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CONSOLIDATED SLIP RESTORATION PROJECT
DRAFT CONCEPT PLAN

SECTION 1. INTRODUCTION

Consolidated Slip is located in the East Basin area of the Port of Los Angeles (Figure 1). The Dominguez Channel Watershed, which is comprised of approximately 110 square miles of land in the southern portion of Los Angeles County, empties into the northeast side of Consolidated Slip. Ninety-six percent of the watershed area is developed and the overall land use is transportation-related, commercial, industrial, and residential. Tributaries to the Dominguez Channel include several storm drains and minor channels. From the 1910s until today, millions of gallons per day of industrial wastewater have been discharged into the Dominguez Channel Watershed significantly contributing to the contaminant loading within Consolidated Slip. Numerous sediment characterization studies have identified elevated levels of heavy metals, organochlorine pesticides, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs) in the slip's sediment and resident organisms. Consequently, Consolidated Slip is currently listed as a Clean Water Act (CWA) Section 303(d) impaired water body and a Bay Protection and Toxic Cleanup Program (BPTCP) toxic hotspot. Based on available information, over 1 million cubic yards of sediment may be impacted and require restoration.

The purpose of this concept plan is to: 1) describe the extent of contamination in Consolidated Slip; 2) identify the appropriate project stakeholders and available funding sources; 3) initiate discussions within the Los Angeles Contaminated Sediments Task Force (CSTF) and the Los Angeles Regional Water Quality Control Board (RWCQB) on project direction and goals; 4) identify data gaps; and 5) establish a framework for moving ahead with the preparation of a definitive restoration plan.

SECTION 2. EXTENT AND MAGNITUDE OF THE PROBLEM

2.1 Geographic Boundaries of the Area of Concern

The geographic area of concern for the restoration project includes Consolidated Slip and a portion of the East Basin and Cerritos Channel (Figure 2). Due to its function as the primary source of contaminants, the entire Dominguez Channel Watershed is also of concern. The primary function of this outline, however, is to address the sediment in Consolidated Slip and potential sources of contaminated sediment to the site.

2.2 Contaminants Present and Impairment Status

Consolidated Slip is listed as a CWA 303(d) impaired water body for the following reasons (1998 California 303(d) List).

- Benthic Community Effects
- Chlordane in tissue and sediment

- Chromium in sediment
- DDT in tissue and sediment (there's a fish consumption advisory for DDT)
- Lead in sediment
- PAHs in sediment
- PCBs in tissue and sediment
- Sediment toxicity
- Tributyltin in sediment
- Zinc in sediment

The 303(d) list is currently in the process of revision. The following are proposed new listings (in addition to the 1998 list) and proposed delistings for Consolidated Slip.

Proposed New Listings
- Cadmium in sediment
- Copper in sediment
- Mercury in sediment
- Nickel in sediment
- Dieldrin in tissue
- Toxaphene in tissue

Proposed Delisting
- Tributyltin in sediment
- Zinc in sediment

SECTION 3. STAKEHOLDERS

Table 1 identifies the agencies and organizations that have a stake in the cleanup of Consolidated Slip.

SECTION 4. APPLICABLE LAWS AND REGULATIONS

This section describes the applicable state and federal regulations that govern water quality, contaminated materials, dredging, dredged material transportation, and dredged material disposal.

4.1 The Los Angeles Basin Plan

The Water Quality Control Plan - Los Angeles Region (Basin Plan) identifies beneficial uses for water bodies throughout the region. Both Consolidated Slip and the Dominguez Channel (to Vermont Avenue) are considered to be impaired for Aquatic Life and Fish Consumption. In addition to these two impairments, the Dominguez Creek above Vermont is also listed for Contact/Non-Contact Recreation. By listing a site as CWA 303(d) impaired, the RWQCB is compelled to conduct an assessment (e.g. cleanup and abatement; TMDLs) on ways to bring the water body into compliance with Basin Plan water quality objectives.

4.2 California Bay Protection and Toxic Cleanup Program

The California State Legislative established the Bay Protection and Toxic Cleanup Program (BPTCP) in 1989 with four major goals.

1. To provide protection of present and future beneficial uses of the bays and estuarine water of California.
2. To identify and characterize toxic hotspots.
3. To plan for toxic hotspot cleanup or other remedial or mitigated actions.
4. To develop prevention and control strategies for toxic pollutants that will prevent creation of new toxic hotspots or the perpetuation of existing ones within the bays and estuaries of California.

By mandate, the BPTCP has conducted sediment quality studies to identify toxic hotspots. BPTCP sediment assessment studies were conducted in Consolidated Slip and surrounding areas in 1992, 1994, and 1996. The results of these studies (elevated chemistry, recurrent toxicity, degraded benthic community structure) established Consolidated Slip as a toxic hot spot which led to its listing as a CWA 303(d) impaired water body.

4.3 Clean Water Act Section 401 Water Quality Certification

Prior to sediment cleanup activities, a Report of Waste Discharge application must be submitted to the RWQCB. The RWQCB will evaluate the potential impacts of the proposed project on surface and ground water quality. The RWQCB will issue a permit along with Waste Discharge Requirements (WDRs). The WDRs specify water quality objectives and project controls, monitoring and reporting requirements.

4.4 Clean Water Act Section 404 Dredge and Fill Activities

The USACE and EPA have joint responsibility for issuing CWA 404 permits. A 404 permit deals with dredge and fill within waters of the US. The permit can have conditions and monitoring requirements. Depending upon how the Consolidated Slip project proceeds, the dredging project may be eligible for a Nationwide Permit (NWP). The USACE may determine that this project falls under NWP 38 Cleanup of Hazardous and Toxic Waste if the RWQCB issues a Cleanup and Abatement Order directing restoration of Consolidate Slip.

4.5 Rivers and Harbors Act of 1899 - Section 10 for Construction in Navigable Waters of the US

This act authorizes the USACE to regulate any obstruction to navigation and the building of structures affecting navigable waters of the U.S. Projects requiring a Section 10 permit typically include new marinas, piers, wharves, floats, intake and outfall pipes, pilings, bulkheads, boat ramps, as well as dredge and fill projects.

Table 1. State, Federal, and Local Stakeholders for the Consolidated Slip Project

Agency/Organization	Stakeholder Interest
State	
Los Angeles Regional Water Quality Control Board (RWQCB)	Lead agency for the CWA 303(d) impaired water bodies programs. Grants CWA 401 water quality certification for dredging projects and issues waste discharge requirements. Regulates the upland disposal or reuse of dredged materials. Possible source of funding for the site assessment and cleanup project.
State Water Resources Control Board (SWRCB)	Authority overseeing RWQCB decisions. Responsible for approving CWA 303(d) impaired water body listing.
California Department of Fish and Game (CDF&G)	Cooperating agency for dredged material permitting. Determination of potential impacts on sensitive resources and state threatened and endangered species.
California Coastal Commission (CCC)	Regulates compliance with the California Coastal Act and the Coastal Zone Management Act (CZMA).
California Department of Toxic Substances Control (DTSC)	Regulates the restoration of hazardous waste sites. The DTSC may be involved in reviewing the reuse of contaminated sediments in upland applications.
Federal	
US Army Corps of Engineers (USACE)	Lead agency for permitting dredging and dredged material disposal activities. Lead agency for NEPA.
Environmental Protection Agency Region 9 (EPA 9)	Shared responsibility with the USACE for regulating dredged material management activities under the Marine Protection, Research, and Sanctuaries Act (MPRSA), and the Federal Water Pollution Control Act Amendments of 1972 (CWA).
US Fish and Wildlife Service (USFWS)	Cooperating agency for dredged material permitting. Determination of potential impacts on federal threatened and endangered (T&E) species. Establishment of environmental windows to protect T&E species.
National Marine Fisheries Service (NMFS)	Cooperating agency for dredged material permitting. Determination of potential impacts on fisheries and essential fish habitat (EFH).
Multi-agency	
Los Angeles Contaminated Sediments Task Force (CSTF)	Directed by the Sate of California to evaluate dredging and dredged material disposal in the Los Angeles Area.
Dominguez Watershed Advisory Council (DWAC)	Responsible for preparation the Dominguez Watershed Management Master Plan. Advisory role for improving water quality in the watershed
Port of Los Angeles	Deeded through the Tidelands Trust to oversee tenants and operations on Port property. Providing funding for the cleanup project.

Table 1. State, Federal, and Local Stakeholders for the Consolidated Slip Project (con't)

Agency/Organization	Stakeholder Interest
Port of Long Beach	Deeded through the Tidelands trust to oversee tenants and operations on Port property. Port of Long Beach property (e.g. the Cerritos Channel) may be part of the cleanup effort.
Consolidated Slip Tenants	Active operations in the project area that may be affected by the cleanup project.
Local Agencies	
City of Los Angeles	Co-permittee for the municipal storm water permit. Owns the storm water system that connects to Dominguez Channel.
County of Los Angeles	Principal permittee for the municipal storm water permit. Controls Dominguez Channel and Torrance Lateral.
Local City Governments	Co-permittees for the municipal storm water permit.
Non-Governmental	
Heal the Bay	Concerned about impacts on ecological and human health from contaminated sediment, dredging, and disposal of sediment.
BayKeeper	Concerned about impacts on ecological and human health from contaminated sediment, dredging, and disposal of sediment.
Audubon Society	Concerned about impacts on ecological health from contaminated sediment, dredging, and disposal of sediment.
Dominguez Channel Watershed Dischargers	May be sources of contaminants that are carried by the Dominguez Channel and tributaries to Consolidated Slip. May be required to contribute funds for cleaning up Consolidated Slip and institute source controls.

4.6 Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act authorizes the SWRCB to adopt, review, and revise policies for all waters of the state (including both surface and ground waters) and directs the RWQCBs to develop regional basin plans. The Act also authorizes the SWRCB to adopt water quality control plans (e.g., The Ocean Plan).

4.7 California Environmental Quality Act (CEQA)

The California Environmental Quality Act (CEQA) is a statute that requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible. The RWQCB is required to ensure that a CEQA finding (e.g. exemption, negative declaration, mitigated negative declaration, etc.) has been made before a CWA 401 permit can be issued.

4.8 Fish and Wildlife Coordination Act

The federal lead agency for a dredging project that may modify any body of water for any purpose is required to consult with and consider the recommendations of the USFWS and with the lead state agency exercising administration over the wildlife resources in California. Consultation and coordination with USFWS and CDF&G will focus on ways to conserve wildlife resources by preventing the loss of and damage to such resources, as well as to further develop and improve these resources. The act is applicable to USACE and the EPA evaluation of CWA Section 404.

4.9 Endangered Species Act (ESA)

The ESA regulates, monitors, and implements programs for protecting the ecosystems upon which freshwater and estuarine fishes, wildlife, and habitat of listed species depends. The USFWS oversees the implementation of the ESA for all species except most marine species, which are under NMFS jurisdiction. Under section 7 of the ESA, federal project proponents must consult with USFWS or NMFS to ensure that the agency's action is not likely to jeopardize the continued existence of any endangered or threatened species or to result in the destruction or adverse modification of critical habitat.

4.10 Magnuson-Stevens Fishery Conservation and Management Act

Amendments to this Magnuson-Stevens Fishery Conservation and Management Act were implemented in 1996 to identify and protect important marine and anadromous fish habitat. In accordance with these amendments, the NMFS developed Fishery Conservation Management Plans that identify essential fish habitat (EFH). EFH is defined in the Act as "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Waters include aquatic areas and their associated physical, chemical, and biological properties used by fishes, and may include areas historically used by fishes. Substrate types include sediment, hard bottom, structures underlying the waters, and associated biological communities. The Act requires federal agencies to consult with the NMFS when their actions may adversely affect EFH.

4.11 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

CERCLA, commonly referred to as Superfund, provides for broad federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. While Consolidated Slip is not a Superfund site, per se, the Montrose Superfund site, located in the Dominguez Channel watershed, may have contributed significantly to the contaminant levels in the proposed restoration area.

4.12 Marine Protection, Research and Sanctuaries Act (MPRSA)

The MPRSA regulates the transportation and disposal of materials in all U.S. ocean waters, requires permits for some wastes, and prohibits the disposal of some wastes entirely. The MPRSA also has jurisdiction over U.S. flagged vessels and vessels leaving U.S. ports intending to dispose of material in ocean waters. Section 103 of the MPRSA authorizes the USACE to issue permits for dumping dredged material into ocean waters after determining that dumping would not unreasonably degrade or endanger human health, welfare, or amenities, or the natural environment, ecological systems, or economic potentialities. Issuance of a Section 103 permit is subject to EPA concurrence or waiver. Prior to issuance of the permit, requirements include compliance with criteria developed by the EPA (unless a waiver has been granted by the EPA) public notice with the opportunity for public hearings, and the proposed use of designated disposal sites.

4.13 Coastal Zone Management Act

This act provides for the development and implementation of coastal management programs by the states. Any federal project or activity affecting the coastal zone must be consistent to the maximum extent practicable with the provisions of federally approved state coastal plans. The CCC is responsible for administration of the California Coastal Management Program.

SECTION 5. PROJECT FUNDING SOURCES

Currently, limited funding exists to complete the Consolidated Slip restoration project to closure. Project funds that are currently available and potential funding sources are detailed below.

5.1 Current Sources

5.1.1 Regional Water Quality Control Board

The RWQCB has settled two actions and is committing the funds to the Consolidated Slip cleanup. This includes 1) $450,000 from the Montrose Current Storm Water Pathways Settlement, and 2) $475,000 from the Supplemental Environmental Project (SEP) approved for Equilon Enterprises (Los Angeles Refining Company). The Equilon SEP was specifically designated by the RWQCB (Resolution No. 00-006) for use to dredge and dispose of contaminated sediments from Consolidated Slip.

5.1.2 Port of Los Angeles in-kind services

The Port is providing in-kind services (staff and consultants assistance) including funding the preparation of this concept plan.

5.2 Potential Sources

Several potential state and federal funding sources are available.

5.2.1 Montrose Settlement

The City of Los Angeles was a party to one of the Montrose consent decrees. In this consent decree, EPA committed to spending $5 million on activities affecting the Los Angeles-Long Beach Harbor complex. The Port of Los Angeles and the RWQCB have both sent letters to EPA Region 9 requesting that some or all of these funds be set aside for the Consolidated Slip cleanup. A decision is pending.

5.2.2 State Cleanup and Abatement Account

The State Water Resources Control Board operates a Cleanup and Abatement Account (CAA) that is funded by Administrative Civil Liability (ACL) complaint settlements that are not put towards SEPs. The amount of funding for the Consolidated Slip project potentially available through this source is over $1 million. This is approximately the amount of funding that the RWQCB has contributed to the CAA, while withdrawing only a small amount for local cleanup and abatement projects.

5.2.3 Other Responsible Parties

The RWQCB may send out "13267 letters" to require businesses or other parties in the Dominguez Creek Watershed to submit technical reports on water quality matters. The law requires that the request for information be reasonable. The RWQCB often uses these letters at the start of a cleanup case in order to get sufficient information to prepare appropriate orders. Compliance with these requests is mandatory, and non-compliance can lead to penalties.

5.2.4 Los Angeles Contaminated Sediments Task Force

The CSTF has limited funds available that must be allocated by March 2003. It's possible that some of these funds may be allocated for conducting additional studies in Consolidated Slip in support of preparing a definitive restoration plan for the site.

SECTION 6. CONSOLIDATED SLIP/DOMINGUEZ CHANNEL PROJECT RELATED REPORTS

The following documents were reviewed when compiling this plan. This section provides a general description of each report; detailed results are reported in Section 8.

Los Angeles Harbor Department Testing Laboratory. 1947. Pollution of Los Angeles Harbor from Dominguez Channel. December.

This report was prepared at the request of the Board of Harbor Commissioners to assess the characteristics of all discharges into the Dominguez Channel. The purpose of this

project was to establish whether the channel was polluted in preparation of future legal action. The report focused primarily on the discharge of hydrogen sulfide in effluents entering the Dominguez Channel, and the production of hydrogen sulfide in Consolidated Slip due to low dissolved oxygen, and its tarnishing effects on boat paint and corrosion of metal objects.

Sanitation Districts of Los Angeles County. 1965. Dominguez Channel Study. A Chemical, Physical, and Biochemical Evaluation of the Wastes in a Man-made Tidal Channel Used for Flood Control and Industrial Waste Disposal, June – December 1965. May.

The reports describes a study that was conducted at the direction of the chief engineer of the Sanitation District to determine if the Dominguez Channel (between Avalon Blvd. and the Los Angeles Harbor) could assimilate the wastes discharged into it by industry. The goal of the study was to determine if the industrial wastes that were being discharged into the channel should be diverted into the sanitary sewer system. The study included chemical, physical, and biological measurements of the channel during the period from August 1965 to December 1965. The study's findings indicated that it was not necessary to divert any more industrial waste into the sewer system than was being diverted at that time. The report further indicates that in 1965, industry discharged approximately 10.2 million gallons per day (MGD) of effluent to the channel.

Los Angeles Regional Water Quality Control Board. 1969. Review of Information Pertinent to Los Angeles-Long Beach Harbor and Dominguez Channel. May.

This document is a staff report from 1969 of available information on the Los Angeles-Long Beach Harbor Complex and Dominguez Channel to assist in a public hearing on the beneficial uses of these water bodies. It is a cursory overview of area characteristics, not a detailed investigation.

Soule, D. F. and M. Oguri. 1974. Marine Studies of San Pedro Bay. Part VII – Sediment Investigation. The Hancock Marine Foundation and California Sea Grant. August.

This document presents results from a harbor-wide sediment characterization study, and a more focused study in the area where a proposed liquefied natural gas (LNG) terminal was to be sited. Physical and chemical characterization of the sediment was performed. A ranking of the chemistry results indicated that the Consolidated Slip site had the highest "relative intensity of contamination" of the over 40 sediment samples analyzed.

Marine Bioassay Laboratories. 1981. Technical Evaluation of Environmental Impact Potential for Proposed Ocean Disposal of Dredged Material from Los Angeles Harbor. Final Report. Material Proposed for Dredging from Berths 200 G&H Dominguez Channel. November.

This document describes bioassay and bioaccumulation results conducted on three sediment composites collected adjacent to Berths 200 G and H in northeast Consolidated

Slip. No sediment chemistry was conducted. The bioassays showed significant toxicity in both suspended particulate and solid phase tests. Clams were found to have significant levels of copper and silver in their tissue following the bioaccumulation analyses.

Los Angeles Department of Public Works. 1986. A Report on Water Quality in San Pedro Bay. January.

A request was made by the Los Angeles City Council to the Board of Public Works to prepare a report relative to the water quality in San Pedro Bay. The report presents a review of water quality, biological, and chemical data for the Los Angeles-Long Beach Harbor Complex that was available at the time. The report indicates that at the time, there were 35 permitted dischargers on the Dominguez Channel that discharged approximately 19.5 MGD.

Toxscan and Kinnetic Laboratories. 1993. Preliminary Testing Program – Preliminary Maintenance Dredging. Pier 400 Design Team and Port of Los Angeles. November.

This report presents sediment chemistry results for samples collected at various locations in the Port of Los Angeles inner harbor. The study included 6 samples collected in Consolidated Slip and 2 samples collected adjacent to Berth 211 (Hugo Neu-proler) in the East Basin. All samples were collected using a vibracore to a depth of up to 12 feet (ft) into the sediment column.

CH2M HILL. 1995. Field Report – Surface Water, Sediments, and Biological Sampling in Stormwater Pathway from Montrose Chemical Company to Los Angeles Harbor. July.

This report was prepared in support of the Montrose Superfund project. Surficial sediment, water, and tissue samples were collected in Consolidated Slip and analyzed for a full range of chemicals. This report only provides a general description of where the sediment samples were collected. Sediment, water, and tissue samples were also collected at numerous locations in Dominguez Channel and one of its tributaries (the Torrance Lateral).

California State Water Resources Control Board, et al. 1998. Sediment Chemistry, Toxicity, and Benthic Community Conditions in Selected Water Bodies of the Los Angeles Region. August.

This report summarizes the results of three separate testing events conducted as part of the BPTCP. These studies included chemical analyses, bioassay testing, benthic community assessment, and tissue bioaccumulation. Not all of these endpoints were analyzed for all three studies. The 1992 and 1994 studies involved analysis on surficial samples only. The 1996 study involved collection of both surficial and deep samples (collected with a gravity corer) up to 150 cm (approximately 5 ft) into the sediment column.

California State Water Resources Control Board (CSWRCB). 1996. State Mussel Watch Program 1993-1995 Data Report (and online database http://www.swrcb.ca.gov). California Environmental Protection Agency.

This document summarizes the results of chemical analyses conducted on the tissue of bay mussels placed in Consolidated Slip for 2 months.

Kinnetic Laboratories. 1997. Evaluation of Maintenance Dredging Sediments, Consolidated Slip Channel, Port of Los Angeles. November.

The Port of Los Angeles conducted this Tier II study to determine the possibility of conducting maintenance dredging in the slip. Fifteen vibracore samples to a depth of 7.5 ft into the sediment column were collected and three sediment composites were prepared with 5 cores each. The three sample composites were analyzed for chemical contaminants and physical properties.

CH2M Hill. 2001. Conceptual Sampling and Analysis Plan for Sediments in the Montrose Site Surface Water Drainage Pathway. August.

This document is a Technical Memorandum submitted to the EPA that summarizes the ecological risk assessment studies conducted to date for the Montrose Superfund Project, and outlines the next step in the process which will be additional sediment collection in the drainage pathway to be conducted in summer 2002.

SECTION 7. SITE HISTORY

7.1 Consolidated Slip/Dominguez Channel

Industry has been discharging wastewater into the Dominguez Channel since the mid-1910s. The area became increasing industrialized, especially during World War II. The combination of poor tidal flushing and pollutant loads from the Dominguez Creek Watershed has seriously degraded Consolidated Slip.

In 1947 the Los Angeles Harbor Department was concerned about nauseous and obnoxious odors in the harbor, and about the corrosive and discoloring effects of hydrogen sulfide on boats and dock hardware (bolts, washers, nuts, etc.). Prompted by numerous complaints, the Harbor Department directed their testing laboratory to conduct a study to assess pollutant inputs to the harbor from the Dominguez Channel. It was difficult at the time to analyze the individual discharges for particular pollutants; however, they concluded that adequate information was available to establish, in court, that the water was polluted. The dischargers named in the report and the estimated volume of discharge is contained in Table 2. The results of this study resulted in the implementation of a sulfide control plan that resulted in a significant decrease in sulfide inputs to the harbor.

In May 1965, the Chief Engineer of the Los Angeles County Sanitation District directed staff to investigate the ability of the Dominguez Flood Control Channel to assimilate wastes discharged into it by industry. This study was conducted to determine if the recent widening and deepening of the channel would necessitate a reduction in the volume of industrial waste discharged into the flood channel and a resultant increase in the volume going to wastewater treatment plants. Any substantial increase in effluent volume going to a treatment plant would necessitate plant expansion at considerable cost to the District. The industrial dischargers into Dominguez Channel at the time are outlined in Table 3. The study only evaluated biological oxygen demand (BOD) and chemical oxygen demand (COD); no additional chemical analyses were conducted.

Table 2. Dischargers to Dominguez Channel in the 1940s (LA Harbor Dept. Lab, 1947)

Discharger	Estimated Volume (MGD)
Goodyear Synthetic Rubber Company	0.43
US Rubber	2.52
Dow Chemical Company	0.14
Union Oil Company (Dominguez Plant)	0.42
Shell Oil (Dominguez Plant)	2.31
Los Angeles County Sanitation District	Unknown
Johns-Manville Company	0.42
Richfield Oil Co. (Watson Refinery)	1.34
Shell Oil Co. (Watson Refinery)	0.67
Tide Water Associated Oil Co.	0.21
Texas Oil Company	1.47
E.B. Hall Company	Unknown

MGD – million gallons per day

Table 3. Dischargers into Dominguez Channel and Approximate Volumes in the 1960s (LA Sanitation District, 1965)

Discharger	Flow Rate (MGD)
Texaco South	0.87
Texaco North	0.70
Shell Wilmington	0.44
Richfield Oil Co.	2.96
Shell Dominguez	2.48
Shell Chemical	2.51

MGD – million gallons per day

In 1969, the RWQCB began to compile information to determine the beneficial uses of the Los Angeles-Long Beach Harbor Complex and the Dominguez Channel. Board staff was able to compile the following tables regarding inputs to Dominguez Channel and Consolidated Slip (Tables 4 and 5, respectively).

Table 4. Wastewater Discharges into Dominguez Channel in the 1960s (RWQCB, 1969)

Discharger	Waste Type	Maximum waste quantity (GPD)
American Chemical Corp	Cooling, boiler blowdown, scrubber, deionizer	576,000
Anco Metal Improvement	Burnishing	4,000
Atlantic Richfield Co.	Cooling, brine, process, softener	4,590,000
B.F. Goodrich Chemical Co.	Boiler blowdown, cooling, yard runoff	36,000
Harvey Aluminum, Inc.	Quench tank, cooling	650,000
Import Dealers Service Corp. (Auto Bubble Bath)	Auto wash	20,000
Johns-Manville Products Corp.	Boiler blowdown, cooling, process	2,070,000
McDonnel Douglas Corp.	Cooling	40,000
Pepsi-Cola Bottling Co. of Los Angeles	Rinse, boiler blowdown, cooling	108,000
Phillips Petroleum Co.	Brine, truck wash	8,000
Plan Hold Corp.	Rinse, cooling	3,000
Shell Chemical Co.	Boiler blowdown, cooling, process	2,380,000
Shell Oil Co. – Dominguez Refinery	Cooling, brine, condensate, softener	3,020,000
Shell Oil Co. – Wilmington Refinery	Cooling, brine, condensate, softener	546,000
Signal Oil and Gas Co.	Brine	43,100
Stauffer Chemical Co.	Cooling, softening, wash, boiler blowdown	72,000
Texaco Inc.	Boiler blowdown, process, cooling	2,630,000
Union Carbide Corp.	Boiler blowdown, softener, steam cleaning	205,000

GPD – gallons per day

The Port of Los Angeles purchased Consolidated Slip and its adjacent lands in March 1980. The overall condition of the slip at the time was somewhat degraded and required extensive restoration to permit port tenant utilization.

Table 5. Wastewater Discharges into Consolidated Slip in the 1960s (RWQCB, 1969)

Discharger or Storm Drain	Waste type	Maximum waste quantity (GPD)
Cooper & Brain	Brine	400
Dor-Mar Oil Co.	Brine	840
Elliott-Herley-Marshall	Not reported	1,680
Flint Avenue Storm Drain (carries 28 discharges)	Brine, groundwater	711,040
Getty Oil Co.	Brine	4,690
E.B. Hall & Co.	Brine	43,000
Humble Oil & Refining Co.	Brine	61,000
Los Amigos Oil Co.	Brine	50
Los Angeles County Flood Control District	Groundwater	600,000
Los Angeles Harbor Department	Equipment wash	4,400
McFarland Avenue Storm Drain	Equipment wash	13,000
Mobil Oil Co.	Brine	15,300
Royalty Service Corp., Ltd.	Brine	41,200
C.F. Sudduth	Brine	2,630
T & F Oil Co.	Brine	2,270
Victory Oil Co.	Brine	4,120
Zeyphyr Oil Co.	Brine	1,890

GPD – gallons per day

In 1986, the Los Angeles Department of Public Works was directed to conduct a study of the water quality in San Pedro Bay. This direction came from a motion made by the Los Angeles City Council, based upon public concerns over the quality of water and marine life in the bay. The report presents the results of a study conducted in 1981 and 1982 that estimated the mass loading of certain pollutants to the harbor from Dominguez Channel (Table 6). The study results indicated that the water quality in the harbor complex had significantly improved following elimination of industrial discharges to the bay, institution of a pre-treatment program, conversion of the Terminal Island Treatment Plant to full secondary, and the elimination of DDT and PCB manufacturing.

Various sediment quality and dredged material studies have been conducted in Consolidated Slip since the mid-1980s. A 1981 study conducted by Marine Bioassay Laboratory (now know as Toxscan, Inc.) was performed in support of a proposed dredging project adjacent to Berth 200 G and H. The study included both solid phase and suspended particulate bioassays. The results of the tests indicated that the sediment was

toxic; consequently, no dredging was conducted. The additional studies conducted in the Consolidated Slip project area are described in detail in the next section.

Table 6. Estimated Mass Loading of Contaminants from Dominguez Channel 1981 and 1982 (LA Public Works, 1986)

	1981	1982
Mean Annual Runoff (MGD)	$7.9x10^7$	$2.9x10^8$
Waste Load, Tons/yr		
BOD_5	220	769
COD	1283	3865
Oil and Grease	13	70
Total Nitrogen	13	47
Phosphate P	10	28
Total Organic Carbon	393	1039
Total DDT	0.001	0.011
Heavy Metals, Tons/yr		
Silver	0.31	ND
Cadmium	0.05	0.02
Chromium	0.39	1.03
Copper	0.49	1.62
Mercury	0.0023	0.0004
Nickel	0.39	0.89
Lead	0.30	1.09
Zinc	1.69	16.91

ND – not detected

In September 1999, the RWQCB fined the Los Angeles Refining Company (Equilon Enterprises) for exceeding their permit limits on its Dominguez Channel discharge for 87 days and not reporting the exceedances. The wastewater included boiler blowdown, cooling tower blowdown, miscellaneous cleanup wastewater, petroleum coke-belt wastewater, and stormwater runoff.

Today, Consolidated Slip's tenants are limited to pleasure craft marinas. The land area to the north is used to store new cars, while the land area to the south is used to dewater dredged materials (the Anchorage Road Site). The Dominguez Channel Watershed still receives millions of gallons of effluent every day from 10 major National Pollutant Discharge Elimination System (NPDES) dischargers including one wastewater treatment plant, two power-generating stations and six refineries (Table 7) (RWQCB, 2001). There are also dozens of minor point source dischargers as well as 424 industrial stormwater dischargers.

Table 7. Current Major NPDES Dischargers to the Dominguez Channel Watershed

Discharger	Facility	Receiving Water	Design Flow (MGD)
Atlantic Richfield Company	Carson Refinery	Dominguez Channel	7.57
Equilon Enterprises, LLC	Carson Plant	Dominguez Channel	28.2
Equilon Enterprises, LLC	L.A. Refining Co. (Wilmington)	Dominguez Channel	2.88
LA City Bureau of Sanitation	Terminal Island WWTP	Los Angeles Outer Harbor	30.0
Long Beach Generation LLC	Long Beach Generation Station	Long Beach Harbor	777
Los Angeles City of DWP	Harbor Generating Station	Los Angeles Harbor	170
Mobil Oil Corp.	Torrance Refinery	Dominguez Channel	1.4
Tosco Corp.	L.A. Refinery, Carson Plant	Dominguez Channel	11.1
Tosco Corp.	L.A. Refinery, Wilmington Plant	Los Angeles Harbor	20.0
Tutor-Saliba Team	Alameda Mid-Corridor Trench Project	Dominguez Channel	18.0

MGD – million gallons per day

7.2 Montrose Superfund Project

The Montrose Chemical Corporation operated a pesticide manufacturing and formulation facility at 21201 South Normandie Avenue in Los Angeles, California from 1947 to 1982. The Montrose facility occupied approximately 13 acres and was dismantled in 1983. Most of the property was regraded and capped by Montrose in 1985 (CH2M Hill, 1996).

Releases from the facility have occurred via groundwater, air, and surface water. Montrose was included on the National Priorities List in 1989 and the Superfund Site includes the property, the surface soil surrounding the property, the underlying contaminated groundwater, the sanitary sewers, and the surface water drainage pathway. The surface water drainage pathway includes Normandie Avenue Ditch (including Jones Ditch), Kenwood Drain, Torrance Lateral, the Dominguez Channel, and Consolidated Slip (CH2M Hill, 1996).

During the years of active operation at the Montrose facility, storm water runoff flowed from the property into the Normandie Avenue Ditch where it entered the County and City of Los Angeles drainage systems (i.e., Kenwood Drain, Torrance Lateral, Dominguez Channel, Consolidated Slip, and Los Angeles Harbor). Runoff from the eastside of the property flowed to the southeast corner of the property where it entered a culvert leading off the property and discharged in the Normandie Avenue Ditch. Runoff from the westside of the property flowed south onto the Jones Chemical property where it either entered the Jones Ditch or continued south to the Farmer Brothers Coffee property. Jones Ditch followed a railroad spur running southeast on the Jones Chemical property before it emptied into the Normandie Avenue Ditch (CH2M HILL, 1996).

CH2M Hill conducted a Phase I Ecological Risk Assessment of the Montrose Site for the EPA. Conclusions of their study are as follows (CH2M Hill, 2001).

- The Montrose property is a source of contamination for downstream and downwind areas, particularly for DDT and its metabolites.

- Chemicals of greatest concern are those that a) persist in soils and sediments in the study area, b) are toxic at concentrations found in those media or in surface water, c) tend to bioaccumulate in animals exposed to them. Available data indicate that DDT and its metabolites are the primary chemicals of ecological concern (COECs).

- Ecological receptors in downstream areas (primarily the Dominguez Channel and Consolidated Slip) include aquatic invertebrates, fish, and semi-aquatic birds. These species are exposed to chemicals in the sediment and surface water through ingestion and dermal contact that can result in toxic effects and bioaccumulation of chemicals.

- Waterborne concentrations of DDT have exceeded water quality criteria in the Torrance Lateral. Maximum observed concentrations of DDT and BHC in the Dominguez Channel and Consolidated Slip cannot be evaluated because the detection limits were at or above the acute and chronic criterion for those chemicals (and because water solubility is very low).

- Concentrations of DDT, DDE, and DDD in sediments at the intersection of the Dominguez Channel and Torrance Lateral exceed levels associated with reported adverse effects in biota or those that have been suggested as sediment criteria.

- Chemical concentrations have not been measured in biota from the surface drainage systems, but bioaccumulation of DDT and metabolites by aquatic invertebrates and fish is expected to reach levels causing adverse effects in fish and birds consuming them. Bioaccumulation of other chemicals is not expected to be significant due to their lower soil affinity.

- Concentrations of DDT in surface soils within 0.75 mile of the Montrose property frequently exceeded 10 mg/kg. Although numerical criteria for evaluation of these concentrations are not available, bioaccumulation of DDT (and particularly DDE)

into the terrestrial food webs can be expected to occur. A bioaccumulation ratio of 10:1 can be expected for earthworms living in DDE-contaminated soils

- Long-term persistence of DDT and metabolites can be expected in soils and sediments.

Based on the conclusion of the Phase 1 ecological risk assessment, CH2M Hill recommended a Phase 2 ecological investigation. The Phase 2 study focused on the drainage pathway from the Montrose Site into Consolidated Slip and included the tidally influence portion of the Dominguez Channel. The assessment included:

- Review of the California State Water Resources Control Board Toxic Substances Monitoring Program (TSMP).
- Review of State Mussel Watch Program (SMWP) results.
- Review of BPTCP results from 1992 to 1996
- An investigation of the surface drainage pathway that included collection of sediment, water, and tissue samples.

Conclusions from the Phase 2 study include (CH2M Hill, 2001):

- DDT and chlordane were the only chemicals to be detected throughout the drainage pathway.

- The number of pesticides detected in Consolidated Slip was also greater than in upstream areas, indicating that the slip may be serving as a sink for chemicals transported downstream during tidal movement of storm events as well as other sources discharging into Los Angeles Harbor.

- The two locations with the largest number of detected levels of contaminants in biota tissue samples were the Dominguez Channel intersection with the Torrance Lateral and in Consolidated Slip.

EPA is planning to have CH2M Hill conduct a follow-up study of the Montrose Site drainage pathway in summer 2002. The proposed study is intended to verify the results of the 1994 Phase 2 ecological risk assessment; however, it will only involve collection of sediment samples and analysis for DDT and related chemicals (i.e., DDE, DDD, and isomers), and total organic carbon (TOC). The proposed study will also be used to collect information on the current distribution of DDT-related chemicals in the drainage, and to evaluate the amount of contaminated sediment present in the drainage that might be mobilized and transported downstream (CH2M Hill, 2001).

SECTION 8. EXISTING DATA

This section describes the results of sediment characterization studies conducted within the Consolidated Slip area of concern and the Dominguez Channel Watershed.

8.1 Consolidated Slip Data Summary

8.1.1 Sediment Chemistry

Several sediment characterization studies have been conducted in and around Consolidated Slip. Figure 3 depicts the locations that sediment samples were collected for the numerous studies. The following table provides the unique identifier for each of the studies, as well as a summary of the studies scope. Study citations are listed in Table 8.

The results of these studies are presented on a series of attached figures. Only those analytes that are drivers or potential drivers of the cleanup are mapped. The chemistry data used to prepare these maps is contained in Appendix A.

- Figure 4 presents the heavy metal results (cadmium, chromium, copper, lead, mercury, and nickel) for the three BPTCP studies, Bight 98, and the CSTF 2001 sample. The chemistry data is shown on Appendix Table A-1.

- Figure 5 presents the organic chemical results (chlordane, DDT, dieldrin, PCBs, and PAHs) for the three BPTCP studies and the CSTF 2001 sample. The chemistry data is shown on Appendix Table A-1.

- Figure 6 presents the results for the Toxscan 1993 study. The chemistry data is shown on Appendix Table A-2.

- Figure 7 presents the CH2M Hill 1994 chemistry results. The chemistry data is shown on Appendix Table A-3.

- Figure 8 presents the Kinnetic 1998 chemistry results. The chemistry data is shown on Appendix Table A-4.

- Figure 9 presents the surficial sediment (approximately the top 1 ft) concentrations of total DDT in Consolidated Slip combining the results from all studies. The concentration contours are shown. Blue represents the lower concentrations, while red identifies the areas of highest concentration.

- Figure 10 presents the mid-depth total DDT concentrations contours at a depth in the sediment column of approximately 1 to 10 ft.

- Figure 11 presents the total DDT concentrations deep in the sediment column (>10 ft).

Table 9 presents a summary of the minimum, maximum, and average concentrations for the analytes of concern obtained from all the Consolidated Slip studies combined. The table also identifies the study in which the maximum concentration was observed and the site location.

Table 8. Sediment Characterization Studies in the Consolidated Slip Project Area

Site Identification	Project Description
Bay Protection Toxic Cleanup Program (BPTCP) 1992	Three samples collected on 7/31/92 all within Consolidated Slip. Station identification numbers 40006.1, 40006.2, and 40006.3 (Leg 1). These were samples collected in the East basin on 7/30/92. Station identification numbers 40005.1, 40005.2, and 40005.3 (Leg 1). All samples were from the surface.
BPTCP 1994	Three replicate samples collected on 2/1/94 within Consolidated Slip. Station identification numbers 40006.1 Rep 1, 40006.1 Rep 2, and 40006.1 Rep 3 (Leg 25). All samples were from the surface.
BPTCP 1996 CS	Fifteen samples collected at 10 sites on July 17 and 18, 1996. Nine samples collected in Consolidated Slip and 1 collected from the Dominguez Channel. Station identification numbers 47001.0 – 198 Surface, 47001.0 – 198 Depth 2, 47002.0 – 200 Surface, 47002.0 – 200 Depth 2, 47003.0 – 200B Surface, 47003.0 – 200B Depth 2, 47004.0 – 200E Surface, 47004.0 – 200E Depth 2, 47005.0 – 200T Surface, 47005.0 – 200T Depth 2, 47005.0 – 200T Depth 3, 47007.0 – End Surface, 47008.0 – Storm Drain, 47009.0 – 200G Surface, 47010.0 – H. Ford Bridge Surface (Leg 46). Surface samples represented the top 30 cm of the sediment column. D2 was 30 to 90 cm and D3 was 90 to 150 cm.
BPTCP 1996 HN	Three samples collected on 6/20/96 in the East Basin adjacent to Hugo Neu-proler (Berths 210-212). Station identification numbers 46001.0 – Hugo Neu-proler #1, 46002.0 – Hugo Neu-proler #2, 46003.0 – Hugo Neu-proler #3 (Leg 45). All samples were from the surface.
Toxscan 1993	Six samples collected in Consolidated Slip and two in the East Basin adjacent to Hugo Neu-proler as part of the Port of Los Angeles' Portwide Maintenance Dredging Preliminary Testing Program in support of Pier 400 construction. Station identification numbers CSL-1 to CSL-6 and HNP-1 and HNP-2. Samples were collected with a vibracore up to 12 ft into the sediment column.
CH2M Hill 1994	Six samples collected in Consolidated Slip to document existing conditions as part of the Montrose project. All samples were from the surface.
Kinnetic 1997	Fifteen vibracore samples were collected on 5/12/97 and 5/13/97. Three sample composites were analyzed (Five core samples per composite). Station identification numbers A-1 through A-5, B-1 through B-5, and C-1 through C-5. Samples were collected with a vibracore up to 7.5 ft into the sediment column.
Bight '98 1998	Two samples collected in the East Basin and one in Cerritos Channel. Station identification numbers 2170 and 2421. All samples were from the surface.
CSTF 2001	One sample collected in Consolidated Slip as a potential source of sediment for the cement stabilization study being conducted by the CSTF. Station identification number CSTF-1. The sample was from the surface.

Table 9. Summary of Minimum and Maximum Sediment Chemical Concentrations Compared to Sediment Quality Guidelines

Analyte	Units (Dry wt.)	ERM	Min Conc.	Max Conc.	Average Conc.	Max Conc. Study ID
Cadmium	mg/kg	9.6	ND	**14.5**	3.3	BPTCP 96 47008.0 01
Chromium	mg/kg	370	6.2	**640**	148	Toxscan 1993 CLS-5-2
Copper	mg/kg	270	27	**2400**	246	Toxscan 1993 CLS-2-2
Lead	mg/kg	218	1.3	**1590**	217	BPTCP 96 47005.0 D3
Mercury	mg/kg	0.71	0.007	**4.75**	**0.80**	CSTF 2001
Nickel	mg/kg	51.6	6.0	**367**	48	Toxscan 1993 CLS-5-3
Total DDT	µg/kg	46.1	ND	**1317**	**316**	BPTCP 96 47004.0 D2
Total PCBs	µg/kg	180	ND	**2000**	**530**	Kinnetic 97 Site C
Total PAHs	µg/kg	44792	ND	**250,000**	9877	CSTF 2001
Chlordane	µg/kg	6	ND	**370**	**56**	CH2M Hill CS-2
Dieldrin	µg/kg	8	ND	**33**	3.7	BPTCP 96 47004.0 D2
Toxaphene	µg/kg	NA	ND	160	56	BPTCP 92 40006.1

ERM – effects range-median
Bold – indicates exceeds ERM
NA – none available

The ERM (effects range-median) is provided for comparison. The ERM is not a cleanup objective or sediment quality criteria, but rather a guideline value based upon empirical effects-chemistry data compiled by NOAA. The ERM is the median concentration of the compiled data and represents a concentration above which toxic effects would be expected. Comparing the Consolidated Slip results to the ERM indicates that the maximum level of all the chemical contaminants exceed the ERM level. The average concentrations of mercury, total DDT-related compounds and metabolites, total PCBs, and chlordane exceeded their respective ERMs (and were close to exceeding in the case of copper, lead, and nickel). Since the average concentration of several contaminants exceeds ERMs, it can be inferred that the majority of the sediment in Consolidated Slip is probably toxic.

8.1.2 Horizontal Extent of Contamination

The good method for assessing the horizontal extent of contamination is by using total DDT as a tracer. Presumably the Dominguez Channel was the only source of DDT into the East Basin. Levels of DDT greater than 100 µg/kg are found throughout the entire Consolidated Slip area as well as portions of the East Basin and Cerritos Channel (Figure 9). The vertical extent of contamination, therefore, covers the entire area of concern.

8.1.3 Vertical Extent of Contamination

Deep core samples were collected in three of the site studies: 1) Toxscan 1993, 2) BPTCP 1996, and 3) Kinnetic 1997. Results for these studies by depth interval are outlined in Appendix Tables A-2, A-1, and A-4, respectively.

Toxscan 1993

Vibracore samples were collected up to 12 ft into the harbor bottom and split into three substrata (Figure 6). Cores were taken to project depth, not to refusal. The length of the subsection varied between cores. The major finding of this study is that while the majority of the contamination was in the upper sediment layers, elevated levels of chromium, copper, lead, mercury, nickel, total DDT, total PCBs, and chlordane were found as deep as 8 to 12 ft in the sediment column.

BPTCP 1996

In this study, a gravity corer was used to collect samples at three distinct intervals: 0 to 30 cm (approximately 1 ft), 30 to 90 cm (approximately 1 to 3 ft), and 90 to 150 cm (approximately 3 to 5 ft) (Figures 4 and 5). Only one of the core samples (Station 47005.0 D3) achieved the 150 cm depth. The report indicates that a hard clay layer below 90 cm prevented the collection of samples at the third depth strata. DDT and lead were detected at elevated concentrations as depth as 5 ft in the sediment column.

Kinnetic 1997

This study involved the collection of 15 vibracore samples to a maximum depth of 6.8 ft into the sediment column (Figure 8). Three composite samples were prepared by combining 5 cores (top to bottom) per composite. Essentially, this results in one sample per composite that represents the sediment quality over a large area. Even with this compositing scheme, the samples still indicated that the site sediments had elevated levels of copper, nickel, DDT, PCBs, and chlordane.

All Studies – Total DDT

Figures 10 and 11 show DDT concentration contours with depth in the sediment column. The sediment samples used to construct these figures were collected by either a gravity corer (BPTCP) or vibracore (Toxscan 1993 and Kinnetic 1997). Comparing Figure 9

(surficial total DDT) to Figure 10 (mid-depth total DDT) indicates that concentrations of total DDT increase with depth in the sediment column. Total DDT is still detected below 10 ft in the sediment column (Figure 11), albeit at significantly decreased levels.

8.1.4 Volume of Impacted Sediment

Consolidated Slip is approximately 38 acres or 185,000 square yards (sq. yd.). Based on the coring studies described above, its possible that as much as the top 10 ft of sediment would need to be remediated. This does not include any restoration that may be necessary in Dominguez Channel, the East Basin, or Cerritos Channel. Table 10 presents estimated volumes of sediment removal with depth into the sediment column.

Table 10. Approximate Sediment Restoration Volumes with Depth

Depth of Removal	Approximate Volume (cubic yards)
0 to 2 ft	123,000
0 to 5 ft	310,000
0 to 10 ft	620,000
0 to 15 ft	925,000

8.1.5 Comparison to California Title 22 Hazardous Waste Criteria

Table 11 presents a comparison of the maximum values obtained for all the Consolidated Slip sediment quality investigations compared to the California Title 22 hazardous waste criteria. Based upon this comparison, although none of the chemicals exceed Title 22 criteria, three contaminants, copper, lead, and total DDT, are of concern from a hazardous waste characterization standpoint. Each of these chemicals should be analyzed further during the restoration process to determine if any of the sediment must be treated as hazardous waste.

8.1.6 Toxicity Test Results

As part of the BPTCP surveys, samples were collected to conduct solid phase bioassay analyses. The 1992 and 1994 studies used *Rhepoxynius abronius* as the test species, while *Eohaustorius estuarius* was used in 1996. The results of these tests are presented in Table 12. Amphipod survival ranged from 0 percent to 98 percent in the study area (Figure 12). The three locations with the lowest survival (47003, 47004, and 47005) are from the southern slip area (47003), the mid-slip area (47004), and the northern slip (47005), respectively. This indicates that contamination is widespread. For samples collected at site 47005, toxicity was observed at the surface (0 percent survival), 1 to 3 ft in the sediment column (18 percent survival), and 3 to 5 ft in the sediment column (13 percent survival). This indicates that chemical contaminates are found deep in the sediment column. The three samples that were not toxic were all collected adjacent to Hugo Neu-proler.

Table 11. Comparison of Maximum Sediment Concentration in the Consolidated Slip Area to California Title 22 Hazardous Waste Criteria

Analyte	Units	Title 22 TTLC Criteria (wet weight)	Maximum Value (wet weight)	Maximum Conc. Sample Location ID
Cadmium	mg/kg	100	6.8	BPTCP 96 47008.0 01
Chromium	mg/kg	2500	339	Toxscan 1993 CLS-5-2
Copper	mg/kg	2500	1224	Toxscan 1993 CLS-2-2
Lead	mg/kg	1000	916	BPTCP 96 47005.0 D3
Mercury	mg/kg	20	1.9	CSTF 2001
Nickel	mg/kg	2000	184	Toxscan 1993 CLS-5-3
Total DDT	µg/kg	1,000	838	BPTCP 96 47004.0 D2
Total PCBs	µg/kg	50,000	980	Kinnetic 97 C
Total PAHs	µg/kg	NA	100,000	CSTF 2001 CSTF-1
Chlordane	µg/kg	2,500	165	CH2M Hill CS-2
Dieldrin	µg/kg	8,000	21	BPTCP 96 47004.0 D2
Toxaphene	µg/kg	5,000	80	BPTCP 92 40006.1

NA – none available

The 1992 study (40005.1, 40006.1, and 40006.2) also included a survival and growth test using the worm *Neanthes arenaceodentata*. No significant effects on worm survival were observed (ranging from 84 to 100 percent), while growth was slightly significant for sample 40005.1.

The 1994 study (40006.1 A, B, and C) also included development tests on extracted porewater samples with abalone (*Haliotis rufescens*) and purple urchin (*Strongylocentrotus purpuratus*) larvae. There was 0 percent normal development in the three abalone larvae tests. Normal development in the purple urchin test was higher (ranging from 40 to 63 percent); however, all levels were still statistically significant.

Table 12. BPTCP Amphipod Toxicity Test Results (BPTCP 1998)

Site Identification	Test Species	Average Survival (%)	Standard Deviation	Statistically Significant?
40005.1	*Rhepoxynius abronius*	74.00	11.9	Yes
40006.1	*R. abronius*	58.00	17.2	Yes
40006.2	*R. abronius*	59.00	16.4	Yes
40006.1 A	*R. abronius*	62.00	21.7	Yes
40006.1 B	*R. abronius*	65.00	9.35	Yes
40006.1 C	*R. abronius*	80.00	11.18	Yes
46001.0	*Eohaustorius estuarius*	95.00	6.00	No
46002.0	*E. estuarius*	98.00	3.00	No
46003.0	*E. estuarius*	92.00	6.00	No
47001.0S	*E. estuarius*	61.00	19.00	Yes
47001.0D2	*E. estuarius*	64.00	13.00	Yes
47002.0S	*E. estuarius*	54.00	7.00	Yes
47002.0D2	*E. estuarius*	86.00	4.00	Yes
47003.0S	*E. estuarius*	70.00	7.00	Yes
47003.0D2	*E. estuarius*	8.00	12.00	Yes
47004.0S	*E. estuarius*	40.00	27.00	Yes
47004.0D2	*E. estuarius*	33.00	23.00	Yes
47005.0S	*E. estuarius*	0.00	0.00	Yes
47005.0D2	*E. estuarius*	18.00	40.00	Yes
47005.0D3	*E. estuarius*	13.00	29.00	Yes
47007	*E. estuarius*	61.00	21.00	Yes

8.1.7 Tissue Chemistry

Toxic Substances Monitoring Program

This information is summarized from CH2M Hill (2001). The SWRCB TSMP was established in 1976 to monitor potential chemical contaminants in fish tissue. In 1992, white croakers (*Genyonemus lineatus*) were collected in the Dominguez Channel at the Pacific Coast Highway Bridge. Fish tissue from this station was found to contain a concentration of total DDT of 6.49 mg/kg, wet weight (AMEC note: The federal Food and Drug Administration (FDA) action level for DDT for poisonous and deleterious substances in fish and shellfish is 5 mg/kg, wet weight.)

California State Mussel Watch Program

This information is summarized from CH2M Hill (1995 and 2001). The California SMWP was established in 1977 to monitor water quality in the state's coastal areas. Bivalve mollusks are collected from clean areas and transplanted to each monitoring site where they are left for several months. They are then collected and analyzed for trace

elements, synthetic organic pesticides, PCBs, and PAHs. California mussels (*Mytilus Californianus* or *galloprovincialis*) are used for most coastal areas.

Two locations in the Consolidated Slip, one at the upstream end by the Henry Ford Avenue Bridge and one at the downstream end were sampled as part of the program. The upstream location at the Henry Ford Avenue Bridge was evaluated for DDT-related chemicals in 1982, 1986, and 1987. The downstream location in the Consolidated Slip was evaluated for DDT-related chemicals yearly from 1982 through 1996. Total DDT levels in mussel tissues collected near the Henry Ford Bridge ranged from 48.4 to 206 µg/kg (wet weight). Levels in mussels collected in the downstream end of the Consolidated Slip ranged from 30.8 to 285 µg/kg total DDT. The Maximum Tissue Residue Level (MRTL) for Enclosed Bays and Estuaries for total DDT was calculated at 32 µg/kg wet weight. This regulatory value was exceeded at both locations for all sampling years except for the downstream end of the Consolidated Slip in 1989.

Montrose Site Phase 2 Ecological Risk Assessment

In 1994, CH2M Hill collected and analyzed Topsmelt and Black Surfperch tissue samples from Consolidated Slip. The results are presented in Table 13. Not all chemicals of concern for this study were analyzed. The key conclusion that can be drawn from these analyses is that a DDT-metabolite (4,4' DDE), presumably from an upstream source, was found in elevated levels in fish in Consolidated Slip.

Table 13. Selected Tissue Chemistry Results for Samples Collected in Consolidated Slip (CH2M Hill 1996)

Chemical Analyte	Units	Minimum Tissue Concentration	Maximum Tissue Concentration
Copper	mg/kg	19.4	30.2
Lead	mg/kg	1.6	4.2
Mercury	mg/kg	0.1	0.1
4,4' DDE	µg/kg	33	240

8.1.8 Grain Size and Total Organic Carbon (TOC)

Grain size in the Consolidated Slip study area is approximately 20-30 percent sand and 70-80 percent fines (silt + clay). Average TOC is approximately 2-4 percent.

8.2 Dominguez Watershed

The entire Dominguez Watershed is depicted in Figure 13. As previously discussed, CH2M Hill conducted a Phase 2 ecological risk assessment in a portion of the Dominguez Watershed in April 1994 as part of the Montrose DDT Superfund project. Surficial sediment and water samples were collected in the drainage channels near the Montrose Site, in the Torrance Lateral, and in the entire length of the tidally influence section of the Dominguez Channel (Vermont Ave. to Consolidated Slip). Animal tissue

samples (mussels, crabs and fish) were also collected at several locations in the drainage system.

8.2.1 Surface Water

The maximum concentrations of contaminants observed in the seven surface waters tested are compared to California Toxics Rule (CTR) ambient water quality criteria in Table 14.

Table 14. Maximum Concentrations of Chemical Contaminants in Dominguez Channel and Tributaries Surface Water Compared to CTR Criteria (CH2M Hill 1996)

Chemical Analyte	Units	Conc.	CTR Maximum*	CTR Continuous*	Location
Copper	µg/L	96.4	4.8	3.1	Kenwood Drain
Lead	µg/L	59.9	210	8.1	Kenwood Drain
Mercury	µg/L	0.89	NA	NA	DC3 (north of I-405 south of Sepulveda Blvd.)
Nickel	µg/L	53.6	74	8.2	Kenwood Drain
DDT	µg/L	2.3	0.13	0.001	Kenwood Drain

*Criteria for saltwater
NA – criteria for mercury have not been promulgated to date

8.2.2 Sediment

Also part of the assessment, 30 surficial sediment samples were collected in the Dominguez Channel and its tributaries leading to the Montrose Site. The range in concentrations for select contaminants observed in the sediment is presented in Table 15 and on Figure 14. Sediment chemistry results are summarized in Appendix Table B-1.

CH2M Hill concluded that metal concentrations generally decreased moving from the Kenwood Drain into the Torrance Lateral and into the Dominguez Channel, with the exception of mercury, which was detected at similar concentrations throughout the stormwater pathway. Based on the very limited set of volatile and semivolatile results (no samples were analyzed for Dominguez Channel itself), CH2M Hill concluded that these compounds are found primarily in the Kenwood Drain, Torrance Lateral – Unlined Segment, and in Consolidated Slip. It was also stated the "a few pesticides were also detected in low concentrations (DDD, DDE, dieldrin, endrin, endrin ketone, and endosulfan II) in both upstream and downstream locations. No attempt was made to define what constitutes a "low concentration." It is clear from these results that there are currently significant sources of lead, DDT, and chlordane contaminated sediment upstream of Consolidated Slip that need be to be considered to ensure that the restoration project is a success.

Table 15. Concentration Range of Chemical Contaminants in Dominguez Channel and Tributaries Sediment Samples (CH2M Hill 1996)

Chemical Analyte	Units	ERM	ND Range	KD Range	TLL Range	TLU Range	DC1 Range
Cadmium	mg/kg	9.6	1.4 – 1.7	2.1 – 2.4	1.6 – 2.7	1.5 – 4.5	1.5 – 2.3
Chromium	mg/kg	370	12.9 – 33.7	13.8 – 28	30.5 – **906**	27.4 – 88.8	9.9 – 77.9
Copper	mg/kg	270	26.1 – 76.9	40.2 - 54.3	43.0 – **334**	43.0 – 223	25.0 – 252
Lead	mg/kg	218	34.1 – 103	73.8 - **252**	41.2 - **235**	41.4 - **290**	82.3 - **474**
Mercury	mg/kg	0.71	0.12 – 0.29	NA	0.32 – 0.35	0.14 – 0.48	0.16 – 0.27
Nickel	mg/kg	51.6	11.9 – 25.5	14.9 – **64.9**	10.9 – 29.8	9.4 – 49.1	20.6 – 36.8
Total DDT	µg/kg	46.1	**70,400 – 151,500**	**5550 – 11,690**	**92 – 260**	**79 – 269**	**113 - 703**
Chlordane	µg/kg	6	NA	NA	**12 - 39**	**6 – 25**	**11 - 80**
Dieldrin	µg/kg	8	NA	NA	NA	6	**17**
Chemical Analyte	Units	ERM	BDCE Range	BDCW Range	DC2 Range	DC3 Range	DC4 Range
Cadmium	mg/kg	9.6	1.7 – 2.3	2.8 – 4.2	1.6 – 2.9	2.2 – 4.7	3.4
Chromium	mg/kg	370	42.7 - 145	92.7 - 248	47.7 - 253	60.5 - 219	19.3 - 282
Copper	mg/kg	270	74.1 - 156	128 - 162	81.6 - 131	106 - 164	25.5 - 139
Lead	mg/kg	218	97.2 - **248**	215 - **438**	119 - 142	132 - **470**	28.2 - **381**
Mercury	mg/kg	0.71	0.19 – 0.29	0.30 – 0.40	0.19 – 0.31	0.18 – 0.42	0.41 – **1.1**
Nickel	mg/kg	51.6	23.1 – 31.7	33.0 – 41.9	24.5 – 30.3	25.7 – 46.2	27.0 – 42.6
Total DDT	µg/kg	46.1	**139 - 235**	**171 - 3510**	**364 - 995**	**138 - 410**	**67.0 - 273**
Chlordane	µg/kg	6	**29.0 – 35.0**	**43.0**	**35.0 - 48**	**30.0 – 58.0**	5.0 - **40**
Dieldrin	µg/kg	8	NA	7.0	NA	NA	NA

NA – no data available
Bold – exceeds ERM
ND – Normandie Ave./Jones Ditch
KD – Kenwood Drain
TLL – Torrance Lateral, Lined Portion
TLU – Torrance Lateral, Unlined Portion
BDCE – East Bank of Dominguez Channel
BDCW – West Bank of Dominguez Channel
DC1 – Dominguez Channel Segment 1
DC2 – Dominguez Channel Segment 2
DC3 – Dominguez Channel Segment 3
DC4 – Dominguez Channel Segment 4

CH2M Hill contacted various agencies (e.g., Los Angeles Sanitation District) to determine if any maintenance activities related to sediments in the drainage pathway had occurred since their 1994 Phase 2 ecological risk assessment study. Is possible that some scraping was conducted in Torrance Lateral, but this could not be confirmed. Consequently, the contaminated sediments that were found within the drainage system is 1994 are still in the system, with the exception of the sediment that has been carried into Los Angeles Harbor through Consolidated Slip.

8.2.3 Tissue

Animal tissue samples were also collected and analyzed as part of the project. Based on their review of the results (Table 16), CH2M Hill concluded that "metals were detected in all drainage pathways samples, whereas pesticides were found more frequently in the Torrance Lateral – Lined Segment, Torrance Lateral at the confluence with the Dominguez Channel, and in Consolidated Slip. The highest concentration of 4,4' DDE (1300 µg/kg) was measure in a duck egg collected along the bank of Dominguez Channel.

Table 16. Tissue Chemistry Results for Samples Collected in the Dominguez Channel Watershed (CH2M Hill 1996)

Chemical Analyte	Units	TLL Range	TLU Range	DC1 Range	TLDC Range	DC2 Range	DC3 Range	DC4 Range
Cadmium	mg/kg	NA	1.0 – 1.4	1.1	NA	1.2	NA	NA
Chromium	mg/kg	2.7	NA	NA	NA	NA	NA	NA
Copper	mg/kg	NA	NA	NA	5.8 – 9.4	NA	24.2	29.0
Lead	mg/kg	0.58 – 1.8	1.0 – 1.1	0.58	0.62 – 1.2	0.9	1.7	1.25 – 2.5
4,4' DDE	µg/kg	68 - 110	NA	1300	120 - 230	NA	NA	NA

NA – no data available
TLL – Torrance Lateral, Lined Portion
TLU – Torrance Lateral, Unlined Portion
DC1 – Dominguez Channel Segment 1
TLDC – Torrance Lateral at the Dominguez Channel
DC2 – Dominguez Channel Segment 2
DC3 – Dominguez Channel Segment 3
DC4 – Dominguez Channel Segment 4

SECTION 9. CLEANUP OBJECTIVES

There are various methods by which the sediment cleanup in Consolidated Slip can be driven.

9.1 Sediment Chemistry-driven Goals

This would involve establishing numerical criteria for the various chemical contaminants, followed by removal of sediments that exceed these levels. The criteria may be based upon generally accepted sediment quality guidance. Guideline levels such as ERMs or PELs can be useful indicators of sediment quality, but are not cleanup levels.

9.2 Effects-based Goals

Establishing effects-based goals would require employing site-specific sediment quality assessment tools (e.g. sediment quality triad) to determine the appropriate sediment cleanup levels. Test site results would be compared to one or more reference locations around the harbor.

9.3 Alternative Goals

Alternative methods may include removing all the non-native sediment in Consolidated Slip leaving only native material.

Following the removal of sediment from Consolidated Slip to the selected restoration goal, verification testing would be required to assess the completeness of the cleanup. In addition, post-closure verification monitoring would be conducted to determine whether upstream sources of chemically contaminated sediments are still available to recontaminate Consolidated Slip.

9.4 United Heckathorn Superfund DDT Cleanup

A DDT remediation project in the Bay Area is similar in nature to the Consolidated Slip project and may be helpful in establishing cleanup criteria. The United Heckathorn Superfund Site is located in Richmond Harbor, an inlet to San Francisco Bay, in Contra Costa County, California (EPA Region IX, 2001). From approximately 1947 to 1966, the site was used to formulate and package pesticides including DDT and dieldrin. The site was added to the EPA's National Priority List (NPL) for site investigation and cleanup in 1990. The median total DDT concentration measured in the two waterways adjacent to the site, the Lauritzen Channel and the Parr Canal, were 47,000 µg/kg and 840 µg/kg, respectively. Concentrations of dieldrin were lower, but displayed the same spatial trend as DDT in relative concentration.

In the 1994 Record of Decision (ROD) for the site, the remediation goal for the bay sediment was set at 590 µg/kg total DDT. This goal was established by calculating the sediment concentration of total DDT needed to ensure no further violations of surface water quality standards, and to meet the National Academy of Sciences action level for DDT in fish and fish-eating birds. No cleanup level was established for dieldrin in sediment. Table 17 shows the restoration goals for the site.

Remediation of the site was completed in 1997. Approximately 2,620 cy of sediment was excavated from the Parr Canal, while 105,000 cy of sediment (containing 3 tons of DDT) was removed form the Lauritzen Channel. The Montrose Chemical Company pursuant to a consent decree with the EPA performed the cleanup at an approximate cost of $7 million. The sediment was taken by rail car to the ECDC Landfill in Utah. Following remediation, the average DDT concentrations in Lauritzen Channel and Parr Canal were 263 µg/kg and 200 µg/kg, respectively.

Table 17. Final Remediation Levels for the United Heckathorn Superfund Site

Medium	Chemical	Restoration Level	Basis	Cancer Risk
Surface Water	DDT	0.59 ng/L	EPA AWQC	1×10^{-6}
Surface Water	Dieldrin	0.14 ng/L	EPA AWQC	1×10^{-6}
Sediment	DDT	590 µg/kg	Ecological Risk Assessment	1×10^{-6}

EPA AWQC – EPA Ambient Water Quality Criteria

Post-restoration monitoring of the site showed that the level of DDT in the sediment, water, and tissue samples did not meet restoration goals. The occurrence of elevated DDT levels in the sediments following restoration may be due to:

- Incomplete dredging of the site.
- Discharge from a storm drain.
- Discharge form an abandoned outfall hidden by debris or rip-rap.
- Due to sloughing from areas inaccessible to dredging.

SECTION 10. IMPACTS ON HYDROLOGY/HYDRAULICS

The restoration alternatives considered for Consolidated Slip will need to be analyzed based on their impacts to the hydrology and hydraulics of the site. Impacts to consider include:

10.1 Dominguez Channel Flows

If Consolidated Slip is partially filled in or otherwise modified, will it impact the storm water or dry weather flows from the Dominguez Channel? Could this lead to upstream impacts such as erosion or flooding?

10.2 Sediment Transport

What will be the impacts on sediment transport? Will dredging cause accretion or erosion that will impact navigation or wharf integrity in Consolidated Slip or the East Basin?

10.3 Site Recontamination

Will restoration of Consolidated Slip create conditions where recontamination of the site will occur? Can designs be built into the project to prevent this (e.g. sumps)?

SECTION 11. DATA GAPS

11.1 Additional Sediment Quality Characterization

Although there is considerable sediment quality data for the project area, it is not adequate for directing the actual clean up of the site. Additional sediment quality investigation is necessary to determine the current conditions in the slip (many of the studies are too old to be used to make reliable decisions), and to determine the vertical extent of contamination in the sediment column. The depth of contamination has not been adequately established, since vibracore collection was never conducted to refusal (i.e. native sediment). However, in the BPTCP report, they indicate that they encountered a hard clay layer below 90 cm. This contradiction indicates that the sediment column depth in Consolidated Slip still needs to be determined definitively by additional vibracoring or possibly sub-bottom profiling.

11.2 Sediment Cleanup Objectives

The establishment of cleanup objectives must be an early step in the project. The cleanup objectives will determine what additional sediment characterization is needed, as well as the volume of sediment to be removed and the ultimate cost of the project.

SECTION 12. OPPORTUNITIES TO DEVELOP ADDITIONAL CHARACTERIZATION DATA

12.1 Montrose Site Surface Water Drainage Pathway Study

EPA Region 9 through their consultant CH2M Hill plans to collect additional samples in the Dominguez Channel and Consolidated Slip in summer 2002 to verify the results of a previous study conducted in 1994. It is estimated that about 97 sediment samples will be collected throughout the surface water drainage pathway. Vibracore samples will be collected at 6 locations in Consolidated Slip to a depth of 6 ft. Three sub-samples will be collected from each core and will consist of a 0 to 6-inch sample, a 6-inch to 3-foot depth, and a 3-foot to 6-foot sample at each location. The intent of this study is to only analyze the samples for DDT-related chemicals and total organic carbon (TOC). The EPA has indicated that they are open to conducting additional analyses (additional cores/deeper cores/additional analytes/etc) provided that the incremental costs for doing so are reimbursed.

12.2 Los Angeles Contaminated Sediment Task Force

The CSTF has funding that must be allocated by March 2003. In support of the preparation of a definitive restoration plan for this site, some of these funds could be used to:

- Conduct additional analyses to address data gaps.
- Conduct additional bench scale treatment technologies studies using Consolidated Slip sediment.

- Identify upstream sources of contamination.

12.3 SCCWRP Bight '03 Study

The Southern California Coastal Water Research Project (SCCWRP) is proposing to conduct a southern California Bight-wide study in 2003, similar to the Bight '98 study (Steve Bay, personal communication). The footprint of the study is from Point Conception to northern Baja California, Mexico. Study tools will include the sediment quality triad (chemistry, toxicity, and benthic community assessment), fish community assessment, and fish bioaccumulation. The focus of the study will be large urban watersheds, coastal wetlands, bay and harbors, and river mouths, but will also extend out into the Pacific Ocean to a depth of 150 meters. SCCWRP will act in the project management with funding coming from large NPDES dischargers (e.g. wastewater treatment plants), flood control agencies, Southern California Edison, Los Angeles Department of Water and Power, and the State Water Resources Control Board.

The proposed SCCRWP study offers a perfect opportunity to conduct additional, focused studies in the Consolidated Slip project site to fill data gaps that exist related to the lateral and vertical extent of contamination. The project planning process is set to begin in June and terminate in September 2002. Coordination with SCCWRP is essential during this time period to ensure that additional Consolidated Slip assessment is programmed into the project.

SECTION 13. PROJECT ALTERNATIVES

The cleanup of Consolidated Slip may include one, or a combination of the following alternatives.

- No action (source control with natural attenuation)
- Offsite engineering controls
- Capping in place
- Dredging with on-site fill/diking
- Dredging with off-site upland disposal (reuse)
- Dredging with Class I, II, and/or III Landfill disposal
- Dredging with in-bay disposal
- Dredging with ocean disposal
- Dredging with sediment treatment then on-site or off-site disposal

SECTION 14. SITE CLEANUP METHODS

14.1 Natural Attenuation/Source Control

This method would require the complete cessation of upstream sources of contaminated sediment to Consolidated Slip. The contaminated sediment within the slip would eventually be covered by clean sediment and naturally detoxify with time. For various

reasons (source control, public acceptability), this restoration alternative is not a viable option.

14.2 Upstream Engineering Controls

This alternative involves offsite controls limiting the continued movement of contaminated sediment downstream, which may include restoration of channel sediments and construction of sediment traps.

14.3 Confined Aquatic Disposal/Capping

This restoration method would involve placing a layer of clean sediment on top of the contaminated sediments now located in Consolidated Slip. The thickness of the cap would be dependent on the hydrology/hydraulics of the waterway, and the ability of contaminants to leach through the cap and negatively impact surface waters. Since capping Consolidated Slip would results in a shallower channel, the ability for safe navigation within the waterway may be impacted, as well as, potential impacts on Dominguez Channel flows, and current and future uses of the berthing areas. There is already an existing concern from the slip's marina operators that shoaling is negatively affecting safe navigation.

14.4 On-site Fill in Consolidated Slip/Diking

Figure 15 is a depiction of the Consolidated Slip site with the northern side diked off and the area filled. This type of restoration has three advantages. First, the bottom sediments within the fill area do not need to be dredged since they are effectively removed from contact with harbor waters by the dike and fill. Second, the diked off area provides a nearby and convenient disposal location for the remaining contaminated sediment. Third, the fill area provides approximately 20 acres of additional land surface that may be used for port operations. Potential concerns regarding this restoration technique involve the negative impacts it cause on the hydrology/hydraulics of the resulting waterway, relocation of current tenants, limitations on future development, and effective control of contaminants within the fill area.

14.5 Off-site Reuse (Fill)

This includes fill in other areas of the Los Angeles-Long Beach Port Complex outside the immediate project footprint, as well as reuse off port property. This method of restoration would involve dredging the sediment in Consolidated Slip, then transporting it by scow or truck to a permitted reuse site. Besides new land creation in the port, other options are land reclamation (e.g. mines), industrial fill, roadbeds, etc. To permit this type of disposal, the RWQCB would require leachability tests to determine the potential for mobilization of contaminants at the reuse site.

14.6 Class I, II, or III Landfill Disposal

Placing contaminated dredged materials in a landfill is not a very attractive option. For California disposal sites, waste discharges on land are regulated by 23 California Code of Regulations (CCR), Subchapter 15. Hazardous waste can be discharged only at a Class I landfill. Class II landfills can accept "designated waste" and non-hazardous solid waste. Class III landfills can accept only non-hazardous, non-designated solid waste.

Solid waste (e.g., sediment) must be classified as hazardous, designated, or non-hazardous waste before approval by the RWQCB for disposal. As defined in the California Water Code §13173 "designated waste" is (a) hazardous waste that has been granted a variance from hazardous waste management requirements pursuant to §25143 of the Health and Safety Code or (b) non-hazardous waste that consists of, or contains pollutants that, under ambient environmental conditions at a waste management unit could be released in concentrations exceeding applicable water quality objectives that could reasonably be expected to affect beneficial uses of state waters.

Class III solid waste landfill space in the Los Angeles area is at a premium. Landfill operators are regulated on how much solid waste they can accept per day. Dredged materials would be at the bottom of the list on what landfill operators would be willing to accept. Solid waste landfill disposal of contaminated dredged materials is very unlikely. In addition, the salt content in the dredged material may be problematic to a landfill operator.

There are no Class I or II landfills in Los Angeles County that accept designated or hazardous wastes. The closest designated or hazardous waste landfills are the Safety-Kleen Landfill in Kern County (Class I) and the CWMI Kettleman Hills Facility in Kings County (Class II). The cost for hauling and disposing of sediment at these landfills is exorbitant. In addition, there are certain liability issues surrounding co-mingling hazardous or potentially hazardous wastes from different sources in a landfill.

14.7 Treatment Technologies

The CSTF is currently evaluating various treatment technologies that make the reuse of contaminated dredged materials more attractive from an environmental and practical standpoint. These technologies include:

- Cement Stabilization
  Combining dredged materials with cement at an appropriate ratio. Solidifies sediments and sequesters contaminants.

- Blending
  Mixing contaminated sediments with clean sediment, soil, cellulose, and/or biosolids at various ratios to lower the sediment contaminants to an acceptable level for reuse.

- Soil Washing

Treating dredged with fluids containing surfactants, and chelating and oxidizing agents to remove inorganic and organic contaminants.

Other treatment technologies include:

- Thermal desorption
- Fluidized bed treatment
- Plasma vitrification

Each of these techniques is describe in more detail in "The Beneficial Reuse of Dredged Material for Upland Disposal," by Paul Krause and Kathleen McDonnell prepared for the Port of Long Beach (available on the CSTF website).

14.8 Ocean Disposal

Ocean disposal at LA-2 or LA-3 is a possibility in a tangential way for the Consolidated Slip restoration project. The remediated sediment certainly would not be acceptable for ocean placement (based on contaminant levels and the fact that the dredging is a cleanup action, and not for navigation purposes). It's possible, however, that sediment within the East Basin close to the site could be tested for ocean disposal as part of an overall plan to change the current uses of the Consolidated Slip area that would require deeper channels.

14.9 Relative Costs

The cost range for the various restoration alternatives is large. While dredge and fill of the contaminated sediment is low on the price scale, the cost for treating the sediments prior to upland disposal could be exorbitant.

The following are estimated costs for various innovative technologies for the beneficial reuse of contaminated sediments (Krause and McDonnell, 2000).

Thermal Desorption/Cement-Lock	$50 - $70/cy
Fluidized Bed Treatment	$40 - $120/cy
Plasma Vitrification	$90 - $120/cy
Base-Catalyzed Decomposition	$108/cy
Soil Washing	$30 - $50/cy
Solidification/Stabilization	$30 - $60/cy
Manufactured Soils	$20/cy
Construction Projects	$20 - $80/cy

SECTION 15. LOCAL ISSUES

Restoration of sediment in Consolidated Slip may have significant impacts on the current or future uses of the site. For example, if diking and filling a portion of the slip with contaminated sediment were selected as the preferred alternative, the pleasure craft marinas that currently occupy the site would need to be relocated. Once the fill project

was completed, more area would be available to expand land-based port operations; however, the future uses of the water area would be significantly restricted. Future site use plans should be considered carefully (e.g. in the Port Master Plan updates) as they may affect which alternative(s) is/are ultimately selected. Also, filling 20 acres of bay bottom would require mitigation offset.

The siting of a dredged material dewatering and processing area is another issue of concern. This involves transportation of dredged material to and from the area and potential impacts on port operations and public safety.

Another major local issue is coordination with the DWAC and dischargers group. To ensure that Consolidated Slip remains free of chemical contamination following removal, a concerted effort must be undertaken to identify upstream sources and institute Best Management Practices for source control.

SECTION 16. SCHEDULES

It is well understood that the proposed cleanup of Consolidated Slip is a multi-year endeavor. Table 18 outlines the proposed timeline for the completion of various projects tasks.

Table 18. Proposed Timeline for Elements of the Consolidated Slip Restoration Project

Task Activity	Proposed Timeline
Funding	TO BE DETERMINED
Site Assessment	TO BE DETERMINED
Restoration Plan	TO BE DETERMINED
Site Cleanup	TO BE DETERMINED
Site Closure	TO BE DETERMINED

SECTION 17. CONCEPT PLAN SUMMARY

- Consolidated Slip has been receiving industrial wastewater from the Dominguez Channel Watershed since the 1910s.
- It is currently listed as both a CWA Section 303(d) impaired water body and California Bay Protection and Toxic Cleanup Program Toxic Spot.
- Consolidated Slip has not been dredged in recent history, in large part due to the designation of the Superfund status for the Montrose drainage pathways (CH2M Hill, 2001).
- The sediments in Consolidated Slip have been shown to contained elevated levels of heavy metal, pesticides, PCBs, and PAHs.
- Tests have also shown that the sediment is toxic to laboratory test animals, the benthic community is impaired, and resident organisms have elevated levels of contaminants in their tissues.
- Core samples of the sediment have shown that chemical contamination is found deep in the sediment column.

- White croakers (*Genyonemus lineatus*) collected in the Dominguez Channel were found to contain a concentration of total DDT of 6.49 mg/kg, wet weight. The federal Food and Drug Administration (FDA) action level for poisonous and deleterious substances in fish and shellfish is 5 mg/kg, wet weight.
- The volume of sediment that may need to be remediated could be over 1 million cubic yards.
- Sediment samples collected in the Dominguez Channel and its tributaries indicate that there are elevated levels of metals and pesticides that could act to recontaminate Consolidated Slip following cleanup.
- Approximately $1 million is currently available for additional investigation of the impacted area and for cleanup. Other potential funds have been identified.
- Several sediment characterization studies are currently in the planning process that could be used to provide additional information for the cleanup project.

SECTION 18. REFERENCES

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