2.0 PROBLEM STATEMENT

Section 303(d)(1)(A) of the Clean Water Act (CWA) requires that "Each State shall identify those waters within its boundaries for which the effluent limitations are not stringent enough to implement any water quality standard applicable to such waters." Water bodies that have been identified in accordance with that requirement are placed on the CWA 303(d) list; these waters are not expected to meet water quality standards even after implementation of technology-based control practices. The CWA requires states to establish a priority ranking of waters on the 303(d) list and establish Total Maximum Daily Loads (TMDLs) for such waters.

In the early 1990s, the Regional Board placed Newport Bay and San Diego Creek on the Clean Water Act Section 303(d) list due to violations, or threatened violations, of the Basin Plan narrative objectives for toxic substances. The listings were primarily based on data obtained from the State Mussel Watch (SMW) and Toxic Substances Monitoring (TSM) programs, which showed evidence of declining, but continuing, bioaccumulation of DDT, PCBs and other toxic substances in mussel and fish tissue at levels that could potentially threaten the biota (SARWQCB Final Problem Statement, 2000). Those listings, and subsequent monitoring data supporting those listings, prompted SARWQCB staff to begin development of TMDLs for toxic pollutants.

On October 31, 1997, USEPA entered into a consent decree, Defend the Bay, Inc. v. Marcus, (N.D. Cal. No. C97-3997 MMC), which established a schedule for development of TMDLs in San Diego Creek and Newport Bay. The decree required development of TMDLs for a variety of pollutants by January 15, 2002; this date was subsequently extended to June 15, 2002. Because the SARWQCB was unable to complete development of TMDLs for toxic pollutants by the date specified in the consent decree, USEPA was required to do so. USEPA, therefore, promulgated TMDLs for 14 toxic pollutants on June 14, 2002.

The consent decree included a list of chemicals for which TMDLs would be prepared; however it specifically provided that USEPA was under no obligation to establish TMDLs for any pollutants that USEPA determined were not necessary, consistent with Section 303(d) of the Clean Water Act. USEPA Region 9 evaluated all readily available data for San Diego Creek and Newport Bay, and used a weight of evidence approach to independently determine which chemicals warranted TMDLs. Their determination as to which organochlorine compounds warranted TMDLs is discussed in the Decision Document, Part H of the Technical TMDL (USEPA 2002).

Subsequent to USEPA's promulgation of technical TMDLs, the State Water Resources Control Board (SWRCB) adopted the State Listing Policy in September 2004. This policy specifies methodology for placing a water body on the CWA

303(d) list. The State's methodology differs somewhat from the methodology used by USEPA for developing the toxics TMDLs. Therefore, SARWQCB staff re-assessed impairment for each of the water body-pollutant combinations that had previously been identified as impaired by USEPA, using the methodology identified in the State Listing Policy. That assessment is discussed below.

2.1 Relevant Investigations/Available Data

These TMDLs are based on analysis of data that were collected in the Newport Bay-San Diego Creek watershed during the period 1994-2004; these data sources are listed below. Many of these data sources are also referenced in the Technical Support Document, Part F of the Technical TMDLs (USEPA 2002), but data obtained from investigations that were completed after USEPA's promulgation of technical TMDLs were also evaluated.

1. Orange County Public Facilities and Resources Department (OCPFRD) Storm Water NPDES Permit Monitoring Data. The County of Orange PFRD (now Resources and Development Management Department [RDMD]) acts as the primary permittee under the Municipal Separate Storm Sewer System (MS4) permit that includes the Newport Bay watershed. This permit includes monitoring requirements. The County's monitoring program includes semi-annual sediment sampling and analysis of OC pollutant concentrations. Sediment data were available for three DDT species, two PCB Aroclors, and chlordane; no data were available for dieldrin or toxaphene. Data were available from 1995 to 2004 for San Diego Creek and some freshwater tributaries, as well as for several sites in Upper and Lower Newport Bay.

2. Toxic Substances Monitoring Program (TSMP). The SWRCB's TSMP collected samples of fish from inland surface waters of the state, and occasionally from marine waters, to determine concentrations of toxic substances in fish tissue. The purpose of the program, which terminated in 2002, was to provide a uniform statewide approach to the detection and evaluation of the occurrence of toxic substances in fresh, estuarine, and marine waters of the State; and water bodies with known or suspected impaired water quality were primarily targeted for evaluation. Species-specific fish tissue data were available for OC pollutants for the time period 1995 to 2002. Sampling locations included San Diego Creek at Michelson Drive, Peters Canyon Channel, San Diego Creek at Barranca Parkway, Santa Ana Delhi Channel, and several sites in Upper and Lower Newport Bay.

3. State Mussel Watch Program (SMWP). The SMWP was a SWRCB program conducted in coordination with Regional Boards from 1987-2000. This program monitored the tissue concentrations of toxic pollutants in resident and transplanted mussels in salt water, and resident and transplanted clams in fresh water. While the organochlorine pollutants are not water soluble and

usually cannot be detected in the water column by traditional analytical techniques, these pollutants can bioaccumulate in shellfish to levels that are detected in routine investigations. Data were evaluated to determine spatial distribution of toxic pollutants as well as temporal trends in their concentrations, and detectable pollutant concentrations in tissue relative to a control are evidence of bioaccumulation in the biota. Shellfish tissue concentration data (1995-2000) were available for several sites within Upper and Lower Newport Bay and Rhine Channel. No data were available for the time period (1995-2004) for San Diego Creek or its tributaries.

4. Bay Protection and Toxic Cleanup Program (BPTCP). This program evolved from the TSMP and SMWP; based on results of those studies, potential toxic hotspots were identified where bioaccumulation could potentially threaten beneficial uses. The BPTCP evaluated sediment chemistry, pore water chemistry, fish tissue chemistry, sediment and pore water toxicity, and the relative benthic index for sites in Upper and Lower Newport Bay in 1994-1998. The results are reported in "Sediment Chemistry, Toxicity, and Benthic Conditions in Selected Water Bodies of the Santa Ana Region, August 1998."

5. Southern California Coastal Water Research Project (SCCWRP) - Newport Bay Sediment Toxicity Studies (2004). This study was undertaken between 2000-2002. It analyzed sediment chemistry at 10 locations in Upper and Lower Bay and Rhine Channel; evaluated sediment toxicity and conducted sediment toxicity evaluations (TIEs); and evaluated water column chemistry and toxicity. Sediment data for PCBs, DDT, chlordane, and dieldrin at selected locations in May 2001 were used to estimate the existing loads for the Bay (see Section 4).

6. SCCWRP – Fish Bioaccumulation Studies (2004). This study was conducted during 2000-2002. Its purpose was to provide data on the distribution and contaminant levels in Newport Bay fishes; identify species that pose a potential health concern to humans or wildlife; identify what fish contaminants may warrant regulatory focus; and identify species or ecological groups of fishes for future study. Data included fish tissue concentrations in muscle fillets from recreationally caught fish, and whole fish tissue concentrations of forage fish in Upper and Lower Newport Bay.

7. SCCWRP – Organochlorine, Trace Elements and Metal Contaminants in the Food Web of the Lightfooted Clapper Rail, Upper Newport Bay, California (2005). This study looked at pollutant concentrations in the food web of the clapper rail to determine the extent of bioaccumulation and biomagnification, and to evaluate contaminant impacts on clapper rail by assessing nonviable eggs.

8. Analysis of Sediment and Fish Tissue obtained from San Diego Creek Unit 2 Basin (2003). SARWQCB staff, along with California Department of Fish and Game staff, collected sediment, shellfish, and finfish from the San Diego Creek Unit 2 basin in 2003, at a time when the basin was drained. The samples were archived at SCCWRP until analysis by CRG Analytical Lab. Sediment and tissue chemistry data were compared to applicable screening values and were used to assess bioaccumulation.

9. Bight '98 and '03 – During Southern California Bight-wide surveys, sediment toxicity and chemistry were examined for Upper and Lower Newport Bay. Available sediment toxicity and chemistry results were evaluated.

10. Masters, P.M. and D.L. Inman (2000). This study examined the fate and transport of organochlorine pollutants discharged from agricultural and urban sources to the salt marsh habitat in Upper Newport Bay. The authors measured concentrations in marsh and channel sediments and salt marsh plants. The data presented included total DDT and chlordane at 11 sites in Upper Newport Bay sediments.

11. Office of Environmental Health Hazard Assessment (OEHHA) Coastal Fish Contamination Program (CFCP). In 1999, OEHHA collected fish samples from Newport Bay and from an offshore site near Newport Beach, and analyzed pollutant concentrations in fillet composites of fish likely to be consumed by humans. Fish species included diamond turbot, shiner surfperch, spotted turbot and yellowfin croaker.

12. Resource Management Associates report (USACE, 1997 – RMA model): Estimates of the sediment distribution for Upper and Lower Newport Bay were made using the results of the sediment transport model developed by RMA. The model simulates wet and dry conditions as well as the largest storm event from 1985 through 1997. Because most sediment entering Upper Bay occurs during storm events, mean daily stream discharge records for San Diego Creek were used to develop a five-day hydrograph and to simulate storm events for the RMA model. Sediment deposition rates that were reported in USEPA's Technical TMDLs for Newport Bay and that are used in this document were derived from 12-year model simulation results.

2.2 Water Quality Standards

Water quality standards include beneficial uses, water quality objectives (numeric and narrative) and an antidegradation policy.

2.2.1 Beneficial Uses

Beneficial uses of San Diego Creek and Newport Bay are designated in the region's Water Quality Control Plan (Basin Plan; SARWQCB, 1995), and are listed below in Table 2-1a,b. Adverse impacts to these beneficial uses that result from discharges of toxic pollutants are violations of the second narrative objective for toxic substances specified in the Basin Plan (see below).

2.2.2 Numeric Water Quality Objectives

In 2000, USEPA established numeric criteria for priority toxic pollutants for the state of California (40 CFR 131; California Toxics Rule [CTR]). The CTR includes numeric water aquatic life criteria for 23 priority toxic pollutants and numeric human health criteria for 57 priority toxic pollutants. CTR criteria for the OC pollutants covered in these TMDLs are identified in Table 2-2.

2.2.3 Narrative Water Quality Objectives

The Basin Plan specifies two narrative water quality objectives for toxic substances. These are:

(1) Toxic substance shall not be discharged at levels that will bioaccumulate in aquatic resources to levels which are harmful to human health, and
(2) The concentration of toxic substances in the water column, sediment or biota shall not adversely affect beneficial uses.

Evidence that toxic substance concentrations in the water column, sediment or biota exceed applicable numeric or narrative objectives and/or guidelines indicates that beneficial uses are being impaired or threatened.

2.2.4 Antidegradation Policy

As the organochlorine compounds are man-made chemicals that do not naturally occur in the environment, it can be argued that their presence in surface water constitutes a lowering of the water quality of that surface water. Pursuant to federal and state antidegradation policies, this is permissible only if beneficial uses are protected and it can be demonstrated that the lowering of water quality is consistent with the maximum benefit to the people of the State of California.

Table 2-1a. Designated Beneficial Uses for San Diego Creek and Newport Bay

	Beneficial Use																			
Water Body	**MUN**	**AGR**	**IND**	**PROC**	**GWR**	**NAV**	**POW**	**REC1**	**REC2**	**COMM**	**WARM**	**LWRM**	**COLD**	**BIOL**	**WILD**	**RARE**	**SPWN**	**MAR**	**SHEL**	**EST**
Lower Newport Bay	+					X		X	X	X					X	X	X	X	X	
Upper Newport Bay	+							X	X	X				X	X	X	X	X	X	X
San Diego Creek Reach 1 – Below Jeffrey Road	+							X[1]	X		X				X					
San Diego Creek Reach 2 – above Jeffrey Road to headwaters	+				I			I	I		I				I					
Other tributaries – Bonita Creek, Serrano Creek, Peters Canyon Wash, Hicks Canyon Wash, Bee Canyon Wash, Borrego Canyon Wash, Agua Chinon Wash, Laguna Canyon Wash, Rattlesnake Canyon Wash, Sand Canyon Wash[2], and other tributaries to these creeks	+				I			I	I		I				I					

[1] – Access prohibited in all or part by Orange County Environmental Management Agency (OCEMA)
[2] Sand Canyon Wash also has RARE Beneficial Use
X= present or potential
I= intermittent

Table 2-1b. Beneficial Use Definitions.

Beneficial Use Definitions

MUN – Municipal and domestic supply
AGR – Agricultural supply
IND – Industrial service supply
PROC – Industrial process supply
GWR – Groundwater recharge
NAV - Navigation
POW – Hydropower generation
REC1 – Water contact recreation
REC2 – Non-contact water recreation
COMM – Commercial and sportfishing
WARM – Warm freshwater habitat
LWRM – Limited warm freshwater habitat
COLD – Cold freshwater habitat
BIOL – Preservation of biological habitats of special significance
WILD – Wildlife habitat
RARE – Rare, threatened, or endangered species
SPWN – Spawning, reproduction, and development
MAR – Marine habitat
SHEL – Shellfish harvesting
EST – Estuarine habitat

Table 2-2. CTR Criteria for Organochlorine Compounds. Units represent total recoverable ppb.

Pollutant	Ambient Water Quality (CTR)					
	Freshwater		Saltwater		Human Health (10^{-6} risk for carcinogens) For consumption of:	
	Criterion Maximum Concentration (CMC)	Criterion Continuous Concentration (CCC)	Criterion Maximum Concentration (CMC)	Criterion Continuous Concentration (CCC)	Water & Organisms	Organisms Only
	µg/L					
p,p-DDD					0.00083	0.00084
p,p-DDE					0.00059	0.00059
p,p-DDT	1.1	0.001	0.13	0.001	0.00059	0.00059
Dieldrin	0.24	0.056	0.71	0.0019	0.00014	0.00014
Chlordane	2.4	0.0043	0.09	0.004	0.00057	0.00059
Total PCBs[1]		0.014		0.03	0.00017	0.00017
Toxaphene	0.73	0.0002	0.21	0.0002	0.00073	0.00075

[1] PCBs value based on sum of seven Aroclors: 1242, 1254, 1221, 1232, 1248, 1268, 1016
Blank space indicates no data available.
"Water & Org" and "Org. Only" refer to human health criteria for consuming water and/or organisms from same water body.

2.3 Impairment Assessment

2.3.1 USEPA Methodology

USEPA conducted an impairment assessment when developing technical TMDLs for toxic substances (2002). A two-tiered approach for assessing impairment was applied in USEPA's evaluation of the data: Tier 1 was considered to be met when there was clear evidence of impairment with probable adverse effects; Tier 2 was considered to be met when there was incomplete evidence and/or evidence of possible adverse effects or potential future impairment. Tier 2 required multiple lines of evidence, while Tier 1 could be met using a single line of evidence. This two-tiered approach is summarized in Part H, Decision Document, of the Technical TMDLs (USEPA, 2002).

2.3.2 SARWQCB Methodology

Because the State Listing Policy was adopted subsequent to USEPA's development of technical TMDLs but prior to adoption of the OCs TMDL Basin

Plan Amendment (BPA), staff reassessed impairment to ensure conformance with State policy. The methodology outlined in the State Listing Policy was followed for this impairment assessment. A weight of evidence approach to evaluating impairment is required under the Policy. According to the Final Functional Equivalent Document (FED) (2004),

> The expression “weight of evidence” describes whether the evidence in favor or against some hypothesis is more or less strong (Good, 1985). In general, components of the weight-of-evidence consist of the strength or persuasiveness of each measurement endpoint and concurrence among various endpoints. Confidence in the measurement endpoints can vary depending on the type or quality of the data and information available or the manner in which the data and information is used to determine impairment.
>
> Scientists have used a variety of definitions for “weight of evidence.” A scientific conclusion based on the weight of evidence is often assembled from multiple sets of data and information or lines of evidence. Lines of evidence can be chemical measurements, biological measurements (bioassessment), and concentrations of chemicals in aquatic life tissue.

In describing how the SWRCB and RWQCBs are to implement a weight-of-evidence approach, the FED states:

> The weight of evidence approach would be a narrative process where individual lines of evidence are evaluated separately and combined using the professional judgment of the RWQCBs and SWRCB. The lines of evidence would be combined to make a stronger inference about water quality standards attainment….Using this approach the SWRCB and RWQCBs would use their judgment to weigh the lines of evidence to determine the attainment of standards based on the available data…Using this approach, a single line of evidence, under certain circumstances, could be *sufficient by itself* to demonstrate water quality standards attainment. (Italics were added by staff.)

According to the State Listing Policy, water segments will be deemed impaired if any of the conditions specified in Sections 3.1-3.11 of the Policy are met. Conditions include *Numeric Water Quality Objectives and Criteria for Toxicants in Water; Health Advisories, Bioaccumulation of Pollutants in Aquatic Life Tissue; Water/Sediment Toxicity; Adverse Biological Response; Degradation of Biological Populations and Communities; Trends In Water Quality; Situation-Specific Weight of Evidence Listing Factors*; among others. Each of these factors requires a minimum number of measured exceedances in order to justify a finding of impairment. The minimum number is based on a binomial test, as presented below in Table 2-3. A finding of impairment was made if the number of exceedances was greater than the minimum number required by the State Listing Policy for any one of the above-listed factors. Data quality requirements of the State Listing Policy were followed as much as possible with respect to spatial representation, quality assurance (QA) and quality control (QC).

2.3.3 Data Evaluated in this Impairment Assessment

Concentrations of organochorine pesticides and PCBs have been declining in fish/shellfish tissue and sediments in the Newport Bay watershed over time. Therefore, to reflect environmentally relevant conditions, this assessment evaluates data obtained from 1995 forward. The one exception is that Bay Protection and Toxic Cleanup Program (BPTCP) sediment chemistry data from late 1994 were used in the evaluation because these data were coupled with toxicity and benthic community measurements. Results reported in Appendix B are separated into the following groups: 1995-2001; 2001-2004; and 1995-2004. The USEPA's impairment assessment documented in the TMDLs for Toxic Pollutants San Diego Creek and Newport Bay, California (2002) evaluated data obtained between 1995 and June 2001. Therefore, the 1995-2001 grouping should roughly correspond to the same data evaluated by USEPA. The State Water Resources Control Board also conducted an impairment assessment in support of its recommendations for the 2006 303(d) listings (SWRCB, 2005), and they used data that generally were collected between 1995-2002 (with some exceptions). This document enables comparisons between this assessment and that performed by USEPA (2002) and the SWRCB in substantiating their 2006 Section 303(d) List Recommendations (2005).

In some studies (e.g., Orange County sediment monitoring under NPDES permit), method detection limits for analysis of some constituents (e.g., chlordane) were greater than the applicable screening values to which pollutant concentrations were compared. In these cases, any detectable concentration often exceeded screening values, but non-detects could not be accurately interpreted (perhaps concentrations in fish tissue or sediment exceeded applicable screening values, or perhaps they did not). For purposes of this impairment assessment, where method detection limits exceeded screening values, data that were above detection limits were used in the assessment, but data showing nondetectable concentrations were considered unusable.

Table 2-3. Minimum Number of Measured Exceedances Needed to Place a Water Segment on the Section 303(d) List for Toxicants. Table is from SWRCB, 2004.

Null Hypothesis (H_o): Actual exceedance proportion ≤3 percent.
Alternate Hypothesis (H_a): Actual exceedance proportion > 18 percent. The minimum effect size is 15 percent.

Sample Size	List if the number of exceedances equals or is greater than
2-24	2*
25-36	3
37-47	4
48-59	5
60-71	6
72-82	7
83-94	8
95-106	9
107-117	10
118-129	211

*Application of the binomial test requires a minimum sample size of 16. The number of exceedances required using the binomial test at a sample size of 16 is extended to smaller sample sizes. For sample sizes greater than 129, the minimum number of measured exceedances is established where α and $\beta \leq 0.2$ and where $|\alpha-\beta|$ is minimized.

α= Excel® Function BINOMDIST (n-k, n, 1-0.03, TRUE)
β=Excel® Function BINOMDIST (k-1, n, 0.18, TRUE)
where n = number of samples,
k = minimum number of measured exceedances to place a water on the section 303(d) list,
0.03 = acceptable exceedance proportion; and
0.18 = unacceptable exceedance proportion

2.3.4 Pollutant Concentrations in Water (Section 3.1 of the Policy)

According to the State Listing Policy, a finding of impairment is made if there is a sufficient number of samples showing exceedances of pollutant concentrations in the water column, compared to the California Toxics Rule (CTR) (Table 2-2). The CTR includes concentrations at which acute toxicity to aquatic life is probable (CMC), as well as levels at which chronic toxic effects are probable (CCC). Additionally, pollutant concentrations in water that are deemed to be protective of human health are identified.

2.3.5 Pollutant Concentrations in Fish Tissue (Section 3.5 of the Policy)

A finding of impairment is made for any pollutant-water body combination where tissue pollutant concentrations exceed an appropriate evaluation guideline and where the minimum number of exceedances is met using a binomial distribution (SWRCB 2004). In this assessment, fish fillet concentrations were compared to OEHHA human health risk screening values (Table 2-4). OEHHA screening values (SVs) were calculated for a 10^{-5} cancer risk, and assume consumption of 21 grams per day of fish by a 70 kilogram adult who frequently consumes fish. The screening value approach identifies chemical contaminants in fish that occur at concentrations that may be of concern to human health for frequent consumers of sport fish. These values are not meant to be regulatory criteria, but instead reveal the need for further investigation to determine if a fish advisory may be warranted. In this impairment assessment, exceedances of OEHHA SVs are assumed to indicate that contaminants have bioaccumulated in fish tissue to levels that may be of concern to human health. OEHHA guidelines were not used for evaluating shellfish tissue concentration data, because the guidelines were developed for sport fish and may not be applicable to shellfish.

Whole fish tissue concentrations were compared to NAS guidelines for protection of aquatic organisms and wildlife that feed on those organisms (Table 2-4). The NAS guidelines (1972) provide recommendations for pollutant residues in whole fish tissue (wet weight basis) that are protective of freshwater aquatic life and predators, as well as recommendations for pollutant residues in whole fish composites that are protective of marine aquatic life and wildlife. NAS guidelines for marine organisms apply only to finfish, not shellfish.

While findings of impairment are most conclusive when pollutant concentrations in *resident* fish species are evaluated (rather than concentrations in *transient* fish), this assessment evaluated all fish tissue data and did not preclude a finding of impairment based on nonresidency. There is a substantial amount of uncertainty when evaluating concentrations in fish whose home range includes areas outside of the Bay. Pollutant concentrations in transient species captured within embayments could reflect the pollutant concentrations of either in-bay or offshore waters, depending upon the amount of time spent in each area. Furthermore, with some fish species, it is not known with certainty whether they are resident or transient, and disregarding these tissue data could lead to erroneous conclusions. In this impairment assessment, staff evaluated tissue data for both resident and transient species.

2.3.6 Water/Sediment Toxicity (Section 3.6 of the Policy)

The State Listing Policy provides for placement of a water body on the CWA 303(d) list based on toxicity alone; however, if a specific pollutant causing toxicity has been identified, then the listing should include that pollutant. Use of sediment quality guidelines (SQGs) is recommended to show the association between toxicity and a given pollutant.

Table 2-4. Fish Tissue Screening Values (SVs) Used in Impairment Assessment. Values in bold print are those suggested for use by the State (SWRCB, 2004).

Pollutant	Fish Tissue Screening Values				
	Human Protection		Aquatic Life/Wildlife Protection		
	OEHHA[1]	FDA[1]	NAS[2]		Environment[1] Canada
			Freshwater	Marine[4]	
	µg/kg wet wt		*µg/kg wet wt*		
p,p-DDD					
p,p-DDE					
p,p-DDT					
Total DDT	**100**		**1,000**	**50**[5]	14 µg/kg diet wet wt
Dieldrin	**2**	**300**	**100**	**5**[3]	
Total Chlordane	**30**		**100**	**50**[6]	
Total PCBs	**20**	**2000**	**500**	**500**	*Mammalian*: 0.78 ng TEQ/kg diet ww *Avian*: 2.4 ng TEQ/kg diet ww
Toxaphene	**30**		**100**	**50**[6]	6.3 µg/kg diet wet wt

[1]Applies for freshwater or marine water organisms; OEHHA values do not apply to shellfish
[2] Water Quality Criteria 1972. A report of the Committee on Water Quality Criteria, Environmental Studies Board, National Academy of Sciences, National Academy of Engineering. Washington, D.C., 1972. At the request and funded by the Environmental Protection Agency.
[3]Sum of concentrations of aldrin, dieldrin, endrin, and heptachlor epoxide in a sample consisting of a homogenate of 25 or more whole fish of any species that is consumed by fish-eating birds and mammals, within the size range consumed by any bird or mammal. Applies to pollutants, individually or in combination.
[4]Applies to marine fish but not marine shellfish
[5]Sum of p,p'DDT, p,p'-DD, p,p'-DDE and their ortho-para isomers, in a sample consisting of a homogenate of 25 or more whole fish of any species that is consumed by fish-eating birds and mammals, within the size range consumed by any bird or mammal. Applies to pollutants, individually or in combination.
[6]Samples consist of a homogenate of 25 or more whole fish of any species that is consumed by fish-eating birds and mammals, with the size range that is consumed by any bird or mammal.

Pollutant Concentrations in Sediment. A sediment triad approach was used in this impairment assessment to evaluate direct effects to aquatic life, similar to the approach being developed by the Sediment Quality Objectives Task Force in developing sediment quality criteria for the state. A sediment triad includes evaluation of sediment chemistry, toxicity, and biological responses. Direct effects are defined as impacts to the aquatic organisms that are directly exposed to sediments, and do not include impacts resulting from food-web bioaccumulation. Effects to wildlife and/or humans due to bioaccumulation of pollutants are considered to be indirect effects. For purposes of this impairment assessment, a finding of impairment was made when exceedances occurred in two of the three triad elements.

Pollutant concentrations in marine and freshwater sediments were compared to the sediment quality guidelines (SQGs) identified in the Final Functional Equivalent Document (FED; 2004) and other applicable SQGs (see Table 2-5). (See Section 3 for a detailed discussion of the derivation and uses of SQGs.) The FED does not endorse the use of SQGs for DDT in marine sediments, and does not identify recommended SQGs for toxaphene in either freshwater or marine sediments; commonly-used SQGs for these compounds are, however, provided for comparison in Table 2-5.

The FED states:

> SQGs should be used with caution because they are not perfect predictors of toxicity and are most useful when accompanied by data from in situ biological analyses, other toxicologic assays, and other interpretive tools…. The predictability of toxicity, using the sediment values reported, is reasonably good and is most useful if accompanied by data from biological analyses, toxicological analyses, and other interpretive tools. These measures are most predictive of toxicity if several values are exceeded. Since these values often are not good predictors of toxicity alone, SQGs that predict toxicity in 50 percent or more samples, should be used in making decisions to place a water body on the section 303(d) list.

In the Listing Policy, SQGs are used to show association between toxic or other biological effects and a given pollutant. They are only to be used in situations where other biological effects data (e.g., toxicity or benthic community degradation) also exist. Therefore, in the absence of toxicity or other biological effects data, pollutant concentrations in sediments were not used as a line of evidence in this assessment. However, when TIE studies identified a particular pollutant (or class of pollutants, e.g., nonpolar organics) as a probable toxicant, statistical tests revealed a correlation between observed toxicity and a particular pollutant, and biological community degradation was statistically linked to a particular pollutant, these data were used in conjunction with sediment chemistry to support a finding of impairment.

Table 2-5. Sediment Quality Guidelines Evaluated in Impairment Assessment Values in bold are those recommended by the State Listing Policy.

	Freshwater Sediment				Marine and Estuarine Sediment					
Pollutant	**TEL[1]**	**PEL[1]**	**TEC[2]**	**PEC[2]**	**TEL[3]**	**PEL[3]**	**ERL**	**ERM**	**Other SQG**	**SoCalERM[6]**
	μg/kg dry wt				**μg/kg dry wt**					
p,p-DDD	3.54	8.51			1.22	7.81	2[5]	20[5]		2.5
p,p-DDE	1.42	6.75			2.07	374	2.2[4]	27[4]		12.2
p,p-DDT					1.19	4.77	1[5]	7[5]		1.9
o,p-DDE										
o,p-DDT										
Sum DDD			4.88	**28.0**						
Sum DDE			3.16	**31.3**						
Sum DDT			4.16	**62.9**						
Total DDT	6.98	4450	5.28	**572**	3.89	51.7	1.58[4]	46.1[4]		
Dieldrin	2.85	6.67	1.90	**61.8**	0.72	4.3	0.02[5]	**8[5]**		1.08
Chlordane	4.5	8.9	3.24	**17.6**	2.26	4.79	0.5[5]	**6[5]**		
Total PCBs	34.1	277	59.8	**676**	21.6	189	22.7[4]	180[4]	**400[8]**	77.2
Toxaphene	0.1[7]									

[1] Buchman, M.F. 1999. NOAA Screening Quick Reference Tables, NOAA HAZMAT Report 99-1, Seattle WA, Coastal Protection and Restoration Division, National Oceanic and Atmospheric Administration, 12 pages.

[2] MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Arch. Environ. Contam. Toxicol. 39: 20-31.

[3] MacDonald, D.D., R.S. Carr, F.D. Calder, E.R. Long, and C.G. Ingersoll. 1996. Development and Evaluation of Sediment Quality Guidelines for Florida Coastal Waters. Ecotoxicology 5: 253-278.

[4] Long, E.R., D.D. MacDonald, S.L. Smith, F.D. Calder. 1995. Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments. Environ. Manage. 19: 81-97.

[5] Long, E.R. and L.G. Morgan. 1990. The Potential for Biological Effects of Sediment-sorbed Contaminants Tested in the National Status and Trends Program, Seattle, WA: National Oceanic and Atmospheric Administration.

[6] Vidal, D.E. and S.M. Bay. 2005. Comparative Sediment Quality Guideline Performance for Predicting Sediment Toxicity in Southern California, USA. Environ. Toxicol. Chem. 24: 3173-3182.
ERM values correspond to the 50th percentile of the distribution of sediment concentrations in the toxic dataset (amphipod survival normalized to the control).

[7] from New York Department of Environmental Conservation

[8] MacDonald,D.D., L.M. Dipinto, J. Fields, C.G. Ingersoll, E.R. Long, and R.C. Swartz. 2000. Development and evaluation of consensus-based sediment effect concentrations for polychlorinated biphenyls. Environ. Toxicol. Chem. 19(5):1403-1413.

2.3.7 Indirect Effects Due to Bioaccumulation and Food Web Biomagnification

Aquatic organisms can accumulate organochlorine pollutants by direct absorption from the dissolved phase in the water column or interstitial water in sediment, or via dietary intake. Bioaccumulation is defined as the net accumulation from all sources (e.g., water and diet), and occurs when the rate of accumulation is greater than the rate of elimination. Indirect adverse effects to human health and/or wildlife may occur when pollutants bioaccumulate and biomagnify within prey species to levels that are toxic to humans or wildlife predators.

The State Listing Policy does not provide specific guidance with which to evaluate water quality impairment related to the effects of food web biomagnification on high trophic level wildlife species (e.g., piscivorous birds). Indirect adverse effects resulting through bioaccumulation and biomagnification of the organochlorine pollutants in the food web of sensitive species (e.g., biomagnification of DDE within the food web of brown pelican, leading to eggshell thinning and reproductive failure) are believed to be more likely to occur than direct effects to aquatic organisms (e.g., mortality or reduced fertilization in benthic organisms).

2.4 Results and Discussion

Figure 2-1 reveals a strong linear relationship between 4,4-DDE concentrations in *Macoma nasuta* (clam) and 4,4-DDE concentrations in sediment from Upper Newport Bay. These data, along with results of other studies that showed bioaccumulation (e.g., SMWP) reveal the OC pollutants are clearly bioavailable in Newport Bay sediments; the degree of bioaccumulation appears to be proportional to the degree of sediment contamination. While the magnitude of bioaccumulation in Newport Bay mussels has declined as pollutant concentrations in sediments have diminished over time (Figures 2-2 through 2-3), sediment-associated contaminants continue to accumulate in the tissues of benthic organisms. Because toxicity to organisms is, by definition, dependent on dose, it must be determined if the contaminant levels currently present in sediments pose a threat to aquatic life, wildlife, or human health, either through direct a toxic response to aquatic organisms or through indirect effects related to bioaccumulation and food web biomagnification.

All existing data were evaluated to determine if observed bioaccumulation is causing or threatening to cause impacts to human health and/or the biota in San Diego Creek and Newport Bay, and an overall summary of results is shown in Table 2-6. Appendices A1-A3 provide a summary of all fish tissue, water column, and sediment chemistry data that were considered in this assessment. Appendix B contains a more comprehensive evaluation of all data, including toxicity and biological effects data. Data collected between 1995-2004 for the organochlorine pollutants (DDTs, PCBs, chlordane, dieldrin, toxaphene) for San

Table 2-6. Summary of Results of Impairment Assessment

Water Body	*Pollutant*	*Line of Evidence*	*Type of Impact*	*Exceedance Frequency*	*Impaired (Y/N)*
San Diego Creek	Total DDT	Fish Tissue (whole)	Aquatic Life/Wildlife	1 of 39 samples>NAS	No
(includes Reach 1,	Chlordane	Fish Tissue (whole)	Aquatic Life/Wildlife	0 of 39 samples>NAS	No
Reach 2, and Peters	Dieldrin	Fish Tissue (whole)	Aquatic Life/Wildlife	0 of 39 samples>NAS	No
Canyon Wash)	Toxaphene	Fish Tissue (whole)	Aquatic Life/Wildlife	9 of 29 samples>NAS	Yes
	Total PCBs	Fish Tissue (whole)	Aquatic Life/Wildlife	0 of 29 samples>NAS	No
	Total DDT	Fish Tissue (fillet)	Human Health	1 of 1 sample>OEHHA	Insufficient Data
	Chlordane	Fish Tissue (fillet)	Human Health	0 of 1 sample>OEHHA	Insufficient Data
	Dieldrin	Fish Tissue (fillet)	Human Health	0 of 1 sample>OEHHA	Insufficient Data
	Toxaphene	Fish Tissue (fillet)	Human Health	No data	Insufficient Data
	Total PCBs	Fish Tissue (fillet)	Human Health	No data	Insufficient Data
	Sum DDD	Sediment Chemistry	Aquatic Life	2 of 127 samples>PEC	Insufficient Data
	Sum DDE	Sediment Chemistry	Aquatic Life	11 of 127 samples>PEC	Sediment triad
	Sum DDT	Sediment Chemistry	Aquatic Life	2 of 127 samples>PEC	requirements
	Total DDT	Sediment Chemistry	Aquatic Life	0 of 127 samples>PEC	not met;
	Chlordane	Sediment Chemistry	Aquatic Life	3 of 22 samples>PEC	Sediment chem.
	Dieldrin	Sediment Chemistry	Aquatic Life	0 of 8 samples>PEC	results are not
	Toxaphene	Sediment Chemistry	Aquatic Life	0 of 8 samples>PEC	validated with
	Total PCBs	Sediment Chemistry	Aquatic Life	0 of 88 samples>PEC	data showing
					sediment
	Total DDT	Sed. Toxicity or	Aquatic Life	No data	toxicity and/or
	Chlordane	Biological Community	Aquatic Life	No data	biological
	Dieldrin	Degradation	Aquatic Life	No data	community
	Toxaphene		Aquatic Life	No data	degradation.
	Total PCBs		Aquatic Life	No data	
Upper Newport Bay	Total DDT	Fish Tissue (whole)	Aquatic Life/Wildlife	8 of 8 samples>NAS All resident fish	Yes
	Chlordane	Fish Tissue (whole)	Aquatic Life/Wildlife	0 of 8 samples>NAS	No
	Dieldrin	Fish Tissue (whole)	Aquatic Life/Wildlife	0 of 8 samples>NAS	No
	Toxaphene	Fish Tissue (whole)	Aquatic Life/Wildlife	No data	Insufficient data
	Total PCBs	Fish Tissue (whole)	Aquatic Life/Wildlife	0 of 8 samples>NAS	No
	Total DDT	Fish Tissue (fillet)	Human Health	7 of 27 samples>OEHHA 4 of 15 resident fish>OEHHA	Yes
	Chlordane	Fish Tissue (fillet)	Human Health	1 of 27 samples>OEHHA	No
	Dieldrin	Fish Tissue (fillet)	Human Health	1 of 27 samples>OEHHA	No
	Toxaphene	Fish Tissue (fillet)	Human Health	0 of 12 samples>OEHHA	No
	Total PCBs	Fish Tissue (fillet)	Human Health	6 of 27 samples>OEHHA 3 of 15 resident fish>OEHHA	Yes
	Total DDT	Sediment Chemistry	Aquatic Life	21 of 98 samples>ERM	N/A for DDT
	Chlordane	Sediment Chemistry	Aquatic Life	27 of 50 samples>ERM	
	Dieldrin	Sediment Chemistry	Aquatic Life	0 of 12 samples>ERM	
	Toxaphene	Sediment Chemistry	Aquatic Life	No data	
	Total PCBs	Sediment Chemistry	Aquatic Life	0 of 72 samples>SQG	

Table 2-5. Summary of Results of Impairment Assessment (continued)

Water Body	*Pollutant*	*Line of Evidence*	*Type of Impact*	*Exceedance Frequency*	*Impaired (Y/N)*
Upper Newport Bay	Total DDT	Sed. Toxicity or	Aquatic Life	SCCWRP (2004) and/or	Yes for DDT and
	Chlordane	Biological Community	Aquatic Life	BPTCP showed correlation	Chlordane
	Dieldrin	Degradation	Aquatic Life	among sediment toxicity,	(Sediment triad
	Toxaphene		Aquatic Life	benthic community degrada-	requirements
	Total PCBs		Aquatic Life	tion, and concentrations of	met)
				DDT and chlordane	
Lower Newport Bay	Total DDT	Fish Tissue (whole)	Aquatic Life/Wildlife	16 of 16 samples>NAS All resident fish	Yes
	Chlordane	Fish Tissue (whole)	Aquatic Life/Wildlife	0 of 16 samples>NAS	No
	Dieldrin	Fish Tissue (whole)	Aquatic Life/Wildlife	0 of 16 samples>NAS	No
	Toxaphene	Fish Tissue (whole)	Aquatic Life/Wildlife	No data	Insufficient data
	Total PCBs	Fish Tissue (whole)	Aquatic Life/Wildlife	0 of 16 samples>NAS	No
	Total DDT	Fish Tissue (fillet)	Human Health	8 of 36 samples>OEHHA 2 of 12 resident fish>OEHHA	Yes
	Chlordane	Fish Tissue (fillet)	Human Health	0 of 35 samples>OEHHA	No
	Dieldrin	Fish Tissue (fillet)	Human Health	0 of 36 samples>OEHHA	No
	Toxaphene	Fish Tissue (fillet)	Human Health	0 of 1 sample>OEHHA	Insufficient data
	Total PCBs	Fish Tissue (fillet)	Human Health	3 of 36 samples>OEHHA 1 of 12 resident fish>OEHHA	Yes
	p,p'-DDD	Sediment Chemistry	Aquatic Life	2 of 45 samples>ERM	
	p,p'-DDE	Sediment Chemistry	Aquatic Life	20 of 45 samples>ERM	
	p,p'-DDT	Sediment Chemistry	Aquatic Life	6 of 45 samples>ERM	
	Total DDT	Sediment Chemistry	Aquatic Life	23 of 56 samples>ERM	N/A for DDT
	Chlordane	Sediment Chemistry	Aquatic Life	13 of 39 samples>ERM	
	Dieldrin	Sediment Chemistry	Aquatic Life	0 of 25 samples>ERM	
	Toxaphene	Sediment Chemistry	Aquatic Life	No data	
	Total PCBs	Sediment Chemistry	Aquatic Life	0 of 53 samples>SQG	No
	Total DDT	Sed. Toxicity or	Aquatic Life	BPTCP TIEs showed	Yes for DDT and
	Chlordane	Biological Community	Aquatic Life	correlation between	chlordane
	Dieldrin	Degradation	Aquatic Life	reduced amphipod	
	Toxaphene		Aquatic Life	survival and urchin	
	Total PCBs		Aquatic Life	development and	
				chlordane, PCBs and	Sediment triad
				DDTs; benthic community	requirements
				degradation significantly	were met
				correlated with DDE.	

Diego Creek, Peters Canyon Wash, Santa Ana Delhi Channel, Upper Newport Bay, Lower Newport Bay, and Rhine Channel (35 water body-pollutant combinations) were evaluated (Appendix B).

2.4.1 San Diego Creek and Tributaries

<u>Freshwater - Aquatic Life/Wildlife Effects</u>. The concentrations of the OC pollutants in whole fish tissue have declined dramatically over time in San Diego Creek and its tributaries, such that few exceedances of NAS guidelines for protection of freshwater aquatic life are currently observed for any of the contaminants, with the exception of toxaphene (Figure 2-4). Toxaphene concentrations in 30 percent of fish sampled in San Diego Creek Reach 1 and

Peters Canyon Wash, between 1995-2002, exceeded the freshwater NAS guideline. The minimum number of samples was met to support a finding of impairment for toxaphene in these water bodies.

While a substantial number of exceedances of the freshwater sediment Probable Effects Concentration (PEC) for sum DDE (31.3 ppb dw) was observed in sediments of San Diego Creek Reaches 1 and 2, and Peters Canyon Wash (Appendix A-2), there were no matched toxicity or other biologic effects data to demonstrate that any adverse effects were caused by DDT or its metabolites. Therefore, in accordance with the State Listing Policy, data were inadequate to enable use of concentrations of DDT species in sediments as a line of evidence in evaluating impairment. Few, if any, exceedances of applicable SQGs were observed for PCBs, dieldrin, toxaphene or chlordane in San Diego Creek or its tributaries, and no toxicity or biologic effects data existed with which to meet the sediment triad requirements.

<u>Freshwater - Human Health Effects</u>. There were insufficient data with which to evaluate potential threat to human health caused by the OC pollutants in San Diego Creek or its tributaries; however, one single catfish obtained from the Unit 2 in-channel sediment detention basin in San Diego Creek Reach 1, in 2003, contained nearly 1 ppm DDT in a muscle fillet sample (OEHHA SV for DDT is 100 ppb wet weight).

2.4.2 Upper and Lower Newport Bay

<u>Marine Aquatic Life/Wildlife Effects</u>. Virtually all of the fish species captured in both Upper and Lower Newport Bay between 1996-2002 had whole body residues of total DDT that exceeded the NAS guideline for marine aquatic life/wildlife protection (SCCWRP, 2004; Figure 2-5a,b). A significant number of exceedances of this guideline indicates that fish may bioaccumulate total DDT to levels that could have either a direct adverse effect on aquatic life or an indirect adverse effect on higher trophic level predator species, including birds and mammals, and constitutes an exceedance of the second narrative water quality objective for toxic substances. No exceedances of NAS guidelines in whole fish tissue were observed for dieldrin, PCBs (Figure 2-5b), chlordane, or toxaphene.

Over 50 percent of sediment samples in Upper Newport Bay, and 30 percent of samples in Lower Newport Bay, exceeded ERM values for chlordane (the state-recommended SQG) between 1995-2004 (see Table 2-5 and Appendix A and B). Significant sediment toxicity and/or benthic community degradation were also observed in both Upper and Lower Newport Bay, and the BPTCP study found a significant correlation between chlordane in sediments and amphipod toxicity and purple sea urchin development. Therefore, chlordane exceedances may pose a threat to marine aquatic life and violate the second narrative water quality objective for toxic substances in the Region's Basin Plan. Applicable SQGs were not exceeded for PCBs, dieldrin or toxaphene; there is no state-endorsed marine

SQG for DDT, however a substantial number of samples exceeded the ERM value (see Table 2-5 and Appendix A and B). Sediment toxicity and/or benthic community degradation were also significantly correlated with DDT in sediments (BPTCP and SCCWRP [2004]).

<u>Marine - Human Health Effects</u>. Between 1995-2004, fish fillet samples were measured in the TSMP, the CFCP, and by SCCWRP (2004). Of a total of 27 samples collected and analyzed, there were 7 exceedances of OEHHA human health SVs for total DDT in fish captured in Upper Newport Bay (see Table 2-5; Figure 2-6a). Fifteen of the fish sampled were resident to the Bay, and 4 of these fish had total DDT concentrations that exceeded OEHHA SVs. There were a total of 8 exceedances for total DDT out of 36 muscle fillet samples analyzed from fish captured in Lower Newport Bay (Table 2-5; Figure 2-6b). Twelve of these fish were resident to the Bay, and 2 had total DDT concentrations in muscle fillet samples that exceeded OEHHA SVs. The number of exceedances was greater than the minimum required to support a finding of impairment for Upper and Lower Newport Bay based on potential adverse effects to humans. The impairment finding is supported whether or not the evaluation was restricted to resident fish species, or whether it considered both resident and transient species. For PCBs, a significant number of fish fillet tissue exceedances was also observed in resident species in Upper Newport Bay (Figure 2-7a). In Lower Newport Bay, there of 3 exceedances out of a total of 36 fish fillet samples analyzed (1 of 12 resident species) (Figure 2-7b).Very few samples of muscle fillets obtained from both Upper and Lower Newport Bay had detectable concentrations of chlordane or dieldrin, and numbers of fish tissue exceedances did not meet the minimum number required to make a finding of impairment. Interestingly, all fillet tissue exceedances were observed in summer; only one DDT exceedance occurred in the winter (Figure 2-6a,b; Figure 2-7a,b).

<u>Avian Effects due to Food Web Biomagnification</u>. The many species of birds that nest or feed in Upper Newport Bay are also important receptors for contaminants. Dietary uptake is probably the main source of exposure to bioaccumulative contaminants for these species. These contaminants are passed from the mother to the developing embryo and may cause developmental abnormalities, eggshell thinning and failed hatching.

To estimate the potential for adverse effects in birds due to exposure to these contaminants, concentrations in various components of their diet, in the surrounding environment, and in egg tissue can be measured, and results compared to literature threshold values. The light-footed clapper rail (clapper rail, *Rallus longirostris levipes*) is a federally listed species and a year-round resident of the Upper Newport Bay Ecological Reserve (UNBER). The clapper rail has been identified as one of the species in UNBER that is at risk of immune system or reproductive impairment from dietary uptake of bioaccumulative compounds. Clapper rails nest in the salt marsh and feed in adjacent mudflats, where sediment-associated contaminants are likely be present.

Non-viable clapper rail eggs, sediment, and food items were evaluated from five nest sites in UNBER over a two-year period by SCCWRP and CH2MHill, and results are reported in Sutula et al. (2005). Only six non-viable eggs were collected, due to limited access to clapper rail nesting areas. DDT (and metabolites) and chlordane were found to be biomagnifying in the food web of the clapper rail. The contaminant of greatest concern was determined to be 4,4'-DDE, as DDE concentrations exceeded screening levels for sediments, bird eggs and embryonic abnormalities. A significant inverse correlation was observed between 4,4'-DDE concentration and eggshell thickness in five eggs (R^2=0.68; p=0.04 at α=0.1). The egg with the highest concentration of DDE also had the thinnest shell, and developmental abnormalities were observed in the embryo. The mean eggshell thickness of the clapper rail eggs collected at UNBER, however, was similar to the mean of pre-DDT era (<1947) eggshell thickness measured from 80 eggs in the collection of the Western Foundation of Vertebrate Zoology, Camarillo, California. Therefore, the degree of eggshell thinning documented for one of the six eggs sampled may not be biologically significant at the population level, although evidence of thinning even at the individual level is important when dealing with endangered species.

The potential adverse biologic effects due to biomagnification in the food web of the light-footed clapper rail provide another line of evidence suggesting that the organochlorine pollutants (in particular, DDT species) are impairing beneficial uses, and current levels in the environment violate or threaten to violate the second narrative water quality objective for toxic substances.

2.4.3 Comparison with USEPA (2002) Impairment Findings

Table 2-6 compares staff findings of impairment with those previously made by USEPA (2002).

USEPA's impairment assessment showed that TMDLs were required for total DDT, PCBs, dieldrin, chlordane and toxaphene in San Diego Creek, based on exceedances of the OEHHA SVs in red shiner whole fish tissue (TSMP); in Regional Board staff's assessment, whole fish tissue samples were compared to NAS guidelines for freshwater aquatic life protection, and impairment was demonstrated only for toxaphene. As stated in the SARWQCB Final Problem Statement, TMDLs for Toxic Substances in Newport Bay and San Diego Creek (2000), whole fish are usually analyzed when fish are small (e.g., red shiner).

Table 2-6. Impairment Summary for all Water Body-Pollutant Combinations & Comparison with Impairment Assessments Performed by USEPA . (+) = Impaired, Requires TMDL; (-) = Not Impaired or Insufficient Data to Make Determination. Note that USEPA did not distinguish between San Diego Creek and its tributaries (Peters Canyon Wash) when evaluating impairment; they also did not include Santa Ana Delhi Channel in their assessment.

Author	Water Body	Total DDT	Total PCBs	Chlordane	Dieldrin	Toxaphene
USEPA	San Diego Creek*	+	+	+	+	+
	Upper Newport Bay	+	+	+	-	-
	Lower Newport Bay	+	+	+	+	-
SARWQCB	San Diego Creek R1	-	-	-	-	+
	Peters Cyn Wash	-	-	-	-	+
	San Diego Creek R2	-	-	-	-	-
	Santa Ana Delhi Ch	-	-	-	-	-
	Upper Newport Bay	+	+	+	-	-
	Lower Newport Bay	+	+	+	-	-

*USEPA's Impairment Assessment did not distinguish between Reach 1 and Reach 2 of San Diego Creek, nor did it distinguish between San Diego Creek and Peters Canyon Wash, its major tributary

This does not represent typical human consumption practices, but does reflect what predator species consume. Whole fish concentrations may be 2-10 times the concentration found in fillets, and the fillet is typically the portion of the fish consumed by people. Therefore, pollutant concentrations in fish fillets are appropriately compared to screening values that have been calculated to evaluate human health risk, while pollutant concentrations in whole fish tissue are most appropriately evaluated with respect to ecological risk. Staff concluded that the paucity of data precluded a determination of impairment for San Diego Creek and its tributaries related to human health risk; further monitoring is needed to assess water quality standards impairment in San Diego Creek Reach 1.

Although impairment was not established for San Diego Creek and its tributaries for chlordane, total DDT and PCBs, TMDLs for those pollutants will nevertheless be developed. The need for TMDLs is based on the fact that San Diego Creek is the primary source of contaminated sediments that are discharged to Newport

Bay. To achieve TMDLs established for the Bay, controls on inputs from San Diego Creek will be necessary.

Upper and Lower Newport Bay. Staff's assessment was in agreement with that of USEPA for every water body-pollutant combination except for dieldrin. Findings of impairment for total DDT and PCBs in the Bay were primarily based on fish tissue exceedances in recreational and forage fishes; a finding of impairment due to chlordane, on the other hand, was primarily based on exceedances of applicable SQGs that were coupled with evidence of adverse biological effects. In contrast to USEPA's impairment assessment, Regional Board staff concluded that there was insufficient evidence to make a finding of impairment for Upper and Lower Newport Bay for dieldrin, based on the methodology outlined in the State Listing Policy. Therefore, no TMDLs will be developed for dieldrin for any water body covered in this document.

Table 2.7 identifies the waterbody-pollutant combinations for which TMDLs will be developed.

Table 2-7. Waterbody-pollutant combinations for which TMDLs are being developed.

Waterbody	***Pollutant***
San Diego Creek and tributaries	Toxaphene, DDT, PCBs, Chlordane
Upper Newport Bay	DDT, PCBs, Chlordane
Lower Newport Bay	DDT, PCBs, Chlordane

The remainder of this document will identify the following required TMDL elements:

- *Quantitative Targets*: Identification of specific goals for the TMDL that equate to attainment of water quality standards. When water quality standards are expressed in narrative terms, it is necessary to develop a quantitative interpretation of narrative standards.
- *Source Analysis*: A discussion of all point sources, nonpoint sources, and background sources, including magnitude and location.
- *Existing Loads*: An quantitative estimate of the amount of pollutants entering receiving waters, or the amount of pollutant that is bioavailable based on historic loadings stored in the aquatic environment (USEPA, 2000).
- *Linkage Analysis and Loading Capacity*: The critical linkage between applicable water quality standards (as interpreted through numeric targets) and the TMDL. The loading capacity is the maximum amount of a pollutant that may be delivered to the water body and still achieve water quality standards.

- *TMDLs and Allocations*: The allowed pollutant amount and its components: wasteload allocations for point sources, load allocations for nonpoint sources and natural background.
- *Margin of Safety*: an implicit or explicit margin of safety to provide for uncertainty within the TMDLs.
- *Seasonal Variations and Critical Conditions*: A discussion of how pollutant discharges and impacts to beneficial uses vary in different years or at different times of the year. This discussion is required in order to ensure that the TMDL will be protective of receiving waters during periods in which they are most sensitive to impacts associated with the pollutant(s) of concern (USEPA, 2000).
- *Implementation Plan*: Specific implementation actions, monitoring plans and a schedule for considering revisions to the TMDLs.