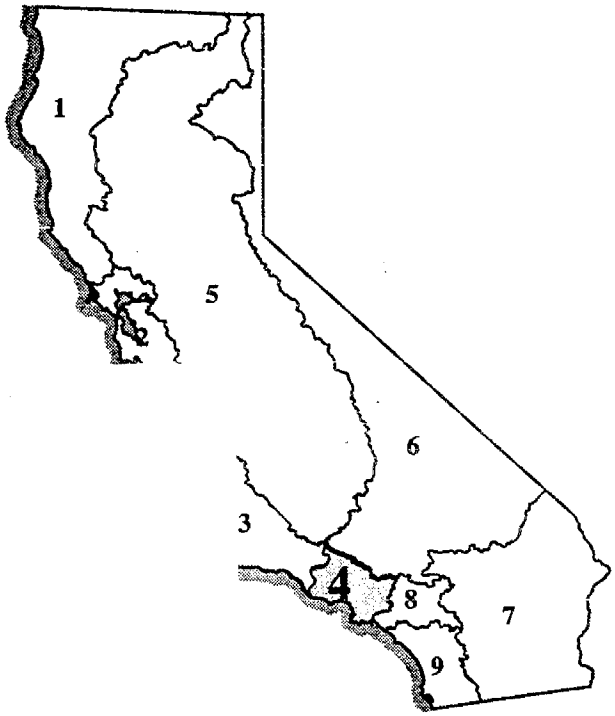
Bay Protection and Toxic Cleanup Program



Proposed Regional Toxic Hot Spot Cleanup Plan

December 1997

LOS ANGELES REGION

REGIONAL WATER QUALITY CONTROL BOARD
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

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PROPOSED REGIONAL
TOXIC HOT SPOT CLEANUP PLAN

DECEMBER 1997

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REGIONAL WATER QUALITY CONTROL BOARD LOS ANGELES REGION

Part I

I. INTRODUCTION

In 1989, The California State legislature established the Bay Protection and Toxic Cleanup Program (BPTCP). The BPTCP has four major goals: (1) to provide protection of present and future beneficial uses of the bays and estuarine waters of California; (2) identify and characterize toxic hot spots; (3) plan for toxic hot spot cleanup or other remedial or mitigation actions; (4) develop prevention and control strategies for toxic pollutants that will prevent creation of new toxic hot spots or the perpetuation of existing ones within the bays and estuaries of the State.

This Regional Toxic Hot Spot Cleanup Plan is intended to provide direction for the remediation or prevention of toxic hot spots in the Los Angeles Region (pursuant to Water Code Sections 13390 et seq.). Pursuant to Sections 13140 and 13143 of the Water Code, this Cleanup Plan is necessary to protect the quality of waters and sediments of the State from discharges of waste, in-place sediment pollution and contamination, and any other factor that can impact beneficial uses of enclosed bays, estuaries and coastal waters. This plan shall be reviewed periodically to ensure that the plan is adequate to complete the mandates of the Bay Protection and Toxic Cleanup Program (Water Code Section 13390 et seq.).

This Plan includes a specific definition of a Toxic Hot Spot, site ranking criteria, and the monitoring approach used to identify the Water Code-mandated requirements for Regional Toxic Hot Spot Cleanup Plans.

Region Description

The Los Angeles Region encompasses all coastal drainages flowing to the Pacific Ocean between Rincon Point (on the coast of western Ventura County) and the eastern Los Angeles County line, as well as the drainages of five coastal islands (Anacapa, San Nicolas, Santa Barbara, Santa Catalina and San Clemente). In addition, the region includes all coastal waters within three miles of the continental and island coastlines.

The enclosed bays, estuaries and coastal waters of the Los Angeles Region subject to the provisions of the Bay Protection and Toxic Cleanup Program are listed in Table 1. The region contains two large deepwater harbors (Los Angeles and Long Beach Harbors) and one smaller deepwater harbor (Port Hueneme). There are small craft marinas within the harbors, as well as tank farms, naval facilities, fish processing plants, boatyards, and container terminals. Several small-craft marinas also occur along the coast (e.g., Marina del Rey, King Harbor, Ventura Harbor); these contain boatyards, other small businesses and dense residential development.

Several large, primarily concrete-lined rivers (e.g., Los Angeles River, San Gabriel River) lead to unlined tidal prisms which are influenced by marine waters. Salinity may be greatly reduced following rains since these rivers drain large urban areas composed of mostly impermeable surfaces. Some of these tidal prisms receive a considerable amount of freshwater throughout the year from publicly-owned treatment plants discharging tertiary-treated effluent. Lagoons are located at the mouths of other rivers draining relatively undeveloped areas (e.g., Mugu Lagoon, Malibu Lagoon, Ventura River Estuary, Santa Clara River estuary). There are also a few isolated coastal brackish water bodies receiving runoff from agricultural or residential areas.

Santa Monica Bay, which includes the Palos Verdes Shelf for the purposes of the Bay Protection and Toxic Cleanup Program, dominates a large portion of the open coastal waters in the region. The region's coastal waters also include the areas along the shoreline of Ventura County and the waters surrounding the five offshore islands in the region.

TABLE 1. Los Angeles Region - Waterbodies Covered Under Bay Protection And Toxic Cleanup Program

WATERBODY NAME OR SEGMENT NAME	HYDROLOGIC UNIT	TOTAL AREAL EXTENT
ESTUARIES		
Ormond Beach Wetlands	400.00	Not available
Ventura River Estuary	402.10	10 acres
Santa Clara River Estuary	403.00	60 acres
Calleguas Creek Tidal Prism	403.11	Not available
McGrath Lake Estuary	403.11	40 acres
Mugu Lagoon-East & West Arms	403.11	1500 acres
Malibu Lagoon	404.31	29 acres
Colorado Lagoon	405.12	13 acres
Dominguez Channel Tidal Prism	405.12	8 miles
Los Angeles River Tidal Prism/Queensway Bay	405.12	3 miles
Los Cerritos Channel Tidal Prism/Wetland	405.12	Not available
Sim's Pond	405.12	1 acre
Ballona Wetlands	405.13	150 acres
Venice Canals	405.13	Not available
San Gabriel River Tidal Prism	405.15	3 miles
ENCLOSED BAYS		
Channel Islands Harbor	403.11	220 acres
Port Hueneme	403.11	121 acres
Ventura Harbor	403.11	423 acres
Alamitos Bay	405.12	285 acres
King Harbor	405.12	90 acres
Long Beach Harbor (Inner)	405.12	840 acres

WATERBODY NAME OR SEGMENT NAME	HYDROLOGIC UNIT	TOTAL AREAL EXTENT
Long Beach Marina	405.12	Not available
Los Angeles Harbor (Inner)	405.12	1,260 acres
San Pedro Bay	405.12	10,700 acres
Shoreline Marina	405.12	Not available
Marina Del Rey Harbor	405.13	354 acres
OPEN BAYS/OCEAN		
Nearshore - Point Mugu to Latigo Point	400.00	11,710 acres
Santa Monica Bay (L.A. County Line to Pt. Fermin)	405.13	256,000 acres
Anacapa Island ASBS	406.10	21,280 acres
San Nicolas Island/Begg Rock ASBS	406.20	102,528 acres
Santa Barbara Island ASBS	406.30	14,000 acres
Santa Catalina Island ASBS	406.40	17,936 acres
San Clemente Island ASBS	406.50	80,512 acres

Legislative Authority

California Water Code, Division 7, Chapter 5.6 established a comprehensive program to protect the existing and future beneficial uses of California's enclosed bays and estuaries. SB 475 (1989), SB 1845 (1990), AB 41 (1989), and SB 1084 (1993) added and modified Chapter 5.6 [Bay Protection and Toxic Cleanup (Water Code Sections 13390-13396.5)] to Division 7 of the Water Code.

The BPTCP has provided a new focus on RWQCBs efforts to control pollution of the State's bays and estuaries by establishing a program to identify toxic hot spots and plan for their cleanup.

Water Code Section 13394 requires that each RWQCB complete a toxic hot spot cleanup plan. Each cleanup plan must include: (1) a priority listing of all known toxic hot spots covered by the plan; (2) a description of each toxic hot spot including a characterization of the pollutants present at the site; (3) an assessment of the most likely source or sources of pollutants; (4) an estimate of the total costs to implement the cleanup plan; (5) an estimate of the costs that can be recovered from parties responsible for the discharge of pollutants that have accumulated in sediments; (6) a preliminary assessment of the actions required to remedy or restore a toxic hot spot; and (7) a two-year expenditure schedule identifying State funds needed to implement the plan.

Limitations

This proposed regional toxic hot spot cleanup plan contains information on sites that are believed to be the worst sites in the Region. Much of the data collected as part of the BPTCP have not been reported and some analyses have yet to be completed. Consequently, this regional toxic hot spot cleanup plan is subject to revision as new information on toxic hot spot identification becomes available. In future versions of the Plan there is an expectation that (1) other sites may be identified as candidate toxic hot spots; (2) potential toxic hot spots will be addressed in future versions of the cleanup plan; (3) cleanup levels for sites may

be added to the cleanup plan; and (4) site rankings may change as new information becomes available.

II. TOXIC HOT SPOT DEFINITION

Codified Definition of A Toxic Hot Spot

Section 13391.5 of the Water Code defines toxic hot spots as:

"...[L]ocations in enclosed bays, estuaries, or adjacent waters in the 'contiguous zone' or the 'ocean' as defined in Section 502 of the Clean Water Act (33. U.S.C. Section 1362), the pollution or contamination of which affects the interests of the State, and where hazardous substances have accumulated in the water or sediment to levels which (1) may pose a substantial present or potential hazard to aquatic life, wildlife, fisheries, or human health, or (2) may adversely affect the beneficial uses of the bay, estuary, or ocean waters as defined in the water quality control plans, or (3) exceeds adopted water quality or sediment quality objectives."

Specific Definition of A Toxic Hot Spot

Although the Water Code provides some direction in defining a toxic hot spot, the definition presented in Section 13391.5 is broad and somewhat ambiguous regarding the specific attributes of a toxic hot spot. The following specific definition provides a mechanism for identifying and distinguishing between "candidate" and "known" toxic hot spots. A Candidate Toxic Hot Spot is considered to have enough information to designate a site as a Known Toxic Hot Spot except that the candidate hot spot has not been approved by the RWQCB and the SWRCB. Once a candidate toxic hot spot has been adopted into the consolidated statewide toxic hot spot cleanup plan then the site shall be considered a known toxic hot spot and all the requirements of the Water Code shall apply to that site.

Candidate Toxic Hot Spot:

A site meeting any one or more of the following conditions is considered to be a "candidate" toxic hot spot.

1. The site exceeds water or sediment quality objectives for toxic pollutants that are contained in appropriate water quality control plans or exceeds water quality criteria promulgated by the U.S. Environmental Protection Agency (U.S. EPA).

   This finding requires chemical measurement of water or sediment, or measurement of toxicity using tests and objectives stipulated in water quality control plans. Determination of a toxic hot spot using this finding should rely on recurrent measures over time (at least two separate sampling dates). Suitable time intervals between measurements must be determined.

2. The water or sediment exhibits toxicity associated with toxic pollutants that is significantly different from the toxicity observed at reference sites (*i.e.*, when compared to the lower confidence interval of the reference envelope), based on toxicity tests acceptable to the SWRCB or the RWQCBs.

   To determine whether toxicity exists, recurrent measurements (at least two separate sampling dates) should demonstrate an effect. Appropriate reference and control measures must be included in the toxicity testing. The methods acceptable to and used by the BPTCP may include some toxicity test protocols not referenced in water quality control plans (*e.g.*, the Bay Protection and Toxic Cleanup Program Quality Assurance Project Plan). Toxic pollutants should be present in the media at concentrations sufficient to cause or contribute to toxic responses in order to satisfy this condition.

3. The tissue toxic pollutant levels of organisms collected from the site exceed levels established by the United States Food and Drug Administration (FDA) for the protection of human health, or the

National Academy of Sciences (NAS) for the protection of human health or wildlife. When a health advisory against the consumption of edible resident non-migratory organisms has been issued by Office of Environmental Health Hazard Assessment (OEHHA) or Department of Health Services (DHS), on a site or water body, the site or water body is automatically classified a "candidate" toxic hot spot if the chemical contaminant is associated with sediment or water at the site or water body.

Acceptable tissue concentrations are measured either as muscle tissue (preferred) or whole body residues. Residues in liver tissue alone are not considered a suitable measure for known toxic hot spot designation. Animals can either be deployed (if a resident species) or collected from resident populations. Recurrent measurements in tissue are required. Residue levels established for one species for the protection of human health can be applied to any other consumable species.

Shellfish: Except for existing information, each sampling episode should include a minimum of three replicates. The value of interest is the average value of the three replicates. Each replicate should be comprised of at least 15 individuals. For existing State Mussel Watch information related to organic pollutants, a single composite sample (20-100 individuals), may be used instead of the replicate measures. When recurrent measurements exceed one of the levels referred to above, the site is considered a candidate toxic hot spot.

Fin-fish: A minimum of three replicates is necessary. The number of individuals needed will depend on the size and availability of the animals collected; although a minimum of five animals per replicate is recommended. The value of interest is the average of the three replicates. Animals of similar age and reproductive stage should be used.

4. Impairment measured in the environment is associated with toxic pollutants found in resident individuals.

Impairment means reduction in growth, reduction in reproductive capacity, abnormal development, histopathological abnormalities. Each of these measures must be made in comparison to a reference condition where the endpoint is measured in the same species and tissue is collected from an unpolluted reference site. Each of the tests shall be acceptable to the SWRCB or the RWQCBs.

Growth Measures: Reductions in growth can be addressed using suitable bioassay acceptable to the State or Regional Boards or through measurements of field populations.

Reproductive Measures: Reproductive measures must clearly indicate reductions in viability of eggs or offspring, or reductions in fecundity. Suitable measures include: pollutant concentrations in tissue, sediment, or water which have been demonstrated in laboratory tests to cause reproductive impairment, or significant differences in viability or development of eggs between reference and test sites.

Abnormal Development: Abnormal development can be determined using measures of physical or behavioral disorders or aberrations. Evidence that the disorder can be caused by toxic pollutants, in whole or in part, must be available.

Histopathology: Abnormalities representing distinct adverse effects, such as carcinomas or tissue necrosis, must be evident. Evidence that toxic pollutants are capable of causing or contributing to the disease condition must also be available.

5. Significant degradation in biological populations and/or communities associated with the presence of elevated levels of toxic pollutants.

This condition requires that the diminished numbers of species or individuals of a single species (when compared to a reference

site) are associated with concentrations of toxic pollutants. The analysis should rely on measurements from multiple stations. Care should be taken to ensure that at least one site is not degraded so that a suitable comparison can be made.

In summary, sites are designated as "candidate" hot spots after generating information which satisfies any one of the five conditions constituting the definition.

Known Toxic Hot Spot:

A site meeting any one or more of the conditions necessary for the designation of a "candidate" toxic hot spot that has gone through a full SWRCB and RWQCB hearing process, is considered to be a "known" toxic hot spot. A site will be considered a "candidate" toxic hot spot until approved as a known toxic hot spot in a Regional Toxic Hot Spot Cleanup Plan by the RWQCB and approved by the SWRCB.

III. MONITORING APPROACH

As part of the legislative mandates, the BPTCP has implemented regional monitoring programs to identify toxic hot spots (Water Code Section 13392.5). The BPTCP has pioneered the use of effects-based measurements of impacts in California's enclosed bays and estuaries. The Program has used a two-step process to identify toxic hot spots. The first step is to screen sites using toxicity tests. In the second step, the highest priority sites with observed toxicity are retested to confirm the effects. This section presents descriptions of the BPTCP monitoring objectives and sampling strategy.

Monitoring Program Objectives

The four objectives of BPTCP regional monitoring are:

1. Identify locations in enclosed bays, estuaries, or the ocean that are potential or candidate toxic hot spots. Potential toxic hot spots are defined as suspect sites with existing information indicating possible impairment but without sufficient information to be classified further as a candidate toxic hot spot.

2. Determine the extent of biological impacts in portions of enclosed bays and estuaries not previously sampled (areas of unknown condition).

3. Confirm the extent of biological impacts in enclosed bays and estuaries that have been previously sampled.

4. Assess the relationship between toxic pollutants and biological effects.

Sampling Strategy

Screening Sites and Confirming Toxic Hot Spots

In order to identify toxic hot spots a two step process was used. Both steps are designed around an approach with three measures (sediment quality triad analysis) plus an optional bioaccumulation component. The triad analysis consists of toxicity testing, benthic community analysis, and chemical analysis for metals and organic chemicals.

The first step is a screening phase that consists of measurements using toxicity tests or benthic community analysis or chemical tests or bioaccumulation data to provide sufficient information to list a site as a potential toxic hot spot or a site of concern. Sediment grain size, total organic carbon (TOC), NH_3 and H_2S concentration are measured to differentiate pollutant effects found in screening tests from natural factors.

A positive result or an effect in any of the triad tests would trigger the confirmation step (depending on available funding). The confirmation

phase consists of performing all components of the sediment quality triad: toxicity, benthic community analysis, and chemical analysis, on the previously sampled site of concern. Assessment of benthic community structure may have not be completed if there was difficulty in measuring or interpreting the information for a water body.

Special Studies Performed in the Region

1. Los Angeles/Long Beach Harbor Study

   In 1992, the State Water Resources Control Board and the National Oceanic and Atmospheric Administration entered into a three-year cooperative agreement to assess the potential adverse biological effects in several coastal bays and harbors in Southern California. This study was performed in San Pedro Bay, Los Angeles Harbor, Long Beach Harbor, Anaheim Bay, Alamitos Bay and Huntington Harbor. The objectives of the study were to: 1) characterize the magnitude and relative spatial extent of toxicant-associated bioeffects in these nearshore areas; 2) determine relationships between concentrations and mixtures of sediment-associated toxicants and the occurrence and severity of bioeffects; and 3) distinguish more severely impacted sediments from less severely impacted sediments.

   Amphipod survival and abalone larval development toxicity tests were performed on sediment and pore water samples. Significant amphipod mortality compared to laboratory controls was observed at the majority of sites in the Los Angeles and Long Beach inner harbor areas. Most of the outer harbor site sediments were not toxic to amphipods. Several chemicals (e.g., acenanaphthene, phenanthrene, fluoranthene, copper, lead, zinc) or chemical groups (e.g., total PAHs) were significantly correlated with amphipod survival.

2. Goby Biomarker Study

   This study was conducted in 1993 as part of the Bay Protection and Toxic Cleanup Program. The project was designed to assess the impact of sediment contaminants on fish, with special emphasis on

evaluation of bay gobies (Lepidogobius lepidus) as a potential indicator species for the California coast. Unfortunately, bay gobies could not be collected and other species were substituted. The study area included nine sites in the Los Angeles Harbor area. Sediments were analyzed for metals, pesticides, polynuclear aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs). In addition, pore water was tested for metals and sediments were assayed for toxicity to amphipods. Although we were unable to identify a single "indicator" species which could be used throughout California coastal waters, all five fish species examined did have lesions consistent with contaminant exposure. Additional studies would be needed to validate the technique.

IV. CRITERIA FOR RANKING TOXIC HOT SPOTS

A value for each criterion described below was developed if appropriate information existed or estimates were possible. Any criterion for which no information exists was assigned a value of "No Action". The RWQCB created a matrix of the scores of the ranking criteria. If the majority of ranking criteria were "High" then the site was listed in the "High" priority list of Toxic Hot Spots. The following ranking criteria was used:

Human Health Impacts

Human Health Advisory issued for consumption of non-migratory aquatic life from the site (assign a "High"); Tissue residues in aquatic organisms exceed FDA/DHS action level and U.S. EPA screening levels ("Moderate").

Aquatic Life Impacts

For aquatic life, site ranking was based on an analysis of the preponderance of information available (*i.e.,* weight-of-evidence). The measures considered were: the sediment quality triad (sediment

chemistry, toxicity, and benthic community analysis), water toxicity, toxicity identification evaluations (TIEs), and/or bioaccumulation.

Stations with hits in any two of the measures if associated with high chemistry, were assigned a "High" priority. A hit in one of the measures associated with high chemistry was assigned "moderate". Stations with high sediment or water chemistry only were assigned "low".

Water Quality Objectives[1]:

Any chemistry data used for ranking under this section was no more than 10 years old, and was analyzed with appropriate analytical methods and quality assurance.

Water quality objective or water quality criterion: Exceeded regularly (assign a "High" priority), occasionally exceeded ("Moderate"), infrequently exceeded ("Low").

Areal Extent of Toxic Hot Spot

Select one of the following values: More than 10 acres, 1 to 10 acres, less than 1 acre.

Pollutant Source

Select one of the following values: Source(s) of pollution identified (assign a "High" priority), Source(s) partially known ("Moderate"), Source is unknown ("Low").

1. Water quality objectives to be used are found in Regional Water Quality Control Board Basin Plans or the California Ocean Plan (depending on which plan applies to the water body being addressed). Where a Basin Plan contains a more stringent value than the statewide plan, the regional water quality objective will be used.

Natural Remediation Potential

Select one of the following values: Site is unlikely to improve without intervention ("High"), site may or may not improve without intervention ("Moderate"), site is likely to improve without intervention ("Low").

V. FUTURE NEEDS

The Los Angeles Regional Board, in cooperation with the California Department of Fish and Game, plans to update existing staff reports to analyze all of the monitoring data collected over the past several years for the Bay Protection and Toxic Cleanup Program. The goal is to produce reports summarizing the findings to date and presenting plans for the future. Four staff reports are planned: (1) summary and interpretation of data collected from Mugu Lagoon/Calleguas Creek Watershed; (2) summary and interpretation of data collected from Los Angeles/Long Beach Harbor complex; (3) summary and interpretation of data collected from Marina del Rey; and (4) development of a reference envelope of stations for the Los Angeles Region. These reports may result in modifications to the existing cleanup plans or development of cleanup plans for other sites. Additional monitoring will be required in some areas to define the areal extent of contamination for known toxic hot spots and to evaluate the condition of sites of concern.

Sites of Concern (Sites that do not qualify as Candidate Toxic Hot Spots)

Waterbody Name	Segment Name	Site Identification	Reason for Listing	Pollutants present at the site	Report reference
Marina del Rey		44014.0	sediment concentrations; accumulation in mussel tissue	DDT, PCBs, metals (Cu, Pb, Zn)	[1], [2], [3]
Long Beach Inner Harbor	Cerritos Channel	44011.0	accumulation in mussel tissue	DDT, PCB, metals	[2]
Port Hueneme		44012.0, 44013.0	accumulation in mussel tissue	DDT, PCBs, tributyltin, PAHs, Zn	[2]
Los Angeles River Estuary	Queensway Bay	40013.1, 40013.2, 40013.3, 40014.1, 40014.2, 40014.3	sediment concentrations; accumulation in mussel tissue and fish tissue	DDT, Cu, Pb, Zn, chlordane	[1], [2]
Ballona Creek Tidal Prism		44024.0	stormwater runoff; sediment concentrations	PAHs, metals (Pb), pesticides	[1], [3]
Santa Monica Bay	offshore		sediment concentrations; accumulation in fish tissue	DDT, PCBs, metals	[3], [4]

Sites of Concern (Sites that do not qualify as Candidate Toxic Hot Spots)
(Continued)

Waterbody Name	Segment Name	Site Identification	Reason for Listing	Pollutants present at the site	Report reference
Venice Canals			accumulation in mussel tissue	As, Pb, chlordane	[2]
Ventura Marina		Hydrological Unit 403.11	sediment concentrations; accumulation in mussel tissue	Metals (Cu, Zn, As, Ni), DDT, Chlordane	[2]
Colorado Lagoon		Hydrological Unit 405.12	sediment concentrations; accumulation in mussel and fish tissue	Pesticides and Pb	[1], [2], [3]
Long Beach Marina		Hydrological Unit 405.12	sediment concentrations	Metals	[3]
Shoreline Marina		44020.0	sediment concentrations	Metals	[1], [3]

Reference list

[1] Bay Protection and Toxic Cleanup Program Monitoring Data, Los Angeles Region
[2] State Mussel Watch Program, Los Angeles Region
[3] Water Quality Assessment [303(d) List], Los Angeles Region, December 1995
[4] Santa Monica Bay Restoration Project, Comprehensive Conservation and Management Plan, 1996

Part II

Candidate Toxic Hot Spot List

Waterbody Name	Segment Name	Site Identification	Reason for Listing	Pollutants present at the site	Report reference
Santa Monica Bay	Palos Verdes Shelf	BPTCP 40031.1, 40031.2, 40031.3	Human health advisory; NAS level exceeded for DDT	DDT, PCB	[1], [2], [3], [4]
Mugu Lagoon/ Calleguas Creek Tidal Prism	Eastern Arm, Main Lagoon, Western Arm/ Tidal Prism	BPTCP 44050, 44052, 44053, 44054; SMW 507.8; TSM 403.11.04, 403.12.06	Reproductive impairment; OEHHA level exceeded for Hg; NAS level exceeded for DDT	DDT, PCB, metals	[4], [5], [6], [7]
Los Angeles Inner Harbor	Dominguez Channel/ Consolidated Slip	BPTCP 40006.1, 40006.2	Human health advisory; NAS level exceeded for DDT	DDT, PCB	[4], [8], [9], [10], [11]
Los Angeles Outer Harbor	Cabrillo Pier	BPTCP 40010.1, 40010.2, 40010.3	Human health advisory; NAS level exceeded for DDT	DDT, PCB	[2], [4], [10]

Reference list

[1] Los Angeles Regional Water Quality Control Board. Santa Monica Bay: State of the Watershed. June, 1997.

[2] California Department of Fish and Game. 1996 California Sport Fishing Regulations.

[3] Santa Monica Bay Restoration Project, Comprehensive Conservation and Management Plan, 1996.

[4] Bay Protection and Toxic Cleanup Program Monitoring Data, Los Angeles Region

[5] Ledig, D. Preliminary report on the ecology of the light-footed clapper rail at Mugu Lagoon, Ventura Co., California.

[6] Final report to California Department of Fish and Game FG 8555, 1990.

[7] Los Angeles Regional Water Quality Control Board. Calleguas Creek Watershed. June, 1996.

[8] Malins, D.C. et al. Toxic chemicals, including aromatic and chlorinated hydrocarbons and their derivatives, and liver lesions in white croaker (Genyonemus lineatus) from the vicinity of Los Angeles. Environ. Sci. and Tech., August 1987, pp. 765-770.

[9] MEC Analytical Systems, Inc. Biological baseline and ecological evaluation of existing habitats in Los Angeles Harbor and adjacent waters, Vol. II, Final Report. Page 4-74. Sept. 1988. Prepared for Port of Los Angeles, Environmental Management Division.

[10] Cross, J.N. et al. Contaminant concentrations and toxicity of sea-surface microlayer near Los Angeles, California. Mar. Environ. Research: 23 (1987) 307-323.

[11] Sapudar, R.A. et al. Sediment chemistry and toxicity in the vicinity of the Los Angeles and Long Beach Harbors. State Water Resources Control Board and National Oceanic Atmospheric Administration. 1994.

Ranking Matrix

Waterbody Name	Site Identification	Human Health Impacts	Aquatic Life Impacts	Water Quality Objectives	Areal Extent	Pollutant Source	Remediation Potential
Santa Monica Bay	Palos Verdes Shelf	High	High	Low	High	High	High
Mugu Lagoon	Eastern Arm, Main Lagoon, Western Arm/ Tidal Prism	Moderate	High	Low	High	Moderate	High
Los Angeles Inner Harbor	Dominguez Channel/ Consolidated Slip	High	High	Low	High	Moderate	High
Los Angeles Outer Harbor	Cabrillo Pier	High	Low	Low	High	Moderate	High

Part III

High Priority Candidate Toxic Hot Spot Characterization

Santa Monica Bay/Palos Verdes Shelf

The contaminated sediments on the Palos Verdes Shelf appear to significantly impact the marine community and may pose a serious risk to individuals who regularly consume fish from the area. Currently, elevated levels of DDT and PCBs are found in the organisms that live in the area of the contaminated sediments, including bottom feeding fish such as white croaker, and water column feeders such as kelp bass. Marine mammals and birds may be affected through the consumption of contaminated fish.

The ongoing release of these hazardous substances from the sediment into the environment and the resulting accumulation of DDT and PCB in food chain organisms may persist if no action is taken. Commercial fishing and recreational fishing have been affected by the contamination. The State of California has published recreational fishing advisories for most areas offshore of Los Angeles and Orange Counties and has closed commercial fishing for white croaker on the Palos Verdes Shelf.

A. Areal Extent of Toxic Hot Spot

The area of DDT- and PCB-contaminated sediment covers portions of the continental shelf and continental slope between Point Vicente in the northwest and Point Fermin to the southeast (Figure 1). Studies by the U.S. Geological Survey in 1992 and 1993 indicated that this layer of contaminated sediments is about two inches to two feet thick and covers an area of more than 15 square miles, with the highest concentrations located in a 3-square mile band near the outfall pipes. The total volume of these contaminated sediments is approximately 11 million cubic yards, and contaminant concentrations range from approximately 1 to over 200 parts per million for DDT and between 0.5 and 15 ppm for PCBs.

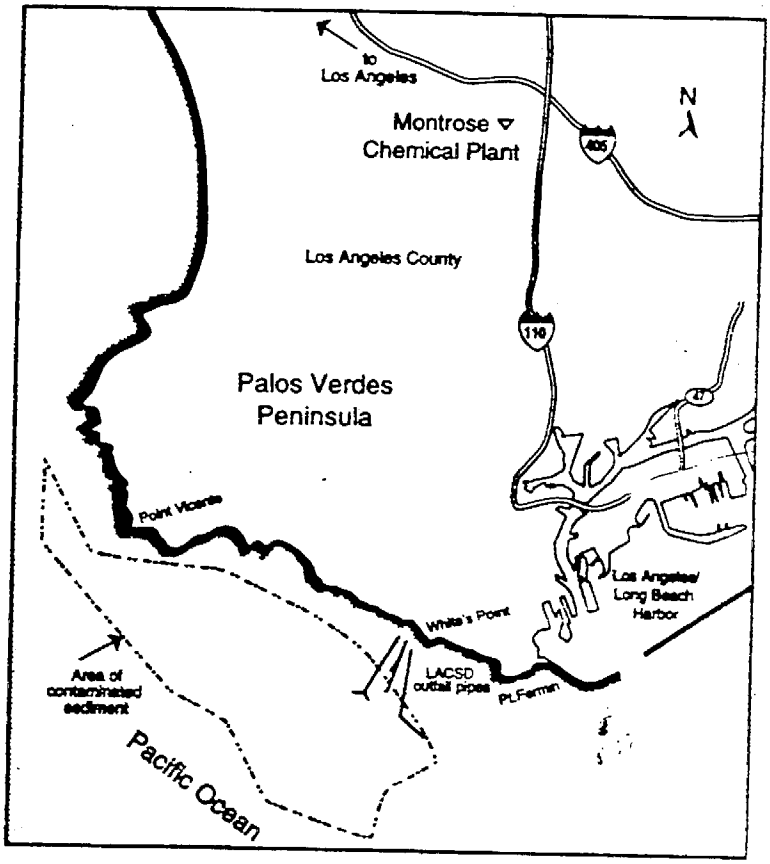

Figure 1. Santa Monica Bay/Palos Verdes Shelf.

B. Sources of Pollutants

From 1947 to 1983, the Montrose Chemical Corporation of California, Inc., manufactured the pesticide dichloro-diphenyl-trichloroethane (DDT) at its plant at 20201 Normandie Avenue in Los Angeles. Wastewater containing significant concentrations of DDT was discharged from the Montrose plant into the sewers, flowed through the Los Angeles County Sanitation Districts' wastewater treatment plant and was discharged to the Pacific Ocean waters on the Palos Verdes Shelf through subsurface outfalls offshore of Whites Point. Montrose's discharge of DDT reportedly stopped around 1972, and the plant was shut down and dismantled in 1983.

Polychlorinated biphenyls (PCBs) also were present in the wastewater discharged from the LACSD wastewater treatment plant and are found along with DDT in the effluent-effected deposits on the ocean floor along the Palos Verdes Shelf. Historically, PCB contamination entered the sewer system as the result of discharges from several industrial sources.

Although DDT and PCBs were banned in the early 1970s, resuspension of historically deposited sediments continues to be a source of these toxic chemicals. Concentrations of total DDT and p,p'-DDE (the predominant metabolite of DDT) in the surface sediments have remained relatively high since the late 1980s. This suggests that historical deposits are brought to the sea floor surface by a combination of natural physical, chemical or biological processes.

Besides DDT and PCB, there has been little evidence that the concentrations of other toxic organic compounds, such as PAHs and heavy metals (including copper, cadmium, chromium, nickel, silver, zinc and lead), discharged from the LACSD wastewater treatment plant have caused impacts to marine organisms. However, the concentrations of heavy metals in the sediments on the Palos Verdes Shelf are significantly higher than the background levels found in most parts of Santa Monica Bay and other parts of the Southern California Bight.

C. Actions by Regional Board

The Los Angeles Regional Board's Water Quality Assessment identifies the Palos Verdes Shelf as an impaired waterbody. The aquatic life beneficial use is impaired due to sediment toxicity, tissue bioaccumulation of pollutants (DDT, PCBs, silver, chromium, lead), sediment contamination (DDT, PCBs, cadmium, copper, lead, mercury, nickel, zinc, PAHs, chlordane), and a health advisory warning against consumption of fish (white croaker). The Regional Board believes that the impairment is due to the effects of historical discharges of these pollutants, since the concentrations presently discharged are very low.

The Santa Monica Bay Restoration Project (SMBRP) was formed in 1988 under the National Estuary Program in response to the critical problems facing Santa Monica Bay. The Los Angeles Regional Board has been an active participant in this program. The SMBRP was charged with the responsibility for assessing the Bay's problems, developing solutions and putting them into action. The scientific characterization of the Bay is described in the SMBRP's "State of the Bay, 1993" report and other technical investigations. This report, along with the Project's recommendations for action, comprises the Bay Restoration Plan which was approved in 1995. With over 200 recommended actions (74 identified as priorities), the plan addresses the need for pollution prevention, public health protection, habitat restoration and comprehensive resource management. The Los Angeles Regional Board is the lead agency responsible for implementation of several recommended actions.

The Los Angeles Regional Board has adopted a watershed management approach, which is expected to regulate pollutant loads from point sources through permits that better focus on issues relevant to each watershed. The Regional Board also expects that pollutant loads from nonpoint sources can be better controlled through the participation of the public in the management of their watersheds. During the 1996-97 Fiscal Year, the watershed management approach was used to renew selected NPDES permits within the Santa Monica Bay Watershed. The NPDES permit for the Los Angeles County Sanitation District's Joint Water Pollution Control Plant, which discharges a mixture of advanced primary and secondary effluent through an ocean outfall onto the Palos Verdes Shelf, was renewed with appropriate limits, performance goals and mass emission caps to limit the discharge of pollutants of concern.

D. Preliminary Assessment of Remediation Actions

In July 1996, the U.S. Environmental Protection Agency decided to undertake a Superfund response (under the Comprehensive Environmental Response, Compensation and Liability Act) called a removal action to address the contaminated sediment problem on the Palos Verdes Shelf. EPA initiated the preparation of an Engineering Evaluation/Cost Analysis (EE/CA) of possible response actions. The EE/CA will evaluate the need for Superfund action and will use the three broad criteria of effectiveness, implementability and cost to evaluate the alternatives for addressing hazardous substances being released into the environment.

As an initial step in the EE/CA process, EPA has prepared the "Screening Evaluation of Response Actions for Contaminated Sediments on the Palos Verdes Shelf". The Screening Evaluation describes the range of potential cleanup and disposal technologies for contaminated sediments and makes an initial determination about which technologies will be incorporated into the alternatives evaluated in detail in the EE/CA. General response actions which were evaluated included:

-removal (i.e., dredging) and treatment or disposal;
-institutional controls; and
-in situ (or in-place) capping.

While sediment removal (i.e., dredging) is technically feasible, it could possibly result in the dispersal of contaminated sediment, thereby increasing short-term risks. Once dredged, the sediment would require disposal, possibly preceded by treatment, which could be both expensive and very difficult to implement. Upland disposal facilities are very limited, and disposal options along the coastline or in the open ocean would likely violate Federal and State environmental laws. For these reasons, EPA has decided not to consider dredging and treatment or disposal options further in the EE/CA.

Institutional control measures, such as warning notices or fishing restrictions, intended to protect human health already have been established for certain coastal areas including the Palos Verdes Shelf by the State of California,

although their effectiveness is uncertain. Additional institutional controls could include measures to: (1) expand the scope of existing State controls by increasing the area affected, (2) increase the awareness of and effectiveness of existing controls through additional public outreach efforts, and (3) enhance State enforcement of the commercial fishing closure.

In situ, or in-place, capping can be used to prevent or reduce direct human or ecological exposure to contaminants and to prevent migration of contaminants into the water. The cap could reduce or eliminate adverse impacts by: (1) physically isolating the contaminated sediment from the ocean environment, (2) preventing resuspension and transport of contaminated sediment, and (3) reducing the flux of dissolved contaminants from the sediments into the water column. Large caps for areas like the Palos Verdes Shelf typically would consist of clean dredged material (i.e., sand or silt) that is placed over the contaminated area using dredge or platform barges. Caps can be constructed to various sizes or thicknesses and may be augmented after initial construction to increase effectiveness. For a large site like the Palos Verdes Shelf, a phase approach to capping would likely be desirable in order to maximize cost-effectiveness. Any cap design would need to consider the engineering characteristics of the cap material and the effluent-affected sediment in order to address potential erosion by currents and waves, mixing of the cap material and underlying sediment by bottom-dwelling organisms or other disturbances.

In situ capping has the potential to isolate the contaminated marine sediments, thereby providing long-term protection for the majority of the mass of contaminants on the Palos Verdes Shelf. Approximately 25% of the mass of contaminants is on the Palos Verdes slope, which is likely to be too steep for capping. Over the short term, capping would have some adverse impact on the existing benthic communities in the capped area, although it is expected that they would rapidly recolonize. If the cap were composed of suitable dredged material generated by local navigation projects (e.g., maintenance dredging), there would be no additional excavation beyond that already required for those projects, and reuse of the material for capping would reduce short-term impacts at traditional disposal sites. Carefully controlled placement of the cap material would minimize the resuspension of contaminated sediment.

In situ caps have been used successfully at numerous sites, although not as deep as the deeper parts of the Palos Verdes Shelf. In general, existing caps have stabilized after initial reworking and consolidation of the contaminated sediment. Capping could be accomplished reasonably quickly, depending on the availability of capping material.

E. Cost Estimate to Implement Cleanup Plan

The cost of a 6-foot thick, 17.4 square kilometer cap containing rock ribs and 40 million cubic yards of material excavated from a borrow site has been estimated at $318.7 million. If suitable dredged material generated by local navigation projects can be used to build the same size cap over a longer period of time, thereby eliminating the cost of initially dredging up the cap material (approximately $40 million), overall costs would be roughly $279 million. Costs could be reduced by constructing a smaller, but still effective (in terms of risk reduction) cap (e.g., 5-10 million cubic yards) without rock ribs in the area of highest contamination. This smaller cap might cost from $35-70 million.

F. Estimate of Recoverable Costs from Dischargers

The United States National Oceanographic and Atmospheric Administration (NOAA), via its Natural Resource Damage Assessment, and the United States Environmental Protection Agency (EPA), via Superfund, are attempting to recover financial damages from parties responsible for DDT-related damages to the environment on the Palos Verdes Shelf. EPA estimates that approximately $20-25 million may be recovered from municipalites through settlement agreements. NOAA is seeking to recover approximately $100 million from Montrose Chemical Corporation, Westinghouse Electric Corporation and other industrial dischargers.

G. Two-year Expenditure Schedule

EPA expects to complete its evaluation of alternatives (including the "no-action" alternative) and issue the EE/CA report by early 1998. At the end of the EE/CA process, EPA will solicit public comment on the EE/CA report, including the recommended removal alternative. If EPA decides to move

ahead, EPA would issue an Action Memorandum formally selecting the response action.

It is likely to be at least mid to late 1998 before remediation work could begin. If capping is selected as the remediation alternative, work could begin as soon as funding is available. It is possible that the areas of highest contamination could be capped during the first two years of implementation at a cost of $35-70 million. If settlement agreements with municipalities are finalized soon, which appears likely, approximately $20-25 million could be available during the next two years. EPA may choose to assist implementation with additional funds from the Superfund Account. It appears unlikely that cost recovery from industrial dischargers will be successful within the next two years.

Mugu Lagoon/Calleguas Creek Tidal Prism

Monitoring of Mugu Lagoon and the lower Calleguas Creek watershed has identified the following problems: (1) impaired reproduction in the light-footed clapper rail, a resident endangered species inhabiting the lagoon, due to elevated levels of DDT and PCBs; (2) fish and shellfish tissue levels exceeded National Academy of Sciences guidelines for several pesticides; (3) possible exceedances of U.S. Environmental Protection Agency water quality criteria for the protection of saltwater biota for nickel, copper and zinc at some locations; (4) possible impacts to sediment and water quality, as well as aquatic community health, from operations at the Naval Air Base over many years. Several pesticides whose use has been discontinued still are found at high concentrations in the sediment and biota.

The Point Mugu Naval Air Base is located in the immediate vicinity of Mugu Lagoon. The surrounding Oxnard Plain supports a large variety of agricultural crops. These fields drain into ditches which either enter the lagoon directly or through Calleguas Creek and its tributaries. The lagoon borders on an Area of Special Biological Significance and supports a great diversity of wildlife, including several endangered birds and one endangered plant species. Except for the military base, the Oxnard Plain portion of the watershed is relatively undeveloped.

Calleguas Creek and its major tributaries (Revolon Slough, Conejo Creek, Arroyo Conejo, Arroyo Santa Rosa and Arroyo Simi) drain an area of 343 square miles in southern Ventura County and a small portion of western Los Angeles County. This watershed is about 30 miles long and 14 miles wide.

The Calleguas Creek watershed exhibits some of the most active and severe erosion rates in the country. Although erosion rates are naturally high in this tectonically active area, land use also is a factor in erosion and sedimentation problems. Channelization of Calleguas Creek was initiated by local farmers in Somis and downstream areas beginning about 1884, and around Revolon Slough in 1924. Following complete channelization, eroded sediment generated in the higher reaches of the Calleguas Creek watershed has begun to reach Mugu Lagoon even during minor flood events. At current rates of erosion, it is estimated that the lagoon habitat could be filled with sediment within 50 years.

Urban developments generally are restricted to the city limits of Simi Valley, Moorpark, Thousand Oaks and Camarillo. Although some residential development has occurred along the slopes of the watershed, most upland areas still are open space. Agricultural activities (primarily cultivation of orchard and row crops) are spread out along valleys and on the Oxnard Plain. The U.S. Navy maintains a Naval Air Base on much of the area around Mugu Lagoon.

The main surface water system drains from the mountains and toward the southwest, where it flows through the flat, expansive Oxnard Plain before emptying into the Pacific Ocean through Mugu Lagoon. Mugu Lagoon, situated at the mouth of the Calleguas Creek system, is one of the few remaining salt marshes in southern California along the Pacific Flyway. Threatened and endangered species that are supported by valuable habitats in Mugu Lagoon include the peregrine falcon, least tern, light-footed clapper rail and brown pelican. In addition to providing one of the last remaining habitats on the mainland for harbor seals to pup, Mugu Lagoon is a nursery ground for many marine fish and mammals.

The Eastern Arm of Mugu Lagoon is somewhat removed from the rest of the lagoon and tends to receive water from and drain directly into the lagoon mouth. The arm empties and fills rather quickly, leaving a considerable

amount of sand near its western end, but moving towards finer sediments further east. The water tends to be marine in character the majority of the time.

The Main Lagoon and Western Arm are the areas most heavily used by birds (including endangered species). The Western Arm, with its slight gradient and slow water flow, has the most widespread freshwater influence during dry weather, receiving water from several drains. The Main Lagoon is affected primarily by Calleguas Creek, which may carry a considerable amount of fresh water during storms, although this flow generally is funneled into a channel which leads to the lagoon mouth.

A. Areal Extent of Toxic Hot Spot

Sediment contamination clearly exists throughout Mugu Lagoon and within the Calleguas Creek Tidal Prism (Figure 2). Problems appear to be worst in the Western Arm of Mugu Lagoon, particularly near the Rio de Santa Clara, which drains neighboring agricultural lands, and parts of the Eastern Arm. Although sediment contamination problems occur in the Main Lagoon, it appears that the large volume of this waterbody and good flushing is helping to keep contamination and associated effects at a lower level than might otherwise be expected. It is estimated that approximately 20% of the Western Arm and approximately 10% of the Eastern Arm of Mugu Lagoon contain contaminated sediments. The total volume of contaminated sediments is estimated to be approximately 725,000 cubic yards (based on approximately 150 acres with 3-foot depth of contamination).

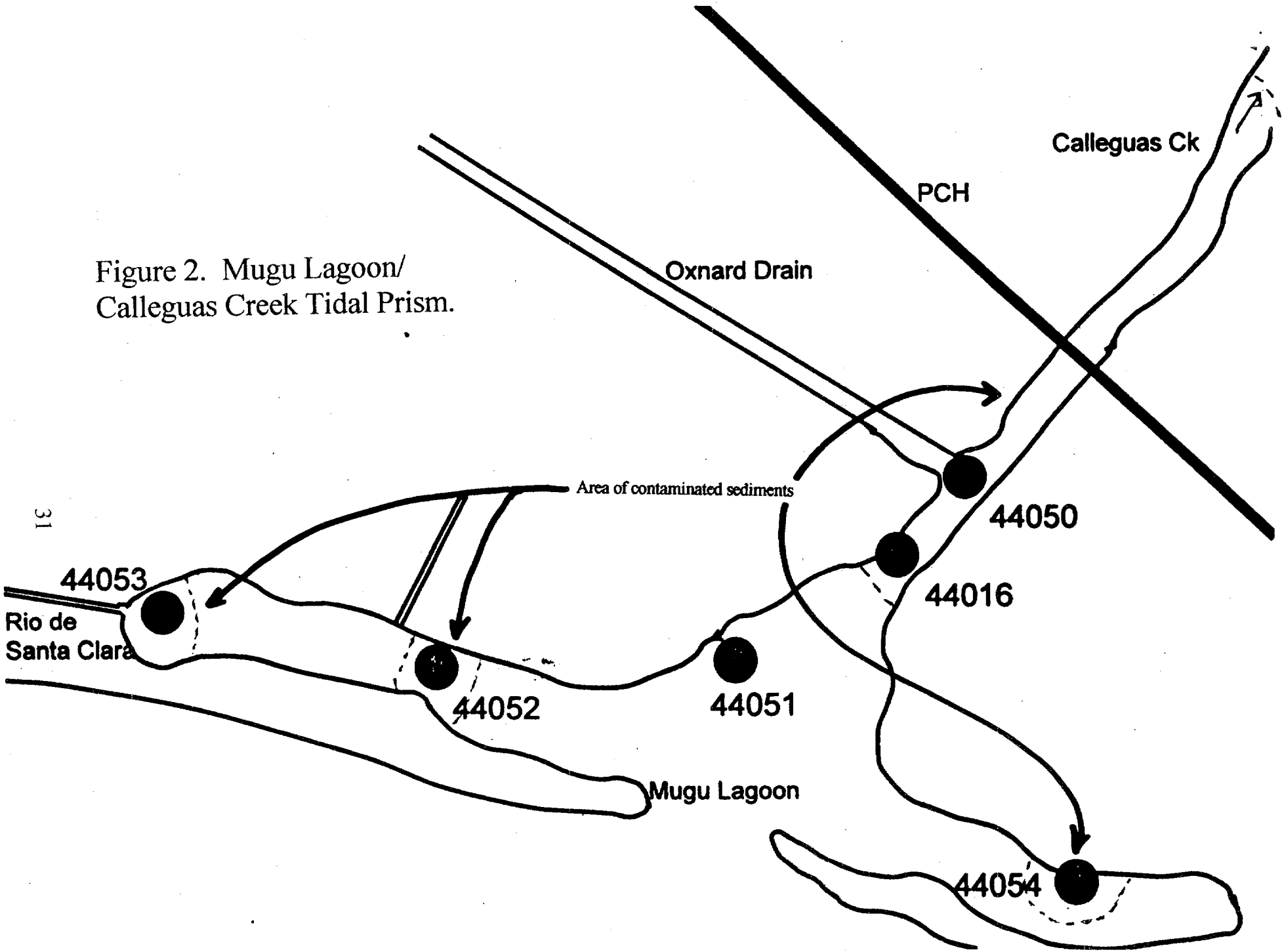

Figure 2. Mugu Lagoon/
Calleguas Creek Tidal Prism.

Twenty-two miles of Calleguas Creek are listed as impaired due to high sediment concentrations of pesticides and accumulation in fish and shellfish. However, the area with the greatest contamination problem is estimated to cover approximately 3 miles. The total volume of contaminated sediments is estimated to be approximately 50,000 to 100,000 cubic yards.

B. Sources of Pollutants

Pesticides are of concern in Mugu Lagoon at the mouth of the Calleguas Creek watershed. The primary source of pesticides probably is agricultural runoff, both during dry weather and wet weather. Water-soluble pesticides currently in use, such as diazinon and chlorpyrifos, may be occurring in sediment porewater at high enough concentrations to be causing observed porewater toxicity. These pesticides are likely involved with observed upstream ambient toxicity. Historical discharges of pesticides, such as DDT, PCBs, toxaphene, chlordane and others, probably has contributed to the existing sediment contamination problem.

The Regional Board has issued 37 permits for discharges of wastewater from point sources into the Calleguas Creek watershed. Of the 22 permitted discharges under the NPDES program, 7 are for municipal wastewaters from publicly-owned treatment works, accounting for a combined permitted discharge of 36.7 million gallons per day (98% of the total permitted discharges). Of the remaining NPDES permits, 11 are for discharges of treated groundwater from hydrocarbon or other contamination, and 5 are general permits for discharges of either well development water or ground water from dewatered aquifers at construction sites. In addition, 88 releases of stormwater from major municipalities, certain industrial activities and construction projects are now permitted under the Regional Board's NPDES program for storm water.

Only one landfill, the Simi Valley Landfill, is active in the watershed. Simi Valley Landfill began operating in 1970. Hazardous wastes were accepted until 1983; since that time, only Class III wastes (municipal solid waste) have been discharged at this landfill. Since operations at the landfill predate current regulations for siting waste management units, only a portion of the Simi Valley Landfill is lined in accordance with current regulations. Leaks from

unlined portions of the landfill have contaminated ground water in an underlying sandstone aquifer; corrective actions are underway by the operator under the direction of the Regional Board.

C. Actions by Regional Board

The Los Angeles Regional Board's Water Quality Assessment identifies the following problems in Mugu Lagoon: aquatic life beneficial use is impaired based on water column exceedances of criteria for copper, mercury, nickel, and zinc, bird reproductivity affected (DDT), tissue accumulation (arsenic, cadmium, silver; chlordane, DDT, endosulfan, dacthal, toxaphene, PCBs); sediment concentrations (DDT, toxaphene), sediment toxicity and excessive sediment. Fish consumption beneficial use is impaired based on tissue accumulation of DDT, PCBs and toxaphene. For Calleguas Creek (Estuary to Arroyo Los Posas), the Water Quality Assessment lists the following problems: aquatic life beneficial use is impaired based on water column toxicity, sediment contamination (DDT, toxaphene), tissue bioaccumulation (chlordane, toxaphene, PCBs, DDT, ChemA, dacthal, endosulfan) and sediment toxicity. Fish consumption beneficial use is impaired based on tissue bioaccumulation (DDT, toxaphene, ChemA, chlordane).

The first large-scale stakeholder effort in the watershed was Mugu Lagoon Task Force, formed in September 1990. The purpose of the Task Force is to improve communication between agencies with various interests and specific projects in Ventura County that may impact water quality in Mugu Lagoon. All of the members share a common goal - to preserve and enhance Mugu Lagoon. The Task Force currently meets infrequently, since many of its members belong to the Calleguas Creek Watershed Management Committee. Active members of the Mugu Lagoon Task Force include the U.S. Army Corps of Engineers, University of California Cooperative Extension Service Farm Advisor, Ventura County Public Works Agency, Ventura County Planning Department, California Department of Fish and Game, California Coastal Conservancy, U.S. Navy Point Mugu Naval Air Station, Ventura County Resource Conservation District, U.S. Natural Resources Conservation Service and Los Angeles Regional Water Quality Control Board.

The Los Angeles Regional Board's Watershed Management Initiative began in late 1994 with the Calleguas Creek (and Ventura River) watersheds. Through watershed management, the Regional Board expects to regulate pollutant loads from point sources through permits that better focus on issues relevant to each watershed. The Regional Board also expects that pollutant loads from nonpoint sources can be better controlled through the participation of the public in the management of their watersheds.

The Los Angeles Regional Board renewed NPDES permits for discharges within the Calleguas Creek Watershed in June 1996. However, the Regional Board was unable to fully assess cumulative impacts to beneficial uses from all pollutant sources, particularly from nonpoint sources, during the first eighteen months of application of the Watershed Management Initiative. The Regional Board was able to develop a regional monitoring program for the inland waters of the watershed which is currently being implemented and should provide additional information needed to assess cumulative impacts.

Thanks to the formation of the Calleguas Creek Watershed Management Committee in 1996, stakeholders will have the opportunity to structure and implement measures that will address pollutants from nonpoint sources through the development of a Watershed Management Plan. The Committee intends to hire a facilitator to help prepare a plan to develop a strategy for the preservation, enhancement and management of the watershed's resources, including identification and control of sources of pollution. The Committee has outlined a three-phased plan to accomplish this goal over a 2.5 year period, beginning in January 1998. The Regional Board plans to reassess cumulative impacts to the beneficial uses of waters in the watershed by fiscal year 2002-2003. Using this information, the Regional Board is scheduled to revise NPDES permits by June 2003.

The Regional Board is working with the Naval Air Weapons Station at Point Mugu to develop a cleanup plan for contamination at this Department of Defense site. This effort still is at the stage of characterizing historical sources of pollution and the extent of existing contamination levels. In the near future, decisions will be made concerning possible remediation and restoration activities in and around Mugu Lagoon.

D. Preliminary Assessment of Remediation Actions

Effects-based data has established that Mugu Lagoon sediment is more toxic than sediment from other lagoons in the region. Current agricultural and erosion control practices are likely moving soils heavily polluted with residuals of banned pesticides to drainages and subsequently into Mugu Lagoon.

Under the direction of the California Coastal Conservancy, Ventura County Resource Conservation District and other members of the Mugu Lagoon Task Force, the U.S. Natural Resources Conservation Service completed a report entitled: "Calleguas Creek Watershed Erosion and Sediment Control Plan for Mugu Lagoon (May 1995)". The primary focus of this study was to address erosion and sedimentation impacts and solutions for the watershed. The U.S. Environmental Protection Agency, State Water Resources Control Board and the Los Angeles Regional Water Quality Control Board recently have granted additional 319(h) funds to implement specific erosion control measures for Grimes Canyon, a critical area targeted for remediation in the plan.

Existing contaminated sediments within Mugu Lagoon and the Calleguas Creek Tidal Prism are unlikely to remediate naturally within a reasonable time frame. Removal of the contaminated sediments (i.e., dredging) or treatment appear to be the most appropriate remediation alternatives, although in situ capping might be the best solution for historical deposits, particularly within the lagoon.

E. Cost Estimate to Implement Cleanup Plan

Given the sensitive nature of Mugu Lagoon as a habitat for endangered species, the most likely remediation alternatives would be no action or in situ treatment. The no action alternative would not have a financial cost, but the contaminated sediment could remain in the environment and continue to cause problems for several more decades. In situ treatment would be very expensive and may pose technical problems for remediation in an estuarine environment. No reliable cost estimate exists at this time for this treatment method, but it would probably exceed $100 per cubic yard.

Dredging could be used to remove the contaminated sediments from the Calleguas Creek Tidal Prism. However, identifying a suitable and legal disposal site for contaminated sediments may be difficult. Application of this technique would cost an estimated $1 million to $5 million, based on a cost estimate of $20-100 per cubic yard (disposal costs are likely to be high, so the cost estimate probably would approach or even exceed the upper limit of the cost estimate range).

F. Estimate of Recoverable Costs From Dischargers

The United States Navy would be liable for any remediation activities required as a result of historical discharges of pollutants due to operations at the Naval Air Weapons Station at Point Mugu. However, the need for such remediation has not yet been determined. It is unlikely that costs can be recovered from any other dischargers in this watershed.

G. Two-Year Expenditure Schedule

The Calleguas Creek Watershed Management Committee has outlined a three-phased plan to hire a facilitator to help develop a watershed management plan. The proposed workplan projects a Phase One budget of $35,000 (January 1998 - June 1998), a Phase Two budget of $61,400 (July 1998 - June 1999), and a Phase Three budget of $65,000 (July 1999 - June 2000). Although the Committee has begun the process to select a facilitator, the funding for this 2.5 year project has not been completely secured.

Los Angeles/Long Beach Harbors

The Los Angeles and Long Beach Harbors are located in the southeastern portion of the Los Angeles Basin. Along the northern portion of San Pedro Bay, there is a natural embayment formed by a westerly extension of the coastline which contains both harbors, with the Palos Verdes Hills as the dominant onshore feature. Offshore, a generally low topographic ridge is associated with the eastern flank of the Palos Verdes uplift and adjacent Palos Verdes fault zone, and extends northwest across the San Pedro shelf nearly to the breakwater of the Los Angeles Harbor.

The port and harbor areas have been modified over the course of more than one hundred years to include construction of breakwaters, landfills, slips and wharves, along with channelization of drainages, dredging of navigation channels and reclamation of marshland. The inner harbor includes the Main Channel, the East and West Basins, and the East Channel Basin. The outer harbor is the basin area located between Terminal Island and the San Pedro and Middle Breakwaters. Los Angeles and Long Beach Harbor are considered to be a single oceanographic unit, and share a common breakwater across the mouth of San Pedro Bay. The outer harbor areas reflect the conditions of the coastal marine waters of the Southern California Bight, while the inner harbor areas typically have lower salinities.

In the presence of the strong currents and rocky habitat of the outer harbor, aquatic life communities are similar to those of the nearby coast, while the inner harbor supports biota generally found in bays and estuaries. The inner harbor has a mostly soft bottom character.

The major surface drainages in the area include the Los Angeles River, which flows in a channel and drains parts of the San Fernando Valley, as well as downtown and south Los Angeles, into eastern San Pedro Bay at Long Beach. The Dominguez Channel drains the intensely urbanized area west of the Los Angeles River into the Consolidated Slip of the Los Angeles Inner Harbor, carrying with it mostly urban runoff and non-process industrial waste discharges. A major source of both freshwater and waste in the outer harbor is secondary effluent from the Terminal Island Treatment Plant. Waste discharges to the inner harbor area of Los Angeles Harbor consist of both contact and non-contact industrial cooling wastewater and stormwater runoff. Fuel spills and oil spills from marine vessel traffic or docking facilities also contribute pollutants to the inner harbor.

Los Angeles Outer Harbor/Cabrillo Pier

A. Areal Extent of Toxic Hot Spot

The site's toxic hot spot status is based on a fish advisory, which resulted from an OEHHA study released in 1991, which cited elevated DDT and PCB levels in a number of fish species caught in the area. Sediment DDT levels in some

BPTCP samples collected from the site were elevated above that found elsewhere in the harbor, while sediment PCB levels were comparable to other sites. Sediment toxicity fluctuated widely. This is a heavily used sustenance and sportfishing pier (Figure 3). It is unclear whether fish caught there are contaminated from DDT found locally or from sources outside of but close to the harbor. It is estimated that 25,000 to 50,000 cubic yards of contaminated sediments exist within the Cabrillo Pier area (based on 1 to 2 foot depth of contaminants).

B. Sources of Pollutants

Historical discharges of DDT, PCBs and metals. Discharge of wastewater effluent from the Terminal Island Treatment Plant is a potential source of pollutants, especially metals. Nonpoint sources include spills from ships and industrial facilities, as well as stormwater runoff. Many areas of the port have experienced soil and/or groundwater contamination, which may result in possible transport of pollutants to the harbor's surface waters.

C. Actions by Regional Board

The Los Angeles Regional Board's Water Quality Assessment lists the following problems in the Cabrillo area of Los Angeles Outer Harbor: aquatic life beneficial use is impaired due to tissue accumulation (DDT), sediment toxicity, sediment contamination (PAHs, DDT, zinc, copper, chromium).

The Los Angeles Regional Board has adopted a watershed management approach, which is expected to regulate pollutant loads from point sources through permits that better focus on issues relevant to each watershed. The Regional Board also expects that pollutant loads from nonpoint sources can be better controlled through the participation of the public in the management of their watersheds. During the 2001-02 Fiscal Year, the watershed management approach will be used to renew NPDES permits within the Los Angeles/Long Beach Harbors Watershed. The Los Angeles Regional Board's Site Cleanup Unit has developed cleanup and remediation plans for many contaminated sites,

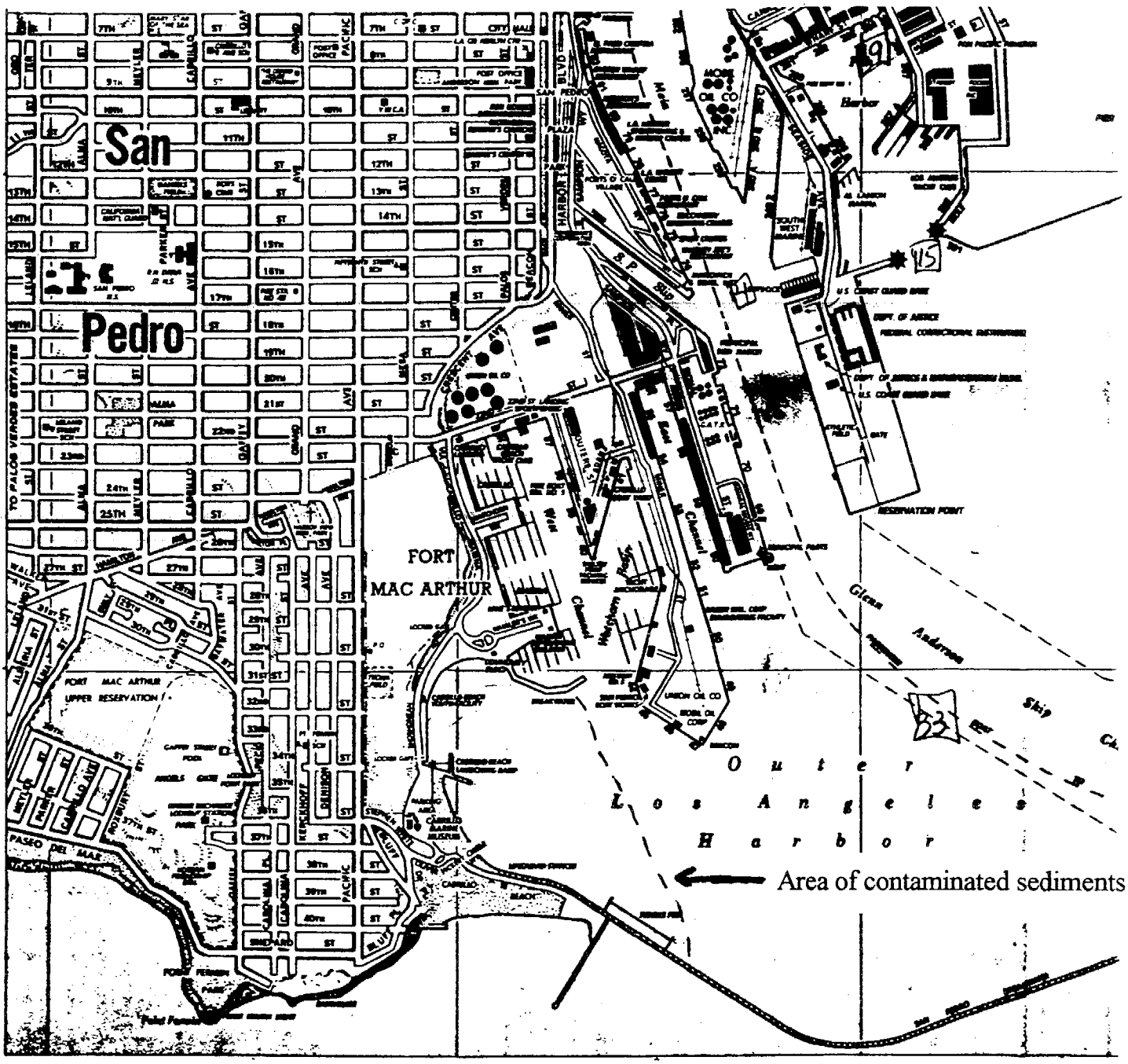

Figure 3. Los Angeles Outer Harbor/Cabrillo Pier.

including refineries and old oil fields. The Regional Board has issued waste discharge requirements for some of the boatyards and stormwater runoff sources within the port.

The Los Angeles Regional Board and the California Coastal Commission will begin work during fiscal year 1997-98 to prepare a long-term management plan for the dredging and disposal of contaminated sediments in the coastal waters adjacent to Los Angeles County. The goals of this plan will be to develop unified multi-agency policies for the management of contaminated dredged material, promote multi-user disposal facilities and reuse, to the extent practicable, and support efforts to control contaminants at their source using a watershed management approach.

D. Preliminary Assessment of Remediation Actions

Given the protected nature of the Cabrillo Pier area within the Los Angeles Outer Harbor, in situ capping might be a feasible method for containment of contaminated sediments. Dredging would be a proven method to remove the contaminated sediments, but identification of a suitable and legal disposal site is often a problem. Treatment of contaminated sediments may be feasible, but is likely to be expensive and difficult to accomplish with marine sediments.

E. Cost Estimate to Implement Cleanup Plan

In situ capping would probably be the least expensive remediation option. However, a stable cap must be designed to prevent reexposure of the contaminated sediments. Application of this technique to contain contaminated sediments from the Cabrillo Pier area would cost an estimated $0.5 million to $1 million, based on a cost estimate of up to $20 per cubic yard.

Dredging could be used to remove the contaminated sediments from the Cabrillo Pier area. However, identifying a suitable and legal disposal site for a large volume of contaminated sediments can be difficult. Application of this technique would cost an estimated $0.5 million to $5 million, based on a cost estimate of $20-100 per cubic yard (if a disposal site, such as a confined aquatic disposal or land disposal site, is available within or close to the Los

Angeles/Long Beach Harbors complex, the cost estimate probably would approach the lower limit of the cost estimate range).

Treatment of the contaminated sediments is likely to be expensive. Application of this technique would cost an estimated $2.5 million to $50 million, based on a cost estimate of $100-$1,000 per cubic yard (due to limited experience in treating marine sediments, costs are likely to be in the upper part of the cost estimate range).

F. Estimate of Recoverable Costs from Dischargers

No cost recovery plans have been developed at this time.

G. Two-year Expenditure Schedule

The Los Angeles Regional Board and the California Coastal Commission will be implementing a contaminated sediment management plan over the next five years. Each agency will be spending $100,000 per year to support these planning activities.

Los Angeles Inner Harbor/Dominguez Channel, Consolidated Slip

A. Areal Extent of Toxic Hot Spot

A reservoir of polluted sediment in Consolidated Slip (moving down from Dominguez Channel) probably is continuing to contaminate a large part of Los Angeles Inner Harbor (Figure 4). It is estimated that approximately 30,000 cubic yards of contaminated sediments exist in Consolidated Slip and approximately 20,000 cubic yards in Dominguez Channel (based on 6 miles of channel contaminated to an average depth of 1 foot). Sediment samples have been collected to establish a three-dimensional view of pollutants and toxicity which will be necessary to further refine the areal extent of the toxic hot spot and plan remedial actions. The Regional Board anticipates evaluating this data during 1998.

B. Sources of Pollutants

Historical discharges of DDT, PCBs and metals probably caused much of the existing contamination. Current point source discharges of process water and other waste streams from refineries located along Dominguez Channel may be contributing to the contamination problem. Numerous nonpoint sources, such as spills, vessel discharges, leaching of pollutants from boat anti-fouling paints, and storm drains, also are present in the area.

C. Actions by Regional Board

The Los Angeles Regional Board's Water Quality Assessment lists the following problems in Dominguez Channel: aquatic life beneficial use is impaired due to sediment contamination (chromium, zinc, DDT, PAHs) and benthic community impairment. The Water Quality Assessment identifies the following problems in Consolidated Slip: aquatic life beneficial use is impaired due to tissue accumulation (DDT, chlordane, PCBs, tributyltin, zinc), sediment toxicity, benthic community effects, sediment contamination (PAHs, zinc, chromium, lead, DDT, chlordane, PCBs); fish consumption advisory.

The Los Angeles Regional Board's Site Cleanup Unit has developed cleanup and remediation plans for many contaminated sites, including refineries and old oil fields. The Regional Board has issued waste discharge requirements for some of the boatyards and stormwater runoff sources within the port.

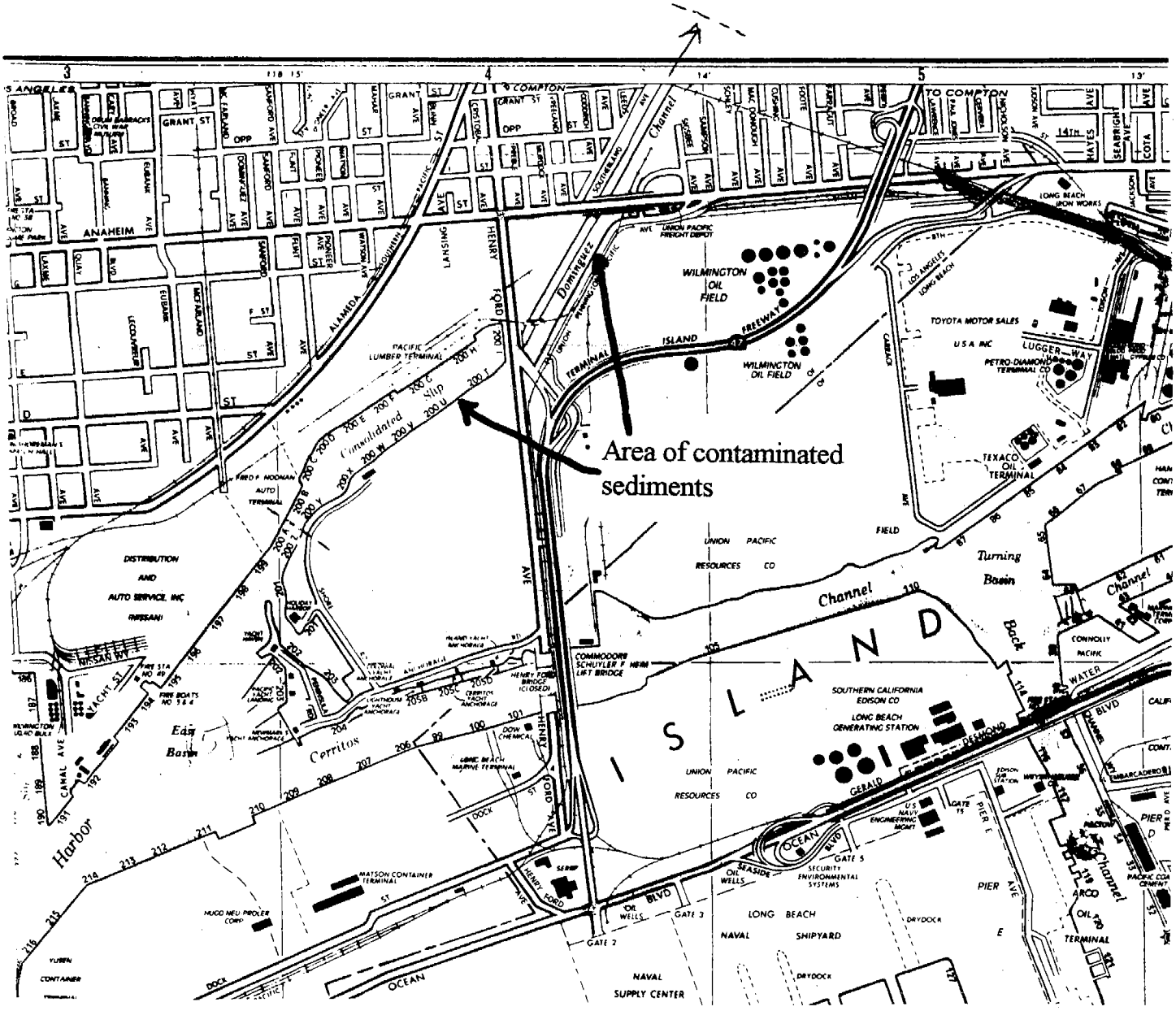

Figure 4. Los Angeles Inner Harbor/Dominguez Channel, Consolidated Slip

The Los Angeles Regional Board has adopted a watershed management approach, which is expected to regulate pollutant loads from point sources through permits that better focus on issues relevant to each watershed. The Regional Board also expects that pollutant loads from nonpoint sources can be better controlled through the participation of the public in the management of their watersheds. During the 2001-02 Fiscal Year, the watershed management approach will be used to renew NPDES permits within the Los Angeles/Long Beach Harbors Watershed and the Dominguez Channel Watershed.

The Los Angeles Regional Board and the California Coastal Commission will begin work during fiscal year 1997-98 to prepare a long-term management plan for the dredging and disposal of contaminated sediments in the coastal waters adjacent to Los Angeles County. The goals of this plan will be to develop unified multi-agency policies for the management of contaminated dredged material, promote multi-user disposal facilities and reuse, to the extent practicable, and support efforts to control contaminants at their source using a watershed management approach.

D. Preliminary Assessment of Remediation Actions

Dredging would be a proven method to remove the contaminated sediments, but identification of a suitable and legal disposal site often can be a problem. Treatment of contaminated sediments may be feasible, but is likely to be expensive and difficult to accomplish with marine sediments. In situ capping is not likely to be chosen as an alternative, due to the high flows that can occur in this area and the potential for reexposure and transport of contaminated material.

E. Cost Estimate to Implement Cleanup Plan

Dredging could be used to remove the contaminated sediments from the Dominguez Channel/Consolidated Slip area. However, identifying a suitable and legal disposal site for a large volume of contaminated sediments can be difficult. Application of this technique would cost an estimated $1 million to $5 million, based on a cost estimate of $20-100 per cubic yard (if a disposal site, such as a confined aquatic disposal or land disposal site, is available within

or close to the Los Angeles/Long Beach Harbors complex, the cost estimate probably would approach the lower limit of the cost estimate range).

Treatment of the contaminated sediments is likely to be expensive. Application of this technique would cost an estimated $5 million to $50 million, based on a cost estimate of $100-$1,000 per cubic yard (due to limited experience in treating marine sediments, costs are likely to be in the upper part of the cost estimate range).

F. Estimate of Recoverable Costs from Dischargers

No cost recovery plans have been developed at this time.

G. Two-year Expenditure Schedule

The Los Angeles Regional Board and the California Coastal Commission will be implementing a contaminated sediment management plan over the next five years. Each agency will be spending $100,000 per year to support these planning activities.