4	97.8	98.4	98.8	
Site Water	84.7	93.2	80.0	94.7	100	90.5		90.8	99.4	98.1	93.3	96.7	97.2	
1%	92.1	85.3	76.8	92.6	92.1	87.8		90.9	97.0	99.3	98.9	98.9	98.6	
10%	89.5	76.3	90.4	91.6	85.8	88.3		96.6	98.0	98.4	98.9	99.4	98.2	
50%	95.8	85.8	84.7	97.4	100	92.7		98.9	98.8	99.4	98.4	99.0	98.9	
100%	95.8	86.3	100	74.2	77.9	86.8		98.4	97.6	99.0	100	96.1	98.2	

Reference toxicant bioassay results show that the test organisms responded to toxic stress in a typical fashion (see Section 6.3).

[1] Due to the absence of significant impairment, the LC_{50} and EC_{50} could not be calculated but can be determined by inspection to be >100% elutriate.

Table 16. Replicate and Mean Survival Results and Median Lethal Concentrations for the 96-Hour Acute Suspended Particulate-Phase Toxicity Tests Using *Americamysis bahia.*

Elutriate Concentrations	Percent Survival at 96 Hours						LC_{50} (%)
	Rep A	Rep B	Rep C	Rep D	Rep E	Mean	
SDHVC-17-A							
Lab Control	100	100	100	100	100	100	>100[1]
Site Water	100	100	100	100	100	100	
1%	100	100	100	100	100	100	
10%	100	100	90	100	100	98	
50%	100	100	90	100	100	98	
100%	90	100	100	100	100	98	
SDHVC-17-B							
Lab Control	80	100	100	100	100	96	>100[1]
Site Water	100	100	100	100	100	100	
1%	100	100	100	100	100	100	
10%	100	100	100	100	100	100	
50%	100	100	100	100	100	100	
100%	100	100	100	100	80	97.8[2]	

Reference toxicant bioassay results show that the test organisms responded to toxic stress in a typical fashion (see Section 6.3).
[1] Due to the absence of significant impairment, the LC_{50} could not be calculated but can be determined by inspection to be >100% elutriate.
[2] One mysid dried to the side of the beaker above water line and was removed from statistical analysis.

Table 17. Replicate and Mean Survival Results and Median Lethal Concentrations for the 96-Hour Acute Suspended Particulate-Phase Toxicity Tests Using *Menidia beryllina.*

Elutriate Concentrations	Percent Survival at 96 Hours						LC_{50} (%)
	Rep A	Rep B	Rep C	Rep D	Rep E	Mean	
SDHVC-17-A							
Lab Control	90	90	100	90	90	92	>100[1]
Site Water	70	100	100	90	100	92	
1%	100	90	90	90	90	92	
10%	100	80	90	90	100	92	
50%	100	90	100	90	100	96	
100%	100	90	90	90	90	92	
SDHVC-17-B							
Lab Control	80	90	100	100	90	92	>100[1]
Site Water	70	100	100	90	100	92	
1%	100	90	90	100	100	96	
10%	90	100	100	100	90	96	
50%	90	100	100	100	90	96	
100%	90	100	100	100	90	96	

Reference toxicant bioassay results show that the test organisms responded to toxic stress in a typical fashion (see Section 6.3).
[1] Due to the absence of significant impairment, the LC50 could not be calculated but can be determined by inspection to be >100% elutriate.

Table 18. Clam and Polychaete Survival for the South Bay Channel Bioaccumulation Exposures.

Site	*Macoma nasuta*		*Nereis virens*	
	% Survival/Rep	Mean % Survival	% Survival/Rep	Mean % Survival
Lab Control	95	98	100	100
	100		100	
	95		100	
	100		100	
	100		100	
LA-5 Reference	100	99	100	100
	100		100	
	100		100	
	100		100	
	95		100	
SDHVC-17-A	100	98	100	100
	95		100	
	95		100	
	100		100	
	100		100	
SDHVC-17-B	100	98	100	98
	100		100	
	100		100	
	90		100	
	100		90	

Table 19. Bioaccumulation Potential Replicate and Mean Tissue Results for *Macoma nasuta* Exposed to San Diego Harbor South Bay Channel, LA-5 Reference and Control Sediments.

Analyte	Composite Replicate and Mean Concentrations for *Macoma nasuta* Tissues																								
	SDHVC-17-A						SDHVC-17-B						LA-5 Ref						CONTROL						T0
	A	B	C	D	E	Mean	A	B	C	D	E	Mean	A	B	C	D	E	Mean	A	B	C	D	E	Mean	
Percent Lipids	0.31	0.39	0.43	0.34	0.27	0.35	0.51	0.36	0.33	0.26	0.32	0.36	0.29	0.4	0.25	0.35	0.29		0.36	0.29	0.44	0.36	0.52	0.39	0.46
Metals (mg/kg, wet)																									
Copper	2.61	2.41	3.66	3.17	2.36	**2.84**	3.17	3.46	2.73	2.7	2.09	**2.83**	2.06	2.32	1.43	2.15	1.07	1.81	1.84	1.83	1.84	1.88	2.09	1.90	1.89
Mercury	<0.00352	<0.00359	<0.00356	<0.00336	<0.00352	ND	<0.00342	<0.00342	<0.00356	<0.00336	<0.00336	ND	<0.00339	<0.00336	<0.00371	<0.00371	<0.00359	ND	<0.00367	<0.00371	<0.00349	<0.00371	<0.00339	ND	<0.00336
Butyltins (µg/kg, wet)																									
Monobutyltin	<1.4	<1.4	<1.4	<1.4	<1.4		<1.4	<1.4	<1.4	<1.4	<1.4		<1.4	<1.4	<1.4	<1.4	<1.4		<1.4	<1.4	<1.4	<1.4	<1.4		<1.4
Dibutyltin	<0.72	<0.72	<0.73	<0.72	<0.73		<0.73	<0.73	<0.72	<0.73	<0.72		<0.72	<0.72	<0.72	<0.72	<0.73		<0.72	<0.73	<0.73	<0.72	<0.72		<0.73
Tributyltin	<1.5	<1.5	<1.5	<1.5	<1.5		<1.5	<1.5	<1.5	<1.5	<1.5		<1.5	<1.5	<1.5	<1.5	<1.5		<1.5	<1.5	<1.5	<1.5	<1.5		<1.5
Tetrabutyltin	<0.74	<0.74	<0.74	<0.74	<0.74	ND	<0.74	<0.74	<0.74	<0.74	<0.74	ND	<0.74	<0.74	<0.74	<0.74	<0.74	ND	<0.74	<0.74	<0.74	<0.74	<0.74	ND	<0.74
OC Pesticides (µg/kg, wet)																									
2,4'-DDD	<0.076	<0.076	<0.076	<0.076	<0.076		<0.076	<0.076	<0.076	<0.076	<0.076		<0.076	<0.076	<0.076	<0.076	<0.076		<0.076	<0.076	<0.076	<0.076	<0.076		<0.076
2,4'-DDE	<0.035	<0.035	<0.035	<0.035	<0.035		<0.035	<0.035	<0.035	<0.035	<0.035		<0.035	<0.035	<0.035	<0.035	<0.035		<0.035	<0.035	<0.035	<0.035	<0.035		<0.035
2,4'-DDT	<0.062	<0.062	<0.062	<0.062	<0.062		<0.062	<0.062	<0.062	<0.062	<0.062		<0.062	<0.062	<0.062	<0.062	<0.062		<0.062	<0.062	<0.062	<0.062	<0.062		<0.062
4,4'-DDD	<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	<0.04	<0.04	<0.04	<0.04		<0.04
4,4'-DDE	<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	<0.04	<0.04	<0.04	<0.04		<0.04
4,4'-DDT	<0.052	<0.052	<0.053	<0.052	<0.053		<0.053	<0.053	<0.052	<0.052	<0.053		<0.052	<0.052	<0.053	<0.052	<0.052		<0.052	<0.053	<0.053	<0.053	<0.053		<0.052
Total DDT's	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB Congeners (µg/kg, wet)																									
PCB018	<0.071	<0.071	<0.071	<0.071	<0.071		<0.071	<0.071	<0.071	<0.071	<0.071		<0.071	<0.071	<0.071	<0.071	<0.071		<0.071	<0.071	<0.071	<0.071	<0.071		<0.071
PCB028	<0.033	<0.033	<0.034	<0.034	<0.034		<0.034	<0.034	<0.033	<0.033	<0.034		<0.033	<0.033	<0.034	<0.033	<0.033		<0.033	<0.034	<0.034	<0.034	<0.034		<0.033
PCB037	<0.06	<0.06	<0.06	<0.06	<0.06		<0.06	<0.06	<0.06	<0.06	<0.06		<0.06	<0.06	<0.06	<0.06	<0.06		<0.06	<0.06	<0.06	<0.06	<0.06		<0.06
PCB044	<0.086	<0.086	<0.087	<0.087	<0.087		<0.087	<0.087	<0.086	<0.086	<0.087		<0.086	<0.086	<0.087	<0.086	<0.086		<0.086	<0.087	<0.087	<0.087	<0.087		<0.086
PCB049	0.33	0.31	0.43	0.29	0.25	0.32	0.38	0.21	0.37	0.28	0.27	0.30	<0.11	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11		<0.11
PCB052	0.38	0.34	0.4	0.31	0.21	0.33	0.45	<0.063	0.4	0.31	0.32	0.37	<0.062	<0.062	<0.063	<0.062	<0.062		<0.062	<0.063	<0.063	<0.063	<0.063		<0.062
PCB066	0.38	0.35	0.65	0.4	0.38	0.43	0.64	0.3	0.44	0.38	0.37	0.43	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		<0.1
PCB070	<0.059	<0.059	0.22	0.22	<0.06	0.22	0.37	<0.06	<0.059	<0.059	<0.06	0.37	<0.059	<0.059	<0.06	<0.059	<0.059		<0.059	<0.06	<0.06	<0.06	<0.06		<0.059
PCB074	<0.086	<0.086	<0.087	<0.087	<0.087		<0.087	<0.087	<0.086	<0.086	<0.087		<0.086	<0.086	<0.087	<0.086	<0.086		<0.086	<0.087	<0.087	<0.087	<0.087		<0.086
PCB077	<0.077	<0.077	<0.078	<0.078	<0.078		<0.078	<0.078	<0.077	<0.077	<0.078		<0.077	<0.077	<0.078	<0.077	<0.077		<0.077	<0.078	<0.078	<0.078	<0.078		<0.077
PCB081	<0.12	<0.12	<0.12	<0.12	<0.12		<0.12	<0.12	<0.12	<0.12	<0.12		<0.12	<0.12	<0.12	<0.12	<0.12		<0.12	<0.12	<0.12	<0.12	<0.12		<0.12
PCB087	<0.11	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11		<0.11
PCB099	0.87	0.82	1.1	0.96	0.61	0.87	1.2	0.51	0.98	0.77	0.73	0.84	<0.06	<0.06	<0.061	<0.06	<0.06		<0.06	<0.061	<0.061	<0.061	<0.061		<0.06
PCB101	0.99	0.93	1.2	1.2	0.77	1.0	1.4	0.57	1.1	0.82	0.81	0.94	<0.097	<0.097	<0.098	0.38	<0.097	0.38	<0.097	<0.098	<0.098	<0.098	<0.098		<0.097
PCB105	<0.054	<0.054	<0.055	<0.055	<0.055		<0.055	<0.055	<0.054	<0.054	<0.055		<0.054	<0.054	<0.055	<0.054	<0.054		<0.054	<0.055	<0.055	<0.055	<0.055		<0.054
PCB110	0.7	0.63	0.93	0.77	0.54	0.71	1	0.48	0.8	0.57	0.59	0.69	<0.046	<0.046	<0.046	0.26	<0.046	0.26	<0.046	<0.046	<0.046	<0.046	<0.046		<0.046
PCB114	<0.082	<0.082	<0.082	<0.082	<0.082		<0.082	<0.082	<0.082	<0.082	<0.082		<0.082	<0.082	<0.082	<0.082	<0.082		<0.082	<0.082	<0.082	<0.082	<0.082		<0.082
PCB118	0.61	0.57	0.8	0.63	0.48	0.62	0.98	0.41	0.8	0.62	0.6	0.68	<0.084	<0.084	<0.084	0.45	<0.084	0.45	<0.084	<0.084	<0.084	<0.084	<0.084		<0.084
PCB119	<0.094	<0.094	<0.094	<0.094	<0.094		<0.094	<0.094	<0.094	<0.094	<0.094		<0.094	<0.094	<0.094	<0.094	<0.094		<0.094	<0.094	<0.094	<0.094	<0.094		<0.094
PCB123	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		<0.1
PCB126	<0.08	<0.08	<0.08	<0.08	<0.08		<0.08	<0.08	<0.08	<0.08	<0.08		<0.08	<0.08	<0.08	<0.08	<0.08		<0.08	<0.08	<0.08	<0.08	<0.08		<0.08
PCB128	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		<0.1
PCB132/153	1.3	1.3	1.8	1.6	1.1	1.42	2	0.8	1.6	1.3	1.1	1.36	<0.17	<0.17	<0.17	0.39J	<0.17		<0.17	<0.17	0.51	<0.17	0.26J	0.39	<0.17
PCB138/158	1	1	1.2	1.1	0.71	1.0	1.4	0.62	0.95	0.89	0.92	0.96	<0.094	<0.094	<0.094	0.33J	<0.094		<0.094	<0.094	<0.094	<0.094	<0.094		<0.094
PCB149	0.79	0.8	1.1	0.89	0.7	0.86	1.2	0.45	0.95	0.81	0.75	0.83	<0.097	<0.097	<0.098	0.24	<0.097	0.24	<0.097	<0.098	<0.098	<0.098	<0.098		<0.097
PCB151	<0.067	<0.067	<0.067	<0.067	<0.067		<0.067	<0.067	<0.067	<0.067	<0.067		<0.067	<0.067	<0.067	<0.067	<0.067		<0.067	<0.067	<0.067	<0.067	<0.067		<0.067
PCB156	<0.057	<0.057	<0.058	<0.058	<0.058		<0.058	<0.058	<0.057	<0.057	<0.058		<0.057	<0.057	<0.058	<0.057	<0.057		<0.057	<0.058	<0.058	<0.058	<0.058		<0.057
PCB157	<0.052	<0.052	<0.052	<0.052	<0.052		<0.052	<0.052	<0.052	<0.052	<0.052		<0.052	<0.052	<0.052	<0.052	<0.052		<0.052	<0.052	<0.052	<0.052	<0.052		<0.052
PCB167	<0.061	<0.061	<0.062	<0.062	<0.062		<0.062	<0.062	<0.061	<0.061	<0.062		<0.061	<0.061	<0.062	<0.061	<0.061		<0.061	<0.062	<0.062	<0.062	<0.062		<0.061
PCB168	<0.048	<0.048	<0.049	<0.049	<0.049		<0.049	<0.049	<0.048	<0.048	<0.049		<0.048	<0.048	<0.049	<0.048	<0.048		<0.048	<0.049	<0.049	<0.049	<0.049		<0.048

Table 19 Continued. Bioaccumulation Potential Replicate and Mean Tissue Results for *Macoma nasuta* Exposed to San Diego Harbor South Bay Channel, LA-5 Reference and Control Sediments.

Analyte	Composite Replicate and Mean Concentrations for *Macoma nasuta* Tissues																								
	SDHVC-17-A						SDHVC-17-B						LA-5 Ref						CONTROL						T0
	A	B	C	D	E	Mean	A	B	C	D	E	Mean	A	B	C	D	E	Mean	A	B	C	D	E	Mean	
PCB169	<0.061	<0.061	<0.061	<0.061	<0.061		<0.061	<0.061	<0.061	<0.061	<0.061		<0.061	<0.061	<0.061	<0.061	<0.061		<0.061	<0.061	<0.061	<0.061	<0.061		<0.061
PCB170	<0.063	<0.063	<0.063	<0.063	<0.063		<0.063	<0.063	<0.063	<0.063	<0.063		<0.063	<0.063	<0.063	<0.063	<0.063		<0.063	<0.063	<0.063	<0.063	<0.063		<0.063
PCB177	<0.087	<0.087	<0.087	<0.087	<0.087		<0.087	<0.087	<0.087	<0.087	<0.087		<0.087	<0.087	<0.087	<0.087	<0.087		<0.087	<0.087	<0.087	<0.087	<0.087		<0.087
PCB180	<0.042	<0.042	<0.042	<0.042	<0.042		<0.042	<0.042	<0.042	<0.042	<0.042		<0.042	<0.042	<0.042	<0.042	<0.042		<0.042	<0.042	<0.042	<0.042	<0.042		<0.042
PCB183	<0.11	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11		<0.11
PCB187	0.55	0.32	0.5	0.48	0.28	0.43	0.6	0.21	0.53	0.46	0.34	0.43	<0.084	<0.084	<0.084	<0.084	<0.084		<0.084	<0.084	<0.084	<0.084	<0.084		<0.084
PCB189	<0.061	<0.061	<0.061	<0.061	<0.061		<0.061	<0.061	<0.061	<0.061	<0.061		<0.061	<0.061	<0.061	<0.061	<0.061		<0.061	<0.061	<0.061	<0.061	<0.061		<0.061
PCB194	<0.11	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11		<0.11
PCB201	<0.096	<0.096	<0.097	<0.097	<0.097		<0.097	<0.097	<0.096	<0.096	<0.097		<0.096	<0.096	<0.097	<0.096	<0.096		<0.096	<0.097	<0.097	<0.097	<0.097		<0.096
PCB206	<0.19	<0.19	<0.19	<0.19	<0.19		<0.19	<0.19	<0.19	<0.19	<0.19		<0.19	<0.19	<0.19	<0.19	<0.19		<0.19	<0.19	<0.19	<0.19	<0.19		<0.19
Total PCBs	7.9	7.4	10	8.9	6.0	8.1	12	4.6	8.9	7.2	6.8	7.8	ND	ND	ND	2.05	ND	0.56	ND	ND	0.51	ND	0.26J	0.15	ND

Notes:

Values in green shaded cells are non-detected replicate concentrations.

Bolded Values and Blue shaded cells indicate statistically significant differences in mean concentrations between test and LA-5 reference tissues.

J = Estimated value between the method detection limit and reporting limit. A "J" value may also indicate an estimated value due to that value not meeting certain QC objectives.

J+ = A high-biased estimate.

< = Not detected at the method detection limit. ND = not detected.

"U" = not detected at the reporting limit.

Table 20. Bioaccumulation Potential Replicate and Mean Tissue Results for *Nereis virens* Exposed to San Diego Harbor South Bay Channel, LA-5 Reference and Control Sediments.

Analyte	Composite Replicate and Mean Concentrations for *Nereis virens* Tissues																								
	SDHVC-17-A						SDHVC-17-B						LA-5 Ref						CONTROL						T0
	A	B	C	D	E	Mean	A	B	C	D	E	Mean	A	B	C	D	E	Mean	A	B	C	D	E	Mean	
Percent Lipids	0.98	0.91	0.69	1.1	0.96	0.93	0.8	0.62	0.84	0.68	0.62	0.71	1	0.87	0.92	0.89	0.94	0.92	0.77	0.62	0.91	0.79	0.9	0.8	1
Metals (mg/kg, wet)																									
Copper	1.76	1.81	2.61	2.95	2.11	2.25	1.88	N/A	1.80	2.10	1.80	1.90	1.3	1.37	1.36	1.18	1.35	1.31	1.27	1.94	1.41	1.50	1.53	1.53	1.81
Mercury	0.0178	0.0127	0.0172	0.0187	0.0163	0.0165	0.0131	0.0133	0.0219	0.0128	0.0121	0.0146	0.02	0.0153	0.0117	0.0183	0.0137	0.0158	0.0122	0.012	0.0167	0.0038J	0.0166	0.0122	0.0155
Butyltins (µg/kg, wet)																									
Monobutyltin	<1.4	<1.4	<1.4	<1.4	<1.4		<1.4	<1.4	<1.4	<1.4	<1.4		<1.4	<1.4	<1.4	<1.4	<1.4		<1.4	<1.4	<1.4	<1.4	<1.4		<1.4
Dibutyltin	<0.72	<0.73	<0.72	<0.72	<0.73		<0.72	<0.73	<0.73	<0.73	<0.72		<0.73	<0.72	<0.72	<0.73	<0.73		<0.73	<0.73	<0.72	<0.72	<0.72		<0.72
Tributyltin	<1.5	<1.5	<1.5	<1.5	<1.5		<1.5	<1.5	<1.5	<1.5	<1.5		<1.5	<1.5	<1.5	<1.5	<1.5		<1.5	<1.5	<1.5	<1.5	<1.5		<1.5
Tetrabutyltin	<0.74	<0.74	<0.74	<0.74	<0.74	ND	<0.74	<0.74	<0.74	<0.74	<0.74	ND	<0.74	<0.74	<0.74	<0.74	<0.74	ND	<0.74	<0.74	<0.74	<0.74	<0.74	ND	<0.74
OC Pesticides (µg/kg, wet)																									
2,4'-DDD	<0.076	<0.076	<0.076	<0.076	<0.076		<0.075	<0.076	<0.076	<0.076	<0.075		<0.076	<0.076	<0.076	<0.076	<0.076		<0.076	<0.076	<0.076	<0.076	<0.076		<0.076
2,4'-DDE	<0.035	<0.035	<0.035	<0.035	<0.035		<0.035	<0.035	<0.035	<0.035	<0.035		<0.035	<0.035	<0.035	<0.035	<0.035		<0.035	<0.035	<0.035	<0.035	<0.035		<0.035
2,4'-DDT	<0.062	<0.062	<0.062	<0.062	<0.062		<0.062	<0.062	<0.062	<0.062	<0.062		<0.062	<0.062	<0.062	<0.062	<0.062		<0.062	<0.062	<0.062	<0.062	<0.062		<0.062
4,4'-DDD	<0.04	<0.04	<0.04	<0.04	<0.04		<0.039	<0.04	<0.04	<0.04	<0.039		<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	<0.04	<0.04	<0.04	<0.04		<0.04
4,4'-DDE	<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	<0.04	<0.04	<0.04	<0.04		<0.04
4,4'-DDT	<0.052	<0.053	<0.053	<0.052	<0.052		<0.052	<0.053	<0.053	<0.053	<0.052		<0.052	<0.052	<0.052	<0.053	<0.053		<0.053	<0.052	<0.053	<0.053	<0.053		<0.052
Total DDT's	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB Congeners (µg/kg, wet)																									
PCB018	<0.071	<0.071	<0.071	<0.071	<0.071		<0.07	<0.071	<0.071	<0.071	<0.07		<0.071	<0.071	<0.071	<0.071	<0.071		<0.071	<0.071	<0.071	<0.071	<0.071		<0.071
PCB028	<0.033	<0.034	<0.034	<0.033	<0.033		<0.033	<0.034	<0.034	<0.034	<0.033		<0.033	<0.033	<0.033	<0.033	<0.034		<0.034	<0.033	<0.034	<0.034	<0.034		<0.033
PCB037	<0.06	<0.06	<0.06	<0.06	<0.06		<0.06	<0.06	<0.06	<0.06	<0.06		<0.06	<0.06	<0.06	<0.06	<0.06		<0.06	<0.06	<0.06	<0.06	<0.06		<0.06
PCB044	<0.086	<0.087	<0.087	<0.086	<0.086		<0.086	<0.087	<0.087	<0.087	<0.086		<0.086	<0.086	<0.086	<0.086	<0.087		<0.087	<0.086	<0.087	<0.087	<0.087		<0.086
PCB049	<0.11	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11		<0.11
PCB052	0.28	0.23	0.42	0.48	<0.062	0.29	<0.062	<0.063	<0.063	<0.063	<0.062		<0.062	<0.062	<0.062	<0.062	<0.063		<0.063	<0.062	<0.063	<0.063	<0.063		<0.062
PCB066	<0.1	<0.1	<0.1	0.27	<0.1	0.09	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		<0.1
PCB070	<0.059	<0.06	<0.06	<0.059	<0.059		<0.059	<0.06	<0.06	<0.06	<0.059		<0.059	<0.059	<0.059	<0.059	<0.06		<0.06	<0.059	<0.06	<0.06	<0.06		<0.059
PCB074	<0.086	<0.087	<0.087	<0.086	<0.086		<0.086	<0.087	<0.087	<0.087	<0.086		<0.086	<0.086	<0.086	<0.086	<0.087		<0.087	<0.086	<0.087	<0.087	<0.087		<0.086
PCB077	<0.077	<0.078	<0.078	<0.077	<0.077		<0.077	<0.078	<0.078	<0.078	<0.077		<0.077	<0.077	<0.077	<0.077	<0.078		<0.078	<0.077	<0.078	<0.078	<0.078		<0.077
PCB081	<0.12	<0.12	<0.12	<0.12	<0.12		<0.12	<0.12	<0.12	<0.12	<0.12		<0.12	<0.12	<0.12	<0.12	<0.12		<0.12	<0.12	<0.12	<0.12	<0.12		<0.12
PCB087	<0.11	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11		<0.11
PCB099	0.55	0.51	0.59	0.72	0.54	0.58	<0.06	0.31	0.25	0.47	0.2	0.25	0.33	0.24	0.32	0.41	<0.061	0.33	<0.061	<0.06	0.22	<0.061	0.31	0.12	0.29
PCB101	0.87	0.61	0.93	1	0.62	0.81	<0.097	0.41	0.39	0.29	0.3	0.29	0.55	0.26	<0.097	0.56	0.41	0.45	0.41	<0.097	0.36	0.26	0.37	0.29	0.49
PCB105	<0.054	<0.055	0.35	<0.054	<0.054	0.09	<0.054	<0.055	<0.055	<0.055	<0.054		<0.054	<0.054	<0.054	<0.054	<0.055		<0.055	<0.054	<0.055	<0.055	<0.055		<0.054
PCB110	0.44	0.51	0.42	0.55	<0.046	0.34	<0.045	<0.046	0.28	0.4	<0.045	0.15	<0.046	<0.046	<0.046	0.21	<0.046	0.21	0.27	<0.046	<0.046	<0.046	0.23	0.14	0.33
PCB114	<0.082	<0.082	<0.082	<0.082	<0.082		<0.081	<0.082	<0.082	<0.082	<0.081		<0.082	<0.082	<0.082	<0.082	<0.082		<0.082	<0.082	<0.082	<0.082	<0.082		<0.082
PCB118	0.51	0.35	0.48	0.54	0.38	0.45	<0.083	<0.084	0.23	<0.084	<0.083	0.0.08	0.29	<0.084	<0.084	<0.084	0.23	0.06	0.2	<0.084	<0.084	<0.084	0.3	0.14	0.32
PCB119	<0.094	<0.094	<0.094	<0.094	<0.094		<0.094	<0.094	<0.094	<0.094	<0.094		<0.094	<0.094	<0.094	<0.094	<0.094		<0.094	<0.094	<0.094	<0.094	<0.094		<0.094
PCB123	0.42	<0.1	<0.1	0.6	<0.1	0.23	<0.1	<0.1	<0.1	<0.1	<0.1		0.52	<0.1	<0.1	<0.1	<0.1	0.14	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1
PCB126	<0.08	<0.08	<0.08	<0.08	<0.08		<0.079	<0.08	<0.08	<0.08	<0.079		<0.08	<0.08	<0.08	<0.08	<0.08		<0.08	<0.08	<0.08	<0.08	<0.08		1.9
PCB128	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		<0.1
PCB132/153	2.8	3.3	2.6	3.6	2.7	3	1.5	2.1	2	1.6	1.6	1.8	2.4	2.4	2.2	2.4	2.3	2.3	2.2	1.5	2.5	2.1	2.4	2.14	1.7
PCB138/158	1.8	1.8	1.6	2.3	1.8	1.9	1.1	0.99	1.4	0.87	0.62	1.0	1.6	1.1	1.2	1.4	1.6	1.4	1.3	0.84	1.6	0.96	1.2	1.18	1.2
PCB149	1.4	1.7	1.4	1.9	1.5	1.6	0.89	1.1	1.1	0.72	0.82	0.93	1.1	1	0.93	1.2	0.97	1.0	1	0.74	1.1	0.87	0.95	0.93	0.95
PCB151	0.27	0.39	<0.067	0.33	<0.067	0.21	<0.067	<0.067	<0.067	<0.067	<0.067		<0.067	<0.067	<0.067	<0.067	<0.067		<0.067	<0.067	0.33	<0.067	0.25	0.14	0.21
PCB156	<0.057	<0.058	<0.058	<0.057	<0.057		<0.057	<0.058	<0.058	<0.058	<0.057		<0.057	<0.057	<0.057	<0.057	<0.058		<0.058	<0.057	<0.058	<0.058	<0.058		<0.057
PCB157	<0.052	<0.052	<0.052	<0.052	<0.052		<0.052	<0.052	<0.052	<0.052	<0.052		<0.052	<0.052	<0.052	<0.052	<0.052		<0.052	<0.052	<0.052	<0.052	<0.052		<0.052

Table 20 Continued. Bioaccumulation Potential Replicate and Mean Tissue Results for *Nereis Virens* Exposed to San Diego Harbor South Bay Channel, LA-5 Reference and Control Sediments.

Analyte	Composite Replicate and Mean Concentrations for *Nereis virens* Tissues																								
	SDHVC-17-A						SDHVC-17-B						LA-5 Ref						CONTROL						T0
	A	B	C	D	E	Mean	A	B	C	D	E	Mean	A	B	C	D	E		A	B	C	D	E	Mean	
PCB167	<0.061	<0.062	<0.062	<0.061	<0.061		<0.061	<0.062	<0.062	<0.062	<0.061		<0.061	<0.061	<0.061	<0.061	<0.062		<0.062	<0.061	<0.062	<0.062	<0.062		<0.061
PCB168	<0.048	<0.049	<0.049	<0.048	<0.048		<0.048	<0.049	<0.049	<0.049	<0.048		<0.048	<0.048	<0.048	<0.048	<0.049		<0.049	<0.048	<0.049	<0.049	<0.049		<0.048
PCB169	<0.061	<0.061	<0.061	<0.061	<0.061		<0.06	<0.061	<0.061	<0.061	<0.06		<0.061	<0.061	<0.061	<0.061	<0.061		<0.061	<0.061	<0.061	<0.061	<0.061		<0.061
PCB170	<0.063	0.64	0.54	0.93	0.69	0.57	<0.063	<0.063	<0.063	<0.063	0.26	0.08	0.58	0.49	0.49	0.6	0.61	0.55	0.54	0.42	0.58	0.5	0.78	0.56	<0.063
PCB177	<0.087	<0.087	<0.087	0.42	<0.087	0.12	<0.086	<0.087	<0.087	<0.087	<0.086		<0.087	<0.087	<0.087	<0.087	<0.087		0.46	<0.087	<0.087	<0.087	0.39	0.19	<0.087
PCB180	0.021	.021	1.00	1.60	1.30	0.78	<0.042	0.76	0.87	0.72	0.66	0.61	1.2	0.9	1	1.3	1.1	1.10	0.92	0.75	1.2	0.86	1.2	0.99	<0.042
PCB183	0.42	0.51	0.38	0.53	0.48	0.46	0.25	0.31	<0.11	<0.11	0.25	0.18	0.26	0.31	0.28	0.38	0.5	0.35	0.32	0.35	0.43	0.31	0.51	0.38	<0.11
PCB187	1.2	1.3	0.98	1.5	1.2	1.2	0.64	0.8	0.74	0.7	0.61	0.70	1	0.94	0.88	0.97	1.1	0.98	0.85	0.75	1.2	0.91	1.2	0.98	0.68
PCB189	<0.061	<0.061	<0.061	<0.061	<0.061		<0.06	<0.061	<0.061	<0.061	<0.06		<0.061	<0.061	<0.061	<0.061	<0.061		<0.061	<0.061	<0.061	<0.061	<0.061		<0.061
PCB194	<0.11	<0.11	0.23	0.33	<0.11	0.14	<0.11	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	0.32	0.32	<0.11	<0.11	<0.11	<0.11	<0.11		<0.11
PCB201	<0.096	<0.097	<0.097	<0.096	<0.096		<0.096	<0.097	<0.097	<0.097	<0.096		<0.096	<0.096	<0.096	<0.096	<0.097		<0.097	<0.096	<0.097	<0.097	<0.097		<0.096
PCB206	<0.19	0.44	<0.19	0.65	<0.19	0.28	<0.19	<0.19	<0.19	<0.19	0.32	0.32	0.14	<0.19	0.32	<0.19	0.48	0.37	<0.19	<0.19	<0.19	0.23	0.5	0.21	0.37
Total PCBs	11	12	12	18	11	13	4.4	6.8	7.3	5.8	5.6	6.0	10	7.6	7.6	9.4	9.6	8.9	8.5	5.3	9.5	7	11	8.2	8.4

Notes:
Values in green shaded cells are non-detected replicate concentrations.
Bolded Values and Blue shaded cells indicate statistically significant differences in mean concentrations between test and LA-5 reference tissues.
J = Estimated value between the method detection limit and reporting limit. A "J" value may also indicate an estimated value due to that value not meeting certain QC objectives.
J+ = A high-biased estimate.
< = Not detected at the method detection limit. ND = not detected.
"U" = not detected at the reporting limit.

Table 21. Statistical Results for the San Diego Harbor South Bay Channel Composite Sample *Macoma nasuta* Detected Tissue Concentrations Compared to Reference and Control Tissue Concentrations.

Analyte	Sample	n	% ND	Mean	Standard Deviation (n-1)	Lower Bound on Mean (95%)	Upper Bound on Mean (95%)	FDA Action Level
% Lipids	Control	5	0	0.39	0.09	0.31	0.48	--
	LA-5 Ref	5	0	0.32	0.06	0.26	0.37	
	Area A	5	0	**0.35**	0.06	0.29	0.41	
	Area B	5	0	**0.36**	0.09	0.27	0.45	
Copper (mg/kg)	Control	5	0	1.90	0.11	1.78	2.01	--
	LA-5 Ref	5	0	1.81	0.53	1.30	2.31	
	Area A	5	0	**2.84**	0.56	2.31	3.38	
	Area B	5	0	**2.83**	0.52	2.33	3.33	
Total PCB's (µg/kg)	Control	5	60	0.27	0.12	NC	NC	2,000
	LA-5 Ref	5	80	0.56	0.74	NC	NC	
	Area A	5	0	**8.10**	1.61	6.56	9.63	
	Area B	5	0	**7.82**	2.63	5.31	10.3	

Bolded values are higher than reference values. Mean tissue concentrations shaded in blue are statistically elevated ($p \leq 0.05$) over mean reference and control tissue concentrations. Mean tissue concentrations shaded in green are statistically elevated ($p \leq 0.05$) over mean reference tissue concentrations only. NC = value unable to be calculated due to high percentage of non-detect samples.

Table 22. Statistical Results for the San Diego Harbor South Bay Channel Composite Sample *Nereis virens* Detected Tissue Concentrations Compared to Reference and Control Tissue Concentrations.

Analyte	Sample	n	% ND	Mean	Standard Deviation (n-1)	Lower Bound on Mean (95%)	Upper Bound on Mean (95%)	FDA Action Level
% Lipids	Control	5	0	0.80	0.12	0.69	0.91	--
	LA-5 Ref	5	0	0.92	0.05	0.88	0.97	
	Area A	5	0	**0.93**	0.15	0.79	1.07	
	Area B	5	0	0.71	0.10	0.61	0.81	
Copper (mg/kg)	Control	5	0	1.53	0.25	1.29	1.77	--
	LA-5 Ref	5	0	1.31	0.08	1.24	1.39	
	Area A	5	0	**2.25**	0.52	1.75	2.74	
	Area B	5	0	**1.90**	0.14	1.73	2.06	
Mercury (mg/kg)	Control	5	0	0.0123	0.0053	0.0073	0.0173	1.0
	LA-5 Ref	5	0	0.0158	0.0034	0.0126	0.0190	
	Area A	5	0	**0.0165**	0.0023	0.0143	0.0187	
	Area B	5	0	0.0146	0.0041	0.0107	0.0185	
Total PCB's (µg/kg)	Control	5	0	9.77	5.13	4.88	14.7	2,000
	LA-5 Ref	5	0	8.89	1.18	7.77	10.0	
	Area A	5	0	**12.9**	3.02	9.84	16.0	
	Area B	5	0	5.97	1.12	4.90	7.03	
Total PCB's (µg/kg Lipid)	Control	5	0	10.1	1.36	8.84	11.4	2,000
	LA-5 Ref	5	0	9.61	1.01	8.64	10.6	
	Area A	5	0	**14.1**	2.78	11.4	16.7	
	Area B	5	0	8.53	1.97	6.65	10.4	

Bolded values are higher than reference values. Mean tissue concentrations shaded in blue are statistically elevated ($p \leq 0.05$) over mean reference and control tissue concentrations. Mean tissue concentrations shaded in green are statistically elevated ($p \leq 0.05$) over mean reference tissue concentrations only.

5.0 DISCUSSION

Subsections that follow describe the physical, chemical, and biological testing results, as summarized in Tables 7 through 22, in terms of sediment screening levels and objectives for beach nourishment and ODMDS placement.

5.1 Sediment Observations

Vibracore boring (sediment) logs are included in Appendix F. According to these logs, the upper sediment from most locations consisted primarily of fat clay or fat clay with sand (CH). This clay layer extended anywhere from one foot below the mudline to the entire core length. Material below the upper clay layer consisted primarily of silty sand (SM), poorly graded sand (SP) or poorly graded sand with silt (SP-SM).

There were no unusual odors noted for any of the cores. There was also no trash or debris noted in any of the cores. Most locations contained trace amounts of organic material and most locations had some shell fragments.

5.2 Sediment Grain Size

Tables 7 and 9 results show that grain size characteristics of the South Bay Channel sediments varied among individual core locations but not necessarily among dredge areas. The weighted average composite grain size gradation was calculated for eight vibracores from each of the two dredge (composite) areas. The weighted average sand content was 51% for Composite Area A and 53% for Composite Area B. In comparison, the average sand content for the Coronado Beach/Silver Strand nearshore sites was 84% for the North site and 80% for the South Site.

Results of the physical compatibility analysis are provided in Appendix B as a separate report prepared by the Los Angeles District USACE. This report determined a maximum allowable fines content of 40% for the North Coronado Beach/Silver Strand nearshore site and 36% for the South Coronado Beach/Silver Strand nearshore site. The reported concluded that the grain size distribution for most of Areas A and B fit poorly as a composite weighted average within the beach compatibility envelope for the nearshore sites. Therefore, the San Diego Harbor South Bay Channel sediments, on average, appear to be physically incompatible for reuse at the nearshore sites.

Individual weighted average grain size analysis for every core indicates that sediments in the vicinity of twelve of the sixteen core locations are also not compatible with the nearshore sites. However, individual weighted averages (Table 9) calculated for four of the individual cores (SDHVC-17-SB-04, 06, 07, and 15) are shown to be compatible for placement at the North nearshore site, and three individual cores (SDHVC-17-SB-04, 06, and 15) are shown to be compatible with the South nearshore site. As shown on Figure 7, individual cores SDHVC-17-SB-04 and 15 and the compatible area surrounding them are located within Area B (within and same as chemical composite Area B) and individual cores SDHVC-17-SB-06 and 07 and the compatible area surrounding them are located within Area A (within and same as chemical composite area A). This figure also shows the quantity of beach compatible sediment (Beneficial Re-use) as approximately 30,000 and 39,000cubic yards at Area A and B, respectively. Because the weighted

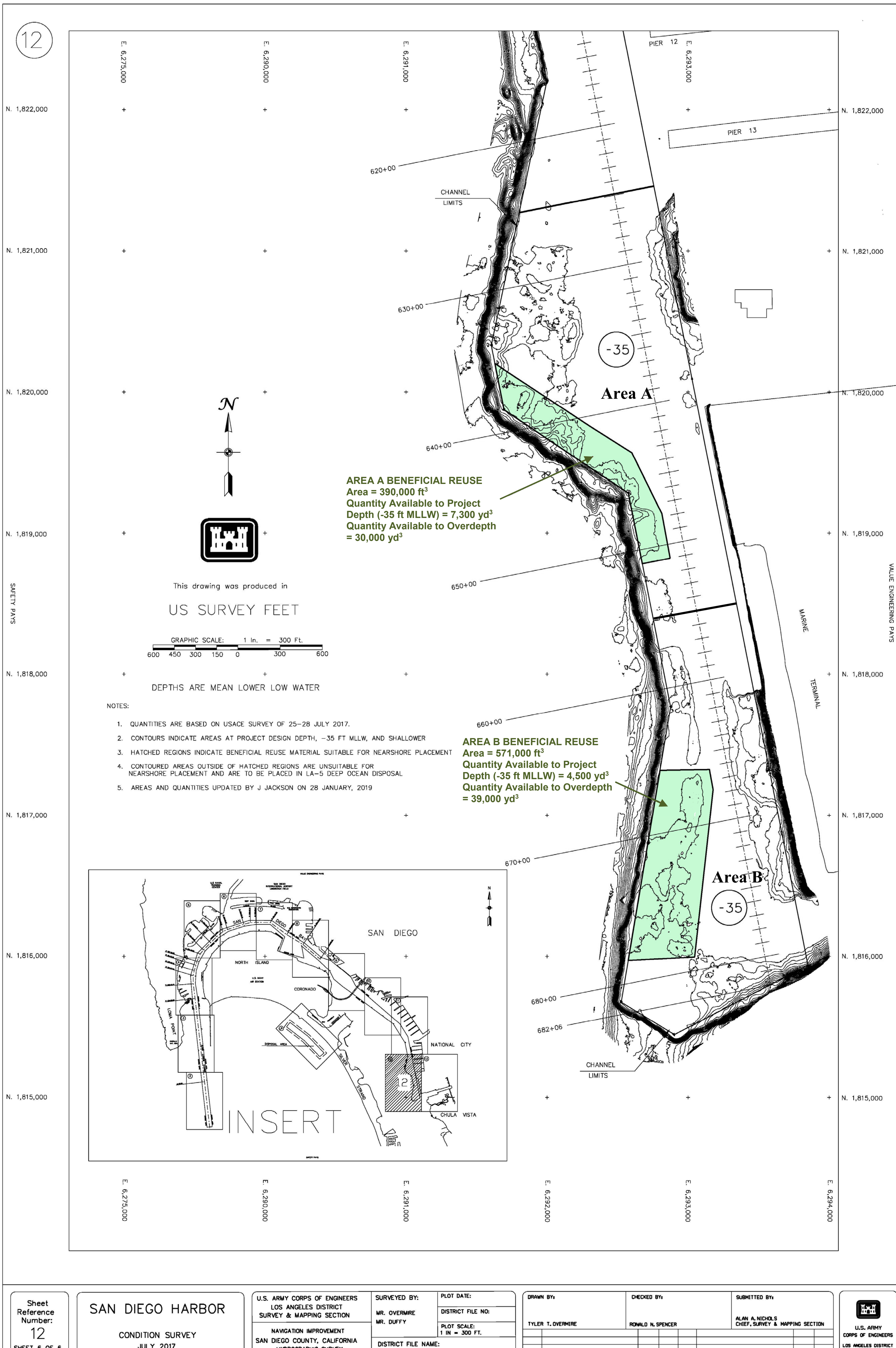

Figure 7. Areas within the South Bay Channel Dredge Footprint that are Compatible with One or Both of the Coronado Beach/Silver Strand Nearshore Sites.

average grain size fines content of individual vibracore SDHVC-17-SB-07 was 38%, all of the 30,000 cubic yard of sediment from Area A should be beneficially re-used at the South nearshore placement site. The 39,000 cubic yards of sediment from Area B can be beneficially re-used at either North or South nearshore placement sites.

5.3 Bulk Sediment Chemistry

Both ecological effects and human health screening values are included with the composite bulk sediment chemistry results in Tables 10 and 11. The discussion also provides comparisons of the composite results to LA-5 reference data.

Compared to NOAA effects-based screening levels (Long et. al., 1995) and LA-5 reference data, contaminant concentrations were elevated for some inorganic constituents in the South Bay Channel sediments. Copper exceeded the ERL value in both composite samples as well as three out of the four individual core samples tested, and mercury and zinc exceeded the ERL value in the Area A composite sample as well as the sample from SDHVC-16-SB-07. There were no inorganic contaminants that exceeded an ERM value, and there were no inorganic ERL exceedances in the LA-5 reference sample. Most metal concentrations were also at least 1.2 times higher than metal concentrations in the LA-5 reference sediments.

A few organic compounds also exceeded NOAA effects-based screening levels and LA-5 reference values in the South Bay Channel samples. Total PCB congener concentrations for the Area A composite sample and core locations SDHVC-16-SB-06 and SDHVC-16-SB-07 were elevated above the ERL value, and PCB congeners were not present in the LA-5 reference sediments. Total DDT, 4,4'-DDE and 4,4'-DDT concentrations were elevated above ERL values in both composite samples but were not elevated above ERM values. Total DDT and 4,4'-DDT were also elevated above ERL values in the LA-5 reference sediments. DDT isomers were not detected in any of the four individual cores analyzed. There were no detected semi-volatile compounds detected above ERL values in any composite or individual core sample, though several PAH and phthalate compounds were at least 1.2 higher in the composite samples than in the LA-5 reference sediments. The only other organic compounds detected in the South Bay Channel samples other than low concentrations of oil and grease and TRPH was dibutyltin. Dibutyltin was not detected in the LA-5 reference sediments, and the concentration of dibutyltin in the Area A composite sample was about 24 times higher than the detection limit and the concentration in the Area B composite sample was about nine times higher than the detection limit. Dibutyltin in the four individual samples were about two to 12 times higher than the detection limit.

The mean ERM quotients (ERMq) among all analytes with ERM values for the composite samples were low (0.1 for Area A and 0.07 for Area B). ERMq for the four individual core samples ranged from 0.04 to 0.1. With an ERMq of 0.1, there is less than a 12% probability of a toxic response to marine amphipods (Long and MacDonald, 1998b). Therefore, the chemistry results do not predict the South Bay Channel sediments will cause significant toxicity to marine amphipods.

Arsenic and benzo (a) pyrene concentrations in the samples were elevated above human health screening values (RSLs and CHHSLs). Arsenic was elevated over both the RSL and CHSSL values for both residential and industrial settings in all samples and benzo (a) pyrene was elevated above the CHSSL value for residential settings in the composite samples and two out of the four individual cores samples (SDHVC-16-SB-07 and SDHVC-16-SB-15). Elevated arsenic concentrations occur commonly in Southern California dredge sediments and soils, and the concentrations of arsenic in the San Diego South Bay Channel samples were not much higher than the background concentration (3.5 mg/kg) of soils throughout California (Bradford et al., 1996). Therefore, human health complications from arsenic are not expected. Residential benzo (a) pyrene CHHSL values are based on a 24-hour per day exposure, which would not occur on recreational beaches. Therefore, human health implications if the LARE sediments are reused for beach nourishment or other reuse options where human contact is possible are not expected.

5.4 Benthic (Solid Phase) Bioassays

Mean survival of *Leptochirus plumulosus* in the control sediments after the 10-day exposures was acceptable at 97%. Mean *Leptochirus* survival results (Table 12) were 100% for Area A and 98% for Area B compared to 94% for the LA-5 reference sample. Since the composite sample survival rates were greater than the survival in the LA-5 reference sediments, neither South Bay Channel composite sample was toxic to *Leptochirus plumulosus.*

Mean *Neanthes arenaceodentata* survival was 100% in all control, reference and test sediments (Table 13). Therefore, no toxicity to *Neanthes* was evident.

5.5 SPP (Suspended Particulate Phase) Water Column Bioassays

Table 23 summarizes the outcomes of the SPP bioassays and the 100% elutriate survival data presented in Tables 15 through 17. These bioassays are discussed separately below for each of the three species.

Table 23. 100% Elutriate SPP Water Column Bioassays Results.

Composite	Species	Mean Percent Survival (Normal Development) in 100% Elutriate	LC_{50} (EC_{50})	Exceed the LPC?
SDHVC-17-A	*Mytilus*	88.3 (98.1)	>100% (>100%)	No
	Americamysis	98	>100%	No
	Menidia	92	>100%	No
SDHVC-17-B	*Mytilus*	86.8 (98.2)	>100% (>100%)	No
	Americamysis	97.8	>100%	No
	Menidia	96	>100%	No

Bold asterisk means response was significantly less than the control response at $p<0.05$.

5.5 1 48-Hour Mussel Larvae Survival and Normal Embryonic Development Test

Mean survival of *Mytilus galloprovincialis* (mussel) embryos was greater than 92% in the laboratory controls, indicating an acceptable survival response to the test organisms (Table 15). Mean survival in the 100% test elutriates was 88.3% for Area A and 86.8% for Area B and were <u>not</u> statistically reduced relative to the dilution water (laboratory control) nor site water control (90.5% mean survival). Resulting LC_{50} values were both greater than 100% elutriate. Therefore, no acute water column toxicity is expected based on elutriate exposures to *Mytilus*.

Mean normally developed mussel embryos were greater than 98% in the laboratory control samples and was 97.2% in the site water (Table 15). Mean normally developed embryos in the 100% test elutriates was 98,1% for Area A and 98.2% for Area B and were not statistically reduced relative to the laboratory control and site water. Resulting EC_{50} values were both greater than 100% elutriate. Therefore, no chronic water column toxicity is expected based on elutriate exposures to *Mytilus*.

5.5.2 96-Hour Mysid Survival Test

Mean survival of *Americamysis bahia* exposed for 96 hours to the undiluted elutriate SET extracts formed from the South Bay Channel composite samples was 98% for Area A and 97.8% for Area B compared to mean control survivals of 96% and 100% (Table 16). None of the composite samples were statistically reduced relative to the dilution water (laboratory controls) nor site water control (100% mean survival). Resulting LC_{50} values were all greater than 100% elutriate, indicating no toxicity to mysids after 96 hours of exposure.

5.5.3 96-Hour Juvenile Fish Survival Test

Mean survival of juvenile *Menidia berylinna* exposed for 96 hours to the undiluted elutriate SET extracts formed from the South Bay Channel composite samples were 92% for Area A and 96% for Area B compared to mean control survivals of 92% (Table 17). Test sample mean survivals were equal to or greater than mean survival in the site water control indicating no toxicity after 96 hours of exposure.

5.5.4 SPP Testing Conclusion

Since there was no observed toxicity in the water column tests with any of the composite samples, the limiting permissible concentrations (LPCs) for discharging the San Diego Harbor South Bay Channel sediments through the water column were met.

5.6 Bioaccumulation Survival

Though the main purpose of the bioaccumulation tests is to determine whether contaminants of concern will bioaccumulate, survival of the clams and worms during the exposure period was also measured. After 28-day bioaccumulation exposures, mean survival for *Macoma* (clams) was 98% for both composite samples and the control sample and mean survival for *Nereis* (worms) was 100% and 98% for Areas A and B, respectively compared to 100% in the control exposures (Table 18). Therefore, the 28-day survival data for the clams and worms further supports the results of the toxicity tests described above that indicate that the San Diego Harbor South Bay Channel sediments are not toxic to benthic organisms.

5.7 Assessment of Bioaccumulation Potential

Based on sediment chemistry data and consultation with USEPA Region IX, tissues derived from the clam and worm bioaccumulation exposures to the South Bay Channel composite samples as well as to the LA-5 reference sample were analyzed for copper, mercury, butyltins, DDT compounds and PCB congeners. Butyltins and DDT compounds were not detected in any of the tissues analyzed, were thus not bioaccumulative, and will not be discussed further. Mean tissue concentrations for the remaining contaminants were statistically compared to mean concentrations from exposures to the reference sediments, when possible. As indicated in the OTM, the statistical comparison of tissue residues in the treatments to the reference provides a starting point to the tiered evaluation. Because variability between replicates in the reference tissues is typically low, a statistical significance may be observed without biological relevance. In this case, other points of comparison and interpretation are used, including: an evaluation of the magnitude of difference, a comparison of observed tissue residues with critical body residue levels, and site specific factors that help to predict effects at the placement sites. Relative points of evaluation are discussed separately for each chemical constituent analyzed in subsections that follow.

The null hypothesis tested was that residue concetrations in the the test tissues were not statistically different than residue concentrations in the reference tissues. Statistical conclusions for copper are provided in Table 21 for *Macoma* and statistical conclusions for copper, mercury and total PCBs are provided in Table 22 for *Nereis*. Statistical hypothesis testing could not be conducted for total PCBs in the *Macoma* samples since only one out of the five LA-5 reference replicates had a detected concentration. Lipid normalized results were used in statistical testing of the *Nereis* PCB data since a positive relationship was found beween lipid and PCB concentrations (Figure 8). Tables 21 and 22 mean concentrations in shaded cells indicate statistically significant differences with mean reference tissue concentrations.

Mean tissue concentrations that were determined to be statistically higher than mean reference concentrations were compared to FDA action levels and the lowest relevant ecological effects data among invertebrates. Although statistical testing could not be conducted for total PCBs in the *Macoma* tissues, it was assumed that total PCBs in the Macoma test tissues were statistically elevated over total PCBs in the *Macoma* reference tissues. The ecological effects data used were toxicity reverence values (TRVs) in USACE's online Environmental Residue Effects Database (ERED)(https://ered.el.erdc.dren.mil/). Only no effects dose (NOED) and lowest effects dose (LOED) end points were queried with the preference being the use of a LOED endpoint. TRVs chosen were only for measurable biological effects such as mortality, reproduction and growth.

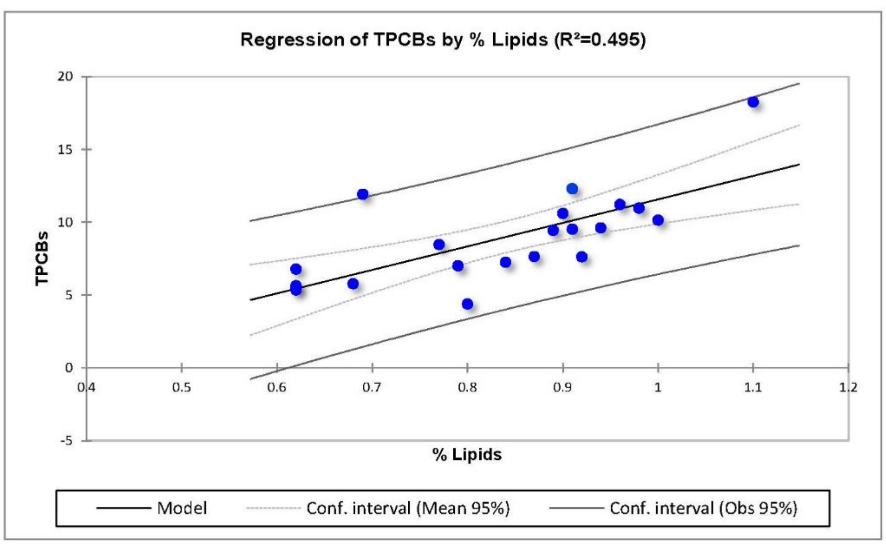

Figure 8. Relationship Between Total PCB and Lipid Concentrations in *Nereis* Tissues.

5.7.1 Uptake of Copper

Mean concentrations of copper in the South Bay Channel *Macoma* and *Nereis* tissue samples after 28 days of exposures were statistically higher than mean concentrations of copper in the *Macoma* and *Nereis* tissues from the 28 days of control and/or reference exposures (Tables 21 and 22). The distribution of copper uptake among test, control and reference tissues is shown on Figure 9 for *Macoma* and Figure 10 for *Nereis*.

Although statistically significant, uptake of copper after the South Bay Channel exposures to the composite samples appears minor relative to uptake after the reference and control exposures. Mean uptakes of copper in the South Bay Channel *Macoma* test tissues (2.83 and 2.84 mg/kg) were only about 1.5 times higher than the mean uptakes in both the reference *Macoma* tissues (1.81 mg/kg) and control *Macoma* tissues (1.90 mg/kg). The mean uptake of copper in the *Macoma* test tissues was also about 1.5 times higher than the concentration of copper in the baseline (T0) tissue sample (1.89 mg/kg). The mean uptake of copper in the *Nereis* tissues for Composite A (2.25 mg/kg) was about 1.7 times higher than the mean uptake in the reference *Nereis* tissues (1.31 mg/kg) and about 1.5 times higher than the mean uptake in the control *Nereis* tissues (1.53 mg/kg). The mean uptake of copper in the *Nereis* test tissues for Composite A was only about 1.2 times higher than the concentration of copper in the baseline (T0) tissues (1.81 mg/kg). The mean uptake of copper in the *Nereis* tissues for Composite B (1.90 mg/kg) was about 1.5 times higher than the mean uptake in reference tissues. The mean uptake of copper in the *Nereis* test tissues for Composite B were not statistically elevated above the mean uptake in the control tissues and was similar to the concentration in the base line tissue sample.

There is no FDA Action Level for copper and there are no known fish advisories based on copper. Therefore, copper tissue burdens are only discussed in terms of ecological effects based on TRVs. The lowest, most relevant copper value in the ERED database for a marine invertebrate was a growth LOED of 4.2 mg/kg for the hydra *Hydra littoralis*, which is slightly higher than the South Bay Channel mean tissue concentrations. The next relevant TRV is a growth LOED of 98 mg/kg for an Australian amphipod (*Allorchestes compressa*). Since there is little evidence showing that copper biomagnifies, it seems unlikely that copper bioaccumulation from the South Bay Channel sediments will have any ecological impacts. Therefore, the statistically significant bioaccumulation of copper observed is considered minor and ecological effects associated with copper uptake from these sediments are not predicted to be observed at LA-5 ODMDS.

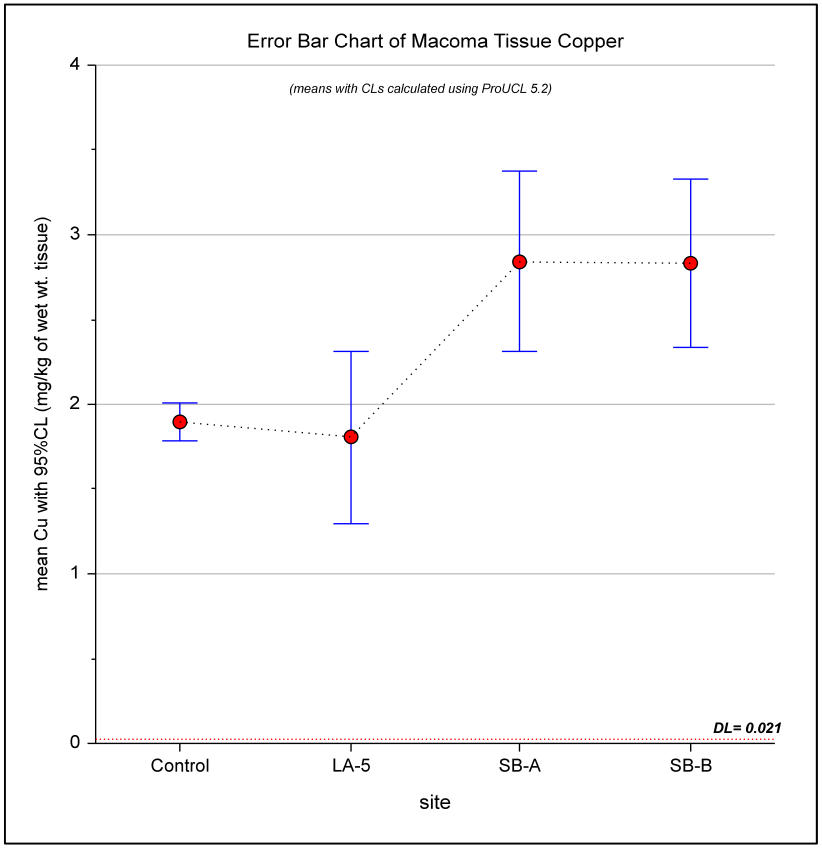

Figure 9. Distribution of *Macoma Nasuta* Copper Uptake.

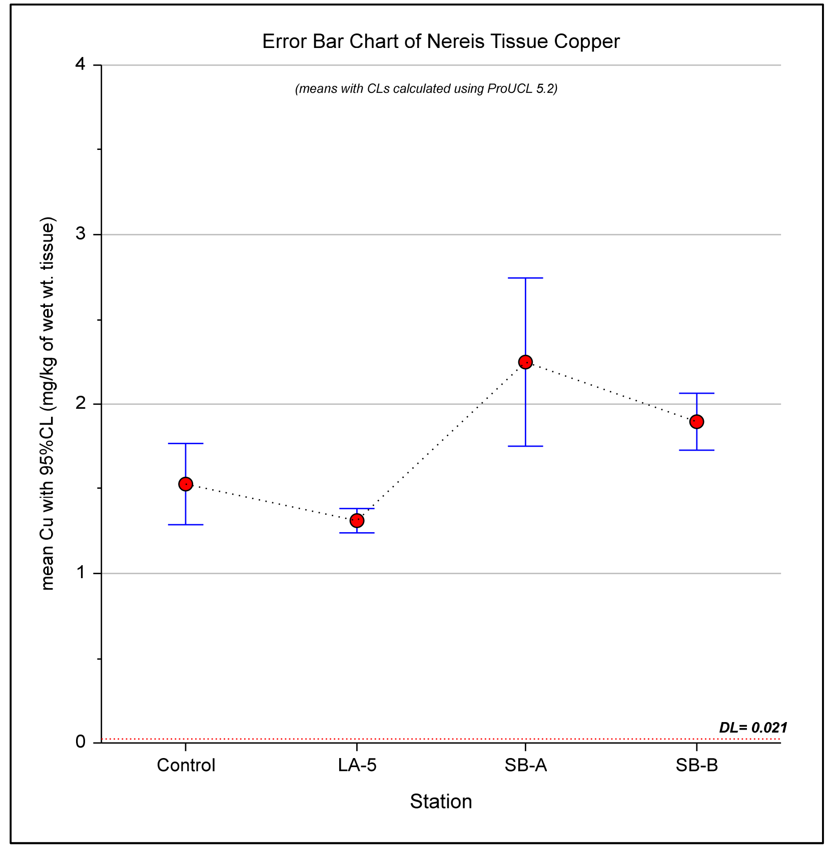

Figure 10. Distribution of *Nereis virens* Copper Uptake.

5.7.2 Uptake of Mercury

Mercury was not detected in any of the *Macoma* tissues samples. Mercury was detected in all *Nereis* tissues. The distribution of mercury uptake among test, control and reference tissues for *Nereis* is shown on Figure 11. Note that the baseline (T0) tissue concentration (0.0155 mg/kg) was similar to or higher than the mean tissue concentrations from the test, reference and control exposures (0.0123 to 0.0165 mg/kg). Furthermore, there were no statistical differences between test and reference and control body burdens. Therefore, the South Bay Channel sediment mercury concentrations were not more readily bioavailable relative to the LA-5 reference sediments.

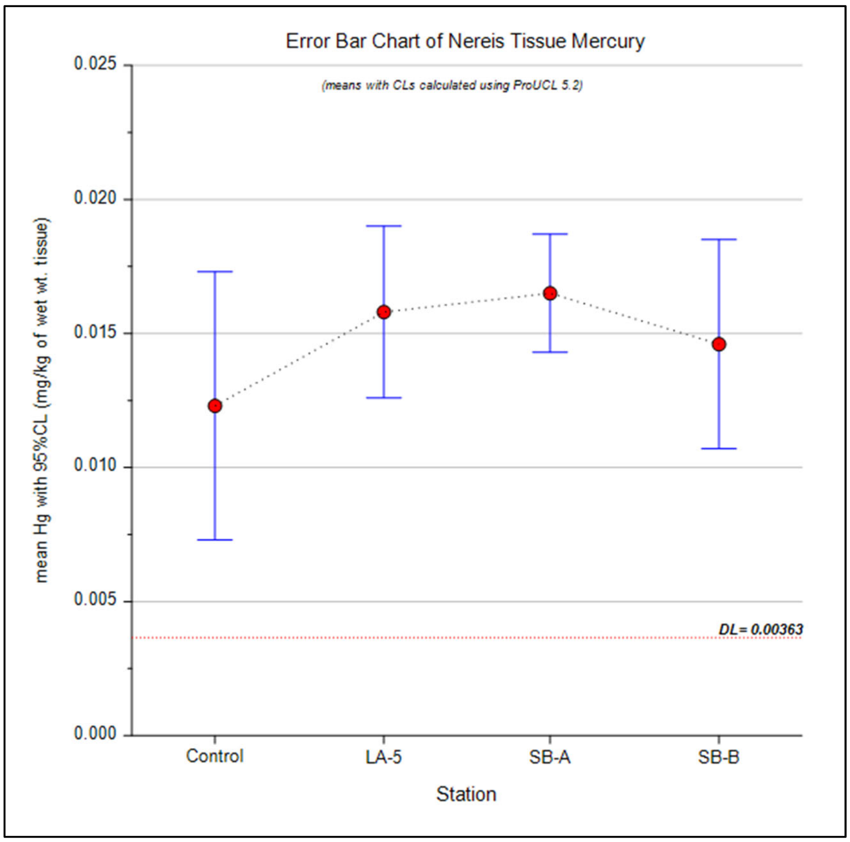

Figure 11. Distribution of *Nereis virens* Mercury Uptake.

5.7.3 Uptake of total PCBs

The distribution of total PCB uptake among test, control and reference tissues is shown on Figure 12 for *Macoma,* and the distribution of lipid normalized total PCB results for *Neries* is shown on Figure 13. As explained earlier, the mean uptake in the *Macoma* test tissues could not be statistically compared to the mean uptake in the reference *Macoma* tissues because of the lack of detected concentrations in the reference replicates. However, the *Macoma* total PCB results were evaluated further since uptakes in the Areas A and B tissues were more than a magnitude higher than detection limits (Table 19). For *Nereis*, there was statistically significant ($p \leq 0.05$) mean uptake of lipid normalized total PCBs in the tissues exposed to the Area A sediments compared to the mean uptake of lipid normalized total PCBs in the tissues exposed to the reference and control sediments (Table 22). Though statistically significant, the mean uptake of lipid normalized total PCBs in the Area A *Nereis* tissues (14.1 µg/kg) was only 1.5 times higher than the mean uptake of lipid normalized total PCBs in the reference tissues. The mean uptake of lipid normalized total PCBs in the *Nereis* tissues exposed to the Area B sediments was less than the lipid normalized mean uptake in the *Nereis* tissues exposed to the reference and control sediments. The concentration of total PCBs in the baseline (T0) Nereis sample (8.4 µg/kg) was similar to mean total PCB concentrations in the reference (8.89 µg/kg) and control (9.77 µg/kg) tissues (Table 20). Since only one baseline tissue sample was analyzed, test, reference and control tissue concentrations were not time zero corrected.

The mean and 95% UCL total PCB concentrations were further evaluated against the FDA Action Level and to relevant TRVs for total PCBs in the ERED database. The 95% UCL tissue concentrations were magnitudes less than the FDA Action Level (2,000 µg/kg). The ERED database queries were limited to LOED endpoints with measurable biological effects (survival/mortality, development, reproduction, etc.) to marine invertebrates. Although there are numerous endpoints in the ERED that are relevant to invertebrates, one value, recommended by USEPA for other Southern California dredge projects, was selected as being most relevant. Specifically, USEPA identified a LOED of 146 µg/kg (Total PCBs), associated with growth impairment of the sea star *Asterias rubens*, as the most appropriate TRV from the ERED. Consequently, *the 95% UCL* total PCB concentrations for both areas and both species were compared to USEPA's selected TRV and were found to be about 10-fold lower than this value.

5.7.4 Bioaccumulation Potential Conclusions

Based on the data presented, the dredged material meets the LPC for bioaccumulation and complies with the benthic criteria of paragraph 227.13(c)(3) in Title 40, Code of Federal Regulations, Parts 220-228 (40 CFR 220-228)(USACE and USEPA, 1991, Appendix A). As a result, no further information is necessary to determine compliance with bioaccumulation regulations.

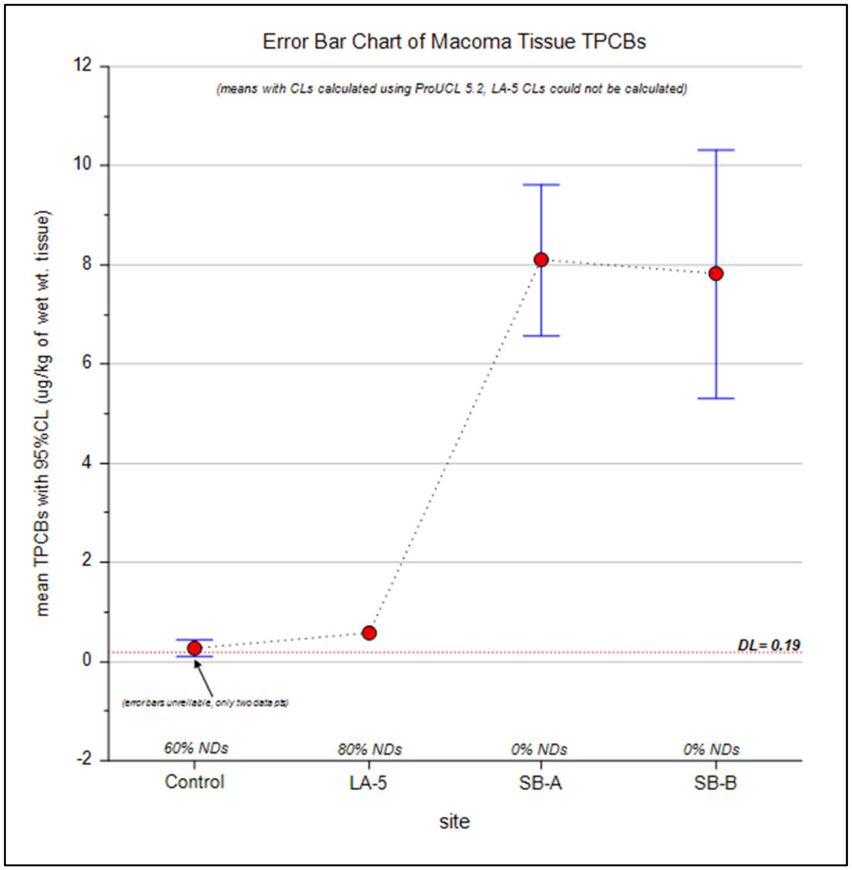

Figure 12. Distribution of *Macoma Nasuta* TPCB Uptake.

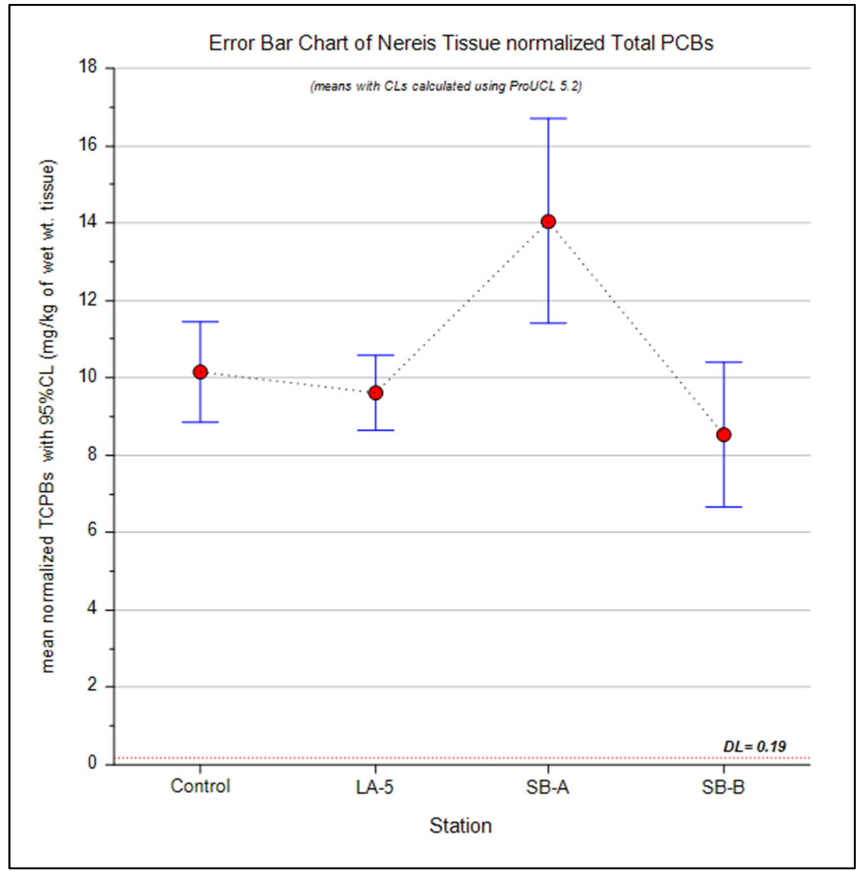

Figure 13. Distribution of *Nereis virens* TPCB Uptake.

5.8 Conclusions and Recommendations

The beach physical compatibility analysis, as described in Appendix B of this report, concluded that most of the South Bay Channel sediments are not physically compatible for reuse at the Coronado Beach/Silver Strand nearshore sites. Therefore, placement at the LA-5 ODMDS is the only viable option for most of the shoaled material. As described above, there is one area in Composite Area A and one area in Composite Area B that are physically compatible for placement at one or both Coronado Beach/Silver Strand nearshore sites. Based on individual core chemistry, these physically compatible areas only showed moderate contamination and are therefore also environmentally suitable. It is recommended that the compatible material within Composite Area B be placed at either nearshore site, while it is recommended that the compatible material within Composite Area A only be placed at the North nearshore site since sediments from Location SDHVC-17-SB-07 exceeded the allowable fines limit (36%) for the South nearshore site. Including the overdepth volume of material (down to -37 feet MLLW), total volume of recommended compatible sediments within Area A is approximately 30,000 cy, and total volume of recommended compatible material within Area B is also approximately 39,000 cy.

The South Bay Channel sediments showed only moderate chemical contamination. Chemical data were mostly below NOAA effects levels and human health objectives. Copper, DDTs and butyltins in both composite samples along with mercury, zinc and PCBs in one sample were the major contaminants of concern in the South Bay Channel sediments. Due to the fact that chemical concentrations did not exceed ERM values, the lack of benthic and water column toxicity, and the fact that copper, mercury, butyltins and total PCBs compounds were determined not to be more bioavailable in the South Bay sediments compared to the LA-5 reference sediments or observed bioaccumulation was not at levels of ecological concern, it is recommended that all sediments from the South Bay Channel that are not physically compatible for nearshore reuse be environmentally suitable for placement at the LA-5 ODMDS.

6.0 QUALITY CONTROL REQUIREMENTS

Formal QA/QC procedures were followed for this project. The objectives of the QA/QC Program were to fully document the field and laboratory data collected, to maintain data integrity from the time of field collection through storage and archiving, and to produce the highest quality data possible. Quality assurance involves all of the planned and systematic actions necessary to provide confidence that work performed by the project team conforms to contract requirements, laboratory methodologies, state and federal regulation requirements, and corporate Standard Operating Procedures (SOPs). The program is designed to allow the data to be assessed by the following parameters: Precision, Accuracy, Comparability, Representativeness, and Completeness. These parameters are controlled by adhering to documented methods and procedures (SOPs), and by the analysis of quality control (QC) samples on a routine basis.

6.1 Field Sampling Quality Management

Field quality control procedures were followed and included adherence to SOPs, field documentation, formal sample documentation and tracking, use of certified clean laboratory containers, protocol cleaning, and sample preservation.

6.2 Chemical Analysis Quality Management

Analytical chemistry QC is formalized by EPA and State Certification agencies and involves internal quality control checks for precision and accuracy. Any issues associated with the analytical laboratory quality control checks are summarized in Appendix H.

QA/QC findings presented are based on the validation of the data according to the quality assurance objectives detailed in the project SAP (Diaz-Yourman, GeoPentech and Kinnetic Laboratories/ Joint Venture, 2017) and in Appendix H, and using guidance from EPA National Functional Guidelines for inorganic and organic data review (USEPA, 2017a and 2017b).

As the first step in the validation process, all results were carefully reviewed to check that the laboratories met project reporting limits and that chemical analyses were completed within holding times. All wet weight detection limits and reporting limits for this project, as specified in the SC-DMMT SAP guidance document, were met. All analyses were completed within EPA a specified holding times.

QA/QC records (1,577 total) for the sediment and tissue analyses included method blanks, laboratory duplicates, laboratory control samples and their duplicates (LCS/LCSDs), matrix spikes and matrix spike duplicates (MS/MSDs), post digestion spikes (PDS) and surrogates. Total numbers of QC records by type are summarized in Table 24. Nineteen sediment sample results and twenty tissue results (1.2% of the results) were qualified as a result of the QC review. Data qualifiers are summarized in Table 25. All qualifications were a result of MS/MSD data that were outside QC objectives and from method blank detections. The reasoning behind these qualifications is explained in Appendix H. Despite these minor QC issues, overall evaluation of the analytical QA/QC data indicates that the chemical data are for the most part within established performance criteria and can be used for characterization of sediments in the San Diego Harbor South Bay Channel project area.

Table 24. Counts of QC records per Chemical Category.

Analyte Group	BLK	DUP	LCS / LCSD	MS / MSD	PDS	SURR	Total
Sediment							
Conventionals							
Percent Solids	2	2					4
Ammonia	2		4	4			10
Total Organic Carbon	3		6	6			15
Total Volatile Solids	2	2					4
O&G	2		4	4			10
TRPH	2		4	4			10
Total Metals	20		30	40	18		108
PAH's, Phthalates & Phenols	96		34	68		54	252
Chlorinated Pesticides	58		44	88		36	226
PCB Congeners	80		45	60		10	195
Butyltins	8		4	8		9	29
Pyrethroids	26		39	52		9	126
Sediment Totals	301	4	214	334	18	118	989
Tissue							
Conventionals							
% Lipids	3	3					6
Metals (Cu & Hg)	6		6	12	3		27
DDTs	18		9	18		90	135
Butyltins	12		6	12		90	120
PCB Congeners	120		45	90		45	300
Tissue Totals	159	3	66	132	3	225	588

Table 25. Final QC Qualification Applied to Sample Results.

Analyte	# Samples Qualified	Final Qualifier	BLK	DUP	LCS	MS	PDS	SURR
Metals – Composite Sediment								
Zinc	3	J+				J+		
Phenols – Sediment Core Archive								
Bisphenol A	4	U	U					
Phthalates –Sediment Core Archive								
Bis(2-Ethylhexyl) Phthalate	4	U	U					
Butyl Benzyl Phthalate	4	U	U					
Di-n-Butyl Phthalate	4	U	U					
OC Pesticides – Tissues								
4,4'-DDT	20	J				J		
Total number of affected samples	39							
Percentage of all samples	1.2%							

6.3 Biological Testing

Quality assurance procedures employed for this project were consistent with the procedures detailed in the ITM and OTM. Sediments used for biological testing were stored at ≤4° C and were used within the eight week holding time period.

Summary bioassay and bioaccumulation testing and quality assurance information is provided in the bioassay reports (Appendix G). This report includes documentation of: 1) test animal collection, shipping and holding/acclimation, 2) water quality parameters monitored during the test, and 3) the positive (reference toxicant) control. Negative control performance is also included in the bioassay report.

Data quality objectives and the associated quality control measures for aquatic toxicity testing are stipulated in the specified bioassay protocols. Measures included test temperatures and acceptable limits of variation, minimum acceptable dissolved oxygen levels with aeration procedures used, and acceptable pH range. These parameters were measured at test initiation and daily thereafter. Salinity ranges are specified for marine tests and the samples were adjusted accordingly. Salinity was measured daily for the bioassays. Measurements of porewater ammonia and sulfides were conducted upon receipt and prior to SP test initiation and at test completion. Overlying water ammonia measurements were made at SP test initiation and termination. Ammonia measurements for the bioaccumulation exposures were made at test initiation and weekly thereafter. Laboratory instruments were calibrated daily. All water quality parameters measured at the beginning and during biological testing were within appropriate limits.

Protocols also provide guidance on test organisms procurement, care and acclimation. Pacific EcoRisk maintains laboratory logbooks documenting these factors. Organism assignment to test tanks and test tank positioning in the laboratory are randomized.

Two other important bioassay QA measures are the inclusion of a negative experimental control, where organisms are simultaneously exposed to laboratory test conditions in the absence of a toxicant stress, and the inclusion of reference toxicant bioassays, in which the organisms are exposed to standard toxicants. Reference toxicant bioassays using potassium chloride (KCL) were run concurrently with and under the same conditions as the bioassays of the test material. Control charts are maintained in the laboratory for each species/toxicant combination. A minimum of five bioassays is required for a valid control chart, and upper and lower limits are developed which are two standard deviations on either side of the mean. Precision is quantified in the control charts by calculation of the coefficient of variation (CV). The application of a maximum acceptable value for the CV or the minimum significant difference (MSD) increases data reliability, and many newer protocols specify such maximum acceptable values. With the exception of the L. *plumulosus* reference toxicant test, bioassays met both negative and positive control test acceptability criteria (TAC) for this project. Although the L. *plumulosus* reference toxicant test survival response in that test's Lab Water Control treatment was slightly below test acceptability goal of 90% survival, the LC50 for this test was consistent with the "typical response" range established by the reference toxicant test database for this species. Therefore, the concentration-response relationships for the sediment elutriate tests and reference toxicant tests were determined to be acceptable.

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Appendix A
San Diego Harbor Dredge Material Evaluation Testing Data from 2008

(Kinnetic Laboratories and Diaz Yourman, 2009)

Appendix B
USACE Nearshore Physical Compatibility Report