TECHNICAL MEMORANDUM #1

RE: SAN GABRIEL / COYOTE CREEK WATERSHED
DATE: March 17, 2006

Prepared for:	**Prepared by**:
County of Orange Resources & Development Management Department Environmental Resources	Tetra Tech, Inc. Irvine, CA

The County of Orange Resources and Development Management Department (RDMD) is in the process of developing Watershed Chapters for each of the watersheds within Orange County. These Watershed Chapters will be included as an appendix to the Drainage Area Master Plan (DAMP) and will provide specific information regarding the watershed setting, an assessment of the water quality, the plan of action within the watershed to improve the water quality, and the steps to be taken to assess the effectiveness of the program.

In each watershed the first step in the development of the Watershed Chapter is an inventory of the existing studies that are available in that watershed. This Technical Memorandum for the San Gabriel / Coyote Creek Watershed summarizes the studies that were collected as part of this effort. The focus of the data collection was on studies within the Orange County portions of the watershed.

The San Gabriel / Coyote Creek Watershed includes the reach of San Gabriel River that flows adjacent to the Orange County corporate limit, Coyote Creek, and the three principal tributaries of Coyote Creek: Carbon Creek, Fullerton Creek and Brea Creek. This watershed covers 41.3 square miles in the northwest corner of Orange County. It includes portions of the cities of Anaheim, Brea, Buena Park, Fullerton, La Habra, La Palma, Los Alamitos, Placentia, and Seal Beach.

The Basin Plan identifies the following receiving waters within this watershed:

- Tidal Prism of San Gabriel River – River Mouth to Marina Drive
- Coyote Creek

Studies Sources / Authors

The data search within the San Gabriel / Coyote Creek Watershed included website searches and contact with staff from municipal agencies and non-profit organizations. The main study contributors include the University of California – Irvine, Berkely, and Los Angeles (UCI, UCB, and UCLA), RDMD, County of Orange Health Care Agency, the U.S. Army Corps of Engineers (USACE), and United States Geological Survey (USGS). The following table identifies the specific agencies and groups for which contact was made to obtain information.

Table 1. Data Research Contacts

Agency	Comments
EPA	No references.
USGS	1 reference was obtained.
USACE	1 reference was obtained.
Regional Board, Santa Ana	No references.
RDMD	1 reference was obtained.
Orange County Health Care Agency	1 reference was obtained.
SCCWRP	No references.
OCSD	No references.
OCWD	No references.
Cities within the Watershed	No references.
UCI, UCB, UCLA	4 references were obtained.

Through these sources, a total of 8 studies were obtained within the San Gabriel / Coyote Creek Watershed.

Geographical Extent of Studies

The studies that were obtained through the data collection effort were categorized as part of the San Gabriel River Watershed or the Coyote Creek Watershed, which is a subwatershed of the San Gabriel River Watershed. Of the 8 studies obtained, 1 focused on Coyote Creek, 2 focused on the coastal area, and the remaining 5 studies focused on the overall watershed.

Water Quality Data

A significant source of persistent water quality data in Orange County is the County of Orange Health Care Agency. The Health Care Agency monitors the ocean water in the surf zone and specifically tests for bacteria. Two sample stations are located in this watershed and 1 sample per week is taken.

The County of Orange monitoring program has evolved through the changing requirements of the NPDES permits. The current program includes several types of monitoring programs. Within this watershed there are three monitoring stations that are includes in the mass emissions monitoring program. They are located in Coyote Creek, Fullerton Creek, and Carbon Creek. Wet and dry weather monitoring is conducted for a broad range of constituent including heavy metals.

Bibliography of Studies

A bibliography that includes the existing studies collected as part of this effort was developed and is included as Attachment 1 to this Technical Memorandum.

Bibilography for the San Gabriel River - Coyote Creek Watersheds

Record #	Program Name or Report Title	Sample Location	Start Date	End Date	flow conditions	entity	Bacteria	nutrients	metals	pesticides	toxicity / TIE studies	water chemistry	fish tissue	sediments	comments
11	Orange County NPDES/TMDL Program	watershed		ongoing	C	OC	x	x	x	x	x	x			
12	2004 Annual Ocean and Bay Water Quality Report	beach	1975	ongoing	c	HCA	x								
1	Activities of the San Gabriel Basin Water Quality Authority, 1992 through 2003: Report to the legislature	San Gabriel Basin	1992	2003		UCI									
2	H.R. 910, the San Gabriel Basin Water Quality Initiative & the role of the Corps					UC Berkely									
5	Water quality and biological effects of urban runoff on Coyote Creek: phase I preliminary study	Coyote Creek		1980		USGS									
6	Water Quality Control Policy for San Gabriel River Tidal Prism	San Gabriel River		Apr-67		UCLA									
9	PCR detection of pathogenic viruses in Southern California Urban rivers	Southern California urban rivers				UCLA	x				x				Aim of study: investigation of human viral contamination in urban rivers and its impact on coastal waters of Southern California; faecal indicator bacteria sampled
10	Westminster Watershed Reconaissance Study	none	2001	2001		COE									watershed study

DRAFT TECHNICAL MEMORANDUM #2

RE: SAN GABRIEL / COYOTE CREEK WATERSHED
DATE: MAY 15, 2006

Prepared for:	**Prepared by**:
County of Orange Resources &	Tetra Tech, Inc.
Development Management Department	Irvine, CA
Environmental Resources	

The County of Orange Resources and Development Management Department (RDMD) is in the process of developing Watershed Chapters for each of the watersheds within Orange County. These Watershed Chapters will be included as an appendix to the Drainage Area Master Plan (DAMP) and will provide specific information regarding the watershed setting, an assessment of the water quality, the plan of action within the watershed to improve the water quality, and the steps to be taken to assess the effectiveness of the program.

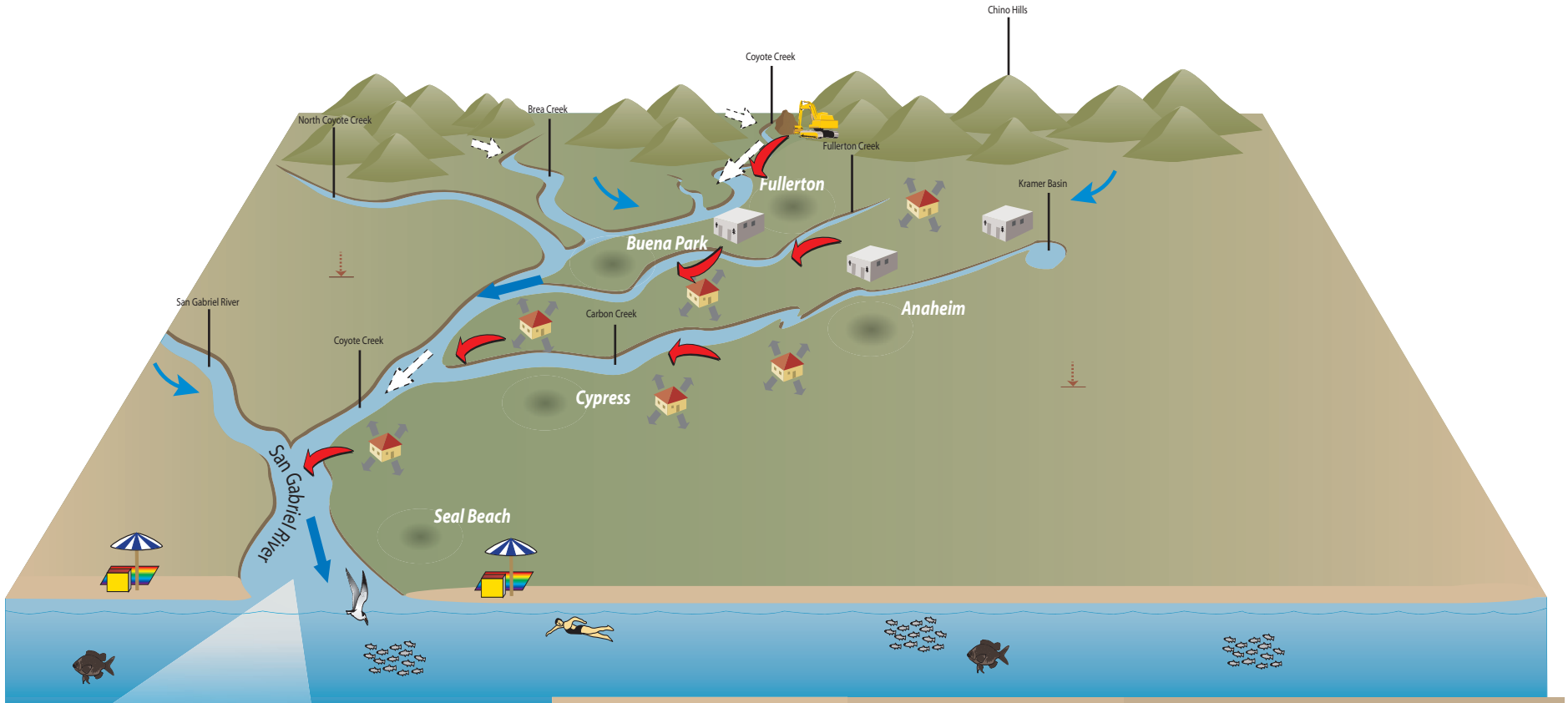
The first step in the development of the Watershed Chapter is an inventory of the existing studies that are available in the watershed. A technical memorandum, Technical Memorandum #1 (dated March 17, 2006), focused on the collection of the existing data. The data collection effort for that memorandum ended in March 2006 and includes studies completed and underway at that time. The second step in the development of the Watershed Chapter is an assessment of the water quality data and identification of data gaps within the body of knowledge that has been generated for the San Gabriel / Coyote Creek Watershed. The assessment and identification of data gaps is presented in this technical memorandum (Technical Memorandum #2).

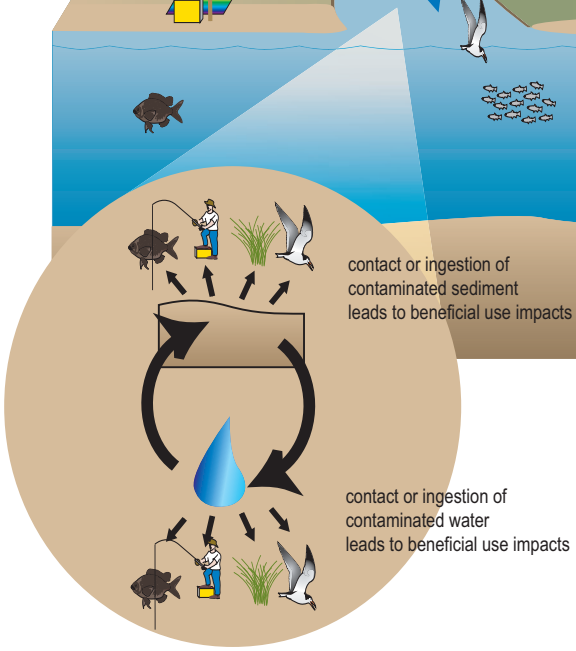
The San Gabriel / Coyote Creek watershed is located on the northern edge of the Orange County Coast, approximately 17 miles southeast of Los Angeles. Coyote Creek is a tributary to the San Gabriel River, joining it at it's southern end. Coyote Creek and the lower San Gabriel river forms the majority of the northern boundary of the County of Orange. The San Gabriel River originates in the San Gabriel Mountains 25 miles to the north, while Coyote Creek originates 6.5 miles north of the County of Orange in Chino hills.

Before assessing the water quality data, it is helpful to understand the water quality related processes at work within these waterbodies. The following figure provides a graphical representation of those processes. The processes include:

1. Source of pollutants – from where do the pollutants originate. In some instances the origination is known only generally; in others the specific origin is know.
2. Transport of pollutants – how are the pollutants transported from the sources into the receiving waters (the rivers and ocean).
3. Fate of pollutants – how do the pollutants impact various users of the system. The fate of the pollutants is directly tied to the impacts of the beneficial uses present in the watershed.

San Gabriel - Coyote Creek Watershed





Sources of Pollutants

- Construction Runoff
- Industrial / Commercial Runoff
- Urban Runoff
- Atmospheric Deposition
- Groundwater
- Sediment from erosion on the land or in the river
- Cities

Transport of Pollutants

- Pollutant Path into Rivers and Creeks via stormdrains or overland flow
- Dissolved in river water
- Attached to sediment
- Dissolved in groundwater

Fate of Pollutants Leading to Beneficial Use Impacts

- Pollutants are taken up into the vegetation and contaminate birds and fish through ingestion
- Invertebrates, fish, and birds accumulate pollutants by ingesting contaminated water or eating other contaminated species
- Pollutants reach human population by contact through recreational activites or consumption of contaminated fish

WATER QUALITY DATA ASSESSMENT

There is a limited amount of water quality data that is available specific to the San Gabriel / Coyote Creek Watershed. Twelve (12) studies were identified that provide water quality information specific to this watershed. A matrix was developed to provide a detailed view of each of the studies / programs discussed in this technical memorandum. This matrix is referred to as the San Gabriel / Coyote Creek Environmental Matrix and includes information such as the specific constituents of concern included in the study / program, and details of the monitoring and management issues supported by that study / program. The San Gabriel / Coyote Creek Environmental Matrix is included in this technical memorandum as Attachment 1.

It is a significant challenge to assemble the report references into a meaningful framework that provides the reader with an idea of what type of data or results are available. In order to meet the various types of user needs that were envisioned, the data has been 'cut' in several directions. Each 'cut' or assessment represents the sum total of all the programs and studies that were assembled as part of this technical memorandum; the difference is only in the perspective taken in that assessment.

Assessment #1: Program Management and Policies

A reasonable question to ask when faced with the abundance of data that exists, is whether this data is providing stormwater program coordinators with the information needed to manage the program and make informed decisions for the watershed. The knowledge needed at various stages in the program development must be able to build on previous efforts to attain constantly improving results. The following passage from Managing Troubled Waters (National Academy Co, 2003) explains this iterative process.

> *"The reality of imperfect knowledge about marine systems means that monitoring should be used as an opportunity to increase and refine our knowledge of them. Data and information derived from monitoring programs should be used to check, validate, and refine the assumptions, models, and understandings on which the monitoring was based. This iterative feedback increased predictive ability, reduces uncertainty, and ultimately reduces the monitoring effort needed. As discussed in Chapter 2, risk-free decision making is not achievable, and monitoring must be viewed as a way of reducing uncertainty, not of eliminating it."*

The following table identifies the aspects of a stormwater program that are needed to advance the knowledge of the systems and identifies the number of studies that are relevant to each category. Each of these categories is considered in relation to specific pollutants of concern or elements of the watershed system.

Table 1. Assessment #1 - Studies by Program Management Category.

	Source Identification	Understanding processes	Developing new tools	Determine compliance with WQs/TMDLs	Evaluate Program/ Measure Effectiveness	Provide Early Warning
Bacteria	3	2	2	4	5	2
Nutrients	1	2	3	2	4	1
Inorganics-Metals	2	1	3	2	5	1
Organics-Pesticides	1	1	2	2	4	1
Toxicity	2	3	2	2	3	1
Water Chemistry	1	1	1	1	1	1
Solids-Sediment	0	0	1	2	3	0
Fish Tissue	0	0	0	0	0	0

Assessment #2 – Study and Program Type

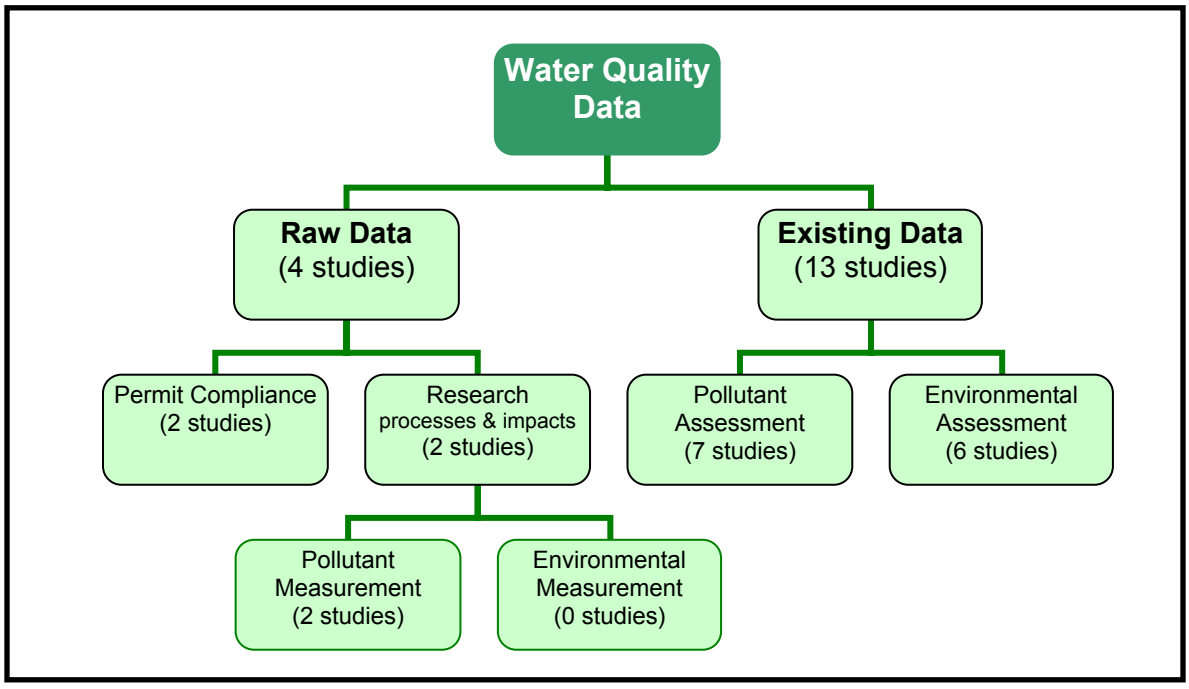
The 12 studies and programs identified within the San Gabriel / Coyote Creek Watershed have generated different types of water quality data. This data falls within two broad categories including: (1) generation of raw data and (2) assessment of existing data.

Raw data studies and programs include specific sampling or monitoring activities. This accounts for 4 of the 12 studies included in this assessment. New data was generated with two different objectives. The first objective was compliance with National Pollutant Discharge Elimination System (NPDES) permits. Compliance activities include the Orange County NPDES and Total Maximum Daily Load (TMDL) monitoring programs as well as monitoring programs conducted by other permitted facilities. The second objective in generating raw data was to understand the concentration levels or processes related to the pollutants, or the impacts of the pollutants, on the ecosystem. Studies targeting pollutant concentrations and processes generally involved direct measurements of the pollutants while studies targeting the impacts of the pollutants generally involved other environmental measurements. Some studies generated new data and used existing data and are included in both categories.

Studies that focused on the assessment of existing data were performed with the objectives of either understanding the behavior of a pollutant within the San Gabriel / Coyote Creek Watershed system through direct measurement of those pollutants or understanding the impacts of the pollutants by measuring other environmental parameters. A total of 13 studies are included in this category.

The following figure shows the category breakdown of the studies as well as the general objective of the study.

Figure 2. Study Category Breakdown.



Assessment #3 – Study or Program Details
The final assessment that was made of the studies and programs was to look at basic details such as who performed the study and what pollutants were included in those studies and programs.

Within the San Gabriel / Coyote Creek Watershed the major generators of water quality data are the County of Orange (RDMD & OCHCA), the Regional Water Quality Control Board (RWQCB), the US Army Corp of Engineers (USACE), the University of California Los Angeles (UCLA) and Irvine (UCI), the American Society of Civil Engineers (ASCE), the US Geological Survey (USGS), and the US Department of Agriculture (USDA). The following table identifies the organizations responsible for each of the 54 studies. For collaborative studies, the primary organization was used for the accounting below.

Table 2. Study Sources

Organization	# of Studies
County of Orange (RDMD, OCHCA)	3
RWQCB	2
USACE	2
UCI	1
UCLA	1
ASCE	1
USGS	1
USDA	1

Each of the 12 water quality studies or programs that were identified as part of this data assessment addressed one or more specific pollutants. Eight (8) categories of constituents were identified that encompass nearly all of the specific data that was monitored or assessed. These 8 categories include:

- Bacteria
- Nutrients
- Metals
- Pesticides
- Toxicity – various levels of toxicity studies were performed
- Conventional water chemistry – this includes a wide ranges of variables such as pH, hardness, and temperature
- Sediment – this includes both bulk sediment and sediment contamination
- Fish Tissue

The following table shows the distribution of the studies within each of these categories. Many studies include work related to several constituents.

Table 3. Constituent Focus of Studies and Programs

Constituent	# of Studies
Bacteria	9
Nutrients	7
Metals	7
Pesticides	6
Toxicity	6
Water chemistry	1
Sediment	6
Fish Tissue	0

DATA GAPS

Managing and improving water quality in an urban environment is a complex issue. The science needed to deal with many of the issues that arise during the management process is evolving, and in some cases has not yet developed to the point that important questions can readily be answered in absolute quantifiable terms. Examples where our understanding is not fully developed are as follows:

- Stormwater runoff modeling relative to pollutants of concern. This modeling is not totally reliable for predictive purposes and needs large data sets to calibrate.
- Methods (such as MST (microbial source tracking)) for more accurately identifying sources of pathogens in runoff (e.g., wildlife, pets, humans) are still being refined. Only qualitative methods exist at this time and they are not yet able to be directly translated into a loading assessment. For example, we may be able to say that 50% of the fecal coliform bacteria from a sample are from dogs but this does not imply that 50% of the loading of fecal bacteria is from dogs.
- The effectiveness of various BMPs (Best Management Practices) under varying conditions has not been systematically assessed under field conditions.

These and other data gaps have been identified to some extent in the research study reports, the research agenda for the Stormwater Monitoring Coalition, and the specific requirements of the NPDES permits. However, a thorough and conceptually organized listing of data gaps must stem from a thoughtful description of the key management questions related to the watershed. There are two reasons for this. First, there is a virtually infinite array of scientific data that could be gathered in a complex system such as this. It is essential to focus effort on those data types that are useful in decision making. Second, data gaps sometimes stem, not from the absence of data, but from the inability to adequately integrate existing data. Articulating clear questions enables studies to be designed so that disparate data types can be combined as needed to address complex issues.

Pollutant Data Gaps

The list below identifies data gaps related to a specific pollutant, bacteria. A lengthier discussion of the bacteria-related data gaps follows the summary list below.

- *Bacteria*
  - Urban vs. natural sources

- Rapid Bacteriological Indicators
- MST (microbiological source tracking) identification methods

Bacteria

A special study will be performed to improve understanding of the correlations between levels of indicator bacteria in the surfzone (where most of the contact recreational activities take place) and levels in the stormdrains themselves. This study will be performed by the County as part of the Santa Ana Region Water Quality Monitoring Program based on the approach recommended by the Stormwater Monitoring Coalition.

The applicability of current bacteriological indicators for measuring human health risk and for identifying the sources of pathogen contamination needs further refinement. Two projects identified in SCCWRP Technical Report 35B *Stormwater Research Needs in Southern California* identify plans to address these issues. The first project (Project 12. *Develop rapid response indicator(s) for microbial contamination*) is focused on producing easily used field tests that would provide a reliable measure of bacteriological contamination within a few hours at most. The second project (Project 13. *Develop microbial source tracking protocol*) will select methods (primarily genetic-based) that provide the most dependable means of identifying and distinguishing among sources.

Considerable resources are being expended to reduce bacterial contamination from watershed sources, but in many cases storms drains continue to discharge large concentrations of fecal indicator bacteria (FIB). A study by SCCWRP will examine if FIB can grow in storm drain sediments. This study, *Storm Drains and Sediments as Reservoirs of Fecal Indicator Bacteria*, is being led by John Griffith.

Other Data Gaps

In addition to the data gaps related to specific pollutants, there are data gaps related to specific beneficial use impairments and the use attainability analyses relative to the achievability of a water quality goal. Specifically, what is the direct and indirect link between the beneficial use impairment by a pollutant and how is this linked to the water quality standard? In addition, what is the link between pollutant source control, and pollutant treatment management relative to achieving a specific water quality standard or goal? In other words, is there data to demonstrate that a goal is achievable or not? In the case of bacteria there may be a need to gather data relative to controllable sources to determine what is truly attainable and whether or not a use attainability analysis should be conducted relative to compliance requirements. Studies needed to answer many of these questions (and eliminate the data gap) have been identified in the *Phase 1 Stormwater Quality Standards* report (SAWPA, 2005).

An additional data gap exists with the ability to use any given set of data for further analysis. The Stormwater Monitoring Coalition has recognized the need to develop a regional stormwater monitoring infrastructure. As part of the *Stormwater Research Needs in Southern California* report (SCCWRP, 2002), the coalition has identified 4 projects to address this need. These projects include (1) integrate and evaluate available

data; (2) standardize sampling and analysis protocols; (3) develop a regional data infrastructure; and (4) measure BMP effectiveness.

An additional data gap that the Stormwater Monitoring Coalition (SCCWRP, 2002) has identified is a need to improve fundamental understanding of stormwater mechanisms and processes. To meet this need the following projects have been identified: (1) develop a system wide conceptual model; (2) Determine appropriate reference conditions; (3) develop a regional method for measuring beneficial use condition; and (4) identify relative contribution of nonpoint sources to urban runoff loads.

The final data gap identified by the Stormwater Monitoring Coalition (SCCWRP, 2002) is related to identifying receiving water impacts. The following studies were identified to address this need: (1) identify the causes of impact in receiving waters; (2) develop bioassessment indicators and protocols; (3) develop improved toxicity testing procedures; (4) develop raid response indicator(s) for microbial contamination; (5) develop microbial source tracking protocol; (6) evaluate BMP effects on receiving water impacts; and (7) develop improved indicators of peak flow impacts.

Several of the identified Stormwater Monitoring Coalition projects have been funded and are underway.

Attachment 1: San Gabriel / Coyote Creek Environmental Matrix

Bibilography for the San Gabriel River - Coyote Creek Watersheds

Record #	Program Name or Report Title	Sample Location	Start Date	End Date	flow conditions	entity	Bacteria	nutrients	metals	pesticides	toxicity / TIE studies	water chemistry	fish tissue	sediments	comments
1	Orange County NPDES/TMDL Program	watershed		ongoing	c	RDMD	1	1	1	1	1	1			
2	2004 Annual Ocean and Bay Water Quality Report	beach	1975	ongoing	c	HCA	1								
3	Coyote and Carbon Creeks Watershed Feasibility Study, Project Management Plan	n/a		2001	n/a	COE	1	1	1	1				1	Review of information concerning watershed
4	Deposition & Processing of Airborne Nitrogen Pollutants in Mediterranean-type ecosystems of Southern California	San Gabriel Basin, LA County		1985	n/a	USDA		1							
5	Estimating Pollutant Loading from Industrial Activities in an Urban Watershed	Upper San Gabriel Watershed		2005	n/a	ASCE			1						
6	Nature & Chlorine Reactivity of Organic Constituents from reclaimed water in groundwater, Los Angeles County, CA	San Gabriel River Aquifer Wells		2001	n/a	USGS					1				
7	PCR detection of pathogenic viruses in Southern California Urban rivers	Southern California urban rivers		2004	c	UCLA	1				1				Virus study
8	Regional Toxic Hotspot Cleanup Plan	n/a		1999	n/a	RWQCB	1	1	1	1	1			1	
9	State of the Watershed - San Gabriel River Watershed	Varies within watershed		2000	c	RWQCB	1	1	1	1	1			1	
10	Summary of Existing Conditions Data: Coyote Creek Watershed Management Plan - Draft	Coyote Creek @ Spring Street by LA Regional Board	1994	2000	w	RDMD	1	1	1	1	1			1	
11	Water Quality Control Policy for San Gabriel River Tidal Prism	San Gabriel River		1967	n/a	UCLA	1							1	
12	Westminster Watershed Reconaissance Study	none	2001	2001	n/a	COE	1	1	1	1				1	watershed study

Table 4. Abbreviation Definitions

Abbreviation	Definition
ASCE	American Society of Civil Engineers
BMP	Best Management Practice
CDFG	California Department Of Fish and Game
DAMP	Drainage Area Management Plan
FIB	Fecal Indicator Bacteria
MST	Microbial Source Tracking
NPDES	National Pollutant Discharge Elimination System
NRDC	National Resources Defense Council
OCHCA	Orange County Health Care Agency
RDMD	Resources & Development Management Department
RWQCB	Regional Water Quality Control Board
SCCWRP	Southern California Coastal Water Research Project
TMDL	Total Maximum Daily Load
UCLA / UCI	University of California Los Angeles / Irvine
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USGS	United States Geological Survey

Bibilography for the San Gabriel River - Coyote Creek Watersheds

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12	Westminster Watershed Reconaissance Study	none	2001	2001	n/a	COE	1	1	1	1				1	watershed study

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EXECUTIVE SUMMARY

This "Watershed Action Plan (WAP)", Appendix D of the Drainage Area Management Plan (DAMP), was prepared to meet Section XVI of the municipal National Pollutant Discharge Elimination System (NPDES) Stormwater Permit - Order R8-2002-0010, as described in **Section 12** of the **DAMP**. Commitments to watershed planning to address water quality issues are also included in **Section 3.0** of the **DAMP**.

Within Orange County there are both watershed and jurisdictional efforts to improve water quality. The jurisdictional efforts are captured as part of the Local Implementation Plans (LIPs). The Watershed Action Plan (WAP) was created to capture the regional efforts that are undertaken to provide a watershed-based collaborative effort to address constituents of concern in a specific watershed.

The purpose of this document is to present a planning framework for the Newport Bay Watershed to:

- Identify the most significant water quality issues related to urban runoff sources that can be addressed at a multi-jurisdictional watershed-scale,
- Focus jurisdictional pollution prevention and source control programs on local constituents, of concern, to identify treatment control opportunities,
- Incorporate prior data from planning studies,
- Identify indicators to track progress, and
- Ultimately develop an integrated plan of action for urban sources that results in meaningful water quality improvement in the San Gabriel River-Coyote Creek Watershed.

The document also describes the numerous existing programs related to water quality and the activities conducted by the Watershed Permittees at the watershed scale.

The following sections comprise the WAP:

Section 1.0 describes the environmental setting of the watershed, discusses program coordination between the Watershed Permittees, and outlines the approach taken in plan development.

Section 2.0 provides an assessment of current water quality conditions and identifies issues and data gaps and constituents of concern. The constituent of concern identified for this watershed is bacteria.

Section 3.0 provides information on the development of existing total maximum daily load (TMDLs) and the schedule for future TMDLs.

Section 4.0 discusses pollution sources and provides an inventory of treatments and enhanced best management practices (BMPs) that have been implemented in the watershed.

Section 5.0 focuses on the recommendations for actions to be taken to address the water quality issues of the watershed and discusses the annual means of assessment of the program effectiveness.

D-1.0 Introduction

The designation of "San Gabriel River-Coyote Creek Watershed" refers to the hydrologic watershed that is defined by drainage and only minimally by jurisdictional boundaries. This watershed covers 41.3 square miles in the northwest corner of Orange County (Orange County portions only).

The San Gabriel River-Coyote Creek has been impacted by water quality problems most of which are from anthropogenic sources or aggravated by human activity. The most well documented problem is high bacteria pollution along the beach. The extent of bacteria contamination has resulted in beach postings and closures which have a significant impact on the beneficial use of the ocean as well as on the local economy. The San Gabriel River-Coyote Creek Watershed is a highly urbanized watershed with multiple potential sources of pollution; therefore water resource managers felt that urban runoff would be more appropriately dealt with within the hydrologic boundaries of the watershed, rather than solely on the jurisdictional basis of political boundaries.

The Watershed Permittees includes eleven cities within the watershed (Anaheim, Brea, Buena Park, Cypress, Fullerton, La Habra, La Palma, Los Alamitos, Placentia, Seal Beach, and Stanton), unincorporated County of Orange, and the Orange County Flood Control District. Based on their experience and recommendations, a Watershed Action Plan (WAP) within the Drainage Area Management Plan (DAMP) has been developed to attain the following multiple objectives:

- To meet the requirement to update Section 12 of the DAMP as contained in the municipal National Pollution Discharge Elimination System (NPDES) stormwater permit (Order R8-2002-0010).

- To identify the most significant water quality issues and constituents of concern on a watershed scale and relate these to urban sources.

- To focus the pollution prevention and source control programs implemented at an individual jurisdiction level on the identified constituents of concern and to identify any jurisdiction-specific treatment control opportunities.

- To identify the water quality issues that are most appropriately addressed through a multi-jurisdictional watershed-scale approach.

- To identify information that is relevant to the Anaheim Bay-Huntington Harbor Watershed that has been developed as part of local, watershed, or regional studies.

- To develop an integrated plan of action that results in meaningful water quality improvement in the Anaheim Bay-Huntington Harbor Watershed and balances economic, social, and environmental constraints.

- To identify indicators to track progress that lead to improvements in the quality of the receiving waters.

The Watershed Permittees have developed Local Implementation Plans (LIPs) addressing programs and activities that are implemented or being pursued on a jurisdictional basis. Watershed cities and stakeholder groups are also pursuing projects that are intended to have a positive effect on water quality issuing to receiving waters. These include the following major initiatives:

- Since 1990, the Watershed Permittees have developed and implemented common water quality programs within their own jurisdictions in response to the requirements of the municipal NPDES stormwater permit.

- In early 2003, an updated version of the Drainage Area Management Plan (2003 DAMP) was provided to the Santa Ana Regional Water Quality Control Board (Regional Board), including Local Implementation Plans (LIPs – 2003 DAMP Appendix A). The LIPs are detailed plans that focus on specific areas required by the NPDES permits including the legal authority to detect and eliminate pollutant discharges; public education; enhanced standards for new development/significant re-development; implementation of best management practices (BMPs) at municipal facilities, construction sites, and commercial and industrial facilities; and water quality monitoring. The BMPs can, in most cases, be focused on targeted constituents of concern to be identified through the monitoring program.

The San Gabriel River-Coyote Creek WAP borrows much of its organization, structure, and terminology from the 2003 DAMP of which it is an appendix. The following sections are included in the WAP:

- **Section 1.0** describes the watershed and environmental setting, the program management coordination between the Watershed Permittees and other stakeholders, and the approach taken to develop the plan.

- **Section 2.0** assesses the water quality information available and identifies the water quality issues and constituents of concern.

- **Section 3.0** provides information on TMDLs and how they will impact watershed planning.

- **Section 4.0** discusses the urban sources of pollution, the available treatments for pollution control, and an inventory of enhanced BMPs that have been implemented in the watershed that address specific pollutants of concern.

- **Section 5.0** focuses on the recommendations for actions to be taken to address the water quality issues of the watershed and discusses the annual means of assessment of the program effectiveness.

The San Gabriel River-Coyote Creek WAP is intended as a living document, one capable of being modified as new information becomes available and problems are addressed. It identifies the current state of knowledge on the issues facing San Gabriel River-Coyote Creek. It also identifies the actions to which the Watershed Permittees have made commitments. Annual assessments will be made to identify the progress on these actions and the schedule for continued efforts related to that action. This assessment will be reflected through annual updates to the strategy tables described in **Section 5.0** and included as an Exhibit to the WAP.

D-1.1 Watershed Setting

The Coyote Creek Watershed is drained by Coyote Creek, and two principal tributaries, Fullerton Creek and Brea Creek. The San Gabriel River runs along the northern boundary of this watershed and has minimal drainage area associated with it inside of Orange County. The San Gabriel River and Coyote Creek confluence approximately 4 miles upstream of the ocean near the interchange of the I-405 and I-605. This watershed covers 41.3 square miles in the northwest corner of Orange County (**Figure D-1**). Coyote Creek, its main tributary, is a concrete-lined trapezoidal channel that flows from Riverside County and empties into the San Gabriel River.

Major transportation arteries through the watershed include Interstate 405 (I-405), Interstate 605 (I-605), Highway 22, Interstate 5 (I-5), Highway 91, and Highway 57. **Figure D-2** shows the major transportation routes within the watershed. School Districts are shown in **Figure D-3a**, cities are shown in **Figure D-3b**, water districts are shown in **Figure D-3c**, and parks are shown in **Figure D-3d**. Existing land use within the watershed is shown in **Figure D-4**.

Figure D-1: Location Map

See next page for figure.

Figure D-1 Location Map
San Gabriel-Coyote Creek Watershed

Figure D-2: Transportation

See next page for figure.

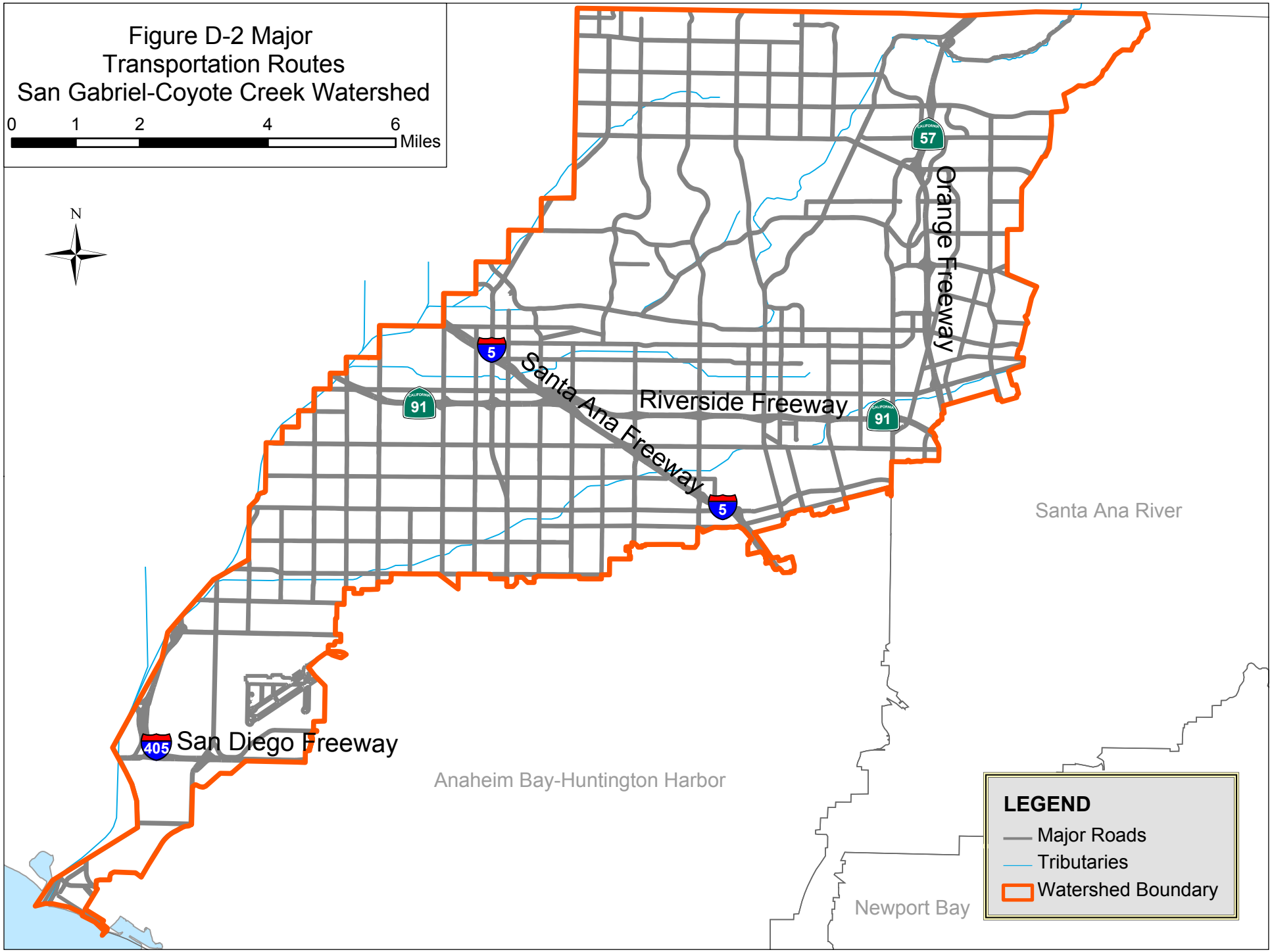


Figure D-2 Major
Transportation Routes
San Gabriel-Coyote Creek Watershed
0 1 2 4 6
Miles
N
57
Orange Freeway
5
Santa Ana Freeway
91
Riverside Freeway
91
5
Santa Ana River
405
San Diego Freeway
Anaheim Bay-Huntington Harbor
Newport Bay
LEGEND
Major Roads
Tributaries
Watershed Boundary

Figure D-3a: Unified School Districts

See next page for figure.

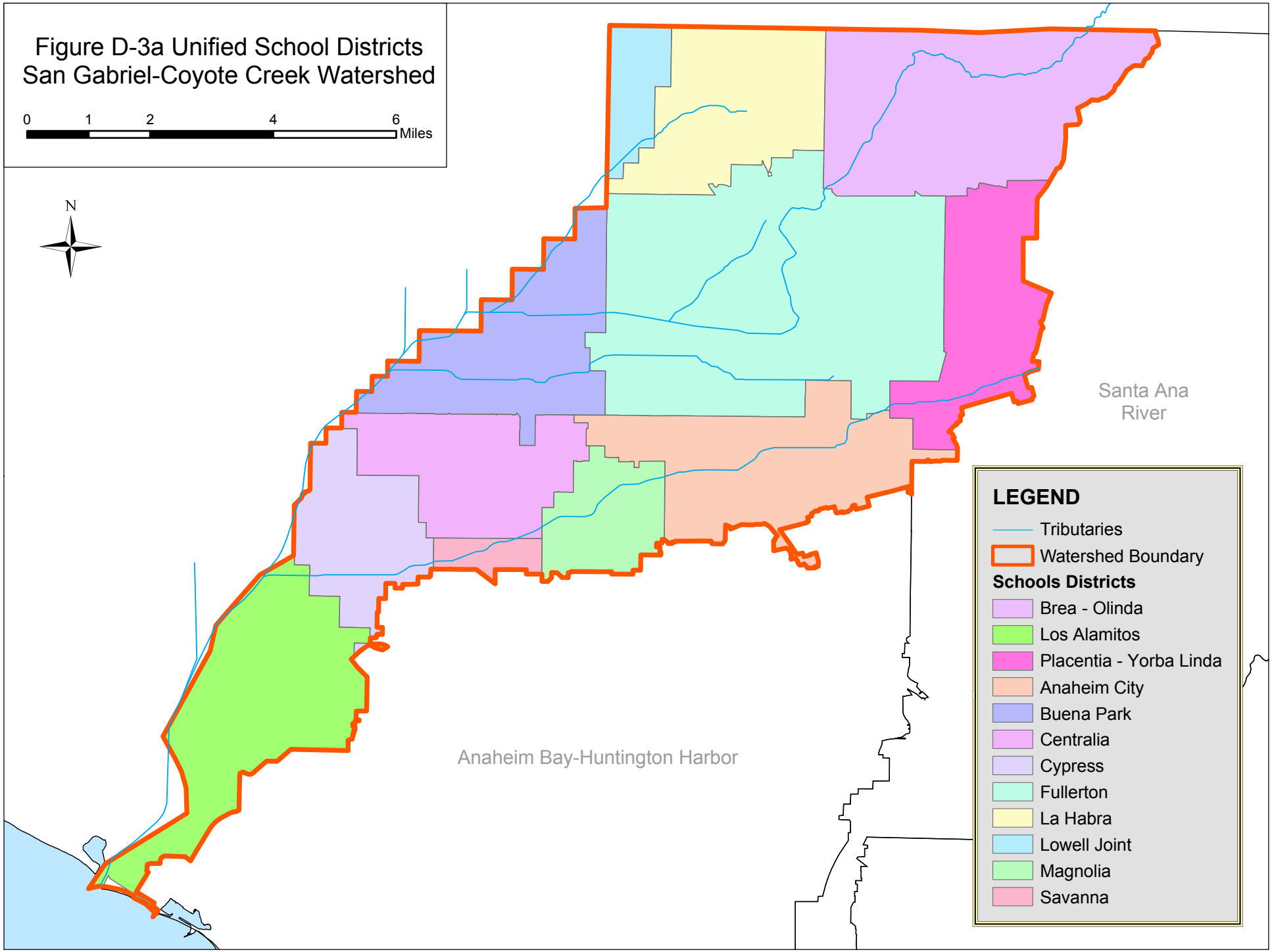


Figure D-3a Unified School Districts
San Gabriel-Coyote Creek Watershed
0 1 2 4 6
Miles
N
Santa Ana River
Anaheim Bay-Huntington Harbor
LEGEND
Tributaries
Watershed Boundary
Schools Districts
Brea - Olinda
Los Alamitos
Placentia - Yorba Linda
Anaheim City
Buena Park
Centralia
Cypress
Fullerton
La Habra
Lowell Joint
Magnolia
Savanna

Figure D-3b: City Boundaries

See next page for figure.

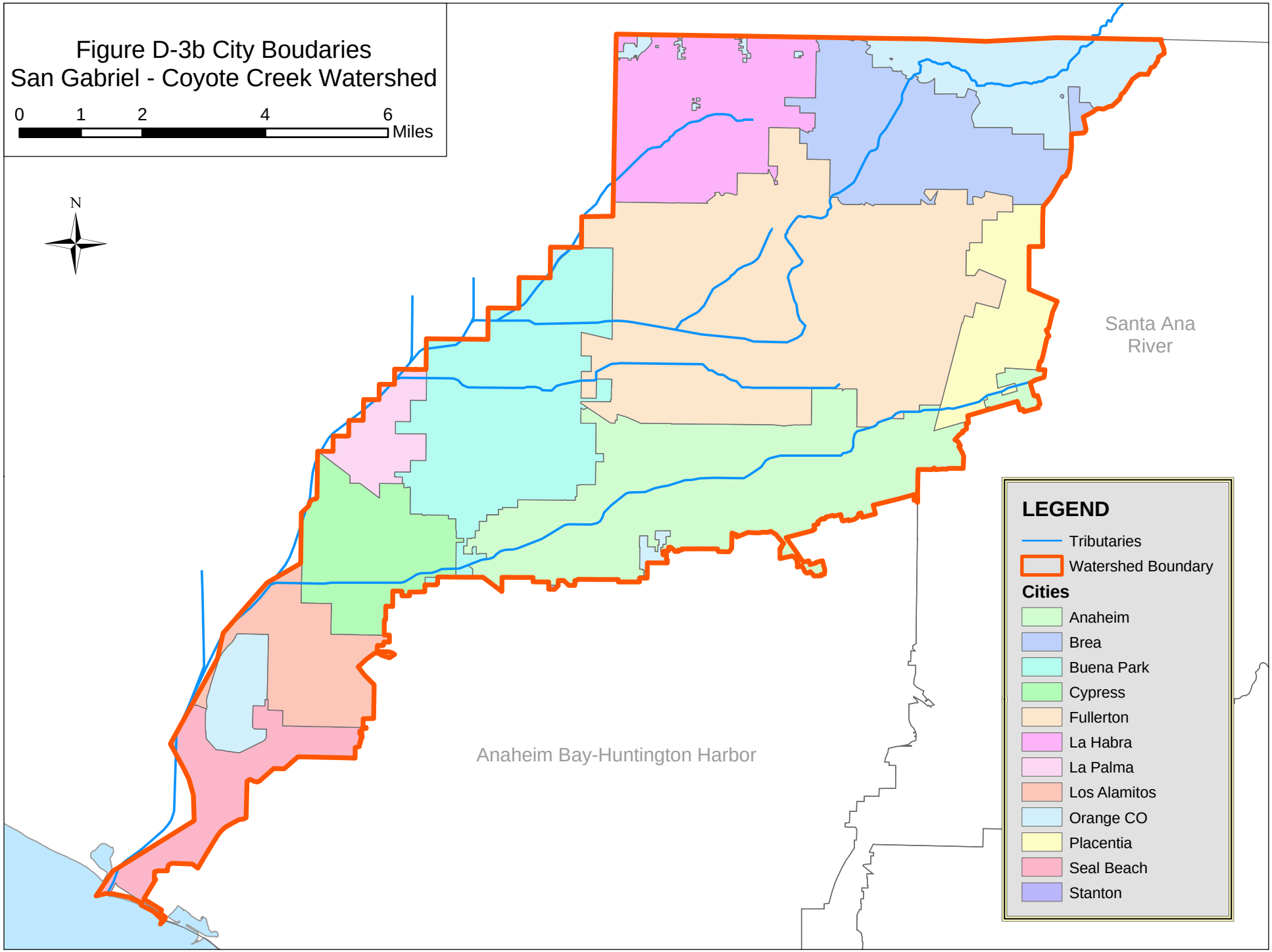


Figure D-3b City Boudaries
San Gabriel - Coyote Creek Watershed
0 1 2 4 6
Miles
N
Santa Ana River
Anaheim Bay-Huntington Harbor
LEGEND
Tributaries
Watershed Boundary
Cities
Anaheim
Brea
Buena Park
Cypress
Fullerton
La Habra
La Palma
Los Alamitos
Orange CO
Placentia
Seal Beach
Stanton

Figure D-3c: Water Providers

See next page for figure.

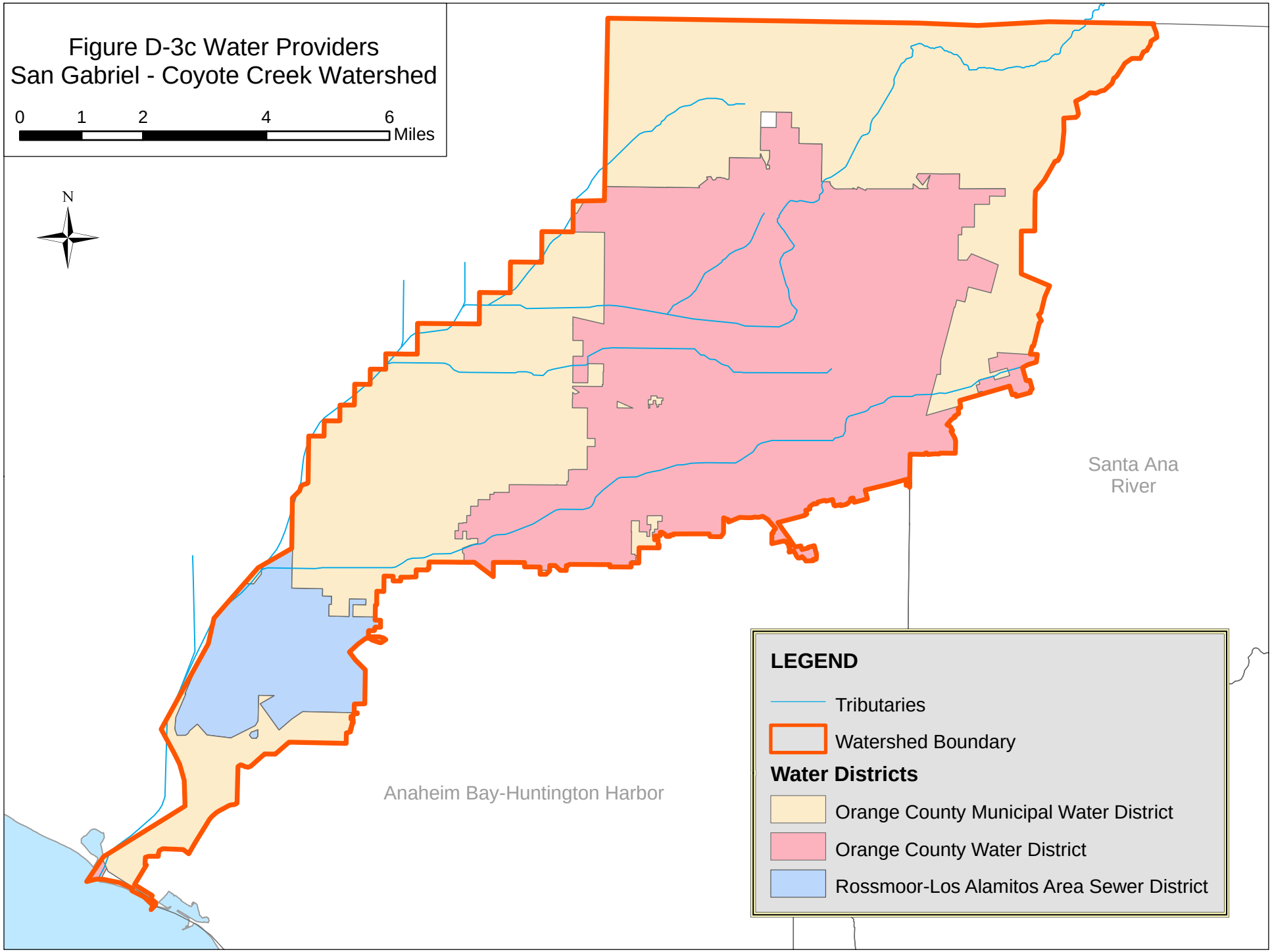


Figure D-3c Water Providers
San Gabriel - Coyote Creek Watershed
0 1 2 4 6
Miles
N
Santa Ana River
Anaheim Bay-Huntington Harbor
LEGEND
Tributaries
Watershed Boundary
Water Districts
Orange County Municipal Water District
Orange County Water District
Rossmoor-Los Alamitos Area Sewer District

Figure D-3d: Parks & Open Space

See next page for figure.

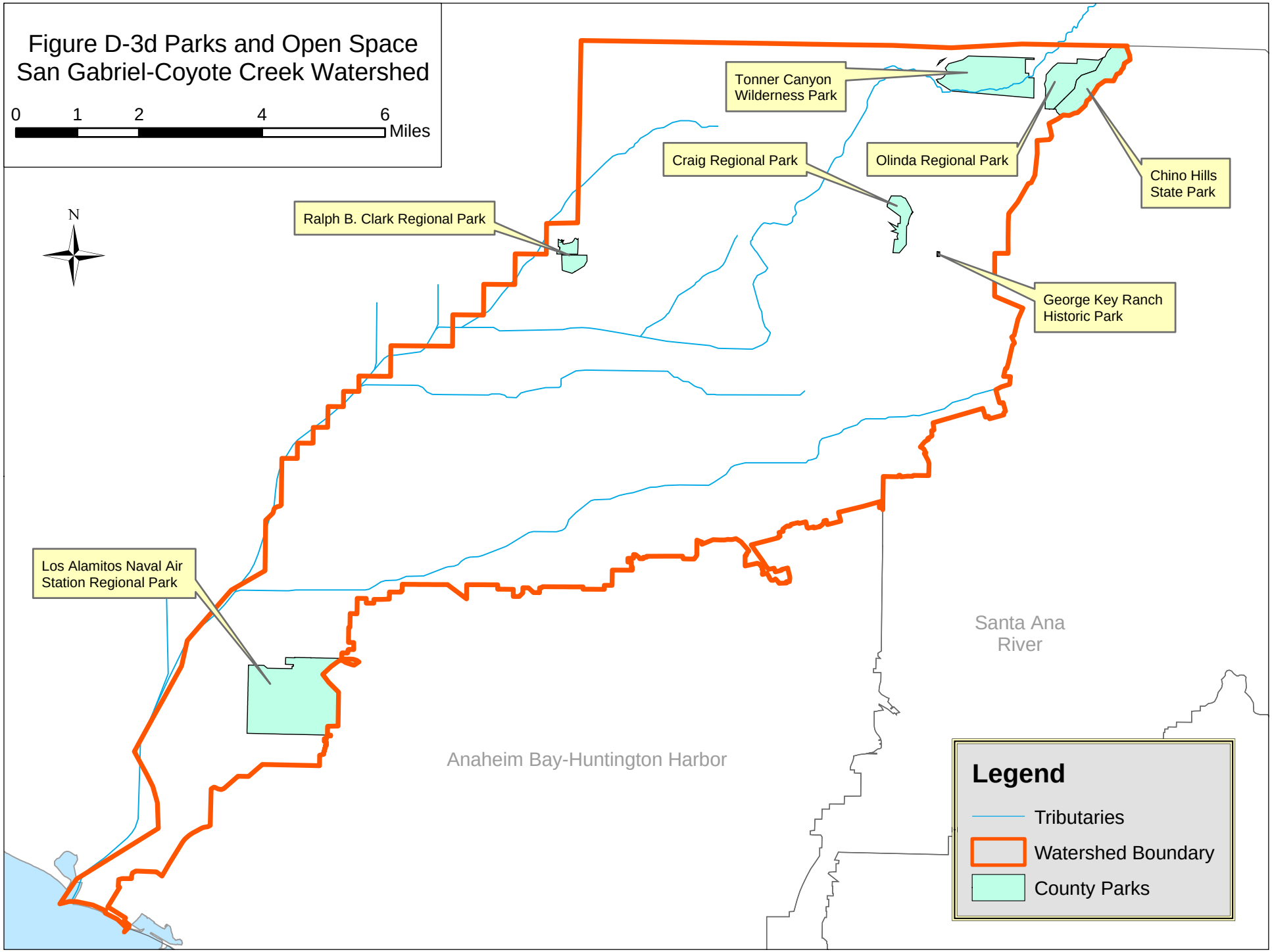


Figure D-3d Parks and Open Space
San Gabriel-Coyote Creek Watershed
0 1 2 4 6
Miles
N
Tonner Canyon Wilderness Park
Craig Regional Park
Olinda Regional Park
Chino Hills State Park
Ralph B. Clark Regional Park
George Key Ranch Historic Park
Los Alamitos Naval Air Station Regional Park
Santa Ana River
Anaheim Bay-Huntington Harbor
Legend
Tributaries
Watershed Boundary
County Parks

Figure D-4 Land Use - Existing

See next page for figure.

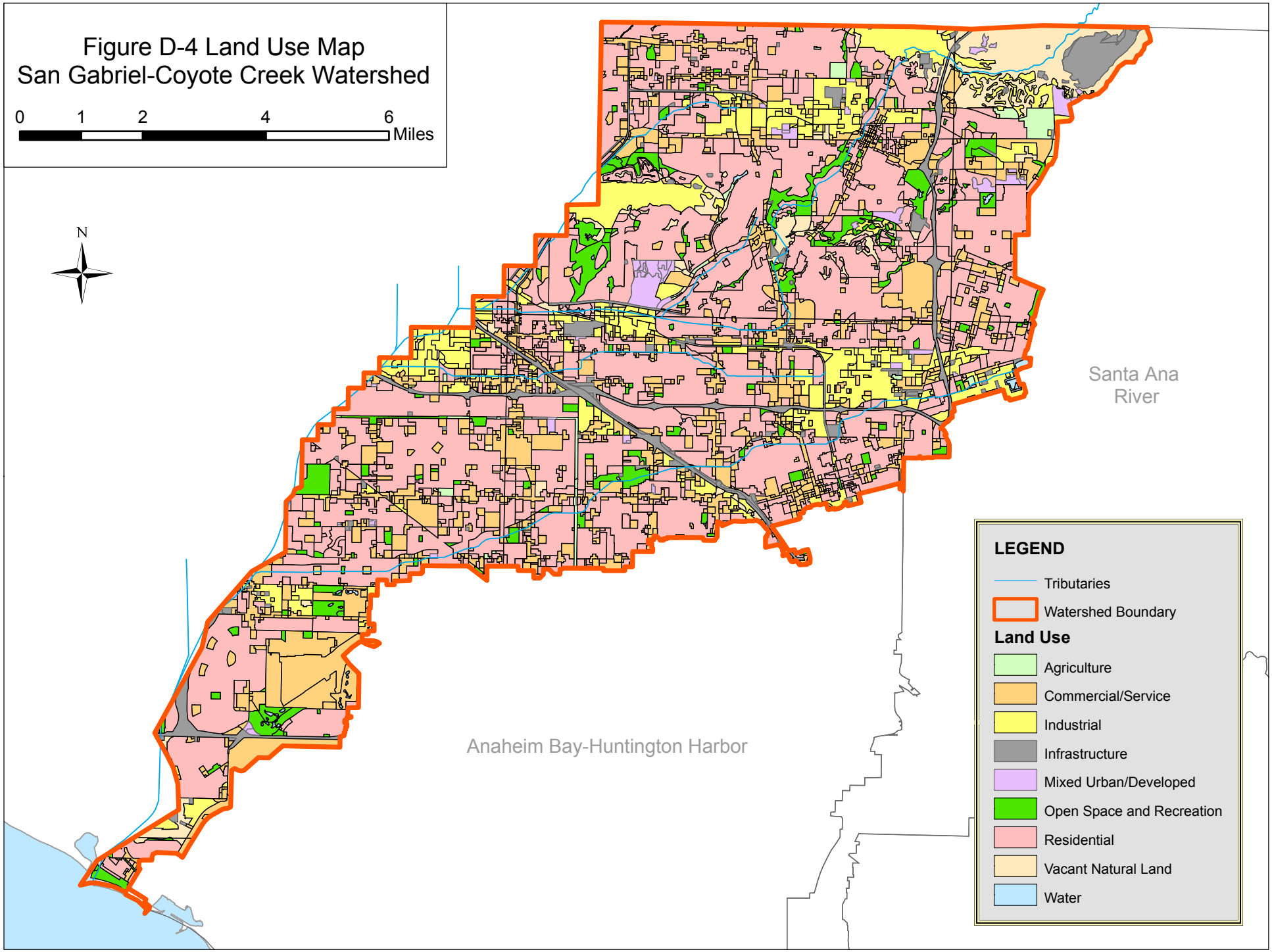


Figure D-4 Land Use Map
San Gabriel-Coyote Creek Watershed
0 1 2 4 6
Miles
N
Santa Ana River
Anaheim Bay-Huntington Harbor
LEGEND
Tributaries
Watershed Boundary
Land Use
Agriculture
Commercial/Service
Industrial
Infrastructure
Mixed Urban/Developed
Open Space and Recreation
Residential
Vacant Natural Land
Water

D-1.2 Beneficial Uses

The San Gabriel River-Coyote Creek Watershed is within the jurisdiction of the Santa Ana Regional Water Quality Control Board (Regional Board). The Water Quality Control Plan (Basin Plan) lists Coyote Creek, within Santa Ana Regional boundary, as a tributary to the San Gabriel River. The following existing beneficial uses are designated in the Basin Plan for the Coyote Creek:

MUN – municipal and domestic supply
REC1 – contact water recreation
REC2 – non-contact water recreation
WARM – warm freshwater habitat
WILD – wildlife habitat

The Basin Plan also lists the Nearshore Zone at San Gabriel River to Poppy Street in Corona del Mar as a waterbody with the following beneficial uses:

MUN – municipal and domestic supply
IND – industrial service supply
NAV - navigation
REC1 – contact water recreation
REC2 – non-contact water recreation
COMM – commercial and sportfishing
WILD – wildlife habitat
RARE – rare, threatened or endangered species
SPWN – spawning, reproduction, and development
MAR – marine habitat
SHEL – shellfish harvesting

Table D-1 shows the beneficial uses associated with this waterbody.

The following is a description of the relevant beneficial use designations:

Municipal and Domestic Supply (MUN) – Supports use for community, military, municipal or individual water supply systems, including drinking water supply.

Industrial Service Supply (IND) – waters are used for industrial activities that do not depend primarily on water quality. These uses may include, but are not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, and oil well repressurization.

Navigation (*NAV*) – Include uses of water for shipping, travel or other transportation by private, commercial or military vessels.

Contact Water Recreation (REC1) – Includes uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include,

but are not limited to, swimming, wading, water-skiing, skin and scuba diving, white water activities, fishing, or use of natural hot springs.

Non-Contact Water Recreation (REC2) – Includes uses of water for recreational activities involving proximity to water, but not normally involving body contact with water where ingestion of water would be reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beach combing, camping, boating, tidepool, and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Commercial and Sportfishing (COMM) – Includes uses of water for commercial or recreational collection of fish or other organisms, including those collected for bait. These uses may include, but are not limited to, uses involving organisms intended for human consumption.*Warm*

Wildlife Habitat (WILD) – Includes uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Rare, Threatened, or Endangered Species (RARE) – Includes uses of water that support habitat necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened or endangered. Among plants or animal species which were used in the designation of specific water bodies with RARE beneficial uses are: least Bell's vireo (bird), California least tern (bird), light-footed clapper rail (bird), California brown pelican (bird), Belding's savannah sparrow (bird), willowy monardella (plant), humpback and blue whale (mammals), bald eagle (bird), tidewater goby (fish), southwestern willow flycatcher (bird), salt-marsh bird's beak (plant), Pacific green sea turtle (reptile), and western snowy plover (shore bird). The RARE designation is placed on water bodies where the protection of a threatened or endangered species depends on the water either directly or to support its habitat.

Spawning, Reproduction, and Development (SPWN) – Includes uses of water to support high quality aquatic habitats necessary for reproduction and early development of fish and wildlife.

Marine Habitat (*MAR*) – Include uses of water to support marine ecosystems that are not limited to, preservation and enhancement of marine habitats, vegetation (e.g., kelp), fish and shellfish, and wildlife (e.g., marine mammals and shorebirds).

Shellfish Harvesting (SHEL) – Includes uses of water to support habitats necessary for shellfish (e.g., clams, oysters, limpets, abalone, shrimp, crab, lobster, sea urchins, and mussels) collected for human consumption, commercial or sports purposes.

Table D-1: Beneficial Uses – San Gabriel River-Coyote Creek Watershed

	Beneficial Use																				
Name	**MUN**	**AGR**	**IND**	**PROC**	**GWR**	**NAV**	**POW**	**REC 1**	**REC 2**	**COMM**	**WARM**	**LWRM**	**COLD**	**BIOL**	**WILD**	**RARE**	**SPWN**	**MAR**	**SHEL**	**EST**	**Hydrologic Unit**
Coyote Creek (within Santa Ana Regional boundary)	X							X	X		X				X						
Nearshore Zone – San Gabriel River to Poppy Street in Corona del Mar	+		X			X				X					X	X	X	X	X		

X Present or Potential Beneficial Use + Excepted from MUN

D-1.3 Constituents of Concern

As discussed in the Introduction, the focus of the WAP is to address the constituents of concern within the watershed. The constituent of concern in the San Gabriel River-Coyote Creek Watershed are those pollutants for which a TMDL has been developed or is proposed to be developed. The proposed TMDLs for this watershed include enterococcus and PCBs, both at Seal Beach. PCBs in the watershed are a legacy pollutant therefore the focus of the watershed activities in on enterococcus (bacteria). The constituent of concern in this watershed is bacteria.

D-1.4 Watershed Program Management

Program management of various water quality improvement programs within the San Gabriel River-Coyote Creek Watershed occurs at two distinct levels: (1) activities conducted by the Watershed Permittees individually in implementing jurisdictional programs in their LIPs based on the model programs in the DAMP in compliance with the municipal NPDES stormwater permits and (2) activities conducted by the Watershed Permittees and others collectively to address specific water quality issues on a watershed scale identified through the Water Quality Planning Process (see **2003 DAMP Section 3** and **Section D-1.4**), and other planning initiatives.

The Watershed Permittees coordinate the program management of the San Gabriel River-Coyote Creek Watershed through the program agreements and coordination meetings, which are described below.

D-1.4.1 NPDES Coordination

The Orange County Stormwater Program is underpinned by an Implementation Agreement between the County of Orange, the Orange County Flood Control District, and the 34 cities of Orange County. The Agreement provides a funding formula and budgeting process for shared countywide costs and monitoring costs by Regional Board area.

The Orange County Stormwater Program also has an extensive committee structure that is described in the DAMP (**2003 DAMP Section 2**) and in the LIPs of the Watershed Permittees (**2003 DAMP Appendix A-2**). Each of the Watershed Permittees participates in the General Permittee meeting and, selectively, in the other oversight and technical committees.

The Watershed Permittees also meet separately from the countywide program on a regular basis, typically quarterly, to coordinate activities in response to the Directive. As the intent of the Directive becomes integrated into both the LIP and the San Gabriel River-Coyote Creek Watershed Chapter, these meetings are anticipated to continue in order to maintain coordination. The Watershed Permittees are currently developing a cost-sharing approach for the additional watershed shared costs to deal with those expenditures not covered by the countywide program.

D-1.4.2 Corps of Engineers Feasibility Study

A feasibility study by the Corps of Engineers has been proposed to develop a rehabilitation plan and identify projects for ecosystem restoration, recreation, water quality, and shoreline protection for the San Gabriel River-Coyote Creek Watershed. This study will be cost-shared 50-

50 by the Corps of Engineers and the County of Orange and other Watershed Permittees, including the County of Los Angeles.

Planning objectives identified for this study include (1) increasing the quantity and quality of wetland and riparian habitats in the watershed, (2) reducing concentrations of ammonia and silver, and address coliform, algae, and abnormal fish histology in the watershed, (3) increasing passive and active recreation opportunities, (4) improving beach nourishment opportunities from sources in the Coyote Creek Watershed, (5) educating the public on watershed-related issues, and (6) improving the aesthetic conditions in flood control channel.

The Corps of Engineers has completed the Project Management Plan (PMP) in September 2002. The PMP defines the planning approach, activities to be accomplished, schedule, and associated costs that the Federal Government and the local Sponsor will be supporting financially. The PMP describes the initial tasks of the feasibility phase, continues through the preparation of the final feasibility report, the project management plan for project implementation and design agreement, and concludes with support during the Washington Level Review of the final feasibility report.

D-2.0 Water Quality Assessment

The WAPs of the DAMP focus on the water quality within particular watersheds and how the water quality is impacted by urban discharges. Urban discharges include surface runoff from residential, commercial, and industrial areas. Pollution sources that are not considered as part of the urban watershed planning responsibilities are atmospheric deposition and agricultural runoff. The following figure (**Figure D-5**) demonstrates the physical processes involved with generation of pollution and its fate and transport.

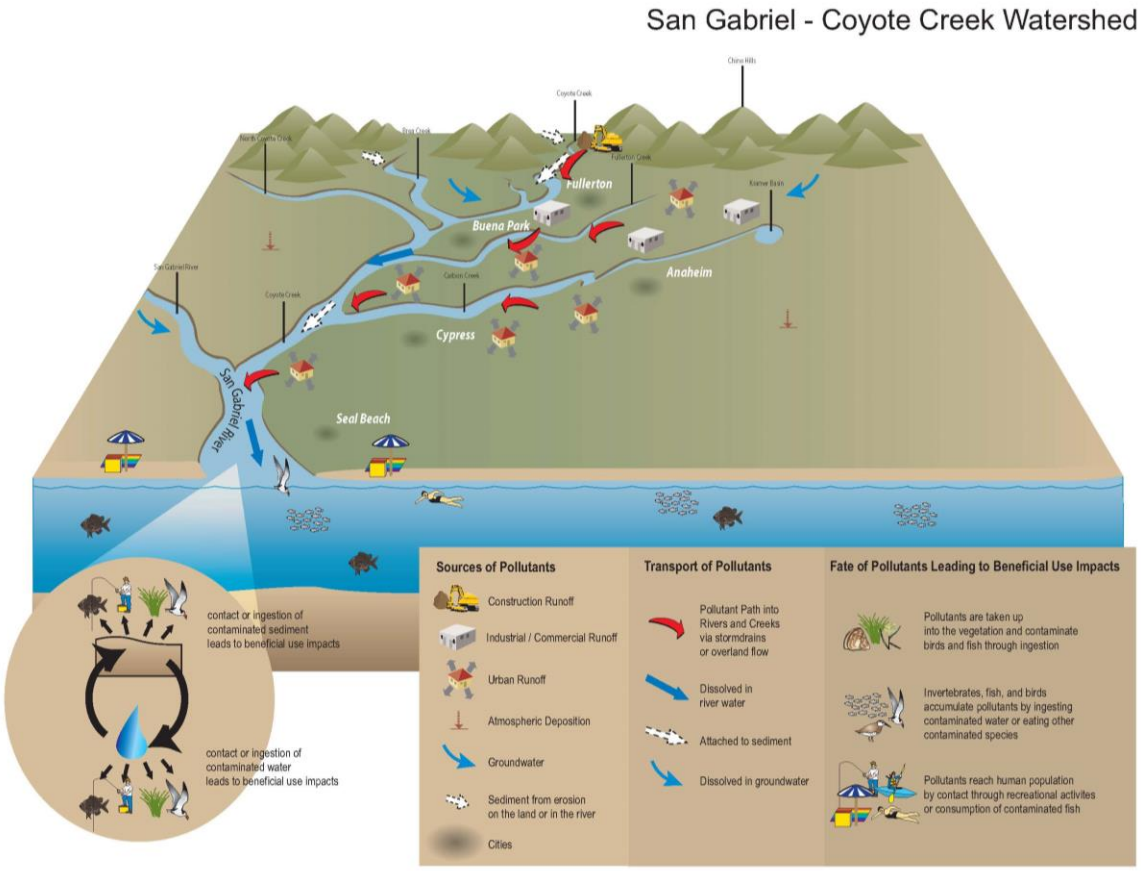


Figure D-5: San Gabriel River-Coyote Creek Watershed Processes

Within the San Gabriel River-Coyote Creek Watershed there have been several major initiatives to monitor and assess the water quality:

- The NPDES Program began in 1990 and is anticipated to continue into the foreseeable future.

- The OCHCA (in cooperation with OCSD) has been testing coastal waters in Orange County over the past 40 years for bacteria that indicate the possible presence of disease-causing organisms. Monitoring the San Gabriel River-Coyote Creek coastal system is performed by OCHCA. Monitoring data are compared to the bacteria water quality standards established following the adoption of AB411.

D-2.1 Summary of Monitoring Activities

D-2.1.1 NPDES Program

NPDES permits are issued for a five-year term and are issued on an area-wide basis. The first municipal NPDES Stormwater Permit was for the period 1990-1996; the Second Term Permit covered 1996-2002; and the Third Term Permit covers 2002-2007. Each of the permits has required the development and implementation of a monitoring program to support an effective County-wide urban stormwater management program.

D-2.1.1.1 *First Term Permit*

The monitoring program for the First Term Permit, which extended through 1998, consisted of four elements—field screening, channel monitoring, harbor/bay monitoring, and sediment sampling.

- Field Screening was performed to detect the presence of illegal discharges or illicit connections. Physical and chemical analyses were conducted in the field. The annual evaluation of each station included two dry-weather samplings and one storm sampling. Field screening monitoring stations within the San Gabriel River-Coyote Creek Watershed included:

    * Coyote Creek (2 locations)
    * Brea Creek
    * Fullerton Creek
    * Brea Canyon Channel
    * Loftus Diversion Channel
    * Imperial Channel
    * La Mirada Creek
    * Tonner Canyon Channel
    * Carbon Creek Channel (4 locations)
    * Placentia Storm Channel
    * Moody Creek Channel

- Channel monitoring focused on specific watercourses with beneficial uses identified in the Basin Plan. Stations were monitored monthly and during storms. Samples were collected using automatic samplers and analyzed for pH, electrical conductivity, turbidity, nutrients, total suspended solids, volatile suspended solids, and total recoverable metals.

- Harbor/bay sites were monitored semiannually and during storms for nutrients in the water column and trace metals and organics in the sediment. In addition sediment sampling was conducted semiannually from designated channels and several bays and harbors. Samples were evaluated for metals, pesticides, herbicides, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs). There were no harbor monitoring locations in the San Gabriel River-Coyote Creek Watershed.

D-2.1.1.2 *Second Term Permit*

The First Permit Term monitoring program was continued into the second permit term. In 1999, the 99-04 Plan was developed and implemented as a transition program between the 2nd and 3rd term permits. This Plan revised the geographic focus of the monitoring effort by designating "warm spots" (where constituents are substantially above system-wide averages) and "Critical Aquatic Resources" or CARs. The CARs were prioritized and additional monitoring stations selected to gather data at those sites. In the San Gabriel River-Coyote Creek Watershed there were no warm spots or CARs designated for monitoring.

D-2.1.1.3 *Third Term Permit*

This current permit period is the most comprehensive monitoring effort to date. It extends the monitoring program to a broader range of locations and to a wider array of methods for measuring impacts. Three kinds of monitoring are considered for this plan.

- Core Monitoring – routine and related to small-scale or site-specific problems and processes,

- Regional Monitoring – periodic, collaborative, and larger-scale surveys, and

- Special Studies – tightly focused and relatively short-term studies.

The following is a list of the seven Program Elements. Each of the 3 types of monitoring listed above are considered and incorporated as appropriate into each of the program elements.

Long-term mass emissions monitoring – includes measurements of key pollutants, loads and exceedances to monitoring progress. Within the San Gabriel River-Coyote Creek Watershed, there are three (3) established stations. Two on Coyote Creek at Richman Avenue and at Valley View Avenue, and one on Carbon Creek at Bloomfield Avenue.

Estuary / wetlands monitoring – includes measurements of key pollutants, loads and biological community parameters to describe impacts of urbanization on estuarine and wetland

ecosystems. This program includes zero (0) channel stations within the San Gabriel River-Coyote Creek Watershed.

Bacteriological/ pathogen – uses a suite of bacterial indicators to determine the impacts of stormwater and non-stormwater runoff and identify spatial and temporal patterns of elevated concentrations in order to prioritize problem areas. Stations were identified through a joint field reconnaissance effort between the County Health Care Agency (HCA) and the County Sanitations Districts of Orange County. Within the San Gabriel River-Coyote Creek watershed there are zero (0) established stations.

Urban stream bioassessment monitoring – uses a triad of indicators (bioassessment, chemistry, and toxicity) to define the impacts to stream communities and the relationship of the impacts to runoff. Within the San Gabriel River-Coyote Creek watershed there are currently zero (0) established stations.

Dry weather reconnaissance – uses measurements of key pollutants to identify illegal discharges and illicit connections. Throughout the County approximately 30 sites will be monitored, with 10 additional sites selected at random. Within the San Gabriel River-Coyote Creek watershed there are currently fourteen (14) established stations.

- Carbon Channel at La Palma Ave in Anaheim
- Imperial Hwy & State College in Brea
- Coyote Creek at Stage Rd. & Beach Blvd in Buena Park
- Coyote Creek downstream of Artesia Blvd in Buena Park
- Coyote Creek upstream of Lincoln Blvd in Cypress
- Nature Park on Ball Road in Cypress
- Gage & Woods Avenues in Fullerton
- Fullerton Creek near Ash Ave in Fullerton
- Near Brea Creek at Rosecrest Ave in La Habra
- Near Brea Creek at Imperial Hwy in La Habra
- De Vines Lane near La Palma Ave in La Palma
- Coyote Creek downstream of Ball Road in Los Alamitos
- San Gabriel River upstream of Marina Drive in Seal Beach
- San Gabriel River at Marina Drive in Seal Beach

Land use correlations– uses available experimental designs to identify changes in runoff and sediment load associated with the urbanization of previously agricultural land. Two land use sites will represent both a flat and a hillside agricultural plot. Within the San Gabriel River-Coyote Creek watershed there are currently zero (0) established stations.

D-2.1.2 Orange County Health Care Agency

Over the past 40 years, the Orange County Health Care Agency (also known as Environmental Health) and local sanitation agencies (Orange County Sanitation District and South Orange County Wastewater Authority) have been testing the coastal waters in Orange County for bacteria that indicate possible presence of human disease-causing organisms. Samples are collected weekly at approximately 150 ocean, bay, and drainage locations throughout coastal

Orange County. Within the San Gabriel River-Coyote Creek Watershed, there are approximately five (5) sample locations along the coast. **Figure D-6** shows the subwatersheds and the monitoring locations within the San Gabriel River-Coyote Creek Watershed.

On July 26, 1999, State law (AB411), mandating new protocols for surf zone monitoring of indicator bacteria, went into effect. The new law requires posting advisory signs to warn against swimming when indicator bacteria exceed regulatory thresholds for total coliform, fecal coliform, and enterococcus. Beach closures during the summer months of 1999 were the response of health officials to the elevated levels of indicator bacteria at Huntington State Beach and Huntington City Beach. The Orange County Sanitation District with Orange County Health Care Agency, the California State Department of Parks and Recreation, the City of Huntington Beach, and the Regional Board to conduct a series of investigations to ascertain the sources of bacterial contamination in the near shore environment.

Figure D-6: Subwatersheds and Monitoring Stations

See next page for figure.

D-2.1.3 SCCWRP Bight Study

SCCWRP coordinates regular monitoring efforts of the Southern California Bight from Point Conception to the Mexico border. The most recent Bight '03 Study was divided into three program components—coastal ecology, water quality, and shoreline microbiology. The coastal ecology component includes monitoring and assessment within coastal reaches of the Anaheim Bay-Huntington Harbor Watershed. The Sediment Toxicity Report (Volume I) has been published and includes monitoring data for stations along the beach in proximity to the San Gabriel River-Coyote Creek Watershed. As part of the Sediment Toxicity work, analyses were performed on samples taken at 359 sites with varying toxicity level results. Ongoing surveys for the Coastal Ecology component of the Bight '03 Study will continue to produce data along the coastal reach of the San Gabriel River-Coyote Creek watershed. The planned reports that will include this information are: Sediment Chemistry, Benthic Macrofauna, and Demersal Fish and Megabenthic Invertebrates.

D-2.2 Assessment of Data and Studies

There is a limited amount of water quality data that is available specific to the San Gabriel / Coyote Creek Watershed. Twelve (12) studies were identified that provide water quality information specific to this watershed. A matrix was developed to provide a detailed view of each of the studies / programs discussed in this technical memorandum. This matrix is referred to as the San Gabriel / Coyote Creek Environmental Matrix and includes information such as the specific constituents of concern included in the study / program, and details of the monitoring and management issues supported by that study / program. The San Gabriel / Coyote Creek Environmental Matrix is included in with this WAP as **Exhibit 1**.

It is a significant challenge to assemble the report references into a meaningful framework that provides the reader with an idea of what type of data or results are available. In order to meet the various types of user needs that were envisioned, the data has been 'cut' in several directions. Each 'cut' or assessment represents the sum total of all the programs and studies that were assembled as part of this technical memorandum; the difference is only in the perspective taken in that assessment.

Assessment #1: Program Management and Policies

A reasonable question to ask when faced with the abundance of data that exists is whether this data is providing stormwater program coordinators with the information needed to manage the program and make informed decisions for the watershed. The knowledge needed at various stages in the program development must be able to build on previous efforts to attain constantly improving results. The following passage from Managing Troubled Waters (National Academy Co, 2003) explains this iterative process.

> *"The reality of imperfect knowledge about marine systems means that monitoring should be used as an opportunity to increase and refine our knowledge of them. Data and information derived from monitoring programs should be used to check, validate, and refine the assumptions, models, and understandings on which the monitoring was based. This iterative feedback increased predictive ability, reduces uncertainty, and ultimately reduces the monitoring effort needed. As discussed in*

Chapter 2, risk-free decision making is not achievable, and monitoring must be viewed as a way of reducing uncertainty, not of eliminating it."

The following table **(Table D-2)** identifies the aspects of a stormwater program that are needed to advance the knowledge of the systems and identifies the number of studies that are relevant to each category. Each of these categories is considered in relation to specific pollutant of concern or elements of the watershed system.

Table D-2: Assessment #1 - Studies by Program Management Category

	Source Identification	Understanding Processes	Developing New Tools	Determine Compliance with WQs/TMDLs	Evaluate Program/ Measure Effectiveness	Provide Early Warning
Bacteria	3	2	2	4	5	2
Nutrients	1	2	3	2	4	1
Inorganics-Metals	2	5	3	2	5	1
Organics-Pesticides	1	1	2	2	4	1
Toxicity	2	3	2	2	3	1
Water Chemistry	1	1	1	1	1	1
Solids-Sediment	0	0	1	2	3	0
Fish Tissue	0	0	0	0	0	0

Assessment #2 – Study and Program Type

The 12 studies and programs identified within the San Gabriel / Coyote Creek Watershed have generated different types of water quality data. This data falls within two broad categories including: (1) generation of raw data and (2) assessment of existing data.

Raw data studies and programs include specific sampling or monitoring activities. This accounts for 4 of the 12 studies included in this assessment. New data was generated with two different objectives. The first objective was compliance with National Pollutant Discharge Elimination System (NPDES) permits. Compliance activities include the Orange County NPDES and Total Maximum Daily Load (TMDL) monitoring programs as well as monitoring programs conducted by other permitted facilities. The second objective in generating raw data was to understand the concentration levels or processes related to the pollutants, or the impacts of the pollutants, on the ecosystem. Studies targeting pollutant concentrations and processes generally involved direct measurements of the pollutants while studies targeting the impacts of the pollutants generally involved other environmental measurements. Some studies generated new data and used existing data and are included in both categories.

Studies that focused on the assessment of existing data were performed with the objectives of either understanding the behavior of a pollutant within the San Gabriel / Coyote Creek Watershed system through direct measurement of those pollutants or understanding the impacts of the pollutants by measuring other environmental parameters. A total of 13 studies are included in this category.

The following figure **(Figure D-7)** shows the category breakdown of the studies as well as the general objective of the study. Some studies include both raw data and existing data.

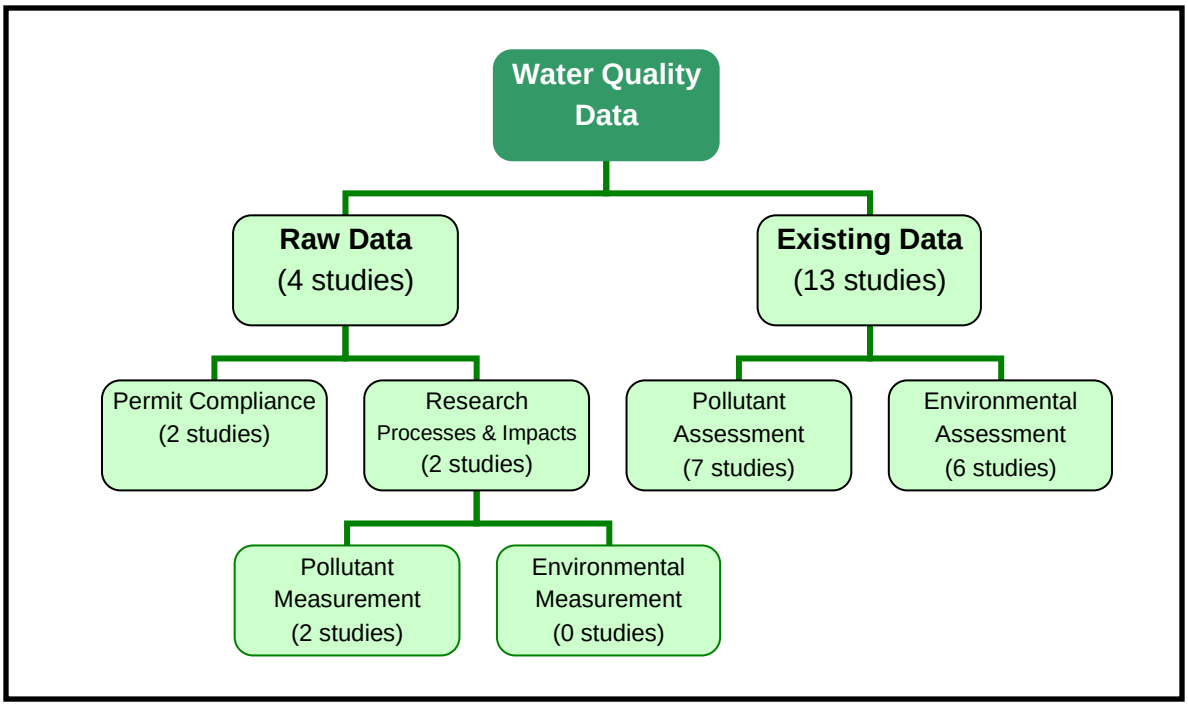


Figure D-7: Study Category Breakdown

Assessment #3 – Study or Program Details

The final assessment that was made of the studies and programs was to look at basic details such as who performed the study and what pollutants were included in those studies and programs.

Within the San Gabriel / Coyote Creek Watershed the major generators of water quality data are the County of Orange (RDMD & OCHCA), the Regional Water Quality Control Board (RWQCB), the US Army Corp of Engineers (USACE), the University of California Los Angeles (UCLA) and Irvine (UCI), the American Society of Civil Engineers (ASCE), the US Geological Survey (USGS), and the US Department of Agriculture (USDA). The following table **(Table D-3)** identifies the organizations responsible for each of the 12 studies. For collaborative studies, the primary organization was used for the accounting below.

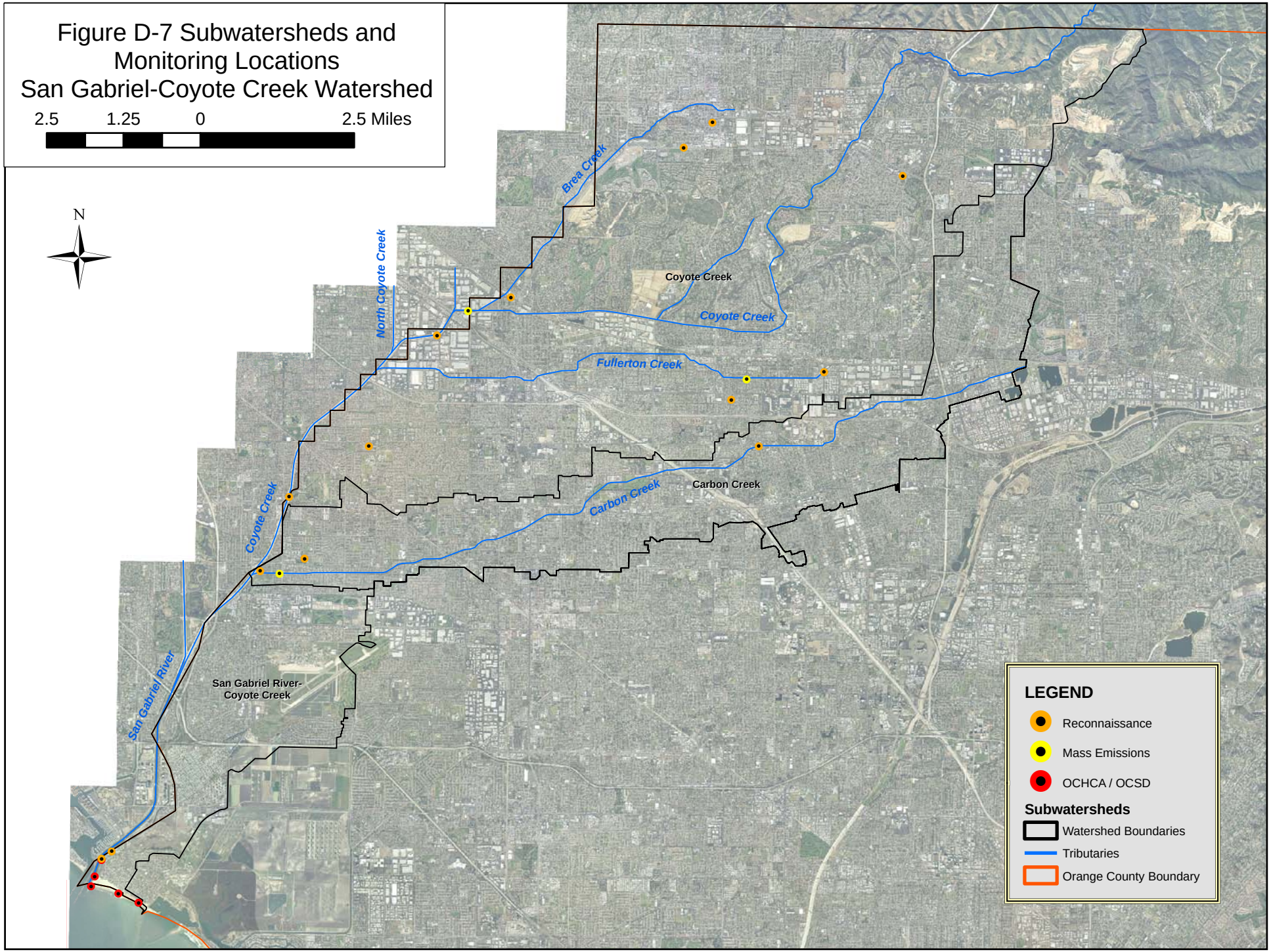


Figure D-7 Subwatersheds and Monitoring Locations
San Gabriel-Coyote Creek Watershed
2.5 1.25 0 2.5 Miles
N
Brea Creek
North Coyote Creek
Coyote Creek
Coyote Creek
Fullerton Creek
Carbon Creek
Carbon Creek
Coyote Creek
San Gabriel River
San Gabriel River-
Coyote Creek
LEGEND
Reconnaissance
Mass Emissions
OCHCA / OCSD
Subwatersheds
Watershed Boundaries
Tributaries
Orange County Boundary

Table D-3: Study Sources

Organization	Number of Studies
County of Orange (RDMD, OCHCA)	3
RWQCB	2
USACE	2
UCI	1
UCLA	1
ASCE	1
USGS	1
USDA	1

Each of the 12 water quality studies or programs that were identified as part of this data assessment addressed one or more specific pollutants. Eight (8) categories of constituents were identified that encompass nearly all of the specific data that was monitored or assessed. These 8 categories include:

- Bacteria
- Nutrients
- Metals
- Pesticides
- Toxicity – various levels of toxicity studies were performed
- Conventional water chemistry – this includes a wide ranges of variables such as pH, hardness, and temperature
- Sediment – this includes both bulk sediment and sediment contamination
- Fish Tissue

The following table **(Table D-4)** shows the distribution of the studies within each of these categories. Many studies include work related to several constituents.

Table D-4: Constituent Focus of Studies and Programs

Constituent	Number of Studies
Bacteria	9
Nutrients	7
Metals	7
Pesticides	6
Toxicity	6
Water chemistry	1
Sediment	6
Fish Tissue	0

D-2.3 Water Quality Status

D-2.3.1 Impaired Waters

Under section 303(d) of the 1972 Clean Water Act, states, territories, and authorized tribes are required to develop a list of water quality limited segments—waters that do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that state or local jurisdictions establish priority rankings for water quality impairment on the list and develop action plans, referred to as TMDLs, to improve water quality.

The SWRCB and the Regional Board staff have evaluated each addition, deletion, and change to section 303(d) based on all the data and information available for each water body and pollutant. These recommendations are based upon "all existing and readily available data and information" (40 CFR 130.7(b)(5)). In developing the recommendations, the SWRCB staff used the recommendations and analysis of the Regional Board as the basis of its analysis.

A new listing policy was used to develop the 2006 303(d) list. Based on that policy, some data, for purposes of developing the section 303(d) list, are sufficient by themselves to demonstrate non-attainment of standards. Examples of these listing factors are (1) numeric data exceeding numeric water quality objectives, maximum contaminant levels, or California/National Toxics Rule water quality criteria and (2) use of numeric evaluation values focused on protection of consumption of aquatic species. Other data types require that multiple lines of evidence be used for listing and de-listing. The listing factors that require multiple lines of evidence are (1) toxicity, (2) health advisories, (3) nuisance, (4) beach postings, (5) adverse biological response, and (6) degradation of aquatic life populations or communities. Each of these lines of evidence generally needs evidence of the presence of the pollutant(s) that cause or contribute to the adverse condition.

The 2006 303(d) list of impaired waters (approved by the SWRCB on October 25, 2006) within the San Gabriel River – Coyote Creek Watershed is presented in **Table D-5**. It should be noted that this list is updated every 2 years and will be replaced within this Watershed Action Plan.

Figure D-8 includes a map that shows the 303(d) listed receiving waters.

Table D-5: Proposed 2006 303(d) List and TMDL Priority Schedule

Type	Name	Hydro Unit	Pollutant/Stressor	Source	Estimated Size Affected	Proposed TMDL Completion
C	Seal Beach	801.11	Enterococcus	Source Unknown	0.53 miles	2019
			PCBs	Source Unknown	0.53 miles	2019

(Note: C – Coastal)

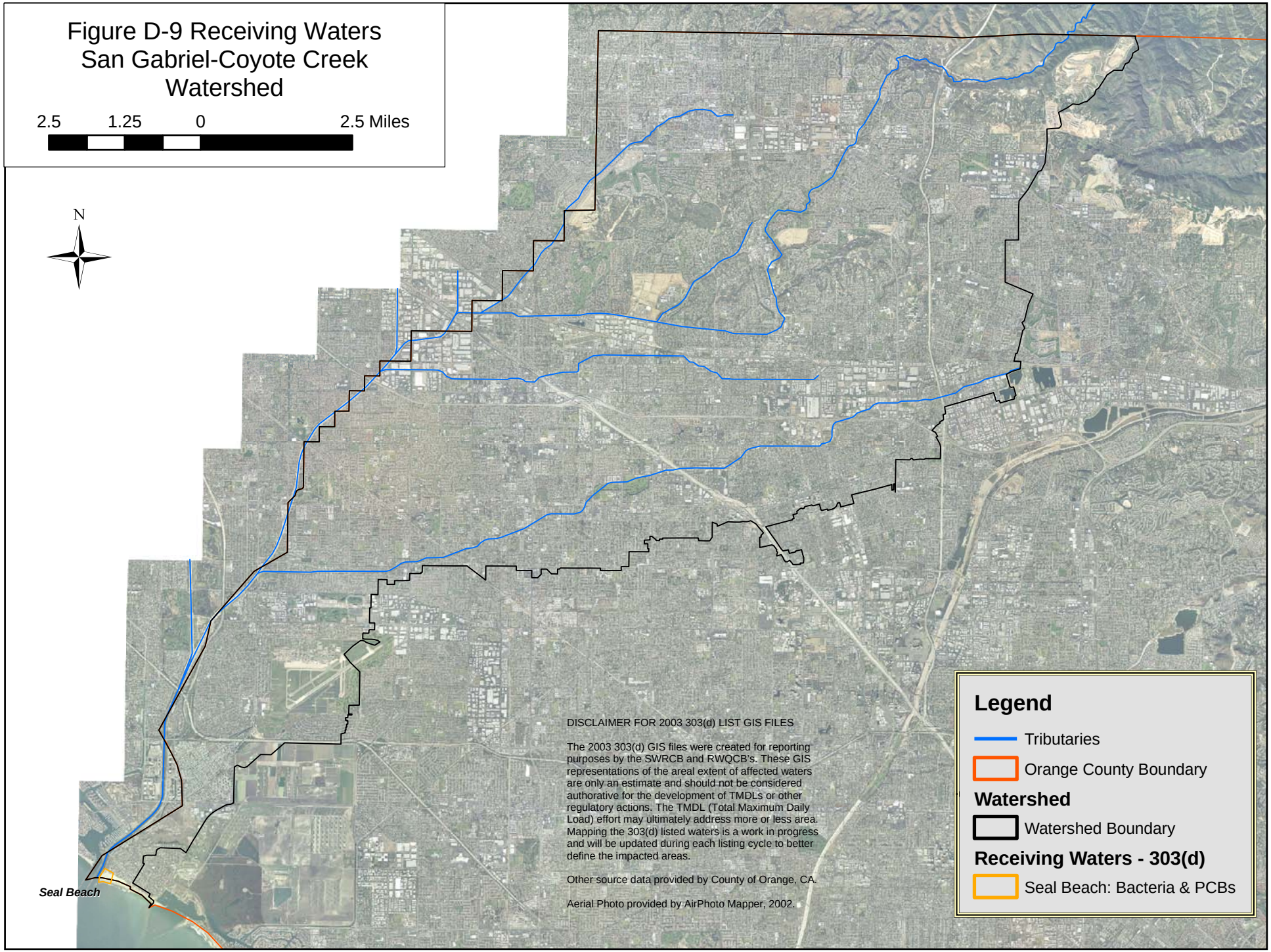
Figure D-8: Receiving Waters

See next page for figure.

Figure D-9 Receiving Waters San Gabriel-Coyote Creek Watershed

2.5 1.25 0 2.5 Miles

N



DISCLAIMER FOR 2003 303(d) LIST GIS FILES

The 2003 303(d) GIS files were created for reporting purposes by the SWRCB and RWQCB's. These GIS representations of the areal extent of affected waters are only an estimate and should not be considered authorative for the development of TMDLs or other regulatory actions. The TMDL (Total Maximum Daily Load) effort may ultimately address more or less area. Mapping the 303(d) listed waters is a work in progress and will be updated during each listing cycle to better define the impacted areas.

Other source data provided by County of Orange, CA.

Aerial Photo provided by AirPhoto Mapper, 2002.

Legend

Tributaries

Orange County Boundary

Watershed

Watershed Boundary

Receiving Waters - 303(d)

Seal Beach: Bacteria & PCBs

D-2.3.2 AB411 Summary

The 2006 Annual Ocean and Bay Water Quality Report (OCHCA, 2007) summarizes bacteria monitoring activities that took place in the San Gabriel River-Coyote Creek Watershed. Five sites are monitored along the 2.0 miles of beach front at Seal Beach and Surfside Beaches. In 2006 there were 8 beach posting from April-October, a record high compared with previous years (since 2000) when postings ranged from 1 to 6. In 2006 there were 9 postings throughout the 2006 calendar year. This is a high number compared with previous years since 2000 when the postings ranged from 8 to 13.

D-2.4 Priority Water Quality Needs

Managing and improving water quality in an urban environment is a complex issue. The science needed to deal with many of the issues that arise during the management process is evolving, and in some cases has not yet developed to the point that important questions can readily be answered in absolute quantifiable terms. Examples where our understanding is not fully developed are as follows:

- Stormwater runoff modeling relative to pollutants of concern. This modeling is not totally reliable for predictive purposes and needs large data sets to calibrate.
- Methods (such as MST (microbial source tracking) for more accurately identifying sources of pathogens in runoff (e.g., wildlife, pets, humans) are still being refined. Only qualitative methods exist at this time and they are not yet able to be directly translated into a loading assessment. For example, we may be able to say that 50% of the fecal coliform bacteria from a sample are from dogs but this does not imply that 50% of the loading of fecal bacteria is from dogs.
- The effectiveness of various BMPs (Best Management Practices) under varying conditions has not been systematically assessed under field conditions.

These and other data gaps have been identified to some extent in the research study reports, the research agenda for the Stormwater Monitoring Coalition, and the specific requirements of the NPDES permits. However, a thorough and conceptually organized listing of data gaps must stem from a thoughtful description of the key management questions related to the watershed. There are two reasons for this. First, there is a virtually infinite array of scientific data that could be gathered in a complex system such as this. It is essential to focus effort on those data types that are useful in decision making. Second, data gaps sometimes stem, not from the absence of data, but from the inability to adequately integrate existing data. Articulating clear questions enables studies to be designed so that disparate data types can be combined as needed to address complex issues.

D-2.4.1 Pollutant Data Gaps

The list below identifies data gaps related to a specific pollutant, bacteria. A lengthier discussion of the bacteria-related data gaps follows the summary list below.

- *Bacteria*
    - Urban vs. Natural Resources
    - Rapid Bacteriological Indicators

- MST (microbiological source tracking) identification methods

D-2.4.1.1 *Bacteria*

A special study will be performed to improve understanding of the correlations between levels of indicator bacteria in the surfzone (where most of the contact recreational activities take place) and levels in the stormdrains themselves. This study will be performed by the County as part of the Santa Ana Region Water Quality Monitoring Program based on the approach recommended by the Stormwater Monitoring Coalition.

The applicability of current bacteriological indicators for measuring human health risk and for identifying the sources of pathogen contamination needs further refinement. Two projects identified in SCCWRP Technical Report 35B *Stormwater Research Needs in Southern California* identify plans to address these issues. The first project (Project 12. *Develop rapid response indicator(s) for microbial contamination*) is focused on producing easily used field tests that would provide a reliable measure of bacteriological contamination within a few hours at most. The second project (Project 13. *Develop microbial source tracking protocol*) will select methods (primarily genetic-based) that provide the most dependable means of identifying and distinguishing among sources.

Considerable resources are being expended to reduce bacterial contamination from watershed sources, but in many cases storms drains continue to discharge large concentrations of fecal indicator bacteria (FIB). A study by SCCWRP will examine if FIB can grow in storm drain sediments. This study, *Storm Drains and Sediments as Reservoirs of Fecal Indicator Bacteria*, is being led by John Griffith.

D-2.4.2 Other Data Gaps

In addition to the data gaps related to specific pollutants, there are data gaps related to specific beneficial use impairments and the use attainability analyses relative to the achievability of a water quality goal. Specifically, what is the direct and indirect link between the beneficial use impairment by a pollutant and how is this linked to the water quality standard? In addition, what is the link between pollutant source control, and pollutant treatment management relative to achieving a specific water quality standard or goal? In other words, is there data to demonstrate that a goal is achievable or not? In the case of bacteria there may be a need to gather data relative to controllable sources to determine what is truly attainable and whether or not a use attainability analysis should be conducted relative to compliance requirements. Studies needed to answer many of these questions (and eliminate the data gap) have been identified in the *Phase 1 Stormwater Quality Standards* report (SAWPA, 2005).

An additional data gap exists with the ability to use any given set of data for further analysis. The Stormwater Monitoring Coalition has recognized the need to develop a regional stormwater monitoring infrastructure. As part of the *Stormwater Research Needs in Southern California* report (SCCWRP, 2002), the coalition has identified 4 projects to address this need. These projects include (1) integrate and evaluate available data; (2) standardize sampling and analysis protocols; (3) develop a regional data infrastructure; and (4) measure BMP effectiveness.

An additional data gap that the Stormwater Monitoring Coalition (SCCWRP, 2002) has identified is a need to improve fundamental understanding of stormwater mechanisms and processes. To meet this need the following projects have been identified: (1) develop a system wide conceptual model; (2) Determine appropriate reference conditions; (3) develop a regional method for measuring beneficial use condition; and (4) identify relative contribution of nonpoint sources to urban runoff loads.

Another data gap identified by the Stormwater Monitoring Coalition (SCCWRP, 2002) is related to identifying receiving water impacts. The following studies were identified to address this need: (1) identify the causes of impact in receiving waters; (2) develop bioassessment indicators and protocols; (3) develop improved toxicity testing procedures; (4) develop raid response indicator(s) for microbial contamination; (5) develop microbial source tracking protocol; (6) evaluate BMP effects on receiving water impacts; and (7) develop improved indicators of peak flow impacts.

Several of the identified Stormwater Monitoring Coalition projects have been funded and are underway.

D-3.0 TMDLs in the Watershed

Section 303(d) of the Clean Water Act requires that each State identify waters that are not meeting the water quality standards for their applicable beneficial uses. This process involves requesting and compiling readily available data and comparing these data to the appropriate water quality objectives (WQOs). The waterbody-pollutant combinations exceeding WQOs at predefined frequencies, which are specified in the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List, are placed on the 303(d) list of impaired waters. Section 303(d) also requires states to establish a priority ranking for waterbody-pollutant combinations on the 303(d) list and to subsequently establish TMDLs for each.

The goal of the TMDL process is to attain water quality standards and protect the beneficial uses of water bodies. It is defined as "the sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background" (40 CFR 130.2) and requires that the capacity of the water body to assimilate pollutant loadings (the Loading Capacity) is not exceeded.

The TMDL process begins with the development of a technical analysis which includes the following 7 components: (1) a **Problem Statement** describing which WQOs are not being attained and which beneficial uses are impaired; (2) identification of **Numeric Targets** which will result in attainment of the WQOs and protection of beneficial uses; (3) a **Source Analysis** to identify all of the point and nonpoint sources of the impairing pollutant in the watershed and to estimate the current pollutant loading for each source; (4) a **Linkage Analysis** to calculate the Loading Capacity of the waterbodies for the pollutant; i.e., the maximum amount of the pollutant that may be discharged to the waterbodies without causing exceedances of WQOs and impairment of beneficial uses; (5) a **Margin of Safety** to account for uncertainties in the analyses; (6) the division and **Allocation** of the TMDL among each of the contributing sources in the watersheds, wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint and background sources; and (7) a description of how **Seasonal Variation and Critical Conditions** are accounted for in the TMDL determination. The write-up of the above components is generally referred to as the technical TMDL analysis.

In addition to a technical TMDL analysis, the State is required to incorporate the TMDLs and their appropriate implementation measures into the State Water Quality Management Plan (40 CFR 130.6(c)(1), 130.7), such as the Regional Board Basin Plan. After a TMDL is adopted into the Basin Plan, it is submitted to EPA and reviewed. Approval from EPA is the last step in the TMDL process.

D-3.1 Existing TMDL Development

To date, TMDLs have not been completed for the enterococcus listing shown on the 2002 303(d) list.

D-3.2 Status of Future TMDL Development

TMDLs will be developed in the future for all waterbody-pollutant combinations on the current 303(d) list. The 2002 303(d) list is the active, approved list and includes a listing for

enterococcus for Seal Beach. The proposed 2006 list for this watershed includes enterococcus and PCBs for Seal Beach. The 2006 303(d) list indicates that the proposed TMDL completion date for these listings is 2019.

D-4.0 BMP Inventory

In developing a plan to address water quality within the San Gabriel River-Coyote Creek Watershed, it is important to (1) understand the sources of pollution within the watershed and (2) know the specific source and treatment controls that have been implemented (or proposed to be implemented) within the watershed to deal with the watershed constituents of concern. This section provides the available information for these two areas and identifies the related knowledge gaps that exist.

D-4.1 Watershed Pollution Sources

Pollution sources in the San Gabriel River-Coyote Creek Watershed include urban runoff, open space runoff, groundwater, permitted discharges, atmospheric deposition, agriculture, and wildlife. Because the mandate of the Orange County Stormwater Program is to address urban runoff, this WAP and planning effort will focus mainly on the urban sources although it is inherently recognized that in many cases, such as sediment control, the Watershed Permittees have taken on a broader role as responsible stakeholders even though the urban contribution is limited.

The urban sources in the watershed include runoff generated during storm events and non-storm related runoff from municipal facilities, residential, commercial, and industrial areas and parks.

D-4.2 Existing and Proposed Structural Enhanced BMPs

Structural BMPs include engineered facilities that are designed to remove pollutants. These facilities can include, but are not limited to wetlands, bioswales, extended detention basins, and proprietary separator units. Enhanced structural BMPs include facilities in which a specific pollutant of concern for that watershed is addressed. Enhanced BMPs are considered to be regional and treat runoff from more than a single developed area, such as a single residential tract. No existing enhanced structural BMPs have been constructed in the watershed that specifically target bacteria. In addition no proposed structural BMPs have been identified in the watershed that specifically target bacteria.

D-4.3 Recommendations for BMPs in the Watershed

New candidate BMPs can be prevention or removal oriented and can be considered either for updating baseline BMPs or for incorporation as watershed based BMPs. New BMPs are generally identified from one or more of the following:

- A review of technical literature (such as the ASCE/EPA database);
- A review of existing control programs;
- Demonstration or research projects;
- Input from consulting firms and municipalities already involved in new BMP implementation; or

- Other sources.

Consistent with DAMP Section 3.0, the process for BMP selection and implementation at the watershed scale involves consideration of a candidate BMP with respect to:

- The Watershed Permittees' needs, goals, and objectives
- Consistency with federal and state programs
- Economies from streamlined analysis and implementation procedures
- Opportunities for flexibility in the development of management alternatives
- Decision-making based on environmental and local considerations
- Effective Capital Improvement Program planning and budgeting

The following table (**Table D-6**) has been modified from that presented in DAMP Section 7.0 referencing the effectiveness of BMPs for specific pollutants. Specifically the types of BMPs have been reduced to reflect those that are more effective in reducing the pollutant of concern (bacteria) within the San Gabriel River-Coyote Creek Watershed. In particular the infiltration BMPs (shaded in the table) have high removal efficiencies for other pollutants of concern commonly seen in Orange County.

Table D-6: BMPs that Target San Gabriel River-Coyote Creek Watershed Pollutants of Concern

	INFILTRATION (2)			*WET PONDS AND WETLANDS*		BIOFILTERS		*FILTRATION*	
Pollutant of Concern	**TC-10 Infiltration Trench**	**TC-11 Infiltration Basin**	**TC-12 Retention/ Irrigation**	**TC-20 Wet Pond**	**TC-21 Constructed Wetland**	**TC-31 Vegetated Buffer Strip**	**TC-32 Bioretention**	**TC-40 Media Filter**	**TC-60 Multiple Systems**
Bacteria & Viruses	H	H	H	H	H	H	H	H	H

Cooperative periodic performance assessment may be necessary. This Treatment Control BMP table will be updated as needed and as knowledge of stormwater treatment BMPs improves.

(2) Including trenches and porous pavement.

H High removal efficiency

Sources:

International Stormwater Best Management Practices Database (2001), including Analysis of treatment system performance (1999 - 2005), dated February 2006

California Stormwater Quality Association (CASQA) Stormwater Best Management Practice Handbook – New Development and Redevelopment (January 2003 with September 2004 Errata)

Guide for BMP Selection in Urban Developed Areas (2001) Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (1993)

D-5.0 Plan Implementation and Assessment

D-5.1 Plan Implementation

Strategy Tables have been developed for the San Gabriel River-Coyote Creek Watershed that identifies the specific actions that are being undertaken to improve urban water quality within the watershed. These strategy tables are specific to the constituents of concern for the watershed and include information on past progress as well as the scheduled tasks to support this action. On an annual basis these tables will be updated to identify the progress made in that year as well as the schedule for the subsequent year. The San Gabriel River-Coyote Creek Watershed Strategy Tables are included as **Exhibit 2** to this WAP.

D-5.2 Plan Assessment

Effectiveness Assessment is the process that managers use to evaluate whether their programs are resulting in desired outcomes, and whether these outcomes are being achieved efficiently and cost-effectively (CASQA, 2003). A principle objective of the WAP is to present an integrated plan of action that will result in meaningful water quality improvements in the San Gabriel River-Coyote Creek Watershed while balancing economic, social and environmental constraints. This plan of action is laid out in the strategy tables which are referenced in **Section 5.1** and included herein as **Exhibit 2**. The program effectiveness assessment strategy requires the identification and thereafter annual consideration of measures that indicate whether progress is being made toward attainment of this objective and the other program objectives discussed in **Section 1.0**.

Assessment measures that are pertinent to the WAP are related to the confirmation of progress on the actions identified in the strategy table. The assessment of progress is integrated in the strategy tables through the annual update to the tables that require documentation on the progress that has been made on that specific action. Reasonable progress on these action items indicates that the WAP is effective.

D-6.0 References

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Nomenclature (Abbreviations)

Table D-7: Abbreviation Definitions

Abbreviation	Definition
NPDES	National Pollutant Discharge Elimination System
OCHCA	Orange County Health Care Agency
SCCWRP	Southern California Coastal Water Research Project
TMDL	Total Maximum Daily Load
BMP	Best Management Practice
USEPA / EPA	United States Environmental Protection Agency
DAMP	Drainage Area Management Plan
LIP	Local Implementation Plan
OCSD	Orange County Sanitation District
RWQCB	Regional Water Quality Control Board
GIS	Geographic Information System/Science
USACE	United States Army Corps of Engineers
SWRCB	State Water Resources Control Board
RDMD	Resources & Development management Department
PCB	Polychlorinated Biphenyls
PAH	Polycyclic Aromatic Hydrocarbons
CARs	Critical Aquatic Resources
UCLA/UCI	University of California Los Angeles / Irvine
WLA / LA	Waste Load Allocation / Load Allocation
CTR	California Toxics Rule
RMA	Resource Management Associates
NTS	Natural Treatment System
CASQA	California Stormwater Quality Association

EXHIBIT D-1

ENVIRONMENTAL MATRIX

EXHIBIT D-2

STRATEGY TABLES