Santa Ana River Watershed Bacteria Monitoring Program

Monitoring Plan

Prepared by

On Behalf of
Santa Ana Watershed Project Authority

Version 3.0
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Acronyms

AgSEP	Agricultural Source Evaluation Plan
AgSEMP	Agricultural Source Evaluation Monitoring Program
Basin Plan	Water Quality Control Plan for the Santa Ana River Basin
BASMP	Bacteria Indicator Agriculture Source Evaluation Plan
BMP	best management practice
BPA	Basin Plan amendment
°C	degrees Celsius
CBRP	Comprehensive Bacteria Reduction Plan
CEDEN	California Environmental Data Exchange Network
cfs	cubic feet per second
cfu	colony forming unit
COC	chain of custody
COE	Army Corps of Engineers
CWP	Center for Watershed Protection
DPD	N,N-Diethylparaphenylenediamine
E. coli	*Escherichia coli*
EPA	Environmental Protection Agency
ft	feet
HCA	Health Care Agency
IC/ID	Illicit connection/illegal discharge
Los Angeles Water Board	Los Angeles Regional Water Quality Control Board
MBAS	Methylene blue active substances
mL	milliliters
mg/mL	milligrams/milliliter
MPN	most probable number
mS/cm	millisiemens/centimeter
MS4	Municipal Separate Storm Sewer System
MSAR	Middle Santa Ana River
MSAR Bacteria TMDL	MSAR Bacterial Indicator TMDL
MSAR TMDL Task Force	MSAR Watershed TMDL Task Force
NTU	Nephelometric Turbidity Unit
OCC	Orange County Coastkeeper
OCFCD	Orange County Flood Control District
OCPW	Orange County Public Works
OCWD	Orange County Water District
OWOW	One Water One Watershed
POTW	publicly owned treatment works
ppth	part per thousand
Project ID	Project Identification Number
Q	Flow
QA	quality assurance
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
RCB	reinforced concrete box

RCP	reinforced concrete pipe
RCFC&WCD	Riverside County Flood Control and Water Conservation District
REC1	water contact recreation
REC2	non-contact water recreation
RMP	Regional Monitoring Program
Sample ID	Sample Identification Number
SBCFCD	San Bernardino County Flood Control District
SAR	Santa Ana River
SAR Bacteria Monitoring Plan	Santa Ana River Watershed Bacteria Monitoring Plan
Santa Ana Water Board	Santa Ana Regional Water Quality Control Board
SAWPA	Santa Ana Watershed Protection Authority
sec or s	second
Site ID	Site Identification Number
SM	Standard Method
State Water Board	State Water Resources Control Board
SWAMP	Surface Water Ambient Monitoring Program
SWQSTF	Stormwater Quality Standards Task Force
t	time
TRFLP	Terminal Restriction Fragment Length Polymorphism
TMDL	Total Maximum Daily Load
TSS	total suspended solids
UAA	use attainability analysis
UC	University of California
USEP	Urban Source Evaluation Plan

Section 1

Watershed Bacteria Monitoring Programs

This Santa Ana River Watershed Bacteria Monitoring Plan ("SAR Bacteria Monitoring Plan") establishes the requirements for bacteria sampling to support the following objectives:

- Fulfill the monitoring and surveillance requirements of the 2012 adopted Basin Plan amendment (BPA) to *Revise Recreation Standards for Inland Freshwaters in the Santa Ana Region*;
- Conduct sampling to support implementation of the Middle Santa Ana River (MSAR) Bacterial Indicator Total Maximum Daily Load (TMDL) ("MSAR Bacteria TMDL"); and
- Support any additional bacterial indicator monitoring that may be conducted in the watershed to support regional regulatory activities or requirements.

1.1 Regulatory Background

This SAR Bacteria Monitoring Plan supports the implementation of several regulatory-related activities associated with the protection of recreational uses in the Santa Ana River Watershed. The following subsections describe these activities and their regulatory relevance.

1.1.1 Basin Plan Amendment

On June 15, 2012, the Santa Ana Regional Water Quality Control Board (Santa Ana Water Board) adopted the BPA to *Revise Recreation Standards for Inland Freshwaters in the Santa Ana Region*[1]. This BPA resulted in the following key modifications to the Water Quality Control Plan for the Santa Ana River Basin (Basin Plan) for the Santa Ana region[2]:

- Addition of "Primary Contact Recreation" as an alternative name for the REC1 (water contact recreation) beneficial use;
- Addition of narrative text clarifying the nature of REC1 activities and the bacteria objectives established to protect these activities;
- Differentiation of inland surface REC1 waters on the basis of frequency of use and other characteristics for the purposes of assigning applicable single sample maximum values;
- Revision of REC1/REC2 (non-contact water recreation) designations for specific inland surface waters based on the results of completed Use Attainability Analyses (UAA);
- Revised water quality objectives to protect the REC1 use of inland freshwaters; and

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[1] Santa Ana Water Board Resolution: R8-2012-0001, June 15, 2012

[2] Page 2 of Attachment 2 to the Santa Ana Water Board Resolution: R8-2012-0001, as approved on June 15, 2012, and corrected on February 12, 2013 and November 15, 2013.

- Identification of criteria for temporary suspension of recreation use designations and objectives (high flow suspension).

Santa Ana Water Board staff developed this BPA in collaboration with the Stormwater Quality Standards Task Force (SWQSTF), comprised of representatives from various stakeholder interests, including the Santa Ana Watershed Protection Authority (SAWPA); the counties of Orange, Riverside, and San Bernardino; Orange County Coastkeeper; Inland Empire Waterkeeper; and the Environmental Protection Agency (EPA) Region 9. The BPA was approved by the State Water Resources Control Board (State Water Board) on January 21, 2014[3] and the California Office of Administrative Law on July 2, 2014[4]. The EPA issued its letter of approval/disapproval on April 8, 2015 and provided a letter of clarification on August 3, 2015.

The BPA requires establishment of a comprehensive monitoring program to support implementation of the changes to the Basin Plan[5]. In 2018, the Santa Ana River Monitoring Program was established to supersede the SWQSTF and satisfy the requirements of the Basin Plan. This Monitoring Plan and its previous versions establishes the framework for the Monitoring Plan and addresses the Basin Plan requirements. .

1.1.2 Statewide Bacteria Provisions

On August 7, 2018, the State Water Resources Control Board adopted Bacteria Provisions and a Water Quality Standards Policy for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Statewide Bacteria Provisions).[6] The Statewide Bacteria Provisions developed new statewide numeric water quality objectives for bacteria to protect primary contact recreation beneficial use, as follows:

- *E. coli*: For all waters where the salinity is equal to or less than 1 part per thousand (ppth) 95 percent or more of the time, a six-week rolling geometric mean, calculated from at least five samples, not to exceed 100 cfu/100mL, calculated weekly, and a statistical threshold value (STV) of 320 cfu/100 mL not to be exceeded by more than 10 percent of the samples collected in a calendar month, calculated in a static manner.

- Enterococci: For all waters where the salinity is greater than 1 ppth 95 percent or more of the time, a six-week rolling geometric mean, calculated from at least five samples, not to exceed 30 cfu/100mL, calculated weekly, and a STV of 110 cfu/100 mL not to be exceeded by more than 10 percent of the samples collected in a calendar month, calculated in a static manner.

The Statewide Bacteria Provisions supersede numeric water quality objectives (WQOs) for REC1 use contained in regional Basin Plans, except for cases involving a site-specific standard (only anti-degradation targets within the SAR watershed) or if an existing TMDL was developed with targets based on prior regional Basin Plan REC1 WQOs (such as the MSAR Bacteria TMDL). The following section describes the MSAR Bacteria TMDL and associated numeric targets, which differ from those included in the Statewide Bacteria Provisions. This comprehensive monitoring program is revised to facilitate data collection needed to evaluate both TMDL wasteload allocations and load allocations

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[3] State Water Board Resolution: 2014-0005, January 21, 2014

[4] Office of Administrative Law: #2014-0520 -02 S; July 2, 2014

[5] Page 76 of Attachment 2 to the Santa Ana Water Board Resolution R8-2012-0001, as corrected

[6] State Water Board Resolution: 2018-0038, August 7, 2018

(WLAs/LAs) and Statewide Bacteria Provisions WQOs for the TMDL waters. Compliance metrics will be based solely on the TMDL WLA/LAs.

Lastly, the Statewide Bacteria Provisions do not supersede narrative WQOs in regional Basin Plans. The BPA to *Revise Recreation Standards for Inland Freshwaters in the Santa Ana Region* is comprised of narrative criteria, which remain in effect for the Santa Ana region. The narrative criteria in the BPA are largely consistent with narrative criteria contained in the Statewide Bacteria Provisions.

1.1.3 Bacteria TMDLs

Currently, there is one bacteria TMDL adopted for freshwaters in the Santa Ana River Watershed: MSAR Bacteria TMDL, which became effective on May 16, 2007. Following is a brief summary of the establishment of this TMDL.

In 1994 and 1998, because of exceedances of the fecal coliform objective established at that time to protect the REC1 use, the Santa Ana Water Board added the following waterbodies in the MSAR watershed to the state 303(d) List of impaired waters:

- Santa Ana River, Reach 3 – Prado Dam to Mission Boulevard
- Chino Creek, Reach 1 – Santa Ana River confluence to beginning of hard lined channel south of Los Serranos Road
- Chino Creek, Reach 2 – Beginning of hard lined channel south of Los Serranos Road to confluence with San Antonio Creek
- Mill Creek (Prado Area) – Natural stream from Cucamonga Creek Reach 1 to Prado Basin
- Cucamonga Creek, Reach 1 – Confluence with Mill Creek to 23rd Street in City of Upland
- Prado Park Lake

The Santa Ana Water Board adopted the MSAR Bacteria TMDL in 2005[7]; it was subsequently approved by the EPA on May 16, 2007. The TMDL established compliance targets for both fecal coliform and *E. coli*:

- Fecal coliform: 5-sample/30-day logarithmic mean less than 180 organisms/100 mL and not more than 10 percent of the samples exceed 360 organisms/100 mL for any 30-day period.
- *E. coli*: 5-sample/30-day logarithmic mean less than 113 organisms/100 mL and not more than 10 percent of the samples exceed 212 organisms/100 mL for any 30-day period.

Per the TMDL, the above compliance targets for fecal coliform became ineffective upon EPA approval of the BPA[8] (see Section 1.1.1).

To focus MSAR Bacteria TMDL implementation activities, stakeholders established the MSAR Watershed TMDL Task Force (MSAR TMDL Task Force) to coordinate TMDL implementation activities designed to manage or eliminate sources of bacterial indicators to waterbodies listed as impaired. The

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[7] Santa Ana Water Board Resolution: R8-2005-0001, August 26, 2005

[8] Page 3 of 15 of Attachment A to Santa Ana Water Board Resolution R8-2005-0001

MSAR TMDL Task Force includes representation by key watershed stakeholders, e.g., urban stormwater dischargers, agricultural operators, and the Santa Ana Water Board.

The MSAR Bacteria TMDL required urban and agricultural dischargers to implement a watershed-wide bacterial indicator compliance monitoring program by November 2007[9]. Stakeholders worked collaboratively through the MSAR TMDL Task Force to develop this program and prepared the MSAR Water Quality Monitoring Plan and associated QAPP for submittal to the Santa Ana Water Board. The MSAR TMDL Task Force implemented the TMDL monitoring program in July 2007; the Santa Ana Water Board formally approved the monitoring program documents in April 2008[10]. The MSAR Water Quality Monitoring Plan and QAPP have been updated as needed since 2007 with the most recent update occurring in 2022[11].

The MSAR Bacteria TMDL also required the development and implementation of source evaluation plans by urban and agricultural dischargers within six months of the TMDL effective date:

- *Urban Dischargers* – Municipal Separate Storm Sewer System (MS4) permittees in Riverside and San Bernardino Counties within the MSAR watershed were required to submit a bacterial indicator Urban Source Evaluation Plan (USEP) within six months of the TMDL effective date. The purpose of this program was to identify activities, operations, and processes in urban areas that contribute bacterial indicators to MSAR watershed waterbodies.

  The USEP was submitted to the Santa Ana Water Board in November 2007 and approved April 18, 2008[12]. The USEP was replaced by Comprehensive Bacteria Reduction Plans (CBRP) prepared by Riverside and San Bernardino MS4 permittees to fulfill 2010 MS4 Permit requirements applicable to urban dischargers subject to the MSAR Bacteria TMDL requirements[13]. The Santa Ana Water Board approved the CBRPs for these counties on February 10, 2012[14].

  To fulfill Los Angeles County 2012 MS4 Permit requirements issued by the Los Angeles Water Quality Control Board (Los Angeles Water Board), additional CBRPs were completed by the Cities of Pomona and Claremont for the portions of their cities that are within the MSAR watershed and subject to MSAR Bacteria TMDL requirements. These CBRPs were approved by the Santa Ana Water Board on March 14, 2014[15]. All CBRPs completed by MS4 dischargers include monitoring activities that to date have been covered by the MSAR Water Quality Monitoring Plan and QAPP prepared by the MSAR TMDL Task Force (see above).

- *Agricultural Dischargers* – Agricultural operators in the MSAR watershed were required to submit an Agricultural Source Evaluation Plan (AgSEP) within six months of the TMDL effective date. The purpose of the AgSEP was to identify activities, operations, and processes in agricultural areas that contribute bacterial indicators to MSAR watershed waterbodies. The

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[9] Page 6 of 15, Table 5-9y of Attachment A to Santa Ana Water Board Resolution R8-2005-0001

[10] Santa Ana Water Board Resolution: R8-2008-0044; April 18, 2008

[11] See http://www.sawpa.org/collaboration/projects/tmdl-taskforce/; under the Monitoring tab

[12] Santa Ana Water Board Resolution: R8-2008-0044, April 18, 2008

[13] Santa Ana Water Board Resolutions: R8-2010-0033 (Riverside County MS4 Permit); R8-2010-0036 (San Bernardino County MS4 Permit)

[14] Santa Ana Water Board Resolutions: R8-2012-0015 (Riverside County MS4 Program); R8-2012-0016 (San Bernardino County MS4 Program)

[15] Santa Ana Water Board Resolution: R8-2014-0030 (City of Claremont); R8-2014-0031 (City of Pomona)

AgSEP included monitoring activities that have been covered by the MSAR Water Quality Monitoring Plan and QAPP prepared by the MSAR TMDL Task Force (see above).

The AgSEP was submitted to the Santa Ana Water Board in November 2007 and approved April 18, 2008[16]. As required by the MSAR Bacteria TMDL, a Bacterial Indicator Agricultural Source Management Plan (BASMP) was developed and submitted in 2014. This BASMP replaces the AgSEP.

This SAR Bacteria Monitoring Plan incorporates all existing MSAR Water Quality Monitoring Plan requirements. Accordingly, this SAR Bacteria Monitoring Plan replaces the existing MSAR Water Quality Monitoring Plan and Addenda.

1.1.4 Waters Impaired for Bacterial Indicators

The State Water Board periodically publishes a list of impaired waters for the State of California, which is prepared according to the requirements of the State Water Board's *Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List*[17]. Subject to EPA Region 9 approval, the most recently approved 303(d) List is contained within the State Water Board's 2020/2022 Integrated Report[18]. Table 1-1 summarizes inland waters currently listed as impaired in the Santa Ana River Watershed for bacterial indicators for which a TMDL has not been adopted. The State Water Board's 2020/2022 Integrated Report provides an estimated date for development of a TMDL. This SAR Bacteria Monitoring Plan includes monitoring requirements for waterbodies listed as impaired but no TMDL has been adopted.

1.2 SAR Bacteria Monitoring Plan Initiation

Implementation of the SAR Bacteria Monitoring Plan required the approval of the Santa Ana Water Board, or its delegated authority, and the establishment of cooperative agreements among participating agencies. The program was initiated in 2018 and is periodically updated to ensure continued implementation of the BPA and MSAR TMDL requirements.

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[16] Santa Ana Water Board Resolution: R8-2008-0044, April 18, 2008

[17] https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2015/020315_8_amendment_clean_version.pdf

[18] Final EPA approval – June 9, 2021; list of impaired waters in California , by region: https://www.waterboards.ca.gov/water_issues/programs/water_quality_assessment/2018_integrated_report.html

Table 1-1. List of Waterbodies within the Jurisdiction of the Santa Ana Water Board currently listed as Impaired for Bacterial Indicators or Pathogens for which a TMDL has not been adopted (Source: State 2014/16 Integrated Report)

County	303(d) Listed Waterbody
Orange	Bolsa Chica Channel[1]
	Borrego Creek[2]
	Buck Gully Creek
	Los Trancos Creek[2,3]
	Morning Canyon Creek[3]
	Peters Canyon Wash[2]
	San Diego Creek Reach 1
	San Diego Creek Reach 2[2]
	Serrano Creek[2]
Riverside	Goldenstar Creek
	San Timoteo Creek Reach 3
San Bernardino	Knickerbocker Creek[4]
	Mill Creek Reach 1
	Mountain Home Creek
	Mountain Home Creek, East Fork
	San Timoteo Creek Reach 1A[2]
	San Timoteo Creek Reach 2
	Santa Ana River Reach 4
	Warm Creek[1]

[1] Presumptive REC1 use; waterbody not specifically listed with beneficial uses in the Basin Plan.

[2] REC1 is designated as an intermittent beneficial use in the Basin Plan

[3] All land in the watershed of this Orange County waterbody is either private or state-owned.

[4] Santa Ana Water Board currently plans to address the pathogens impairment listing for Knickerbocker Creek through an alternative approach to a TMDL.

1.3 Monitoring Plan Roadmap

As noted above, this SAR Bacteria Monitoring Plan currently serves three key purposes: (a) implement the monitoring and surveillance requirements of the 2012 adopted Basin Plan amendment (BPA) to *Revise Recreation Standards for Inland Freshwaters in the Santa Ana Region*; (b) conduct sampling to support implementation of the MSAR Bacteria TMDL; and (c) support any additional bacterial indicator monitoring that may be conducted in the watershed to support regional regulatory activities or requirements. With regards to MSAR Bacteria TMDL monitoring requirements, upon implementation, this SAR Bacteria Monitoring Plan replaces the existing MSAR Water Quality Monitoring Plan that currently guides all monitoring activities for the MSAR Bacteria TMDL.

The SAR Bacteria Monitoring Plan includes seven sections with supporting attachments. To support use of this document and ensure appropriate monitoring requirements are implemented, Table 1-2 describes the purpose or use for each document section and identifies supporting attachments included in this Monitoring Plan.

Table 1-2. Purpose, Content and Supporting Documentation for each SAR Bacteria Monitoring Plan Section

Section	Title	Purpose and Content	Supporting Documentation
Section 1	Watershed Bacteria Monitoring Programs	Provides an overview of the regulatory basis for the bacteria sampling that will be supported by the SAR Bacteria Monitoring Plan and program initiation requirements.	N/A
Section 2	Santa Ana Watershed	Provides a general description of Santa Ana River Watershed characteristics to provide geographic context for this Monitoring Plan.	N/A
Section 3	Regional Monitoring Program	This section establishes monitoring requirements to support implementation of the BPA. In some cases, sites required to be monitored to support TMDL implementation are also required to be sampled under the RMP. This section will establish RMP requirements for those sites. Supplemental sampling required to fulfill other TMDL requirements will be addressed in Section 4.	▪ Attachment A – Site descriptions of each RMP monitoring site ▪ Attachment B – Summary of other waterbodies identified in the BPA, but not included in the RMP
Section 4	TMDL Monitoring Programs	This section establishes monitoring requirements to support MSAR Bacteria TMDL implementation that are supplemental to monitoring requirements already included the RMP.	▪ Attachment C - Site descriptions of targeted MSAR Bacteria TMDL monitoring sites in Riverside and San Bernardino Counties
Section 5	Standard Sampling and Analysis Procedures	This section establishes standard sampling and analysis procedures for the collection and analysis of all water samples to evaluate compliance with water quality objectives or numeric TMDL targets. These procedures apply regardless of whether the monitoring site is part of the RMP or a TMDL compliance monitoring program.	▪ Attachment D – Field Data Sheet Form ▪ Attachment E – Chain of Custody Forms ▪ Attachment F – Flow Measurement Form
Section 6	Specialized Sampling and Analysis Procedures	This section establishes specialized procedures for field investigations, sample collection or laboratories to support efforts to understand sources of bacterial indicators.	▪ Attachment D – Field Data Sheet Form ▪ Attachment E – Chain of Custody Forms ▪ Attachment F – Flow Measurement Form
Section 7	Data Management and Reporting	This section establishes all reporting requirements associated with the SAR Bacteria Monitoring Plan and describes how data collected under this Plan will be collectively managed and stored.	N/A

1.4 Process to Modify the SAR Bacteria Monitoring Plan and QAPP

Per the BPA, the SAR Bacteria Monitoring Program may be implemented only upon the approval of the Regional Board or its delegated authority. In addition, the proposed program shall be conducted in accordance with a QAPP that has been approved by the Regional Board's Quality Assurance Officer. These two requirements shall be met before this RMP and its associated QAPP are implemented.

The BPA requires that the SAR Bacteria Monitoring Program be reviewed and, as appropriate, revised at least once every three years[19]. In coordination with the Project Director, the Santa Ana Water Board Project Manager responsible for the oversight of the SAR Bacteria Monitoring Program shall be responsible for ensuring this triennial review occurs as scheduled. Any changes to the SAR Bacteria Monitoring Plan or QAPP made as part of a triennial review shall be approved by the Santa Ana Water Board Executive Officer.

Modifications to the SAR Bacteria Monitoring Plan and/or QAPP may occur more frequently than the required triennial review. The Project Director shall be responsible for coordinating revisions to the SAR Bacteria Monitoring Plan and QAPP. For non-substantive changes to these documents (e.g., laboratory updates, updates to Tables 1-1 or 3-1 of the QAPP, editorial changes, minor schedule modifications, etc.), the Santa Ana Water Board Project Manager will submit these changes to the Santa Ana Water Board for approval. The Executive Officer is authorized to approve such changes to the Monitoring Plan and QAPP. However, if proposed changes are deemed substantive or significant, and of potential public interest, these changes would need to be considered by the Regional Board. The Project Director will coordinate with Santa Ana Water Board staff to determine the appropriate process for obtaining approval of changes to the Monitoring Plan and QAPP.

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[19] Page 77 of Attachment 2 to the Santa Ana Water Board Resolution R8-2012-0001, as corrected

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Section 2

Santa Ana River Watershed

2.1 Physical Characteristics

The Santa Ana River watershed covers an area of approximately 2,650 square miles and includes portions of Orange, Riverside, and San Bernardino County, and a small portion of Los Angeles County (Figure 2-1). The mainstem Santa Ana River is the primary waterbody in the watershed. It flows in a generally southwest direction nearly 100 miles, from its headwaters to the Pacific Ocean (Figure 2-1). Sections of the Santa Ana River are only intermittent or seasonal flows . Perennial sections are due to effluent flows from POTWs.

2.1.1 Major Geographic Subareas

The Santa Ana River watershed can be divided into three major geographic subareas:

- ***San Jacinto River and Temescal Creek Region*** – This area covers much of the south central and southeastern portions of the watershed and is located mostly within Riverside County. The San Jacinto River drains an area of approximately 780 square miles to Canyon Lake and Lake Elsinore. Often flows from the upper San Jacinto River watershed are captured by Mystic Lake, which is a natural sump or hydrologic barrier to flows moving further downstream to Canyon Lake or Lake Elsinore. Downstream of Lake Elsinore, Temescal Creek carries surface flow, when it occurs, from below Lake Elsinore to its confluence with Prado Basin.

- ***Santa Ana River above Prado Dam and Chino Basin Region*** – This area includes much of the north central and northeastern portions of the watershed and is located mostly within San Bernardino County. This region drains to Prado Basin where Prado Dam captures all surface flows from this region and the Temescal Creek watershed.

  The Santa Ana River headwaters are located in the San Bernardino Mountains in the northeastern part of the watershed. Major tributaries to the Santa Ana River in this region include Warm Creek, Lytle Creek, and San Timoteo Creek.

  In the north central portion several major Santa Ana River tributaries arise in the San Gabriel Mountains and drain generally south into the Chino Basin before their confluence with the Santa Ana River, including Day Creek, Cucamonga Creek and San Antonio Creek. Many of these drainages carry little to no flow during dry conditions because of the presence of extensive recharge basins in this region.

  Prado Basin above Prado Dam is a flood control basin that captures all flows from the upper part of the Santa Ana River Watershed. For the most part the basin is an undisturbed, dense riparian wetland.

- ***Santa Ana River below Prado Dam and Coastal Plains Region*** – This area covers the western portion of the Santa Ana River watershed and includes coastal waterbodies that are not part of the Santa Ana River drainage area. This area is located within Orange County. Below Prado Dam the Santa Ana River flows through the Santa Ana Mountains before crossing the coastal plain and emptying into the Pacific Ocean near Huntington Beach. Groundwater recharge areas near the City of Anaheim capture water in the Santa Ana River and the Santa Ana River is often dry below this area. Other watersheds on the Coastal Plain include Newport Bay, Anaheim Bay-Huntington Harbour and Coyote Creek.

2.1.2 Middle Santa Ana River Watershed

A brief description of the MSAR watershed is provided here because of the inclusion of the MSAR Bacteria TMDL in this Monitoring Plan (see Section 1.1.2).

The MSAR watershed covers approximately 488 square miles and lies largely in the southwestern corner of San Bernardino County and the northwestern corner of Riverside County. A small part of Los Angeles County (Pomona/Claremont area) is also included. Per the TMDL, the MSAR watershed includes three sub–watersheds (Figure 2-2):

- Chino Basin (San Bernardino County, Los Angeles County, and Riverside Counties) – Surface drainage in this area, which is directed to Chino Creek and Mill-Cucamonga Creek, flows generally southward, from the San Gabriel Mountains, and west or southwestward, from the San Bernardino Mountains, toward the Santa Ana River and the Prado Flood Control Basin.

- Riverside Watershed (Riverside County) – Surface drainage in this area is generally westward or southward from the City of Riverside and the community of Rubidoux to Reach 3 of the Santa Ana River.

- Temescal Canyon Watershed (Riverside County) – Surface drainage in this area is generally northwest to Temescal Creek (however, note that Temescal Creek is not included as an impaired waterbody in the MSAR Bacteria TMDL).

Land uses in the MSAR watershed include urban, agriculture, and open space. Although originally developed as an agricultural area, the watershed continues to rapidly urbanize. Incorporated cities in the MSAR watershed include Chino, Chino Hills, Claremont, Corona, Eastvale, Fontana, Jurupa Valley, Montclair, Norco, Ontario, Pomona, Rancho Cucamonga, Rialto, Riverside, and Upland. In addition, there are several pockets of urbanized unincorporated areas. Open space areas include National Forest lands and State Park lands.

2.2 Hydrology

2.2.1 Rainfall

Rainfall varies considerably across the watershed (Figure 2-3). Highest average rainfall occurs in the San Gabriel, San Bernardino and San Jacinto mountains in the upper parts of the watershed and the Santa Ana Mountains in the south-central part of the region. Average annual rainfall (1960-2001) in the northern and eastern areas can be > 35 inches/year. In lowland regions, e.g., along the Coastal Plain or in central parts of the region such as Riverside, Chino or Prado Basin, rainfall averages from about 11 to 19 inches per year. A few localized areas in the central part of the basin can receive less than 10 inches of rain per year.

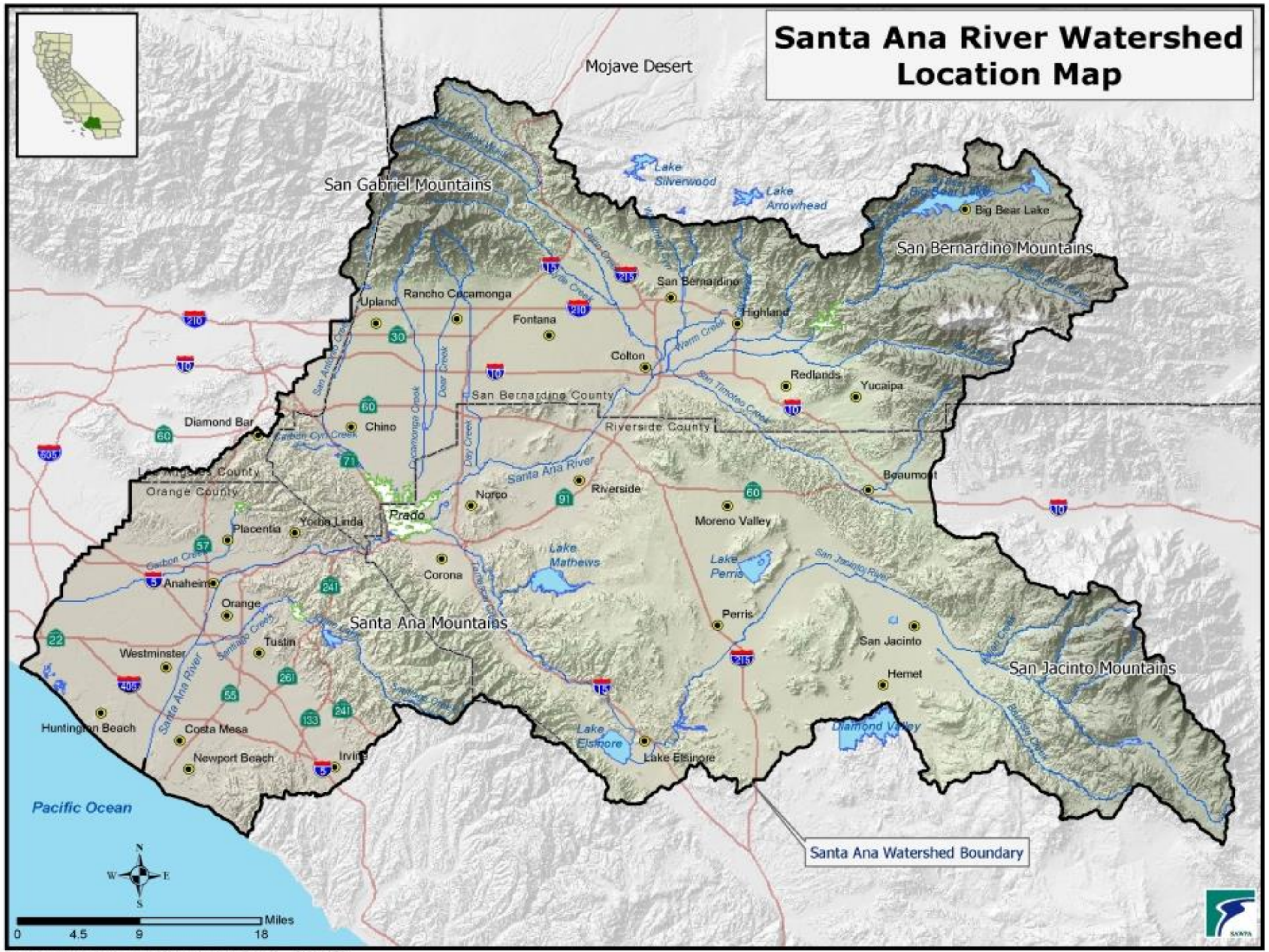

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Figure 2-1. Santa Ana River Watershed and Location of Orange, Riverside and San Bernardino Counties (Source: Santa Ana Watershed Project Authority).

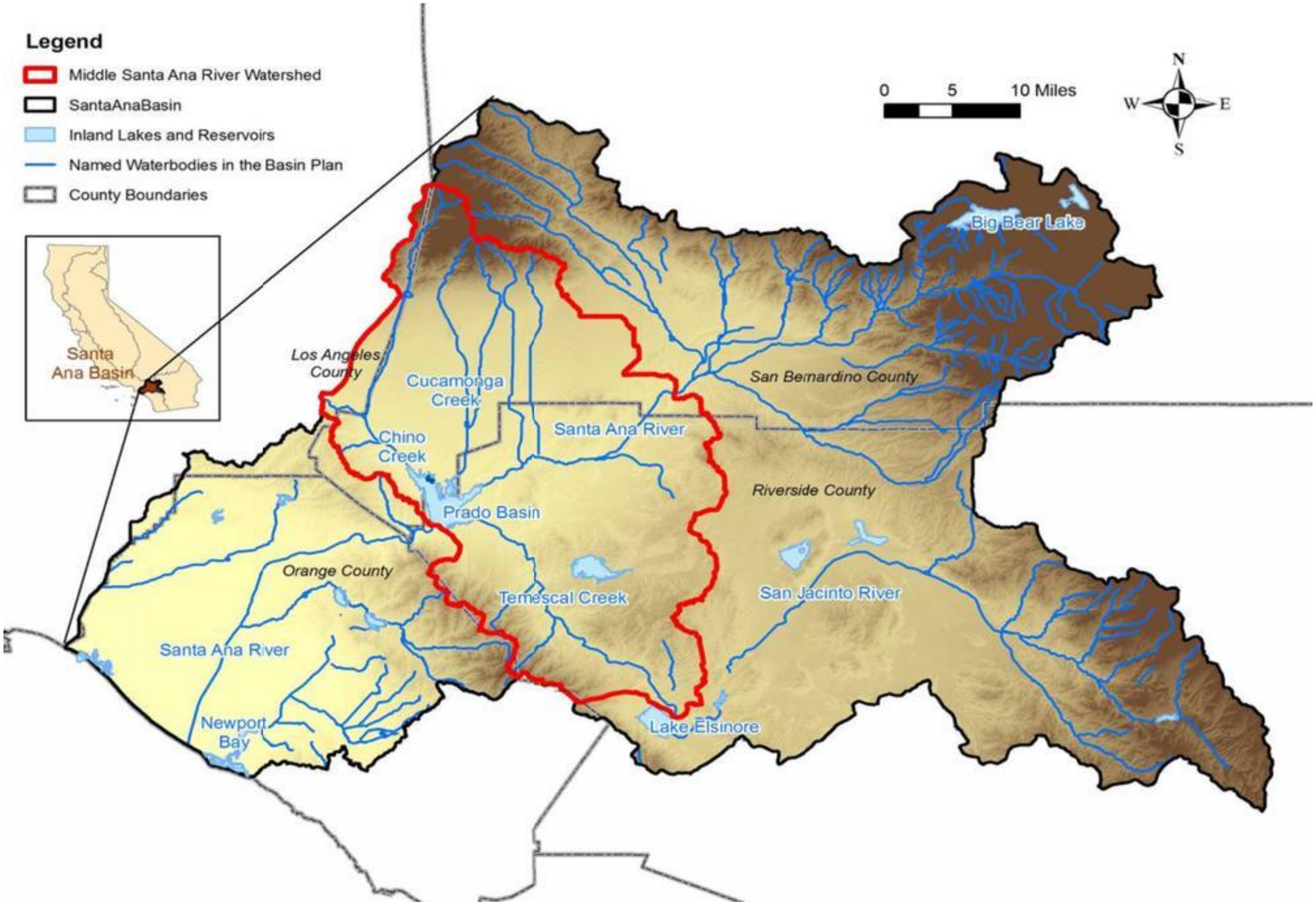

Figure 2-2. Portion of the Santa Ana River Watershed that is the Middle Santa Ana River Watershed and subject to the MSAR Bacteria TMDL.

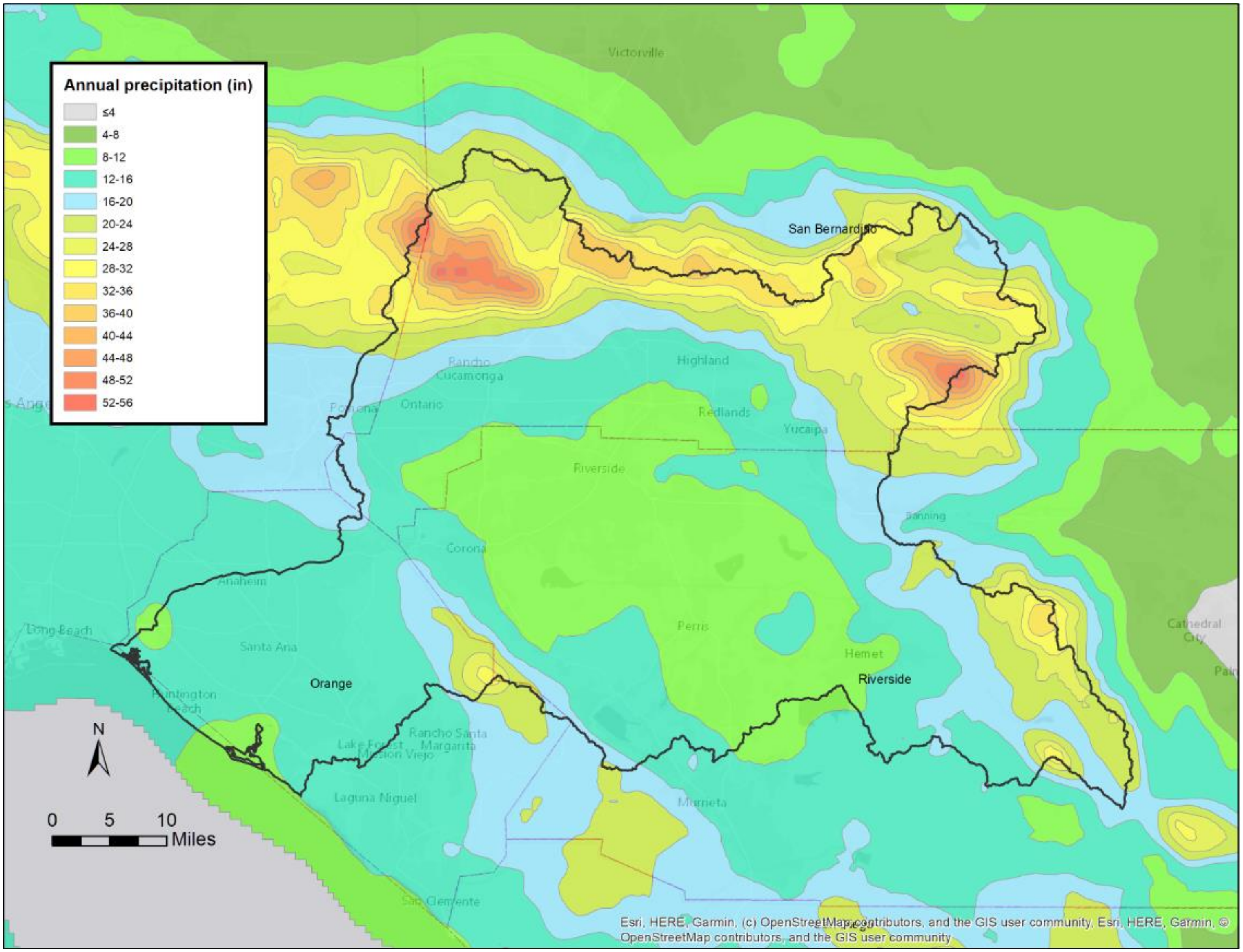

Figure 2-3. Average Rainfall in the Santa Ana River Watershed (Source: 2020-2021 SAR RMP Annual Report).

2.2.2 Surface Water Flow Characteristics

Significant portions of the natural surface flow from rainfall or snowmelt are captured throughout the watershed in reservoirs, stormwater capture basins or water storage facilities. For example, San Bernardino County recently completed an analysis of the number and extent of recharge basins in its area (Santa Ana River above Prado Dam and within Chino Basin). Currently 118 recharge basins are in operation resulting in up to 100% capture of dry weather flows within some subwatersheds that drain to the Santa Ana River.[20]

Treated effluent that meets California Title 22 standards is discharged from several publicly owned treatment works (POTW) to the Santa Ana River, especially in the central portion of the watershed. In some places, e.g., Reach 3 of the Santa Ana River, up to 100% of the flow during dry conditions consists of treated effluent.

2.3 Basin Plan Description

The Basin Plan for the Santa Ana Region identifies beneficial uses for many of the surface waters in the Santa Ana River watershed, including recreational uses (see Table 3-1 in the Basin Plan). Table 3-1 divides the Santa Ana River into six reaches (Figure 2-4):

- Reach 1 – Tidal Prism to 17th Street in Santa Ana.
- Reach 2 – 17th Street in Santa Ana to Prado Dam
- Reach 3 – Prado Dam to Mission Boulevard Bridge
- Reach 4 – Mission Boulevard Bridge to San Jacinto Fault in San Bernardino
- Reach 5 – San Jacinto Fault in San Bernardino to Seven Oaks Dam
- Reach 6 – Seven Oaks Dam to Headwaters

Basin Plan Figure 1-2 also shows the Santa Ana River reach divisions and identifies the wastewater facilities and some major water management facilities associated with each reach.

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[20] Report of Waste Discharge: Application for Renewal of the Municipal NPDES Stormwater Permit
NPDES Permit No. CAS618036 San Bernardino County, San Bernardino County MS4 Program, July 29, 2014

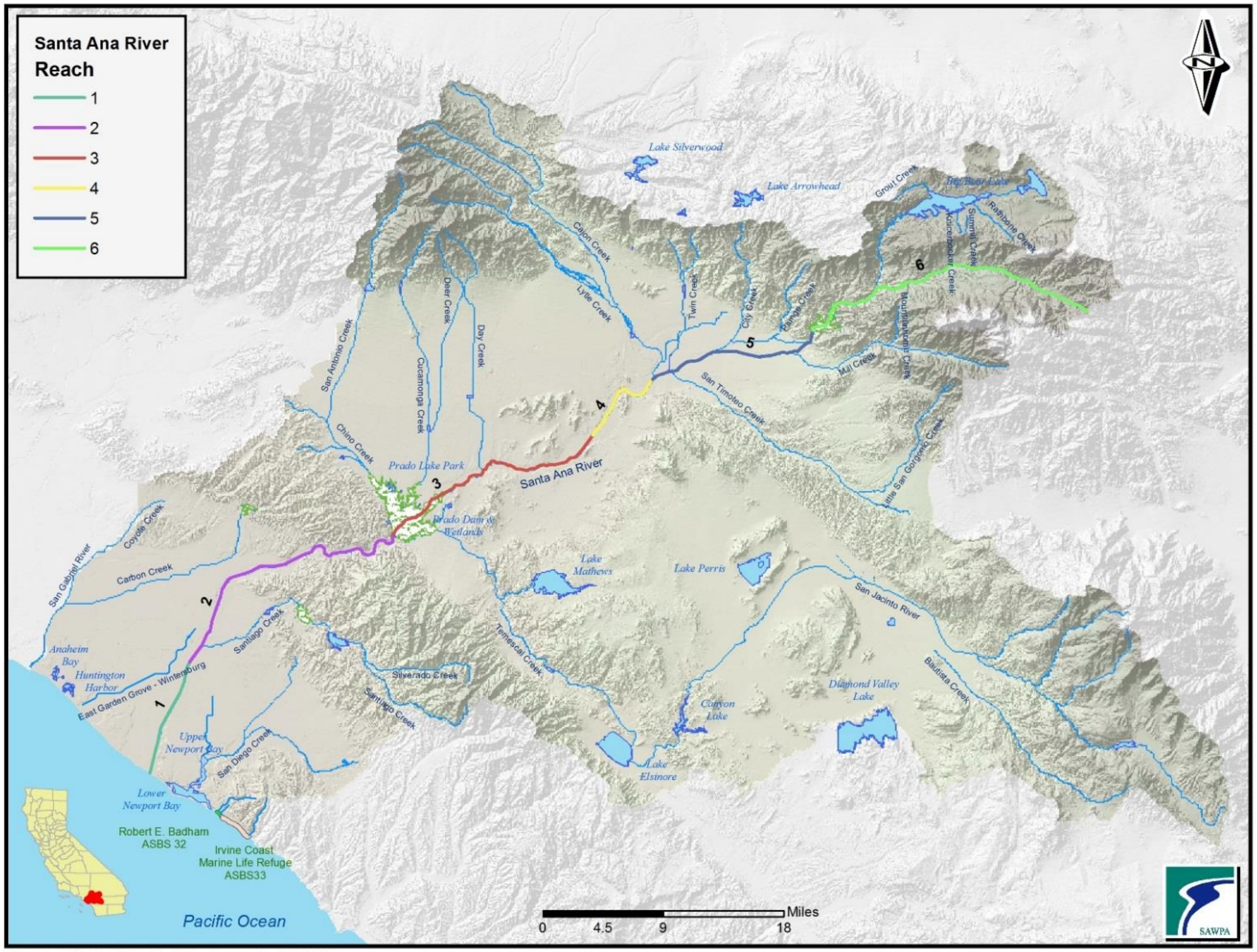

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Figure 2-4. Santa Ana River Reaches established in the Basin Plan for the Santa Ana Region (Source: Santa Ana Watershed Project Authority).

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Section 3

Regional Monitoring Program

Section 1.1 summarized the regulatory background that provides the basis for the establishment of a Santa Ana River watershed RMP to evaluate compliance with bacterial indicator water quality objectives established in the Basin Plan. The BPA established minimum requirements for the RMP. The following sections first provide a rationale and framework for the RMP that is compliant with the BPA. Subsequent sections establish specific monitoring requirements for RMP sites under the SAR Bacteria Monitoring Plan.

3.1 Program Rationale

3.1.1 Overview

One of the principal goals for updating recreational water quality standards in the Santa Ana region was to encourage the most cost-effective allocation of finite public resources. As such, all efforts undertaken to assure compliance with these revised standards should concentrate on projects and programs that are likely to produce the greatest public health benefit. The same philosophy is employed in the ongoing conduct of the RMP to meet new statewide bacteria provisions. This risk-based approach, which is designed to guide all aspects of protecting water contact recreation, provides the foundation for this RMP. Just as it is prudent to prioritize mitigation projects in a manner that assures the greatest public health benefit, it is wise to organize related water quality monitoring efforts along the same lines. To this end, local agencies have developed an RMP based on the priorities and principles described below.

3.1.2 Regional Priorities

The RMP is structured to direct water quality monitoring resources to the highest priority waterbodies. As such, the RMP is designed to:

- Provide the data needed to determine if water quality is safe when and where people are most likely to engage in water contact recreation.
- Facilitate the TMDL implementation process and track progress toward attainment of applicable water quality standards, where water quality is impaired due to excessive bacterial indicator levels.
- Apply a risk-based implementation strategy to allocate public resources in a manner that is expected to produce the greatest public health benefit.

With these considerations in mind, priority waterbodies for monitoring under this RMP are described as follows:

- ***Priority 1***: The first priority is to establish a monitoring program that can determine whether bacteria levels are "safe" at those locations where and when people are most likely to engage in water contact recreation.
- ***Priority 2***: The second priority is to focus monitoring resources on those waterbodies that have been identified as "impaired" due to excessive bacterial indicator concentrations and a TMDL

has already been adopted. Monitoring efforts to evaluate progress toward attainment with the water quality standard in these impaired waters fall with in priority two. This will ensure that the RMP is closely coordinated with TMDL-related sampling efforts.

- ***Priority 3***: The third priority is 303(d)-listed or impaired waterbodies where a TMDL has not yet been developed. For these Priority 3 sites the RMP includes periodic sample collection on an annual basis. Existing priority 3 sites may be removed from the RMP if sufficient data has been obtained to support delisting. New priority 3 sites may be added to the RMP per the direction of the Task Force.

- ***Priority 4***: The fourth priority is to collect the bacteria indicator data needed to implement the antidegradation targets that have been established for waterbodies designated as REC2 only (i.e., the REC1 beneficial use has been de-designated through an approved UAA). Data collection from these Priority 4 waterbodies provides the Santa Ana Water Board with the ability to assess the status and trend of bacterial indicator water quality as part of the normal Triennial Review process.

3.2 Program Framework

The BPA describes the required elements for inclusion in the RMP:[21]

- The designated sampling locations must be selected so as to characterize bacteria concentrations immediately upstream of areas where the greatest level of recreational activity normally occurs;

- The monitoring plan must identify the latitude and longitude of routine sampling location(s), the rationale for selecting each location, other locations considered but rejected, and the agency responsible for collecting and analyzing the sample from each high priority location;

- The monitoring plan must include a proposal for periodic bacteria monitoring of waters designated REC2 only in order to confirm that there is no significant degradation of the quality of these waters;

- Each identified high priority waterbody must be sampled for pathogen indicator bacteria sufficient to provide a minimum of 5 samples per six-week period, year-round, unless documented waterbody conditions (e.g., water temperature, ice on the surface of lakes, high risk of flash flooding, etc.) exist that justify a reduced frequency;

- Bacteria monitoring data must be compatible with the state's Surface Water Ambient Monitoring Program (SWAMP);

- Waterbodies proposed as a high priority for monitoring shall be identified and the rationale for their selection documented;

- Results from the comprehensive bacteria monitoring program must be submitted annually. The agencies implementing the program may submit the report collectively or on an individual basis;

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[21] Page 77 of Attachment 2 to the Santa Ana Water Board Resolution: R8-2012-0001, as corrected

- Data, which are of an appropriate and acceptable data type, must be put into the CEDEN (SWAMP) database and the database maintained by SAWPA; and
- All water quality monitoring for pathogen indicator bacteria must be conducted in accordance with a QAPP that has been approved by the State's Quality Assurance (QA) Officer.

These Basin Plan requirements for a RMP were used as a basis for the development of a monitoring approach for each of the priority categories described in Section 3.1 above. General principles include:

- The most rigorous monitoring should occur in Priority 1 REC1 waterbodies during dry weather conditions. These are the waterbodies and the conditions where the expectation for water contact recreation is the highest. Data collection must occur at a sufficient frequency to demonstrate that these waters are safe for recreation.
- Where a waterbody has an adopted TMDL for bacterial indicators, consider existing monitoring requirements that have already been established to evaluate progress towards achieving attainment with water quality objectives.
- For waterbodies listed as impaired, but no TMDL has been adopted, monitoring should occur periodically to provide additional data regarding the impairment status of these waterbodies.
- Ensure sufficient sample collection from REC2 only waters to assess compliance with antidegradation requirements per the BPA.

These general principles provide the foundation for the development of a monitoring program tailored to meet the specific needs of each of the priority categories described above.

3.3 Regional Monitoring Program

The following sections describe the monitoring sites that have been included in the RMP and the sampling frequency and schedule based on the sites priority designation.

3.3.1 Priority 1

3.3.1.1 Introduction

The purpose of monitoring Priority 1 waters is to assess compliance with REC1 use water quality objectives for *E. coli,* and where required due to high specific conductivity, Enterococci. The potential for human health impacts as a result of exposure to pathogens is highest in these Priority 1 waters where water contact recreational activities are most likely to occur.

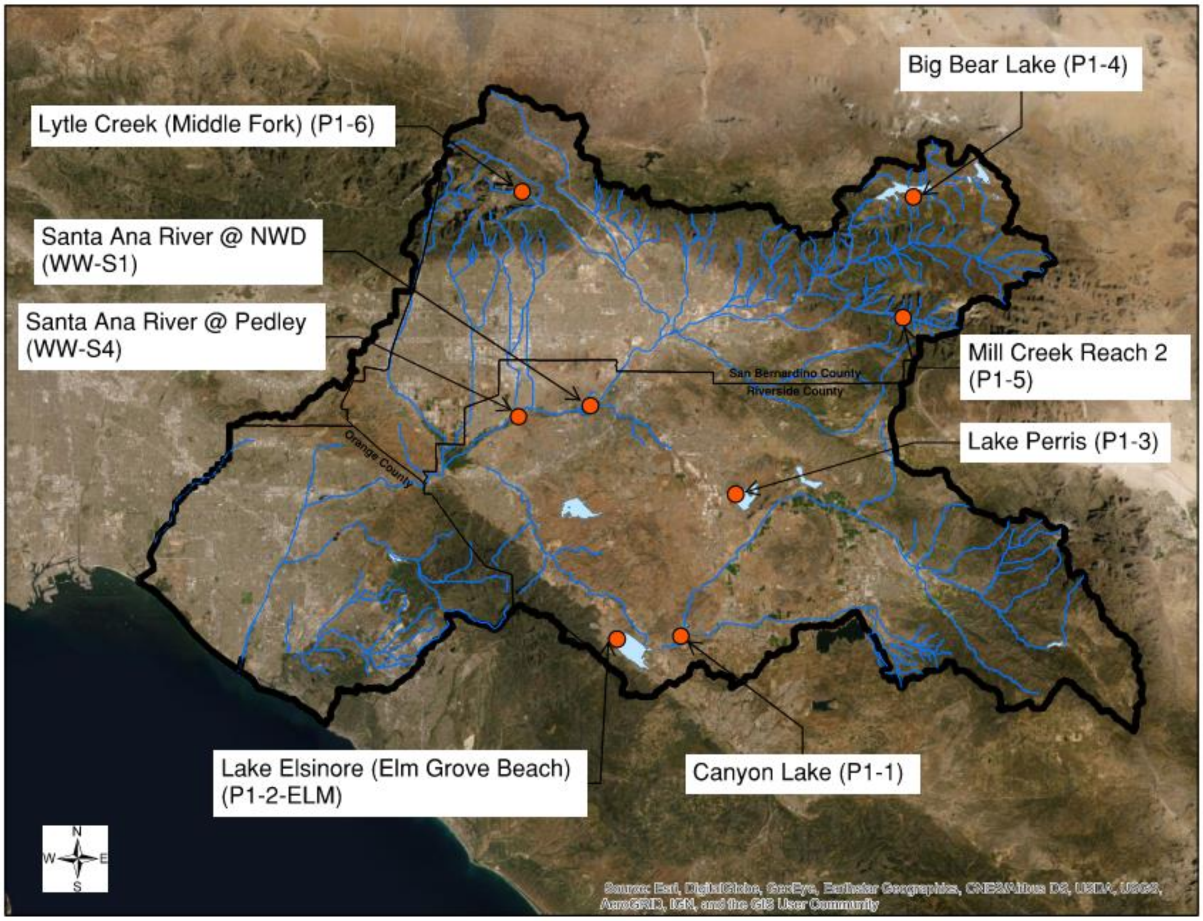
3.3.1.2 Monitoring Sites

Table 3-1 identifies eight monitoring sites as Priority 1 waters. These include four lake sites: Big Bear Lake, Lake Perris, Canyon Lake, and Lake Elsinore; and four flowing water sites: Santa Ana River Reach 3 (two sites), Lytle Creek (Middle Fork) and Mill Creek Reach 2. Eight sample sites were selected to assess water quality on these waterbodies, with one site per waterbody except for Santa Ana River Reach 3 where two stations were selected. Five sites are located in Riverside County and three sites are located in San Bernardino County (Figure 3-1).

The two Priority 1 Santa Ana River sites (MWD Crossing and Pedley Avenue) are also MSAR Bacteria TMDL compliance sites (Table 3-1). Data collected from these Priority 1 sites will also be used for evaluating compliance with the MSAR Bacteria TMDL.

Table 3-1. Priority 1 REC1 Tier A sample sites

Site ID	Site Description	RMP Priority	Latitude	Longitude
P1-1	Canyon Lake at Holiday Harbor	1	33.6808	-117.2724
P1-2-ELM	Lake Elsinore (Elm Grove Beach)	1	33.6664	-117.3356
P1-3	Lake Perris	1	33.8614	-117.1908
P1-4	Big Bear Lake at Swim Beach	1	34.2482	-116.9034
P1-5	Mill Creek Reach 2	1	34.0891	-116.9247
P1-6	Lytle Creek (Middle Fork)	1	34.2480	-117.5110
WW-S1	Santa Ana River Reach 3 at MWD Crossing	1	33.9681	-117.4479
WW-S4	Santa Ana River Reach 3 at Pedley Avenue	1	33.9552	-117.5327



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 3-1. Priority 1 monitoring sites

3.3.1.3 Sample Frequency[22]

Priority 1 sample sites will be sampled weekly during dry weather (defined as no measurable rainfall within a 72-hour period prior to sampling) for a 20-week period during the warmest part of the year between May 1 and September 30. In addition, Priority 1 sample sites will also be sampled during one 5-week period from end of October through most of November each year during the cooler season. The resulting dataset will include 25 samples each year from each site and provide sufficient data to calculate 15 geometric means during the 20-week sample period and one geometric mean during the cool season.

Samples from all Priority 1 sites will be analyzed for *E. coli*. Samples from Lake Elsinore (P1-2) will also be analyzed for Enterococci based on conductivity results from 2016 through 2018, which suggest exceedance of the 1 ppth salinity threshold[23] specified in the Statewide Bacteria Provisions.

Data will be used to evaluate compliance with:

- Statewide bacteria provision for *E. coli* WQO: 5-sample minimum/6-week geometric mean of < 100 organisms/100 mL and not more than 10% of the samples to exceed the statistical threshold value (STV) of 320 organisms/100 mL in a calendar month.
- Statewide bacteria provision for Enterococci WQO: 5-sample minimum/6-week geometric mean of < 30 organisms/100 mL and not more than 10% of the samples to exceed the statistical threshold value (STV) of 110 organisms/100 mL in a calendar month.
- MSAR Bacteria TMDL WLAs for *E. coli*: 5-sample/30-day geometric mean of < 113 organisms/100 mL and not more than 10% of the samples to exceed 212 organisms/100 mL for any 30-day period.

While it is unlikely that ice conditions will occur during each year's cool season sample period, if ice conditions prevent sampling at a Priority 1 site, that finding will be documented on the field form and photo documentation will be provided.

3.3.1.4 Sample Schedule

Table 3-2 provides the Priority 1 site sample schedule for an eight year period from January 1, 2016 through December 31, 2023 (Column – Priority 1). The column "First Week of Sampling" indicates the week when sampling will begin and the column "Last Week of Sampling" indicates the final week of sampling for each multi-week period. The day of sampling in a given week or the time of sampling on a

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[22] The dry weather sampling frequency for the two MSAR Bacteria TMDL sites (Santa Ana River Reach 3) was modified for the RMP in 2016 (see Section 4.1.1 for more information regarding original MSAR Bacteria TMDL watershed-wide compliance monitoring program). This change was made to align existing bacteria monitoring programs and allocate monitoring resources more efficiently.

[23] EPA, in the California Toxics Rule, defined that freshwater quality criteria apply to waters where salinity is less than or equal to 1 ppth (~1400 uS/cm of specific conductivity) 95 or more percent of the time; and salt water criteria apply where salinity in equal to or greater than 10 ppth 95 or more percent of the time; and for waters with salinities in the range between 1 ppth and 10 ppth, the more stringent of saltwater or freshwater criteria apply, unless a scientifically defensible and site specific demonstration is made to show the biology of the waterbody is dominated by freshwater or saltwater aquatic life (Federal Register, V65, No97, May 18 2000). Given this, changes to applicable criteria for inland waters in the SAR region may be developed based on aquatic biology. In the event that such demonstrations are made, this Monitoring Program will be updated to focus on the criteria that are determined to be applicable on a waterbody specific basis.

given day can vary and should be determined in a manner that ensures dry weather conditions exists, uses resources most efficiently, and takes into account constraints such as sample holding times and laboratory sample delivery schedules. The schedule in Table 3-2 may be amended as needed with approval of the Santa Ana Water Board and/or their designee.

3.3.2 Priority 2 – Waterbodies with an Adopted TMDL

3.3.2.1 Introduction

The purpose for monitoring Priority 2 waters is to evaluate attainment of water quality objectives in waters that have an adopted bacteria TMDL. Currently, only one bacteria TMDL has been adopted for inland waters in the watershed: MSAR Bacteria TMDL. Dry weather sampling has been ongoing in these waters since 2007 to satisfy TMDL implementation requirements. This dry weather sampling will continue as described in this section of the RMP; any other monitoring necessary to satisfy the TMDL, e.g., wet weather event sampling, is described in Section 4.

Table 3-2. Sample Schedule for Priority 1 and 2 Waters during Dry Weather Conditions (2016 - 2023)

Year	Sample Season	First Week of Sampling	Last Week of Sampling	Priority 1 Waters	Priority 2 Waters
2016	Warm Season	May 8	September 18	All Table 3-1 Waters	All Table 3-3 Waters
	Cool Season	October 30	November 27	All Table 3-1 Waters	All Table 3-3 Waters
2017	Warm Season	May 7	September 17	All Table 3-1 Waters	All Table 3-3 Waters
	Cool Season	October 29	November 26	All Table 3-1 Waters	All Table 3-3 Waters
2018	Warm Season	May 6	September 16	All Table 3-1 Waters	All Table 3-3 Waters
	Cool Season	October 28	November 25	All Table 3-1 Waters	All Table 3-3 Waters
2019	Warm Season	May 5	September 15	All Table 3-1 Waters	All Table 3-3 Waters
	Cool Season	October 20	November 24	All Table 3-1 Waters	All Table 3-3 Waters
2020	Warm Season	May 10	September 20	All Table 3-1 Waters	All Table 3-3 Waters
	Cool Season	October 18	November 22	All Table 3-1 Waters	All Table 3-3 Waters
2021	Warm Season	May 9	September 20	All Table 3-1 Waters	All Table 3-3 Waters
	Cool Season	October 17	November 22	All Table 3-1 Waters	All Table 3-3 Waters
2022	Warm Season	May 8	September 20	All Table 3-1 Waters	All Table 3-3 Waters
	Cool Season	October 16	November 22	All Table 3-1 Waters	All Table 3-3 Waters
2023	Warm Season	May 7	September 20	All Table 3-1 Waters	All Table 3-3 Waters
	Cool Season	October 15	November 22	All Table 3-1 Waters	All Table 3-3 Waters

3.3.2.2 Monitoring Sites

Monitoring for Priority 2 waters will occur at the same five monitoring sites previously established for evaluating compliance with the numeric targets in the MSAR Bacteria TMDL: Two Santa Ana River Reach 3 sites (@ MWD Crossing and @ Pedley Avenue), and one site each on Mill-Cucamonga Creek, Chino Creek, and Prado Park Lake[24] (Table 3-3; Figure 3-2). As discussed in Section 3.3.1.2, the two Santa Ana River sites are also Priority 1 waters. Figure 3-2 indicates the dual designation for these sites. Except for the Mill-Cucamonga Creek monitoring site, the location of each sample site remains the same as previously sampled under the MSAR Bacteria TMDL. The Mill-Cucamonga Creek site has been moved to take into account changes in the local area, resulting from the completion of the Mill Creek Wetlands. Information regarding the original and new sample sites is provided in Attachment A,

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[24] See Section 4.1.1 for the original basis for the selection of these monitoring sites.

Section A.2.1. A new site in the Santa Ana River at Mission Boulevard Bridge (MISSION) was added to the program for dry weather sampling only to represent upstream flow from Reach 4 to Reach 3 that has been demonstrated to be entirely from POTW effluent discharge. Bacteria measured at MISSION provide an estimate of in-stream sources because there are no external loads during dry weather.

Table 3-3. Priority 2 Sample Sites (Note that WW-S1 and WW-S4 sites are also Priority 1 sites)

Site ID	Site Description	RMP Priority	Latitude	Longitude
WW-M6	Mill-Cucamonga Creek below Wetlands	2	33.9268	-117.6250
WW-C7	Chino Creek at Central Avenue	2	33.9737	-117.6889
WW-C3	Prado Park Lake	2	33.9400	-117.6473
WW-S1	Santa Ana River Reach 3 at MWD Crossing	1,2	33.9681	-117.4479
WW-S4	Santa Ana River Reach 3 at Pedley Avenue	1,2	33.9552	-117.5327
MISSION	Santa Ana River at Mission Blvd. Bridge	NA*	33.9906	-117.3951

* Additional mainstem sampling site was added beginning the 2020-2021 sampling season to support source tracking analysis.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 3-2. Priority 2 Monitoring Sites (note that the two monitoring sites on the Santa Ana River are also Priority 1 sites, see text for explanation)

3.3.2.3 Dry Weather Sample Frequency

The sampling frequency during dry weather (defined as no measurable rainfall within a 72-hour period prior to sampling) for Priority 2 waters is the same as described for Priority 1 waters.

3.3.2.4 Sample Schedule

The sample schedule for Priority 1 and 2 waters is the same. See discussion in Section 3.3.1.4 and refer to Table 3-2 for the sample schedule for these waters.

3.3.3 Priority 3 – 303(d) Listed Waterbodies without Adopted TMDL

3.3.3.1 Introduction

Priority 3 waters are those that have been listed as impaired for bacterial indicators and have been placed on the state's 303(d) List, but do not have an adopted TMDL. The most recent EPA-approved list of impaired waters is based on the State Water Board's 2018 Integrated Report[25]. These waters can be removed from the 303(d) List (per the requirements of the State Water Board's Listing Policy) if water quality data indicate that removal from the list is appropriate; otherwise, a TMDL will be established for Priority 3 waters in the future. The purpose for monitoring these waters is to gather data to support eventual regulatory decisions regarding the degree of impairment in each Priority 3 waterbody (e.g., to support a delisting decision). For some waters, monitoring will stop because sufficient data has been collected to support the Regional Board decisions in the 2022 water quality assessment in Santa Ana region. The Task Force will coordinate with the Regional Board to interpret the long-term data from all priority 3 monitoring locations and identify potential delisting or supplemental monitoring needs to support water quality improvement efforts.

3.3.3.2 Monitoring Sites

In the Santa Ana River watershed, 23 waterbodies are currently on the 303(d) List with no adopted TMDL: fourteen in Orange Count, two in Riverside County, and seven in San Bernardino County (Table 1.1). The following waterbodies have not been included in this RMP as Priority 3 waterbodies for the following reasons:

- The 303(d) listing for Knickerbocker Creek in San Bernardino County is being addressed through that county's MS4 Permit (R8-2010-0036); recent studies have shown that impairment is due to wildlife concentration.
- Mill Creek Reach 1 is an old listing and there is no data available that provides the original basis for its current listing as impaired. In addition, this reach is designated with an intermittent REC1 beneficial use and a recent reconnaissance found no surface water. Given the likelihood that REC1 activity would be limited in this reach and more likely to occur in the upstream Reach 2, this waterbody was not included as a Priority 3 waterbody.
- Mountain Home Creek and Mountain Home Creek, East Fork listings are based on outdated data.
- Huntington Harbour, Seal Beach, Little Corona del Mar, and Newport Slough are marine waters and are not included in the RMP.
- Lake Fulmor (P3-RC2) and Santa Ana River Reach 2 (P3-OC10), Temescal Creek Reach 6, Lytle Creek, Mill Creek Reach 2 and Canyon Lake were delisted from the 2014/2016 303(d) List of Impaired Waters and have been removed from the monitoring program beginning with the 2019-2020 monitoring period.

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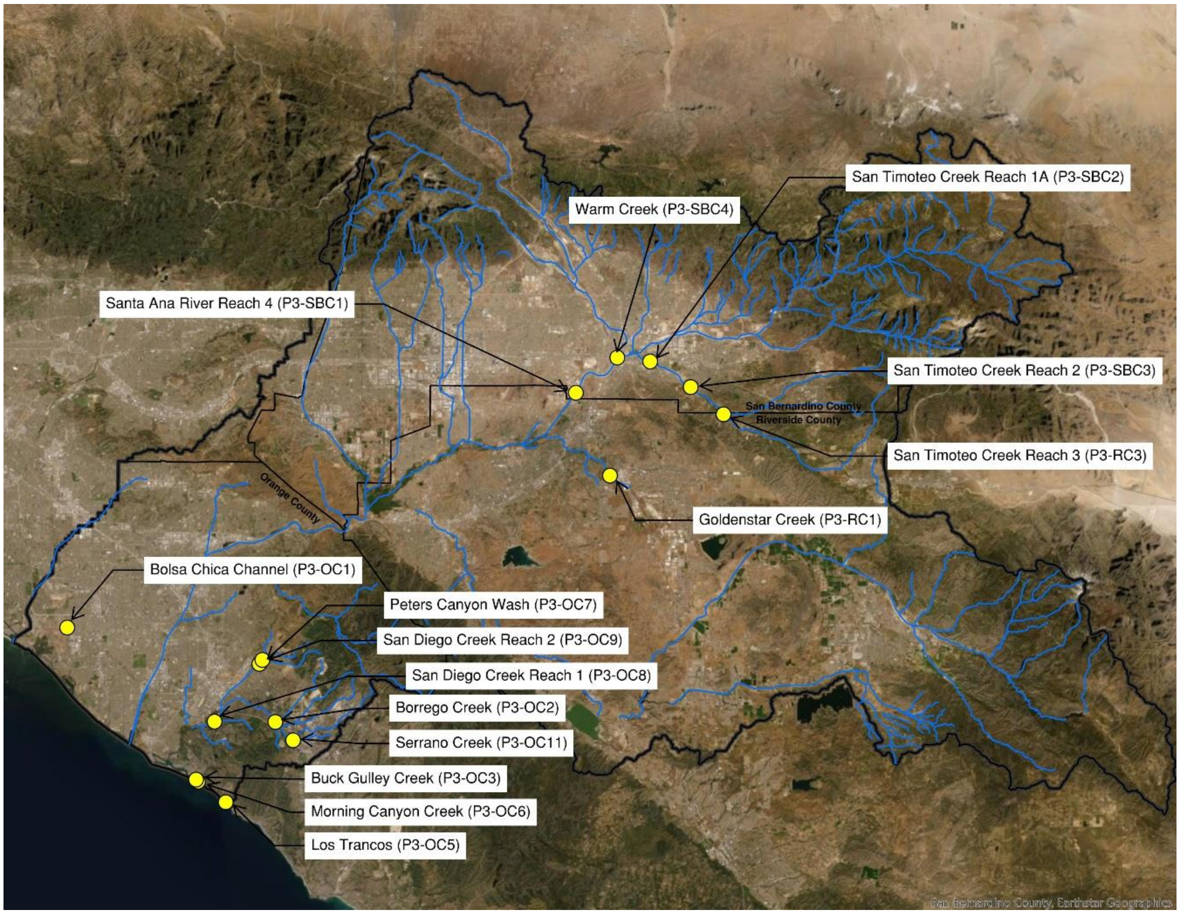
[25] The final list which includes waterbodies added to the list by EPA Region 9 is found here: https://www.waterboards.ca.gov/water_issues/programs/water_quality_assessment/2018_integrated_report.html

Figure 3-3 shows the general monitoring location for each of the remaining water bodies in each county. Selection of a sample site for each waterbody relied on the following criteria:

- One sample site per waterbody, unless there is a compelling need for a second site, e.g., significant differences exist in the waterbody's characteristics in different reaches;
- Site should be close to areas of existing or potential water contact recreational activities;
- For sites near the Pacific Ocean, site is upstream of the tidal prism; and
- If possible, maintain historical monitoring site.



San Bernardino County, Earthstar Geographics

Figure 3-3. Priority 3 Monitoring Sites by County within the Santa Ana River watershed

3.3.3.3 Sample Frequency

Water quality samples will be collected during dry weather (defined as no measurable rainfall within a 72-hour period prior to sampling) according to the schedule in Table 3-5. The sampling frequency for each site is collect a minimum of 5 weekly samples over six-week increments as specified in Table 3-5. The overall sample schedule for these sites overlaps with the Priority 1 & 2 sample site schedule to maximize efficiency with the collection of samples. The resulting dataset for these sites will consist of a minimum of five samples per year from each site. Data from each year from 2019 through 2023 will represent a different five- or six-week period. Table 3-4 shows all of the Priority 3 sites that have been included in the RMP along with the 303(d) listing justification

For sites where 50 percent or more of the conductivity results from 2016 through 2018 suggest exceedance of the 1 ppth salinity threshold specified in the Statewide Bacteria Provisions, samples will be analyzed for Enterococci in addition to *E. coli*. This includes:

- Riverside County: Goldenstar Creek (P3-RC1)
- Orange County: Los Trancos Creek (P3-OC5) and Morning Canyon Creek (P3-OC6)

3.3.3.4 Sample Schedule

To establish a sample schedule for Priority 3 waters, the waterbodies were organized into five groups. The placement of a waterbody into a group was based on geography, input from the counties and responsibility for sampling. This grouping will also help facilitate sample delivery to laboratories to meet six hour holding time requirements for bacterial indicator samples.

Table 3-4. Priority 3 Sample Sites and the Basis for 303(d) Listing

Site ID	Site Description	Latitude	Longitude	Frequency of *E. coli* Exceedance[1,2]	Comments[2]
P3-OC1	Bolsa Chica Channel upstream of Westminster Blvd/Bolsa Chica Rd	33.75958	-118.04295	*E. coli* 49/63	Based on Orange County Coastkeeper Coastal (OCC) Watersheds Project Report. Data collected between March 31, 2004 and March 30, 2006 from two sites: "bc1" – in Cypress in the upper Bolsa Chica Channel at Warland Street Bridge; "bc2" – in Huntington Beach in the lower Bolsa Chica Channel at the intersection of Bolsa Chica Rd. and Rancho Rd.
P3-OC2	Borrego Creek upstream of Barranca Parkway	33.65457	-117.73213	*E. coli* 37/43	Based on OCC Coastal Watersheds Project Report. Data collected between March 11, 2004 and March 29, 2006 from two sites: "bor1" – in Foothill Ranch in upper Borrego Channel on Town Center Dr.; "bor2" – in Irvine in the lower Borrego Channel on Barranca Pkwy next to the train station.
P3-OC3	Buck Gully Creek Little Corona Beach at Poppy Avenue/Ocean Blvd[3]	33.59000	-117.86841	*E. coli* 23/68	303(d) list states that listing is for reach downstream of Pacific Coast Highway; state website states that listing decision made prior to 2006 and there is no information in state assessment database. However, OCC database shows two sites labeled "bg1" 'and "bg2" that were sampled from March 8, 2004 to April 13, 2006 (exceedance frequency in this table based on those results); no information in OCC database regarding where sites are located.
P3-OC5	Los Trancos Creek at Crystal Cove State Park[3]	33.57601	-117.84062	Fecal coliform 5/9	303(d) list states that listing is for reach downstream of Pacific Coast Highway; state website states that listing decision made prior to 2006 and there is no information in state assessment database. However, data obtained from Regional Board shows three sample locations sampled for fecal coliform in July and September in 2000. All exceedances (5 of 9) occurred at a sample site adjacent to the most upstream golf cart bridge of the Pelican Hill Golf Course.
P3-OC6	Morning Canyon Creek at Morning Canyon Beach[3]	33.58759	-117.86575	*E. coli* 17/61	Based on OCC Coastal Watersheds Project. Data collected between March 8, 2004 and April 10, 2006 from two sites: "mc1" – in Newport Beach in the upper part of Morning Canyon Creek at Surrey street; "mc2" – in Newport Beach in the lower part of Morning Canyon Creek at Morning Canyon Beach.
P3-OC7	Peters Canyon Wash downstream of Barranca Parkway	33.69076	-117.82404	*E. coli* 40/66	Based on OCC Coastal Watersheds Project. Data collected between March 9, 2004 and March 29, 2006 from two sites: "pc1" – in Irvine in upper Peter's Canyon Channel on Bryan Street between Jamboree Rd. and Culver Dr.; "pc2" – in Irvine in lower Peter's Canyon Channel on Barranca Pkwy between Jamboree Rd. and Harvard Ave.
P3-OC8	San Diego Creek downstream of Campus Drive (Reach 1)	33.65530	-117.84535	*E. coli* 33/84	State website states that listing decision made prior to 2006 and there is no information in state assessment database. However, based on OCC Coastal Watersheds Project, data was collected between October 22, 2002 and June 21, 2004 from three sites: "sd4", "sd5", and "sd6". Exceedance frequency shown in this table is from OCC report; no information available on specific sample locations.

Table 3-4. Priority 3 Sample Sites and the Basis for 303(d) Listing

Site ID	Site Description	Latitude	Longitude	Frequency of *E. coli* Exceedance[1,2]	Comments[2]
P3-OC9	San Diego Creek at Harvard Avenue (Reach 21)	33.688033	-117.818685	*E. coli* 31/64	Based on OCC Coastal Watersheds Project. Data collected between October 22, 2002 and June 21, 2004 from three sites: "sd1" – Bake Parkway, site is located off of Irvine Center Dr. on the right hand side before Wild Rivers water park; "sd2" – 133 Fwy, the 133 Fwy is located off of Pacifica and Alton in the dead end down the ramp in the riverbed; and "sd3"- Sand Canyon, site is located off of the 405 Fwy at Sand Canyon Avenue past Alton at the bridge on the NE corner of Barranca and Sand Canyon Avenue.
P3-OC11	Serrano Creek upstream of Barranca/Alton Parkway	33.64870	-117.72442	*E. coli* 35/68	Based on OCC Coastal Watersheds Project. Data collected between March 11, 2004 and March 29, 2006 from two sites: "ser1" – in Forest Grove in the upper Serrano Channel in Trabuco Rd and Peachwood under the bridge; "ser2" – in Irvine in the lower Serrano Channel, next to the Alton/Barranca intersection.
P3-RC1	Goldenstar Creek at Ridge Canyon Drive	33.8964	-117.3586	*E. coli* 19/79	Based on OCC Coastal Watersheds Project. Data collected between October 29, 2002 and June 3, 2004 from three sites: "gs1" – near the intersection of Van Buren Boulevard and Wood Road in City of Riverside; "gs2" – located at the end of Ridge Run Road in City of Riverside; and "gs3" – downstream of Golden Star Creek Road in City of Riverside. Exceedances at gs1 and gs2 only.
P3-RC3	San Timoteo Creek Reach 3	34.0025	-117.1645	*E. coli* 30/43	This site was added during the 2014/16 303(d) Listing. Data was collected from 2008-2009 with 30/43 samples exceeding the geomean target of 126 org/100 mL and 31/58 exceeding the single sample target of 235 org/100 mL.
P3-SBC1	Santa Ana River Reach 4 above S. Riverside Avenue Bridge	34.0248	-117.3628	Data unavailable	State website states that listing decision made prior to 2006 and there is no information in state assessment database.
P3-SBC2	San Timoteo Creek Reach 1A	34.0615	-117.2629	*E. coli* 30/42	This site was added during the 2014/16 303(d) Listing. Data was collected from 2008-2009 with 30/42 samples exceeding the geomean target of 126 org/100 mL and 38/57 exceeding the single sample target of 235 org/100 mL.
P3-SBC3	San Timoteo Creek Reach 2	34.0328	-117.2089	*E. coli* 35/35	This site was added during the 2014/16 303(d) Listing. Data was collected from 2008-2009 with 35/35 samples exceeding the geomean target of 126 org/100 mL and 45/52 exceeding the single sample target of 235 org/100 mL.
P3-SBC4	Warm Creek	34.0646	-117.3072	*E. coli* 42/70	This site was added during the 2014/16 303(d) Listing. Data was collected from 2008-2009 with 42/70 samples exceeding the geomean target of 126 org/100 mL and 49/102 exceeding the single sample target of 235 org/100 mL.

[1] X/Y = First number is the number of exceedances; the second number is the number of samples.

[2] Source for information regarding exceedances is (a) the State Water Board's website for 2010 Integrated Report: http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/category5_report.shtml (find the relevant waterbody and click on the specific pollutant for summary of available data and listing history.; (b) Santa Ana River Citizen Monitoring Project Final Report ("Orange County Coastkeeper Coastal Watersheds Project", November 2004); (c) the State Water Board's website for 2014/16 Integrated Report: https://www.waterboards.ca.gov/water_issues/programs/tmdl/2014_16state_ir_reports/category5_report.shtml.

[3] Although located in Orange County, the City of Newport Beach is responsible for monitoring at Buck Gully Creek, Los Trancos Creek, and Morning Canyon Creek.

Table 3-5 documents when each Priority 3 Group of monitoring sites is scheduled to be sampled. In the first year of implementation, Groups 1 through 5 will be sampled in order over the five Priority 3 monitoring events that occur in coordination with Priority 1 and 2 sampling site events. In subsequent years, the order of groups varies so that the Group's assigned five-week sample period varies over the long-term (e.g., varying dates during warm or cool seasons).

Table 3-5. Target Sample Schedule for Priority 3 Waters during Dry Weather Conditions (2020 - 2023)

Year	First Week of Sampling	Last Week of Sampling	Priority 3 Waters
2020	May 10	November 29	Group 4: Santa Ana River Reach 4
	May 10	June 7	Group 5: Goldenstar Creek
	June 14	July 12	Group 6: Warm Creek, San Timoteo Creek
	July 19	August 16	Group 2: Borrego Creek, Serrano Creek
	August 23	September 20	Group 3: Los Trancos Creek, Morning Canyon Creek, Buck Gully Creek
	October 25	November 29	Group 1: Bolsa Chica Channel
2021	June 13	July 11	Group 4: Santa Ana River Reach 4
	June 13	July 11	Group 5: Goldenstar Creek
	TBD	TBD	Group 1: Bolsa Chica
	August 22	September 19	Group 6: Warm Creek, San Timoteo Creek
	August 15	September 19	Group 2: Serrano Creek
2022	July 10	August 7	Group 1: Bolsa Chica
	August 14	September 11	Group 4: Santa Ana River Reach 4
	August 14	September 11	Group 5: Goldenstar Creek
	July 10	August 7	Group 6: Warm Creek, San Timoteo Creek
	May 29	June 26	Group 2: Serrano Creek
2023	May 21	June 18	Group 1: Bolsa Chica
	July 2	July 30	Group 5: Goldenstar Creek
	July 2	July 30	Group 4: Santa Ana River Reach 4
	May 14	June 11	Group 6: Warm Creek, San Timoteo Creek
	July 9	August 13	Group 2: Serrano Creek

3.3.4 Priority 4 – REC2 Only Waterbodies

3.3.4.1 Introduction

Priority 4 waters are those where the REC1 beneficial use has been removed as a result of an approved UAA. The applicable *E. coli* or Enterococci water quality objectives for these waters are based on antidegradation targets established by the BPA[26]. Currently, there are four waterbodies with REC2 designations only as a result of an approved UAA (Table 3-6): Temescal Creek (Reaches 1a and 1b, Riverside County), Santa Ana Delhi Channel (Tidal Prism and Reaches 1 and 2, Orange County); Greenville-Banning Channel (Tidal Prism, Orange County), and Cucamonga Creek (Reach 1, San Bernardino County).

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[26] The BPA presents antidegradation targets and describes the statistical methodology employed to develop the numeric values. In short, historical data was fitted to a lognormal distribution, and the 75th percentile of the fitted lognormal distribution was selected as the antidegradation target. Accordingly, the 75th percentile of the fitted log-normal distribution for a newly acquired dataset with comparable spatial (within reach) and temporal (seasonal) variability, should be less than or equal to that of the historical dataset.

3.3.4.2 Monitoring Sites

The monitoring sites for each Priority 4 waterbody are as follows (see Section A.4 in Attachment A for additional location information):

- *Santa Ana Delhi Channel* – The Santa Ana Delhi Channel has two reaches that are REC2 only: (a) Reach 2 is within the City of Santa Ana, Orange County, CA and extends from Sunflower Avenue upstream to Warner Avenue, a distance of approximately 1 mile; (b) Reach 1 is within the cities of Costa Mesa and Newport Beach, CA and extends from the tidal prism upstream to Sunflower Avenue, a distance of approximately 2.5 miles. Two monitoring sites have been selected for the Santa Ana Delhi Channel to provide sample results from freshwater and tidal prism area: (a) Upstream of Irvine Avenue; and (b) within the tidal prism at the Bicycle Bridge (Figure 3-4) (see Attachment A, Section A.4.1 for site-specific information).

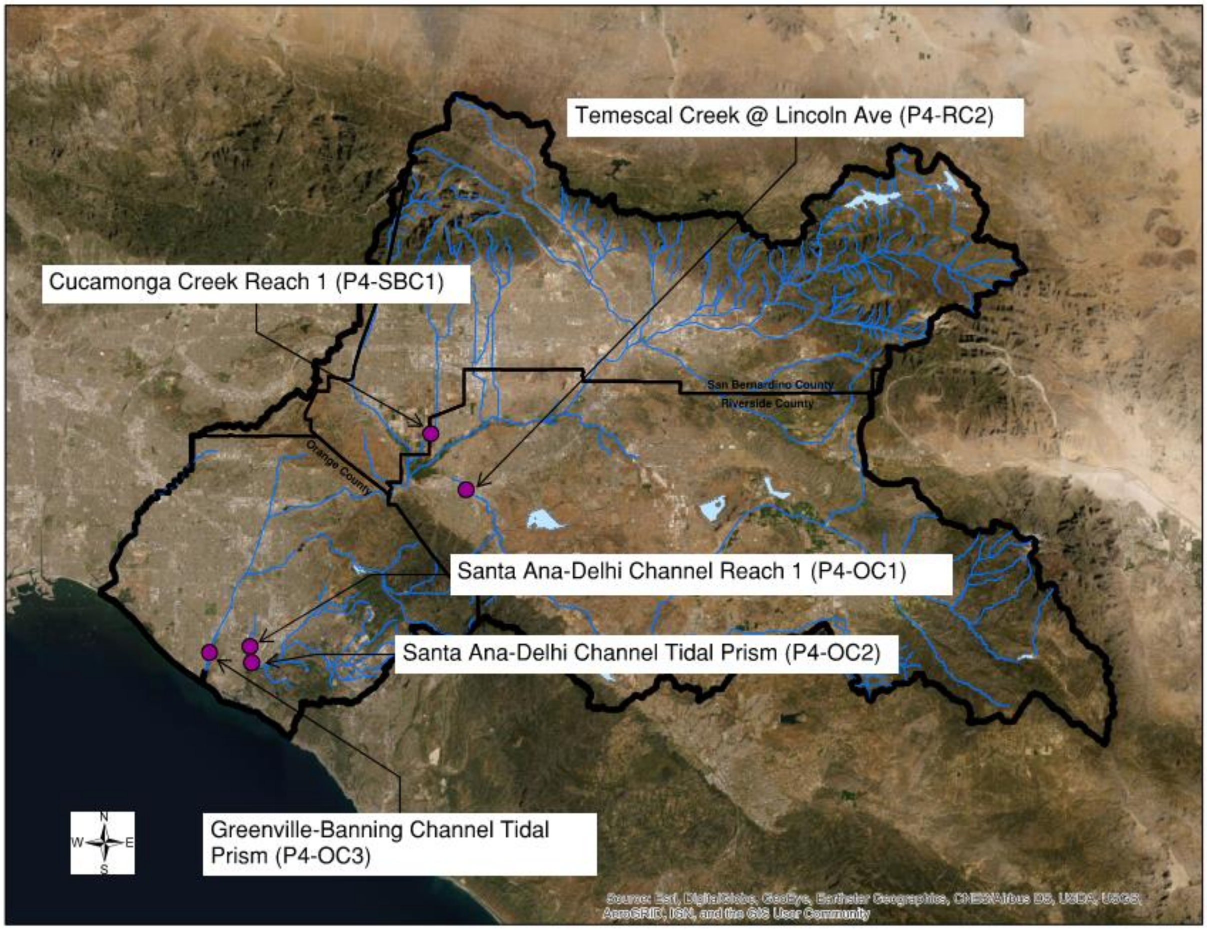
- *Greenville-Banning Channel Tidal Prism Segment*– This segment of the Greenville-Banning channel is designated REC2 only. It begins at its confluence with the Santa Ana River and extends upstream approximately 1.2 mile to the inflatable rubber dam operated by the Orange County Public Works Department. The monitoring site is located at an access ramp approximately 60 meters downstream of the trash boom below the rubber diversion dam (see Attachment A, Section A.4.1 for site-specific information).

- *Temescal Creek* – Temescal Creek has two reaches that are REC2 only: (a) Reach 1a is within the City of Corona, Riverside County and extends from Lincoln Avenue to confluence with Arlington Channel, a distance of approximately 3 miles; (b) Reach 1b within City of Corona and extends from Arlington Channel confluence to 1400 feet upstream of Magnolia Avenue (City of Corona). The monitoring site for Temescal Creek is located upstream of Lincoln Avenue (see Attachment A, Section A.4.2 for site-specific information).

- *Cucamonga Creek Reach 1* – Cucamonga Creek Reach 1 extends from the confluence with Mill Creek in the Prado area to near 23rd Street in the City of Upland. The monitoring site for Cucamonga Creek Reach 1 is at Hellman Road (See Attachment A, Section A.4.3 for site-specific information).

Table 3-6. Priority 4 Sample Sites

Site ID	Site Description	RMP Priority	Latitude	Longitude
P4-RC2	Temescal Creek at Lincoln Avenue	4	33.8941	-117.5772
P4-OC1	Santa Ana Delhi Channel Upstream of Irvine Avenue	4	33.6602	-117.8810
P4-OC2	Santa Ana Delhi Channel in Tidal Prism	4	33.6529	-117.8837
P4-OC3	Greenville-Banning Channel in Tidal Prism	4	33.6594	-117.9479
P4-SBC1	Cucamonga Creek at Hellman Avenue	4	33.9493	-117.6104



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 3-4. Priority 4 Monitoring Sites by County within the Santa Ana River watershed.

3.3.4.3 Sample Frequency

Water quality samples will be collected at different frequencies based on site, as follows:

Temescal Creek (P4-RC2), Santa Ana Delhi Channel (P4-OC1 and P4-OC2), Greenville-Banning Channel (P4-OC3), Cucamonga Creek (P4-SBC1): once per year during dry weather. Samples will be analyzed for *E. coli* or Enterococci to determine if the result exceeds the antidegradation target threshold value for the site (equal to the 75th percentile of the lognormal distribution fitted to historical data). If an exceedance of the antidegradation target is observed at the Riverside County or Orange County Priority 4 sites, additional bacterial indicator samples will be collected once/month for the three following months. If any of the follow-up samples exceed the antidegradation target, then sampling will continue on a monthly basis until source(s) of the increased bacterial indicators is identified and mitigated and bacteria levels return to below the antidegradation target in three of four samples collected over three consecutive months.

3.3.4.4 Sample Schedule

The annual dry weather sample will be collected during the summer season (June 21 to September 21) when REC2 activities are most likely to occur. If additional sampling is required due to an observed exceedance, the schedule will be determined based on the requirements of Section 3.3.4.3.

3.4 Constituents to Monitor at Priority Sites

Table 3-7 summarizes the constituents to be measured or analyzed during each dry weather condition sampling event. Field parameter data (temperature, pH, dissolved oxygen, conductivity, and turbidity) will be collected as described in Section 5.7. Water samples will be collected for analysis of *E. coli* and/or Enterococci and total suspended solids (TSS), as described in Section 5.3.

Table 3-7. Constituents to be monitored during dry weather conditions at all sample sites

Priority Sites	Parameter	Field or Laboratory	Units	Data Collection or Analytical Methods	Target Report Limits
All sites	Temperature	Field	°C	Water Quality Sonde (e.g., YSI or equivalent)	NA
All sites	pH	Field	Standard Units	Water Quality Sonde (e.g., YSI or equivalent)	NA
All sites	Dissolved Oxygen	Field	mg/L	Water Quality Sonde (e.g., YSI or equivalent)	NA
All sites	Conductivity	Field	mS/cm	Water Quality Sonde (e.g., YSI or equivalent)	NA
All sites	Turbidity	Field	Nephelometric Turbidity Units (NTU)	Water Quality Sonde (e.g., YSI, Hach or equivalent)	NA
All sites except P4-0C2 & P4-OC3	*E. coli*	Laboratory	cfu/100 mL	EPA 1603	Varies[1]
			MPN/100 mL	SM 9223B IDEXX 18HR	Varies[1]
P1-2; P3-RC1; P3-OC5; P3-OC6; P4-OC2; P4-OC3 only	Enterococci[2]	Laboratory	cfu/100 mL	EPA 1600 IDEXX Enterolert	Varies[1]
All sites	TSS	Laboratory	mg/L	SM 2540D	0.5 mg/L

[1] The target reporting limits are dependent on analytical methods and sample dilutions conducted by laboratories

[2] EPA, in the California Toxics Rule, defined that freshwater quality criteria apply to waters where salinity is less than or equal to 1 ppth (~1400 uS/cm of specific conductivity) 95 or more percent of the time; and salt water criteria apply where salinity in equal to or greater than 10 ppth 95 or more percent of the time; and for waters with salinities in the range between 1 ppth and 10 ppth, the more stringent of saltwater or freshwater criteria apply, unless a scientifically defensible and site specific demonstration is made to show the biology of the waterbody is dominated by freshwater or saltwater aquatic life (Federal Register, V65, No97, May 18 2000). Given this, changes to applicable criteria for inland waters in the SAR region may be developed based on aquatic biology. In the event that such demonstrations are made, this Monitoring Program will be updated to focus on the criteria that are determined to be applicable on a waterbody specific basis.

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Section 4

TMDL Monitoring Programs

4.1 Middle Santa Ana River Bacteria TMDL

Section 1.1.2 provides the regulatory background for the adoption of the MSAR Bacteria TMDL and describes the formation of the MSAR TMDL Task Force to focus and coordinate TMDL implementation activities among stakeholders - in particular, coordination of required monitoring activities. In addition, the Riverside and San Bernardino County MS4 permittees, Los Angeles County MS4 permittees (Cities of Claremont and Pomona), and agricultural operators named as responsible parties in the TMDL have been implementing monitoring activities required by the TMDL.

As noted in Section 1.1.2, a Monitoring Plan to support MSAR bacteria monitoring activities was first established in 2007 and has been amended as needed to support TMDL implementation activities. This SAR Bacteria Monitoring Plan replaces the existing MSAR Bacteria TMDL Monitoring Plan. Existing TMDL monitoring activities that are consistent with the purpose of the RMP have been incorporated into Section 3 as needed (in particular see monitoring activities for Priority 1 and 2 waterbodies in Sections 3.3.1 and 3.3.2, respectively). Monitoring activities that are specifically required to support TMDL implementation, but are not elements of the RMP, are incorporated into this Section and described below.

4.1.1 Watershed-wide Compliance Monitoring

The TMDL required the establishment of a watershed-wide compliance monitoring program to measure compliance with numeric targets established by the TMDL, which were derived from Basin Plan objectives established to protect the REC1 beneficial use. This program was initiated in 2007 and is ongoing. The MSAR Bacteria TMDL requires that bacterial indicator samples be collected under both dry and wet weather conditions. Following is an historical overview of the compliance monitoring program, the basis for selection of dry and wet weather monitoring sites, and how this program has been incorporated into this RMP.

4.1.1.1 Dry Weather Monitoring

Monitoring Sites

Two key factors were used to select the dry weather watershed-wide compliance monitoring sites established in 2007:

- Sites should be located on waterbodies that are impaired and thus incorporated into the MSAR Bacteria TMDL; and
- Sites should be located in reaches of the impaired waterbodies where REC1 activity is likely to occur, i.e., there is an increased risk from exposure to pathogens.

Using the impaired waters list (as approved in 2007), recreational use data developed by the SWQSTF, and recommendations from Santa Ana Water Board staff, six sites were selected for watershed-wide compliance monitoring during the dry season (Table 4-1).

Table 4-1. MSAR Bacteria TMDL Watershed-wide Compliance Monitoring Sites established in 2007

Site ID	Site Description	Longitude	Latitude
WW-C1	Icehouse Canyon Creek (*)	-117.6290	34.2604
WW-C3	Prado Park Lake at Lake Outlet	-117.6473	33.9400
WW-C7	Chino Creek at Central Avenue	-117.6884	33.9737
WW-M6	Mill-Cucamonga Creek below Wetlands	-117.6250	33.9268
WW-S1	Santa Ana River Reach 3 @ MWD Crossing	-117.4479	33.9681
WW-S4	Santa Ana River Reach 3 @ Pedley Ave	-117.5327	33.9552

[*] Icehouse Canyon Creek was removed from the Watershed-wide Compliance Monitoring Program in 2009.

By mutual agreement between the Santa Ana Water Board and MSAR Task Force, one site, Icehouse Canyon Creek, was removed from this list of dry weather watershed-wide compliance monitoring sites prior to the start of the 2009 dry season monitoring program.

All of the sample sites in Table 4-1 were either recommended as watershed-wide compliance monitoring sites in the TMDL or located very close to a recommended site. The rationale for not including other sites recommended in the TMDL was as follows:

- *Temescal Wash at Lincoln Avenue* – This waterbody was incorporated into the USEP because it is a potential urban source of bacteria to an impaired waterbody (Santa Ana River Reach 3) (see Section 4.1.2 below regarding USEP Monitoring Program). Also, Temescal Wash itself is not listed as impaired and therefore not subject to MSAR Bacteria TMDL requirements.

- *Tequesquite Arroyo at Palm Avenue* – This site was incorporated into the USEP Monitoring Program and is a Tier 1 source evaluation site in CBRP inspection program because it is a potential source of bacteria to an impaired waterbody (Santa Ana River Reach 3). Also, Tequesquite Arroyo itself is not listed as impaired and therefore not subject to MSAR Bacteria TMDL requirements.

- *Cucamonga Creek at Regional Plant 1* – This site was not included primarily because the channel is concrete-lined; accordingly, there is a very low expectation of recreational activity because of the lack of a natural channel and lack of access. However, nearby storm drains that may contribute elevated bacteria concentrations to this impaired reach of Chino Creek were included in the USEP Monitoring Program.

- *Chino Creek at Schaeffer* – This site was not included primarily because the channel is concrete-lined; accordingly, there is a very low expectation of recreational activity because of the lack of a natural channel and lack of access. The SWQSTF also characterized this site in its Phase 1 efforts and determined that the likelihood of REC1 activity is very low. Nearby storm drains that may contribute elevated bacteria concentrations to this impaired reach of Chino Creek are included in the USEP Monitoring Program.

- *Chino Creek at Prado Golf Course* – This site was not included as it would be somewhat redundant to the upstream Chino Creek at Central Avenue site. The Santa Ana Water Board has evidence that the Central Avenue site is used for REC1 activities; accordingly, it will serve as a better location for monitoring to meet Watershed-wide compliance monitoring program objectives.

Dry weather monitoring has been occurring at the sites in Table 4-1 on a regular basis since 2007[27]. Monitoring reports have been prepared to regularly document monitoring results; these reports are available at www.sawpa.org/collaboration/projects/tmdl-taskforce/.

Sampling Approach and Frequency

The sampling approach and frequency for the watershed-wide dry weather monitoring sites in Table 4-1 is the same as described for Priority 1 or 2 waters (see Sections 3.3.1.3 and 3.3.2.3, respectively).

4.1.1.2 Wet Weather Monitoring

Monitoring Sites

The MSAR Bacteria TMDL requires the collection of bacteria water quality samples during wet weather. The MSAR Bacteria TMDL recommended that the following four sites be incorporated into the watershed-wide compliance monitoring program for sampling only during storm events:

- Bon View Avenue at Merrill Avenue
- Archibald Avenue at Cloverdale Avenue
- Grove Channel at Pine Avenue
- Euclid Avenue Channel at Pine Avenue

However, none of these sites was incorporated into the wet weather monitoring program for the following reasons:

- Per the Santa Ana Water Board, the primary reason for the original inclusion of the above wet weather sites was the need to assess water quality runoff in drains carrying runoff that primarily originates from agricultural areas. Rather than include these sites in the watershed-wide compliance monitoring program, it was decided that these sites could be considered for inclusion in the AgSEP (or BASMP), required for development under the MSAR Bacteria TMDL (see Section 4.1.3).
- All four of the above sites are storm drains and not listed as impaired waterbodies; accordingly, the objective of the watershed-wide compliance monitoring program (to evaluate compliance with the TMDL WLAs) did not apply at these sites.

As an alternative to the four sites listed above, it was agreed that wet weather event monitoring would occur at the same sites where dry weather monitoring occurred (see Table 4-1 for sites).

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[27] Dry weather monitoring frequency has been one sample per week over 20 consecutive weeks in the summer dry season and one sample per week over 11 consecutive weeks during the winter wet season. The RMP only modifies this sample frequency and schedule to align sampling efforts at all Priority 1 & 2 sites (see Sections 3.3.1 and 3.3.2). Wet weather sampling frequency has not been modified.

Sampling Approach and Frequency

One wet weather event is targeted for sampling each wet season, defined as November 1 through March 31 in the MSAR Bacteria TMDL. The goal of wet weather event sampling is to collect bacterial indicator data during the rising and falling limbs of the hydrograph. Often when wet weather sampling occurs a second wet weather event will occur causing a rise in the hydrograph. When this is the case, the sampling team will delay follow-up samples to collect the falling limb of the second event. To accomplish this goal, a wet weather sample event requires the collection of four samples over an approximately four day period:

- *Sample 1* – Target sample collection on the day of the storm event when it is apparent that flow within the channel is elevated above typical dry weather conditions as a result of rainfall induced runoff.
- *Sample 2* – Collect samples approximately 24 hours after collection of Sample 1.
- *Sample 3* – Collect samples approximately 48 hours after collection of Sample 1.
- *Sample 4* – Collect samples approximately 72 hours after collection of Sample 1.

For the purposes of this Monitoring Plan, the decision whether to conduct wet weather sampling will be made by implementing the following steps:

- *Step 1* - Prepare to deploy the sampling team if rain is forecast (National Weather Service forecast on http://www.Accuweather.com), i.e., the sample teams are put on stand-by;
- *Step 2* - If rain develops, monitor rain gauges in the area (Riverside Municipal Airport and Ontario International Airport); and
- *Step 3* - Mobilize sampling crews at first daylight on the appropriate morning for sampling based upon the time that rainfall is expected. For instance, if rainfall onset is predicted for 0400 hours, samplers will be mobilized so that they arrive at sampling sites by daylight on the day of the predicted rainfall. If rainfall is predicted for 1300 hours, then samplers will mobilize at daylight of the next morning.

Regardless of when rainfall begins, mobilization of sample teams is limited to first daylight to meet two sampling requirements:

- For safety purposes, sampling may only be conducted during daylight hours; and
- Samples must be dropped off at the laboratory, typically no later than 1500 hours to comply with laboratory processing procedures and to meet holding times.

Samples shall not be collected if conditions are determined to be unsafe by an on-site assessment conducted by the field team leader. If a wet weather event occurs during weekends or holidays, then additional coordination with the laboratory will be necessary to ensure water samples can be accepted for processing.

Consistent with the MSAR Bacteria TMDL, the following constituents will be analyzed in water samples collected at each site on each day during a wet weather event
(Table 4-2):

- *Field Analysis:* Temperature, conductivity, pH, dissolved oxygen, and turbidity
- *Laboratory Water Quality Analysis: E. coli*, and TSS

Where appropriate, water quality sample results will be compared to the TMDL compliance targets for *E. coli*: 5-sample/30-day logarithmic mean less than 113 organisms/100 mL and not more than 10% of the samples exceed 212 organisms/100 mL for any 30-day period. Other sample results, e.g., for field parameters and TSS, will be periodically compared to bacterial indicator data to evaluate the presence of any correlations.

Table 4-2. Analytical Methods for Constituents monitored during Wet Weather Events

Parameter[1]	Laboratory	Units	Data Collection or Analytical Methods	Target Report Limits
Temperature	In Field	°C	Water Quality Sonde (e.g., YSI or equivalent)	NA
pH	In Field	Standard Units	Water Quality Sonde (e.g., YSI or equivalent)	NA
Dissolved Oxygen	In Field	mg/L	Water Quality Sonde (e.g., YSI or equivalent)	NA
Conductivity	In Field	mS/cm	Water Quality Sonde (e.g., YSI or equivalent)	NA
Turbidity	In Field	NTU	Water Quality Sonde (e.g., YSI, Hach or equivalent)	NA
E. coli	Varies	cfu/100 mL	EPA 1603	Varies[2]
		MPN/100 mL	SM 9223B IDEXX 18HR	Varies[2]
TSS	Varies	mg/L	SM 2540D	0.5 mg/L

[1] Fecal coliform was also sampled for from the 2007-2008 wet season through the 2014-2015 wet season; with EPA approval of the BPA, fecal coliform water quality objectives are no longer applicable.

[2] The target reporting limits are dependent on analytical methods and sample dilutions conducted by laboratories. Target limits are not always able to be met and can vary due to analytical methods, matrix interference, and sample dilutions.

Wet weather event monitoring has been occurring at the sites in Table 4-1 on a regular basis since the 2007-2008 wet season. Monitoring reports have been prepared in May of each year to regularly document monitoring results from the wet weather event sampled during the previous wet season; these reports are available at www.sawpa.org/collaboration/projects/tmdl-taskforce/, under the Monitoring tab. Sampling results from most recent quarter can be viewed by the public on the online digital dashboard located here: https://sawpa.cdmsmith.com/. Under this Monitoring Plan, wet weather event monitoring results will be reported as part of the program's Annual Report (see Section 7).

4.1.2 Urban Source Evaluation Program

4.1.2.1 MSAR Bacteria TMDL Source Evaluation Requirements

The MSAR Bacteria TMDL required MS4 dischargers to develop a USEP by November 30, 2007, six months after EPA approval of the MSAR TMDL. The purpose of the USEP was to identify specific activities, operations, and processes in urban areas that contribute bacterial indicators to waterbodies under the MSAR Bacteria TMDL. Prepared through the MSAR TMDL Task Force, the USEP was submitted to the Santa Ana Water Board in a timely manner and formally approved on April 18,. 2008[28]. The approved USEP included the following objectives:

- Describe an Urban Source Evaluation Monitoring Program to be implemented to identify urban bacterial indicator sources;
- Establish a risk-based framework for evaluating water quality data obtained with regards to human illness from the Urban Source Evaluation Monitoring Program;
- Identify investigative activities that may be implemented to the maximum extent practicable based on water quality data; and
- Provide a schedule for USEP implementation with contingencies built in to allow for consideration of new data, modified regulations, changed priorities, or new technologies.

Subsequent to the approval of the USEP, a number of bacteria source evaluation studies were implemented through the MSAR TMDL Task Force as approved by the Santa Ana Water Board. The findings from these studies are located at http://www.sawpa.org/collaboration/projects/tmdl-taskforce/, see source evaluation studies under Resources Tab.

On January 29, 2010 the Santa Ana Water Board adopted new MS4 permits for Riverside and San Bernardino Counties. These permits required that each County develop a CBRP to meet MSAR TMDL wasteload allocations for the dry season. The source evaluation activities described in the USEP were incorporated into the CBRP. Accordingly, following Santa Ana Water Board approval of the CBRPs for each County on February 10, 2012[29], the CBRPs superseded the previously approved USEP and became the basis for bacterial indicator urban source evaluation activities carried out in the MSAR watershed (see page A-11 in the Riverside County CBRP; similar language is contained in the San Bernardino County CBRP)[30]. The Santa Ana Water Board's 2018 CBRP audits found that the MS4 Programs are in compliance with existing CBRPs.

The Los Angeles Water Board adopted a new Los Angeles County MS4 Permit in 2012 that became effective December 28, 2012[31]. This permit required the Cities of Pomona and Claremont to develop CBRPs for the portions of their cities that are within the MSAR watershed[32]. Because the Santa Ana Water Board oversees MSAR Bacteria TMDL implementation, the Santa Ana Water Board oversaw development of the CBRPs for these cities. The Santa Ana Board approved the CBRPs for the Cities of Pomona and Claremont on March 14, 2014.[33]

4.1.2.2 Bacterial Indicator Urban Source Evaluation Program

First through implementation of the USEP and now through implementation of the CBRPs, elevated levels of indicator bacteria have been documented in most monitored subwatersheds within the MSAR watershed; however, the sources of bacteria largely remain unknown. Thus, the primary goal of the source evaluation monitoring program is to guide efforts to identify and where possible mitigate

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[28] Santa Ana Water Board Resolution: R8-2008-0044; April 18, 2008

[29] Santa Ana Water Board Resolutions: R8-2012-0015 (Riverside County MS4 Program; R8-2012-0016 (San Bernardino County MS4 Program)

[30] CBRPs available at http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/msar_tmdl.shtml

[31] Los Angeles Water Board Resolution R4-2012-0175

[32] See Attachment R, Los Angeles Water Board Resolution R4-2012-0175

[33] Santa Ana Water Board Resolution: R8-2014-0030 (City of Claremont); R8-2014-0031 (City of Pomona)

controllable sources of bacterial indicator derived from discharges covered by MS4 permits. Source evaluation activities seek to answer the following questions:

- Which subwatershed areas are hydrologically connected to the waterbodies listed as impaired (in particular the Santa Ana River) by the MSAR Bacteria TMDL during dry flow conditions?
- What is the concentration of *E. coli* in MS4 facilities that have the potential to discharge dry weather flow to a downstream watershed-wide compliance site?
- What is the running geometric mean of *E. coli* in water samples collected from MS4 facilities?

The CBRPs establish an implementation approach to address these questions.

CBRP Implementation Approach

The MS4 permittees in each county implement source evaluation activities using a comprehensive, methodical approach that provides data to make informed decisions regarding the potential for an MS4 outfall or group of outfalls to discharge controllable sources of bacterial indicators. This approach relies on the following activities:

- *Tier 1 Reconnaissance* – Tier 1 sites are defined as sites where urban sources of dry weather flow may directly discharge to a downstream watershed-wide compliance site (see Table 4-1). Some of the Tier 1 sites are at the same sites sampled as part of implementation of the USEP in 2007-2008. Additional Tier 1 sites were included, where needed, to supplement existing information. Some Tier 1 locations were dry or had minimal dry weather flow, or in some instances were hydrologically disconnected to downstream waters. The data collected during Tier 1 was used to determine each outfall's potential to contribute controllable sources of bacterial indicators[34].
- *Prioritization of MS4 Drainage Areas* – Based on the findings from Tier 1 reconnaissance activities, MS4 drainage areas with potentially controllable urban sources of bacterial indicators are prioritized based on factors such as the magnitude of bacterial indicator concentrations and results from source tracking analyses. Areas with controllable sources of bacteria (as determined through the use of *Bacteroides* testing for human marker) receive the highest priority for action.
- *Tier 2 Source Evaluation* – Source evaluation activities are being implemented first in the MS4 drainage areas with the highest priority Tier 1 sites. These activities include a strategically timed mix of field reconnaissance, secondary screening tool deployment, and bacterial water quality sample collection. Tier 2 sites are tributary to a Tier 1 site. Implementation of source evaluation activities at Tier 2 sites can be unique and is tailored for each drainage area. This ensures that source evaluation activities are as effective as possible given the large number of potential monitoring sites within large urbanized drainage areas to an MS4 outfall. Methods for conducting Tier 2 source evaluation studies are provided in Section 6 of this Monitoring Plan.

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[34] MS4 outfall sites upstream of Cucamonga Reach 1 were reclassified to Tier 2 after the approval of the UAA for Reach 1 to REC2-only

General Source Evaluation Sampling Protocols

Source evaluation sampling protocols may be tailored to the sample site. However, in general the following sampling and analysis activities occur during a Tier 1 or Tier 2 sample collection event (Table 4-3):

- *Field Analysis*: Field parameters as well as other secondary human source evaluation screening tools may be deployed (see Section 6 of this Monitoring Plan).
- *Laboratory Water Quality Analysis*: Collection of water samples for *E. coli* and TSS analyses.

Table 4-3. Analytical Methods for Constituents potentially monitored during Tier 1 or Tier 2 Source Evaluations

Parameter	Laboratory[1]	Units	Analytical Methods	Target Report Limits
Temperature	In Field	°C	Horiba, YSI or equivalent	n/a
pH	In Field	Standard Units	Horiba, YSI or equivalent	n/a
Dissolved Oxygen	In Field	mg/L	Horiba, YSI or equivalent	n/a
Conductivity	In Field	mS/cm	Horiba, YSI or equivalent	n/a
Turbidity	In Field	NTU	Horiba, YSI or equivalent	n/a
E. coli	Varies	MPN or cfu/100 mL	SM 9223B IDEXX 18HR	Varies[2]
TSS	Varies	mg/L	SM 2540D	1.0 mg/L
Human Source Bacteria	TBD	Copies/filter	qPCR, ddPCR	n/a
Canine Source Bacteria	TBD	Copies/filter	qPCR, ddPCR	n/a
Ruminant Source Bacteria	TBD	Copies/filters	qPCR, ddPCR	n/a
Avian Source Bacteria	TBD	Copies/filter	qPCR, ddPCR	n/a
Swine Source Bacteria	TBD	Copies/filter	qPCR, ddPCR	n/a
Horse Source Bacteria	TBD	Daltons	qPCR. ddPCR	n/a

[1] Laboratory will be selected based on project specific criteria

[2] The target reporting limits are dependent on analytical methods and volumes analyzed by laboratories.

- *Flow*: During each sample event, if conditions are safe, flow is characterized.

- *Bacteria Source Analyses*: Collection of water samples for application of procedures to analyze for sources of bacterial indicators[35].

Methods for the collection of flow data and the collection of water samples for conducting laboratory analyses are described in Section 5.

The frequency of sample collection at any Tier 1 or Tier 2 site is determined by the need for source evaluation data to identify controllable sources of bacterial indicators, but typically at least five weeks of sampling is planned in order to allow for geomean calculation and to create comparable datasets.

Hydrologic Connectivity

During sampling at a Tier 1 site, the hydrologic connectivity of the surface flow at each site to a downstream impaired waterbody (Santa Ana River Reach 3, Mill Creek, Cucamonga Creek, and Chino Creek Reach 1 and 2) is characterized to the maximum extent possible. The purpose for characterizing hydrologic connectivity is to determine whether dry weather flow from the sampled waterbody reaches the impaired waterbody. If hydrologic connectivity is not apparent at a given site, water sample collection is optional, depending on the need for the data.

Tier 1 and Tier 2 Sample Sites

Table 4-4 lists the 33 Tier 1 sites that have previously been monitored (Figure 4-1). These sites were recommended for sampling in the CBRPs prepared for Riverside and San Bernardino Counties. For the Cities of Pomona and Claremont, located in Los Angeles County and also subject to the MSAR Bacteria TMDL, monitoring occurred at the CHINOCRK site in 2011 and again in 2015; this data was incorporated into the 2019 Tier 1 sampling effort.

For Tier 2, the selection of sample sites is determined by the characteristics of the drainage area upstream of the MS4 outfall and real time observations by field staff. As a consequence, there is no list of specific sites for Tier 2 source evaluations. Site selection is determined based on locations of potential sources of bacterial indicators and knowledge regarding the local drainage area. Once sample sites are identified, source evaluation methods described in Section 6 of this Monitoring Plan are selected as appropriate for each site.

4.1.3 Agricultural Source Evaluation Program

4.1.3.1 Overview

TMDL Requirements Applicable to Agricultural Dischargers

With EPA approval of the MSAR Bacteria TMDL in May 2007, agricultural dischargers (as defined by the TMDL) were required to complete specific implementation activities either in collaboration with other TMDL responsible parties or separately. Specifically, agricultural discharges were required to complete the following activities:

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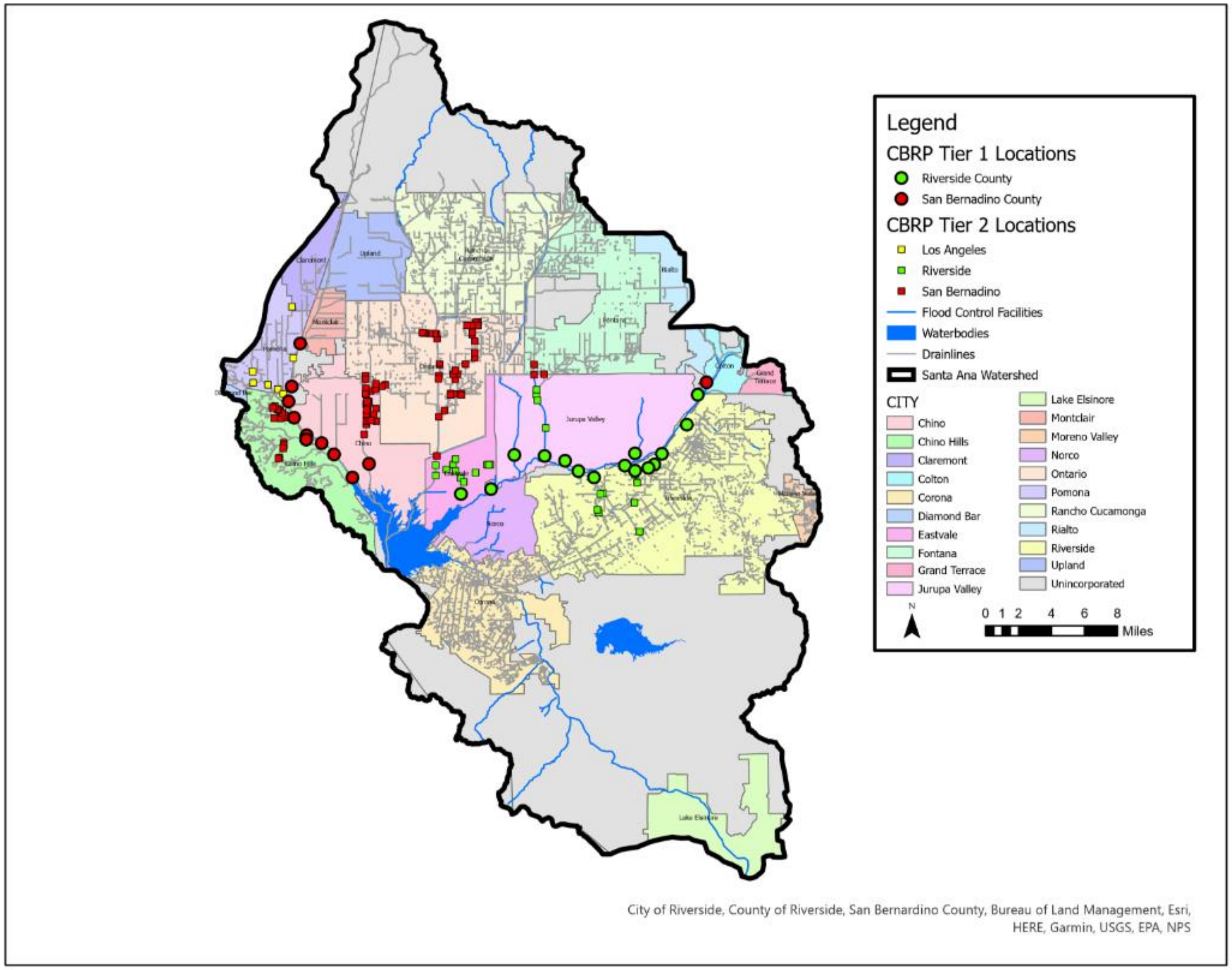
[35] Source evaluation methods continue to evolve, the Southern California Coastal Water Research Project (SCCWRP) published *The California Microbial Source Identification Manual: A Tiered Approach to identifying Fecal Pollution Sources to Beaches* (2013). This guidance manual provides information for cost-effectively identifying sources of fecal contamination within a watershed. Table 4-3 was developed to meet the needs of ongoing source identification activities in the watershed; this guidance was considered when developing the content of Table 4-3. For more information, the guidance may be downloaded from this link: http://www.waterboards.ca.gov/water_issues/programs/beaches/cbi_projects/docs/sipp_manual.pdf.

- Implement a watershed-wide compliance monitoring program (currently being implemented in collaboration with urban dischargers; see Section 4.1.1);
- Develop an AgSEP by November 30, 2007; and
- Develop a BASMP.

The purpose of the AgSEP was to identify specific activities, operations and processes in agricultural areas that contribute bacterial indicators to MSAR watershed waterbodies. The plan was to include a proposed schedule for the steps identified and include contingency provisions as needed to reflect any uncertainty in the proposed steps or schedule.



City of Riverside, County of Riverside, San Bernardino County, Bureau of Land Management, Esri, HERE, Garmin, USGS, EPA, NPS

Figure 4-1. Tier 1 Source Evaluation Sites sampled in the MSAR Watershed to support Implementation of the MSAR Bacteria TMDL

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Table 4-4. Tier 1 sample sites in the MSAR watershed[1]

Site ID	Site Description	Longitude	Latitude
Riverside County			
T1-64ST	64th Street Storm Drain (SAR Reach 3)	-117.488532	33.970798
T1-ANZA	Anza Drain (SAR Reach 3)	-117.463100	33.95869
T1-BXSP	Box Springs Creek @ Tequesquite Ave	-117.403599	33.975899
T1-CREST	City of Riverside Outfall (Crest/Ontario) (SAR Reach 3)	-177.476290	33.963361
T1-IDST	City of Riverside (Industrial/Freemont) (SAR Reach 4)	-117.436110	33.967330
T1-EVAN	City of Riverside Outfall (Lake Evans) (SAR Reach 4)	-117.381757	33.997002
T1-RBDX	City of Riverside Outfall at Rubidoux (SAR Reach 3)	-117.410220	33.968060
T1-DAY	Day Creek	-117.532980	33.975010
T1-EVLD	Eastvale MDP Line D (SAR Reach 3)	-117.579781	33.946701
T1-EVLE	Eastvale MDP Line E (SAR Reach 3)	-117.553434	33.950298
T1-MCSD	Magnolia Center SD (SAR Reach 3)	-117.415473	33.965599
T1-PHNX	Phoenix Storm Drain (SAR Reach 3)	-117.427128	33.963600
T1-SSCH	San Sevaine Channel	-117.506433	33.974300
T1-SNCH	Sunnyslope Channel	-117.427180	33.976200
T1-WLSD	Wilson Storm Drain (SAR Reach 4)	-117.372187	34.018700
San Bernardino County			
T1-SACH	San Antonio Channel @ SR 60	-117.72811	34.02470
T1-BRSC	Boys Republic South Channel @ confluence with Chino Creek	-117.72611	34.00208
T1-PPLN	Pipeline Ave 84" RCP outlet under bridge	-117.71506	33.98930
T1-CCCH	Carbon Canyon Creek @ Pipeline Ave	-117.71543	33.98620
T1-YRBA	Chino Creek, @ Yorba Ave ext., large outlet to SE of extension	-117.70192	33.98362
T1-LLSC	Lake Los Serranos Channel @ Red Barn Court crossing, above confluence with Chino Creek	-117.69106	33.97542
T1-CBLD	Chino Creek/San Antonio Creek @ ext. of Flowers St., behind Big League Dreams	-117.67493	33.95864
T1-CUCAMONGA[2]	Cucamonga Creek at Hellman	-117.61034	33.94936
T1-CYP	Cypress Channel @ Kimball Avenue	-117.66039	33.96860
T1-RISD	SW of Riverside Avenue @ SAR - City S.D.	-117.36447	34.02774
Los Angeles County			
CHINOCRK	Chino Creek upstream of San Antonio Channel	-117.73057	34.01343

[1] Coordinates are shown as Geographic WGS 1984 World Datum

[2] Prior MS4 outfalls to Cucamonga Reach 1 were reclassified to Tier 2 after the approval of the UAA for Reach 1 to REC2-only and are shown in in Figure 4-1

Information from implementation of the AgSEP would be used by the Santa Ana Water Board and agricultural stakeholders to support development of the BASMP. Per the TMDL, the BASMP should include, plans and schedules for the following:

- Implementation of bacteria indicator controls, BMPs and reduction strategies designed to meet load allocations;
- Evaluation of effectiveness of BMPs; and
- Development and implementation of compliance monitoring program(s).

Agricultural Source Evaluation Plan

The AgSEP was submitted to the Santa Ana Water Board by November 30, 2007; it was approved on April 18, 2008[36]. AgSEP objectives included:

- Establish an Agricultural Operator Database based upon previous data collected from the Santa Ana Water Board and integration of San Bernardino and Riverside County Assessor Parcel Number data;
- Describe the Agricultural Source Evaluation Monitoring Program (AgSEMP) to be implemented to identify bacterial indicator sources;
- Describe programmatic activities (site prioritization and source investigation activities) that will potentially be implemented; and
- Provide a schedule for AgSEP implementation with contingencies built in to allow for consideration of new data, modified regulations, changing land uses or changing priorities.

Based on these objectives the AgSEP was developed around the following four-step framework:

- *Step 1: Agricultural Operator Database* – The first step, to be completed by the Santa Ana Water Board, involved creating an Agricultural Operator Database based upon existing information sources.
- *Step 2: AgSEMP* – The second step in the plan was to conduct a monitoring program at key sites to gather bacterial indicator source data.
- *Step 3: Programmatic Activities* – This step involved implementing a number of activities including site prioritization and source investigation activities such as field surveys, research studies, and controllability assessments.
- *Step 4: Adaptive Implementation* - It was expected that as known facts change (e.g., new data become available or land use changes) or if changes in recreational uses occur on waterbodies as a result of RMP efforts, then site prioritization or the schedule for AgSEP implementation could change.

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[36] Santa Ana Water Board Resolution: R8-2008-0044; April 18, 2008

Of these four steps, Step 2 (AgSEMP) was included in the previously approved MSAR Bacteria TMDL Monitoring Plan. A description of this program, which was completed in 2008-2009, is provided below in Section 4.1.3.2.

Bacterial Indicator Agricultural Source Management Plan

A BASMP was developed by agricultural dischargers in the MSAR watershed.

4.1.3.2 Agricultural Source Evaluation Monitoring Program

Program Summary

The AgSEMP was structured to provide information on bacterial indicator sources in areas where agricultural activities are occurring[37]. In addition to the collection of bacterial indicator data, source identification analyses relied on the use of *Bacteroides thetaiotaomicron* (“*Bacteroides*”) markers specific to human and domestic canine sources and *Prevotella ruminiola* (“*Prevotella*”) for bovine sources.

The AgSEMP collected bacterial indicator and source data from four sites during the wet weather season from November 1, 2008 to March 31, 2009. The following data were collected during each sampling event:

- Field Parameters: Flow, temperature, conductivity, pH, dissolved oxygen, and turbidity
- Laboratory Water Quality Parameters: Fecal coliform, *E. coli*, and TSS
- *Bacteroides* and *Prevotella* Marker Analysis: Samples were assayed for host-specific markers for humans, bovine, and domestic canine.

Samples were collected during the wet season under wet weather conditions. Detailed information on field data collection methods, sample frequency and laboratory analysis methods were provided in the AgSEP and MSAR Bacteria TMDL Monitoring Plan and QAPP prepared to support the monitoring program.

Future sampling activities for agricultural lands may be conducted following the Regional Board approval of the BASMP.

Monitoring Sites

Four sites were sampled under this monitoring program. In the TMDL, Table 5-9a-a, “Additional Watershed Storm Event Sampling Locations,” listed four proposed wet weather sampling sites. Per the Santa Ana Water Board, the primary reason for the inclusion of these wet weather sites in the TMDL was the need to assess water quality runoff in drains carrying stormwater that originates primarily from agricultural areas (personal communication, William Rice, Santa Ana Water Board).

These same four sites were considered for inclusion in the AgSEMP. However, after field review and based upon the recommendation of the Santa Ana Water Board staff, some sample sites were replaced due to increasing urban development within the vicinity of these sites since the development of the TMDL. The newly selected wet weather AgSEMP sites that were sampled are summarized in Table 4-5

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[37] The Middle Santa Ana Agricultural Land Use Report (October 31, 2012), prepared by Aerial Information Systems on behalf of SAWPA is available at http://www.sawpa.org/wp-content/uploads/2013/01/MSAR_final_10-24-112.pdf

and Figure 4-2. Included in this site list is a backup site (AG-CL1) to address uncertainty in the nature of the wet weather runoff that may occur at one site (AG-G1).

Table 4-5. AgSEMP sample sites

Site ID	Site Description	Longitude	Latitude
Prado Park Lake Drainage Area			
AG-G2	Grove Avenue Channel at Merrill Avenue	-117.37685	33.58986
AG-G1	Eucalyptus Avenue at Walker Avenue	-117.37163	33.59425
AG-E2	Euclid Avenue Channel at Pine Avenue	-117.38926	33.57220
Cucamonga Creek, Reach 1 Drainage Area			
AG-CL1	Eucalyptus Avenue at Cleveland Avenue (*Backup to Walker Avenue, depending on flow conditions)* (CL1)	-117.34031	33.59405
Chino Creek, Reach 1 Drainage Area			
AG-CYP1	Cypress Channel at Kimball Avenue (*dual site; same as USEP site US-CYP*)	-117.66043	33.96888

Monitoring Approach

The following text describes the overall sampling approach used for samples collected per the AgSEMP during the wet weather season from November 1, 2008 to March 31, 2009:

Obtain bacterial indicator data from two storm events during the wet season. If two storm events do not occur in one wet season, then the second storm event would be sampled in the next wet season. To the extent practical, taking into account the timing of the storm event, when a storm event is sampled, two samples would be collected from each site as follows:

- Sample 1 will be collected during the storm event upon arrival at the sample site; and
- Sample 2 will be collected 30 minutes after the collection of the first sample.

The decision whether to conduct wet weather sampling was made by implementing the following steps in the same manner that other wet weather sampling is done under the MSAR Bacteria TMDL:

- *Step 1* - Prepare to deploy the sampling team if rain is forecasted (National Weather Service forecast on http://www.accuweather.com), i.e., the sample teams are put on stand-by;
- *Step 2* - If rain develops, monitor rain gauges in the area (Riverside Municipal Airport and Ontario International Airport); and
- *Step 3* - Mobilize sampling crews at first daylight on the appropriate morning for sampling based upon the time that rainfall is expected. For instance, if rainfall onset is predicted for 0400 hours, samplers will be mobilized so that they arrive at sampling sites by daylight on the day of the predicted rainfall. If rainfall is predicted for 1300 hours, then samplers will mobilize at daylight of the next morning.

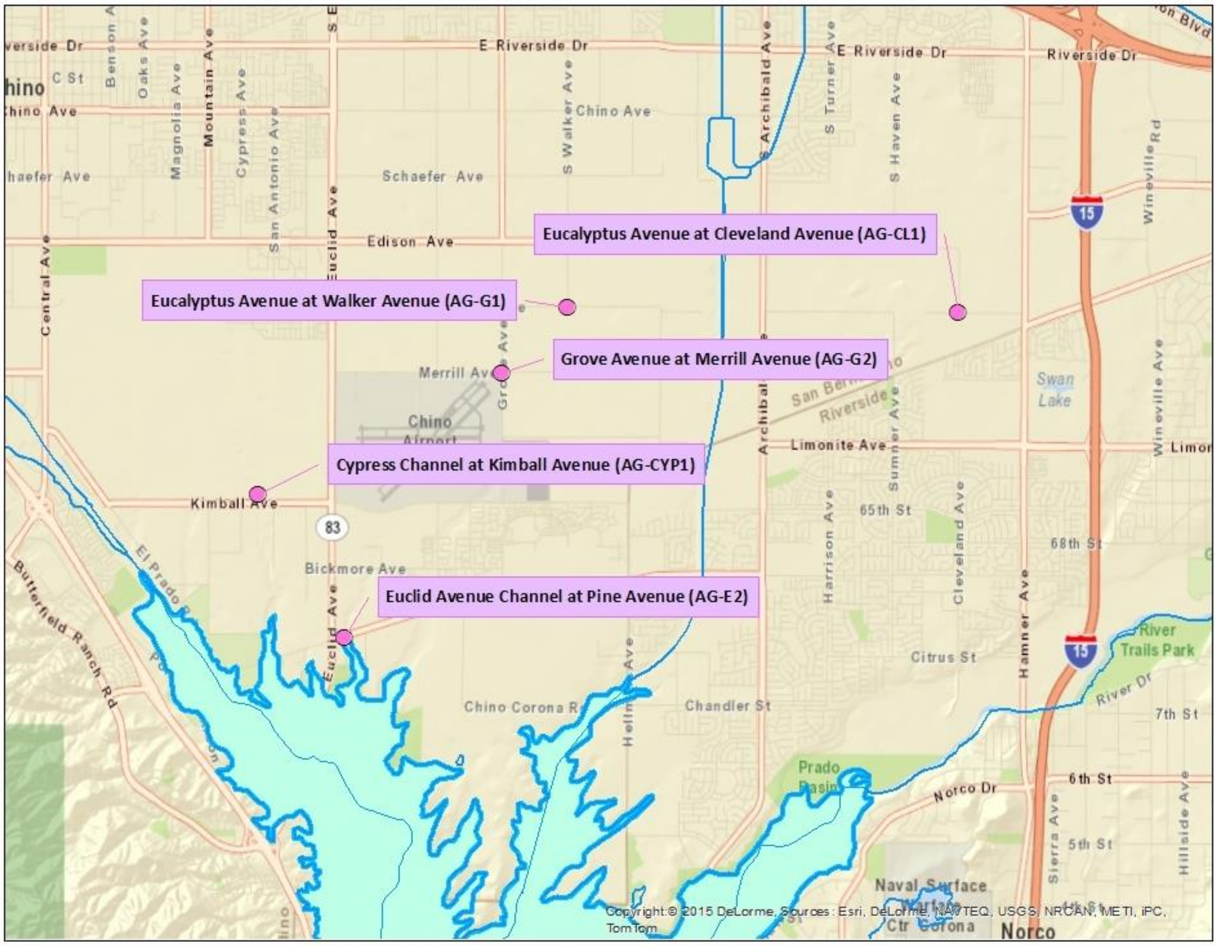

Figure 4-2. Location of AgSEMP Sites sampled in 2008-2009.

Regardless of when rainfall begins, mobilization of sample teams is limited to first daylight to meet to sampling requirements:

- For safety purposes, sampling may only be conducted during daylight hours; and
- Samples must be dropped off at the laboratory typically no later than 1500 hours to comply with laboratory processing procedures and to meet holding times.

Samples shall not be collected if conditions are determined to be unsafe by an on-site assessment conducted by the field team leader. If a wet weather event occurs during weekends or holidays, then additional coordination with the laboratory would be necessary to ensure water samples can be accepted for processing.

Data Reports

The results of the AgSEMP conducted in 2008-2009 were submitted to the MSAR Task Force. This report is available at http://www.sawpa.org/collaboration/projects/tmdl-taskforce/ under the Resource tab.

Section 5

Standard Sampling and Analysis Procedures

This section provides the standard sampling and analysis procedures for the collection of (a) all dry weather samples; (b) wet weather event samples; and (c) and other routine data collection to gather field measurement data (e.g., pH, dissolved oxygen, temperature, conductivity, turbidity) or water samples for submittal to a laboratory for analysis, e.g., *E. coli* analysis.

Dry weather sampling at priority sites should only occur under dry weather conditions defined as no measurable rainfall within a 72 hour period prior to sampling. During dry weather conditions, if flow is elevated due to non-wet weather sources, e.g., upstream dam releases or dewatering activities, sample collection should still occur as long as conditions are safe. The elevated water levels will be documented on the field data sheet and flow will be estimated (see Section 5.8).

5.1 Pre-Sampling Procedures

Prior to the collection of field data, the sample teams will complete the following activities:

- Prepare and calibrate a multi-parameter instrument (see the equipment operation manual for specific calibration instructions) for use in collecting field measurements (see Section 5.7).
- Prepare ice coolers with ice packs or crushed ice to transport samples to the laboratory.
- Obtain sample containers from laboratories, including bottles for field blanks and water collection.
- Prepare pre-labeled sampling containers with Site Identification Number (Site ID), sample Identification Number (Sample ID), analysis information, Project Identification Number (Project ID), and blank fields for date and time.
- Prepare a solution of 70 percent ethanol for field sterilization of sampling equipment.
- Prepare and calibrate a portable Turbidity Meter (e.g., Hach or equivalent), as necessary.
- Pack a flat head screw driver - used to loosen the band that holds the sampling bottle to the sampling pole.
- Check safety gear, including rubber boots and waders, protective gloves, and safety vests.
- Pack a waterproof pen and field log book and/or field data sheets.
- Pack peristaltic pump and sterile tubing.
- Pack box cutter and razor blades.
- Pack duct tape
- Prepare vehicle, including fueling.

- Pack supplies for shipping samples, if applicable.
- Pack chain of custody forms, field data sheets, camera, and zip lock bags.
- Ensure keys to monitoring sites with locked access are available.

5.2 Field Documentation

Field crews are required to complete a form with data from each monitoring site visited (Attachment C) (Note: Electronic mobile databases may be used in place of a field log or data forms to directly input data from the field). The form includes the following items that must be recorded for each sampling event at each sample site:

- Date and time of sample collection.
- Project, Site, and Sample ID numbers.
- Unique IDs for any replicate or blank samples collected from the site.
- The results of any field measurements (temperature, dissolved oxygen, pH, conductivity, turbidity) and the time that measurements were made.
- Qualitative descriptions of relevant water conditions (e.g., color, flow level, clarity) or weather (e.g., wind, rain) at the time of sample collection.
- The field form includes a section regarding "flow connectivity". This element is filled out for Tier 1 and Tier 2 sample sites only to characterize the hydrologic connectivity of the surface flow at the sample site to the downstream impaired waterbody to which it is tributary. This should be regularly documented as hydrologic connectivity can vary by season, amount of time since last rain event or other watershed events which may change flow patterns. A finding of no hydrologic connectivity during any given sample event is not an indicator of connectivity at other times of the year. When completing this section of the field form, the following should be considered or documented:
    - If no connectivity is observed, then the characterization shall, at a minimum, describe the general distance between the point where surface flow ceases and the channel confluences with the downstream impaired water.
    - If there is no connection of surface waters, then the flow rate from the sample site to the downstream water is assumed to be zero and collection of a water quality sample is optional, depending on the need for the data.
    - If connectivity is observed, then the characterization shall, at a minimum, describe the typical width and depth of the surface flow reaching the downstream impaired water, and any observations that suggest that flows have recently been higher than what is currently observed.
- A description of any unusual occurrences associated with the sampling event, particularly those that may affect sample or data quality

Field crews are required to take digital photographs during each sampling event at each site and maintain a photo log of all photographs taken. At a minimum, the following digital photographs should be taken during each sampling event:

- A photograph which shows a view of the waterbody upstream of the sample site.
- A photograph which shows a view of the waterbody downstream of the sample site.
- Photographs which characterize the width and depth of flow and field observations such as water clarity and algal growth.

To the extent possible, the photographs that provide an upstream and downstream view of the waterbody should be taken from the same point during each sample event.

A photo log of all photographs taken at each sample site shall be maintained, which documents the purpose of the photo (for example, upstream or downstream view) and the date and time of the photograph.

5.3 Water Sample Collection

Water samples are best collected before any other work is done at the site. If other work is done prior to the collection of water samples (for example, flow measurement or other field measurements), bottom sediment may be disturbed into the water column, which may not reflect representative conditions for water chemistry and bacteria analyses.

To the extent practical, water samples are collected from a location in the stream (or storm drain as may be the case for urban or agricultural source evaluation activities) where the stream visually appears to be well-mixed and flowing. Ideally this would be at the centroid of the flow (*Centroid* is defined as the midpoint of that portion of the stream width that contains 50% of the total flow), but depth and flow do not always allow collection of samples from the centroid location. Ultimately, the selection of the best location to collect water samples is based on best professional judgment. In addition, the sample should be collected in an area free of debris or algae.

Samples shall not be collected if conditions are determined to be unsafe by an on-site assessment by the field team leader. Photo documentation shall be provided to illustrate unsafe conditions and the specific issues of concern shall be noted on the field form.

For sites where the samples will be taken from a distance, a sampling pole similar to that shown in Figure 5-1 will be used. This sampling pole is approximately 7 feet long and has a mechanism that holds the sampling bottle in place, as shown in Figure 5-2. The mechanism should be sterilized in the field with a 70 percent ethanol solution prior to the collection of each sample. Allow the pole to air-dry before the sample is taken. A similar sampling pole that extends to greater height may be used for sites where sampling from a bridge is necessary. For Tier 2 source evaluation activities, samples may need to be collected from storm drain manholes (see Section 6.1.3.2).

Figure 5-1. Water Sampling Pole

Figure 5-2. Close-up of Sampling Pole with Water Sample Bottle

The following lists contain steps to take when collecting a water sample:[38]

- Label each sample container with a Site ID, Sample ID, analysis information, Project ID, date, and time (ideally, some of this information may be pre-labeled on the containers). After sampling, if waterproof labels are not used, secure the label by taping it around the bottle with clear packaging tape.

- For *E. coli* and Enterococci samples, the sterilized bottle will contain sodium thiosulfate for chlorine elimination. Therefore, the bottles for analysis of these constituents cannot be held under the water to collect a sample. In contrast, the sterilized TSS bottle contains no preservatives and no such restrictions exist. Similarly, the bottle used to collect a sample for Bacteroides analysis contains no preservatives and, like TSS, no such restrictions exist.

- When wading (if applicable) to the sampling point, try not to disturb bottom sediment before collection of a sample.

    - Use a separate sterilized bottle to collect a water sample to transfer to the sample containers with or without preservatives. If using a sterilized transfer vessel for TSS, *E. coli*, or Enterococci samples, water can then be decanted from this bottle (after shaking the sample) into the sample containers that will be submitted to the laboratory.

    - Fill the bacteria bottle to the 100 or 125 mL mark. Do not overfill the sample bottles (so the sample can be shaken before analysis). Recap the bottle, remembering not to touch the inside.

    - To collect a water sample with a bottle without preservative, stand in the water facing upstream. The sample should be collected from the surface from your upstream side, i.e., in front of you, by holding the bottle upright under the surface while it is capped. Open the lid carefully to let the water run in. At all times, avoid touching the inside of the bottle or cap. If you accidentally touch the inside of the bottle or cap, use another bottle. Once the bottle is filled, recap the bottle, remembering not to touch the inside.

- When flow is too shallow to collect a surface sample, such as when there is sheet flow across a channel, the sample should be collected at a location where there is greater water depth, such as at a seam in the channel, or near an obstruction, or where the flow spills over a concrete apron or lip. Follow the sample collection procedures for bottles with and without preservative as described above.

    If there are no features in the channel that increase water depth and it is not possible to fill the bottle directly from the flow, then carefully collect a sample as follows (adapted from *Standard Operating Procedure for the Collection of Bacteria Samples from Storm Drains and Receiving Waters (Creeks, lagoons, bays, and ocean) for the City of San Diego 2002-03 Coastal Monitoring Annual Report*):

    - Use a clean, sterile syringe to collect a water sample from the surface without sampling floating particulates, yet far enough away from the bottom to avoid suction of soil, silt, and

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[38] adapted from EPA's Volunteer Stream Monitoring: A Methods Monitoring Manual, EPA 841-B-97-003, 1997 and California's SWAMP Quality Assurance Management Plan, Puckett, 2002

    organic matter. Care should be taken to not touch the tip of the syringe. Draw back the plunger slowly while monitoring the syringe for organic matter, silt, sand, and floating particulates. Without touching the syringe to the sample bottle, dispense the sample into the sample bottle. Repeat until the sample bottle is full. Appropriately discard used syringe after each sample.

  - Alternatively, a sampler can deploy waddles to further channelize the flow and increase the depth available to sample from. When doing so, the sampler will ensure that the deployment of the waddles does not disturb the channel bed causing increased sedimentation in the sample collected. If sediment disturbance occurs, the sampler will wait until the channel returns to normal conditions prior to collecting the sample.

- The sampler may also tape the bottle to an extension pole to sample from deeper water. The sampling pole will be cleaned with a 70% ethanol solution prior to use at each sample site. After being cleaned with ethanol (70%) the sampling pole should be rinsed thoroughly.

- Place the sample containers in a resealable plastic bag in a cooler with cold packs for transport to the laboratory. The maximum holding time prior to water quality analysis for bacteria indicator concentrations is 6 hours; the maximum holding time prior to *Bacteroides* analysis is 24 hours. Sampling bottles and parameter specific sample containers will be provided by the laboratories for each sample and will include:

  - Water Quality Analysis Laboratory – typically 100 to 125 mL for *E. coli* or Enterococci; 1 liter for TSS

  - Molecular Analysis Laboratory – 1 liter (1,000 mL) bottles for *Bacteroides* analysis.

5.4 Sediment and Biofilm Sample Collection

Sampling of sediment or biofilms may occur as part of Tier 1 or Tier 2 sampling events (see Section 4.1.2.2) to support TMDL-related source evaluation activities. Surface sediment and biofilm grab samples will be collected from the midpoint of shallow, wadable channel and stream widths. When multiple samples are collected along a transect of the stream, samples locations should reflect 25%, 50%, and 75% of the stream width. In cases where both water and sediment samples are collected from the same study site, water should be collected first and care should be taken to not disturb the sediment.

The following lists contain specific steps to take when collecting a sediment sample (adapted from EPA's Field Sampling Guidance Document #1215 for Sediment Sampling, September 1999):

- Label each container with Site ID, Sample ID, analysis information, Project ID, date, and time (some of this information may be pre-labeled on the containers). After sampling, secure the label by taping it around the bottle with clear packaging tape.

- When wading (if applicable) to the sampling point, do not disturb bottom sediment.

- Stand in the water, facing upstream. Collect the sediment and biofilm sample on your upstream side, in front of you.

- Use a sterile stainless steel or plastic scoop or similar equipment to scoop sediment along the bottom of the waterbody surface in the upstream direction. For biofilms, scoop along the surface biofilms are attached to. Do not use plated scoops (e.g. garden spades) as they can result in contamination of samples.

- Decant excess water without loss of fine particles from the scoop and deposit sediment into sterile sample container. Avoid touching the inside of the bottle or cap with anything but sample. If you accidentally touch the inside, use another bottle. Fill the bottle leaving a 1-inch air space.
- Carefully recap the bottle without touching the inside of the container.
- Place the bottles in a resealable plastic bag in a cooler with cold packs for transport to the laboratory. The maximum holding time prior to analysis for bacteria concentrations is 6 hours; the maximum holding time prior to molecular analysis is 24 hours. Bottles will include a single, sterile 50 mL tube for both *E. coli* and bacterial indicator source analyses.

5.5 QA/QC Requirements

Specific Quality Assurance/Quality Control (QA/QC) requirements for the collection of water samples and field measurements are provided in the QAPP that accompanies this Monitoring Plan. The following sections provide a general overview of QA/QC requirements.

5.5.1 Monitoring Sites Except Tier 2 Sites

- ***Field Equipment Blanks*** –Field equipment blank samples (equal volume for each constituent) are tobe collected in accordance with SWAMP recommendation to provide field equipment blanks for 5% of the total sampling performed in a year.
    - Sterile deionized water is poured through any equipment used to collect the *E.coli* or Enterococci sample at the site where the field equipment blank is being collected and then into the 100 or 125 mL sample bottle.
    - For the *Bacteroides* equipment blanks, high purity water (in amber bottles) from an approved laboratory will be poured into the 1 liter sample bottle.
    - For the TSS field equipment blank, distilled water is poured through any equipment used to collect the TSS sample at the site where the field equipment blank is being collected and then into the 1 liter TSS sample bottle. If no equipment is used to collect the TSS sample, then the distilled water is poured directly into the 1 liter TSS sample bottle.
    - One set of field equipment blank samples will be collected to be, consistent with the 2018 SWAMP protocol; the site for collection of blank samples will be selected on a rotational basis. After field equipment blanks have been collected from all monitoring sites, the rotation will start again with the first monitoring site.
- ***Field Replicates*** – One set of field replicates will be in accordance with SWAMP recommendation to provide field replicates for 5% of the total sampling performed in a year.. The site for collection of replicate samples will be selected on a rotational basis. After replicates have been collected from all monitoring sites, the rotation will start again with the first monitoring site.

5.5.2 Tier 2 Monitoring Sites

The purpose of Tier 2 source evaluation monitoring is to identify areas within the MS4 where bacterial source activities should be targeted. Selection of Tier 2 monitoring sites within a drainage area is unique and tailored to the area of interest. The goal is to quickly identify which subareas within the drainage should be targeted for application of techniques to identify potential bacteria sources. Given the purpose of Tier 2 sampling, the collection of field equipment blanks or field replicates is not required at Tier 2 monitoring sites.

5.6 Sample Handling and Custody

Proper gloves must be worn to prevent contamination of the sample and to protect the sampler from environmental hazards (disposable polyethylene, nitrile, or non-talc latex gloves are recommended). Wear at least one layer of gloves, but two layers help protect against leaks. Safety precautions are needed when collecting samples, especially samples that are suspected to contain hazardous substances, bacteria, or viruses.

Properly store and preserve samples as soon as possible. Usually this is done immediately after returning from the collection site by placing the containers on bagged, crushed or cube ice in an ice chest. Sufficient ice will be needed to lower the sample temperature to at least 4°C within 45 minutes after time of collection. Sample temperature will be maintained at 4°C until delivered to the appropriate laboratory. Care should be taken at all times during sample collection, handling, and transport to prevent exposure of the sample to direct sunlight.

Samples that are to be analyzed for bacterial indicators must be kept on ice or in a refrigerator and delivered to a qualified laboratory within six hours. The QAPP identifies qualified laboratories for the purposes of implementing this SAR Bacteria Monitoring Plan.

Samples analyzed for *Bacteroides* must be kept on ice or in a refrigerator and delivered within 24 hours of collection to an appropriate laboratory, which may include:

- California State University, Fullerton Department of Public Health, KHS-121 800 N. State College Blvd, Fullerton, CA 92831; 657-278-5498, contact Phillip Gedalanga
- Orange County Public Health Lab, 1729 W 17th Street, Santa Ana, CA 92706; 949-219-0424, contact Joseph Guzman Weston Solutions Laboratory (5817 Dryden Pl #101, Carlsbad, CA 92008; 760- 931-9225, contact Alex Schriewer).
- Weston Solutions (5881 Obispo Ave #101, Long Beach, CA 90805; 610 701-3000; contact Alexander Schriewer).

Every shipment must contain a complete Chain of Custody (COC) Form (see Attachment E) that lists all samples taken and the analyses to be performed on these samples. COCs must be completed every time samples are transported to a laboratory. Include any special instructions to the laboratory. The original COC sheet (not the copies) is included with the shipment (insert into zip lock bag); one copy goes to the sampling coordinator; and the sampling crew keeps one copy. Samples collected should have the date/time collected on every COC.

Due to increased shipping restrictions, samples being sent via a freight carrier require additional packing. Although care is taken in sealing the ice chest, leaks can and do occur. Samples and ice should be placed inside a large plastic bag inside the ice chest for shipping. The bag can be sealed by simply twisting the bag closed (while removing excess air) and taping the tail down. Prior to shipping the drain plug of the ice chests have to be taped shut. Leaking ice chests can cause samples to be returned or arrive at the laboratory beyond the required holding time. Although glass containers are acceptable for sample collection, bubble wrap must be used when shipping glass.

5.7 Field Measurements

Field measurements are made at all Priority and Tier 1 monitoring sites during each sample event. For Tier 2 sites, field measurements will be made on an as needed basis where necessary to support the purposes of monitoring activities at these sites.

After collecting the water samples, record the applicable field parameters: water temperature, pH, conductivity, turbidity, and dissolved oxygen. These parameters as well as other field data are measured and recorded using a multi-parameter probe (Horiba, YSI, etc.) or equivalent probe. When field measurements are made with a multi-parameter instrument, sufficient time should be allowed for the instrument to equilibrate in the water before field measurements are recorded.

To the extent practical, field measurements are made at or near the centroid of flow where it appears the flow is well-mixed. The evaluation of the best location to measure field parameters is based on best professional judgment. For routine field measurements, the date, time and depth are reported as a grab. To provide QA/QC of field instruments and sampling personnel, three replicates of each field measurement will be collected at each site and averaged for reporting. Below is a brief discussion of each recorded field measurement (California SWAMP Procedures for Conducting Routine Field Measurements):

- *Dissolved Oxygen* - Calibrate the dissolved oxygen sensor on the multi-probe instrument within 24 hours of collecting field measurements. Preferably, dissolved oxygen is measured directly in-stream close to the flow centroid. The dissolved oxygen probe must equilibrate for at least 90 seconds before dissolved oxygen is recorded to the nearest 0.1 mg/L. Since dissolved oxygen takes the longest to stabilize, record this parameter after temperature, conductivity, and pH.

- *pH* - Preferably, pH is measured directly in-stream close to the surface flow centroid. If the pH meter value does not stabilize in several minutes, out-gassing of carbon dioxide or hydrogen sulfide or the settling of charged clay particles may be occurring. If out-gassing is suspected as the cause of meter drift, collect a fresh sample, immerse the pH probe and read pH at one minute. If suspended clay particles are the suspected cause of meter drift, allow the sample to settle for 10 minutes, and then read the pH in the upper layer of sample without agitating the sample. With care, pH measurements should be accurately measured to the nearest 0.1 pH unit.

- *Conductivity* - Preferably, specific conductance is measured directly in-stream close to the flow centroid. Allow the conductivity probe to equilibrate for at least one minute before specific conductance is recorded to three significant figures (if the value exceeds 100). The primary physical problem in using a specific conductance meter is entrapment of air in the conductivity probe chambers. The presence of air in the probe is indicated by unstable specific conductance values fluctuating up to ±100 mS/cm. The entrainment of air can be minimized by slowly, carefully placing the probe into the water; and when the probe is completely submerged, quickly move it through the water to release any air bubbles.

- *Temperature* is measured directly in-stream close to the flow centroid. Measure temperature directly from the stream by immersing multi-parameter probe.

- *Turbidity* is measured directly in-stream close to the flow centroid via multi-parameter probe.

  For separate turbidity measurements: Measure turbidity by collecting a sample close to the stream centroid to be used in a Hach Portable Turbidity Meter (or equivalent). The glass sample container must be wiped with a soft cloth before placing into the turbidity meter for analysis. Be careful not to scratch the glass sample container as this will impact the accuracy of the turbidity meter.

5.8 Flow Measurements

With one exception, flow measurements will be recorded by field personnel for every site visited using one of the methods described below (when safe). The exception is monitoring sites near a stream gage station that provides representative flow data for the monitoring site. The data from the gage station may be used instead of estimating flow in the field. A depth-discharge rating curve can be developed by conducting multiple flow measurements at water depths in 0.1 foot increments. Once developed, only depth measurements would be required during site visits, assuming the depth of flow is within 0.1 foot of a previously completed flow measurement. A depth-discharge rating curve will need to be re-calculated whenever the stream cross section is altered. Methods for estimating flow at a monitoring site include:

- *Visual Flow Estimate* - Flow estimate data may be recorded for a non-tidally influenced stream when it is not possible to measure flows by the volumetric or cross section velocity profile methods described above either because flows are too high or so shallow that obtaining a velocity measurement is difficult or impossible. Visual flow estimates are subjective measures based on field personnel's experience and ability to estimate distances, depths, and velocities.

  - Observe the stream and choose a reach of the stream where it is possible to estimate the stream cross section and velocity. Estimate stream width (feet) at that reach and record.

  - Estimate average stream depth (feet) at that reach and record.

  - Estimate stream velocity (ft/s) at that reach and record. A good way to do this is to time the travel of a piece of floating debris. This can be done by selecting points of reference along the stream channel which can be used as upper and lower boundaries for an area of measurement. After establishing the boundaries, measure the length of the flow reach. One person stands at the upper end of the reach and drops a floating object and says “start.” A second person stands at the lower end of the reach and times the number of seconds for the floating object to float the reach. This measurement is conducted three times and the three results are averaged. The velocity is the length of the reach in feet divided by the average time in seconds. Alternatively, temporary sandbags or similar structures can be used to facilitate concentration of flow prior to volumetric flow measurements.

  - If doing this method from a bridge (for example, because flows are too high to be in the channel), measure the width of the bridge. Have one person drop a floating object (something that can be distinguished from other floating material) at the upstream side of the bridge and say “start”. The person on the downstream side of the bridge will stop the clock when the floating object reaches the downstream side of the bridge. Divide the bridge width by the number of seconds to calculate the velocity. The velocity should be measured at multiple locations along the bridge at least three times. These velocities are averaged.

  - Multiply stream width (feet) by average stream depth (feet) to determine the cross sectional area (ft^2) which when multiplied by the stream velocity (ft/s) and a correction constant, gives an estimated flow (ft^3/s).

- *Float (Orange Peel) Velocity Method* – This methodology follows a similar approach as Visual Flow Estimate but is used when flows are not too high and it is safe to record stream cross section measurements.

  - Observe the stream and choose a reach of the stream where it is possible to measure the stream cross section and velocity. Measure stream width (feet) at that reach and record.

  - Measure average stream depth (feet) at that reach and record.

  - Estimate stream velocity (ft/s) at that reach and record. A good way to do this is to time the travel of a piece of floating debris. This can be done by selecting points of reference along the stream channel which can be used as upper and lower boundaries for an area of measurement. After establishing the boundaries, measure the length of the flow reach. One person stands at the upper end of the reach and drops a floating object and says "start." A second person stands at the lower end of the reach and times the number of seconds for the floating object to float the reach. This measurement is conducted three times and the three results are averaged. The velocity is the length of the reach in feet divided by the average time in seconds. Alternatively, temporary sandbags or similar structures can be used to facilitate concentration of flow prior to volumetric flow measurements.

  - Multiply stream width (feet) by average stream depth (feet) to determine the cross sectional area (ft^2) which when multiplied by the stream velocity (ft/s) and a correction constant, gives an estimated flow (ft^3/s).

- *Volumetric Flow (Q) Estimate* - Where possible, a volumetric flow measurement approach will be used. This method shall not be used if conditions are determined to be unsafe by an on-site assessment by the field team leader. A volumetric flow measurement entails estimation of the time in seconds (t) required to fill a 5 gallon bucket with concentrated runoff. Sites with low flow and a free outfall would allow for this type of flow measurement. The following equation would then give the flow rate for a test with one 5-gallon bucket of volume captured, Q (cfs) = 0.67 * t. If there are multiple points where runoff is concentrated, then volumetric measurements can be made at each point along the stream and summed to provide total discharge.

- *Cross-Section Velocity Profile Flow Measurement* - The following steps guide the development of a velocity profile for a streamflow cross section. This approach will require that the field personnel be equipped with a Marsh-McBirney Electronic meter or equivalent, top-setting wading rod (preferably measured in tenths of feet) (Figure 5-3), and a tape measure. This method shall not be used if conditions for wading are determined to be unsafe by an on-site assessment by the field team leader.

  - The measuring tape across the stream at right angles to the direction of flow. When using an electronic flow meter, the tape does not have to be exactly perpendicular to the bank (direction of flow). Avoid measuring flow in areas with back eddies. The first choice would be to select a site with no back eddy development. However, this cannot be avoided in certain situations. Measure the negative flows in the areas with back eddies.

- Record the following information on the flow measurement form (Attachment F):
  - Site Location and Site ID
  - Date
  - Time measurement is initiated and ended
  - Name of person(s) measuring flow
  - Note if measurements are in feet or meters
  - Total stream width and width of each measurement section
  - For each measurement section, record the mid-point, section depth, and flow velocity
- Determine the spacing and location of flow measurement sections. Measurements will be taken at the midpoint of each of the flow measurement sections. Flow measurements will be taken at the following points at a stream site, as shown in Figure 5-4.
  - A point from the left bank representing 10% of the total width. This measurement will provide a velocity estimate for the section representing 0 % – 20% of the total width from the left bank;
  - A point from the left bank representing 50% of the total width. This measurement will provide a velocity estimate for the section representing 20 % – 80% of the total width from the left bank;
  - A point from the left bank representing 90% of the total width. This measurement will provide a velocity estimate for the section representing 80 % – 100% of the total width from the left bank;
- Place the top setting wading rod at each flow measurement point.
- Using a tape measure, measure the depth of water to the nearest ½ inch.
- Adjust the position of the sensor to the correct depth at each flow measurement point. The purpose of the top setting wading rod is to allow the user to easily set the sensor at 20%, 60%, and 80% of the total depth. On the wading rod, each single mark represents 0.10 foot, each double mark represents 0.50 foot, and each triple mark represents 1.00 foot (Figure 5-3). Position the meter at 60% of the total depth from the water surface (if depth of flow is greater than 2.5 feet, then take two readings, at 20% and 80% of total depth).
- Measure and record the velocity and depth. The wading rod is kept vertical and the flow sensor kept perpendicular to the cross section. Permit the meter to adjust to the current for a few seconds. Measure the velocity for a minimum of 20 seconds with the Marsh-McBirney meter. When measuring the flow by wading, stand in the position that least affects the

velocity of the water passing the current meter. The person wading stands a minimum of 1.5 feet downstream and off to the side of the flow sensor.

- Report flow values less than 10 ft^3/s to two significant figures. Report flow values greater than 10 ft^3/s to the nearest whole number, but no more than three significant figures.
- Calculate flow by multiplying the width *x* depth (ft^2) to derive the area of each of the three flow measurement sections. The area of the section is then multiplied by the velocity (ft/s) to calculate the flow in cubic feet per second (cfs or ft^3/sec) for each flow measurement section. Do not treat cross sections with negative flow values as zero. Negative values obtained from areas with back eddies should be subtracted during the summation of the flow for a site. When flow is calculated for all of the measurement sections, they are added together for the total stream flow.

- *Continuous Flow Meter Deployment* – Flow sensing technologies are able to measure flow in pipes, natural channels, or lined channels without the need to develop a velocity-area profile. Deployment of flow sensors according to manufacturer specifications is another method that may be used to collect flow data from the monitoring stations.

5.9 Responsible Agencies and Contract Laboratories

The QAPP that accompanies the SAR Bacteria Monitoring Plan identifies Responsible Agencies and Contract Laboratories for the purpose of implementing this plan (in particular see Section 4)

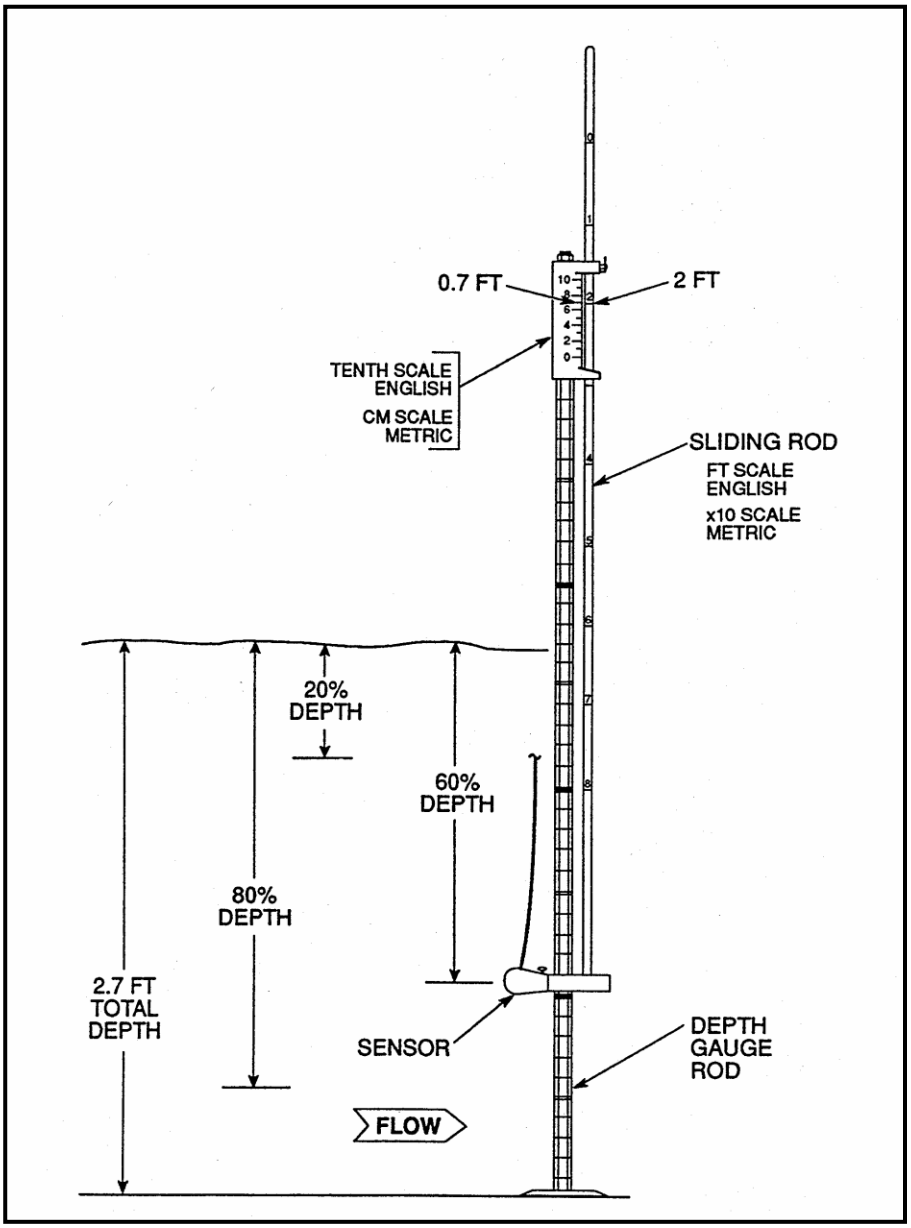

Figure 5-3. Top-setting Wading Rod (Source: California's SWAMP Quality Assurance Project Plan, Appendix E, December 2002)

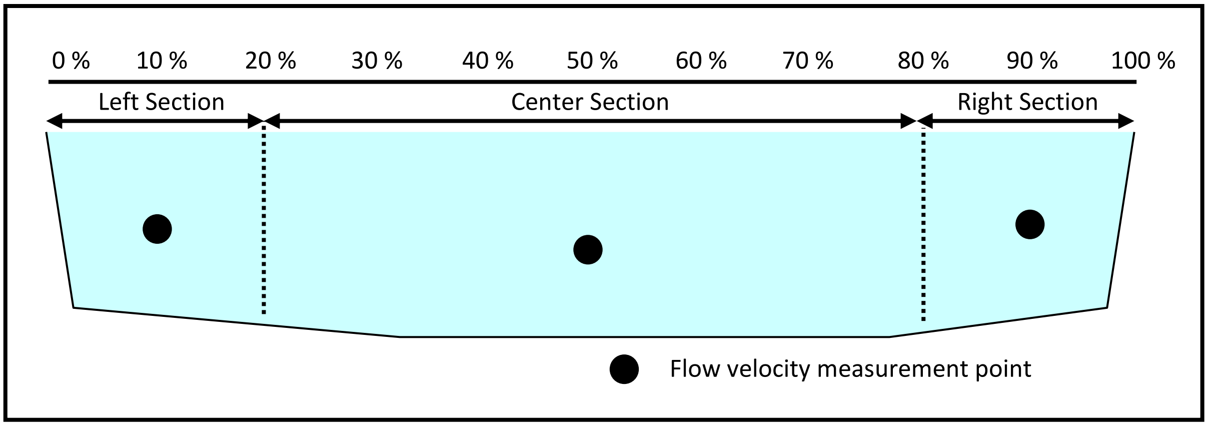

Figure 5-4. Approach used in Cross-section Velocity Profile Flow Measurements

Section 6

Specialized Sampling and Analysis Procedures

This section of the SAR Bacteria Monitoring Plan describes sampling and analysis procedures used by urban dischargers to evaluate sources of bacterial indicators in the MS4 to support implementation of bacteria TMDLs. The procedures are innovative and separate from procedures described in Section 5. This section will be expanded as needed when new procedures are incorporated into the source evaluation program.

6.1 Bacterial Indicator Source Evaluation Procedures

The procedures in this section have been developed over time to support implementation of the MSAR Bacteria TMDL to identify controllable sources of bacteria in the MS4. These same procedures could be applied to other bacteria TMDLs where urban runoff is identified as a potential source of bacterial indicators; however, these procedures may also be amended in the future if needed to address specific requirements that may be established in future TMDLs when adopted.

6.1.1 Santa Ana River Watershed Bacteria TMDLs

This section provides general background information regarding monitoring approaches associated with the implementation of specific bacteria TMDLs adopted in the watershed.

6.1.1.1 MSAR Bacteria TMDL

Since adoption in 2012, the MS4 programs in the MSAR watershed have been actively implementing their respective CBRPs (see Section 4.1.2.1) to implement the MSAR Bacteria TMDL. To date, two rounds of Tier 1 source evaluations have been completed (2012 and 2019 dry seasons). The findings from these Tier 1 source evaluation were submitted to the Santa Ana Water Board on February 11, 2013 and February 10, 2020[39]. These reports included recommended prioritization of Tier 1 drainage areas for Tier 2 source evaluation activities (Figure 6-1). Since 2014, MS4s have actively conducted Tier 2 source investigations within prioritized drainage areas. Human sources have been identified and eliminated as a result of many of these activities and summaries are generally provided to the MSAR TMDL Task Force or in the 2016 and 2020 Triennial Review Reports.

The CBRP includes a schedule of activities, which in the 2013 and 2014 dry seasons included implementation of Tier 2 source evaluation activities. The goal of Tier 2 source evaluations is to identify specific controllable urban sources of fecal bacteria within MS4 drainages areas in the MSAR watershed and to take action wherever possible to eliminate these sources. Prioritization of MS4 drainage areas to Tier 1 sites, based on 10 weeks of dry season source evaluation monitoring in 2012, found certain areas that were of greatest concern for either bacterial indicator loading or for presence of the human *Bacteroides* marker. Tier 2 activities focus on these drainage areas; however, the principles of Tier 2 source evaluation can be applied to any drainage area regardless of priority. The CBRP included an adaptive implementation approach to continue Tier 1 site prioritization sampling followed by Tier 2 source investigation to identify and eliminate controllable sources of fecal bacteria. After several years of successful Tier 2 source investigations by multiple MS4s, exceedances of WLAs

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[39] https://sawpa.org/task-forces/middle-santa-ana-river-watershed-tmdl-task-force/#resourcesb8a6-4b67

at the compliance monitoring locations remained The Task Force embraced the iterative process in 2019 and embarked upon an updated Tier 1 analysis. Results are currently being used to prioritize Tier 2 source investigation in 2020 and 2021.

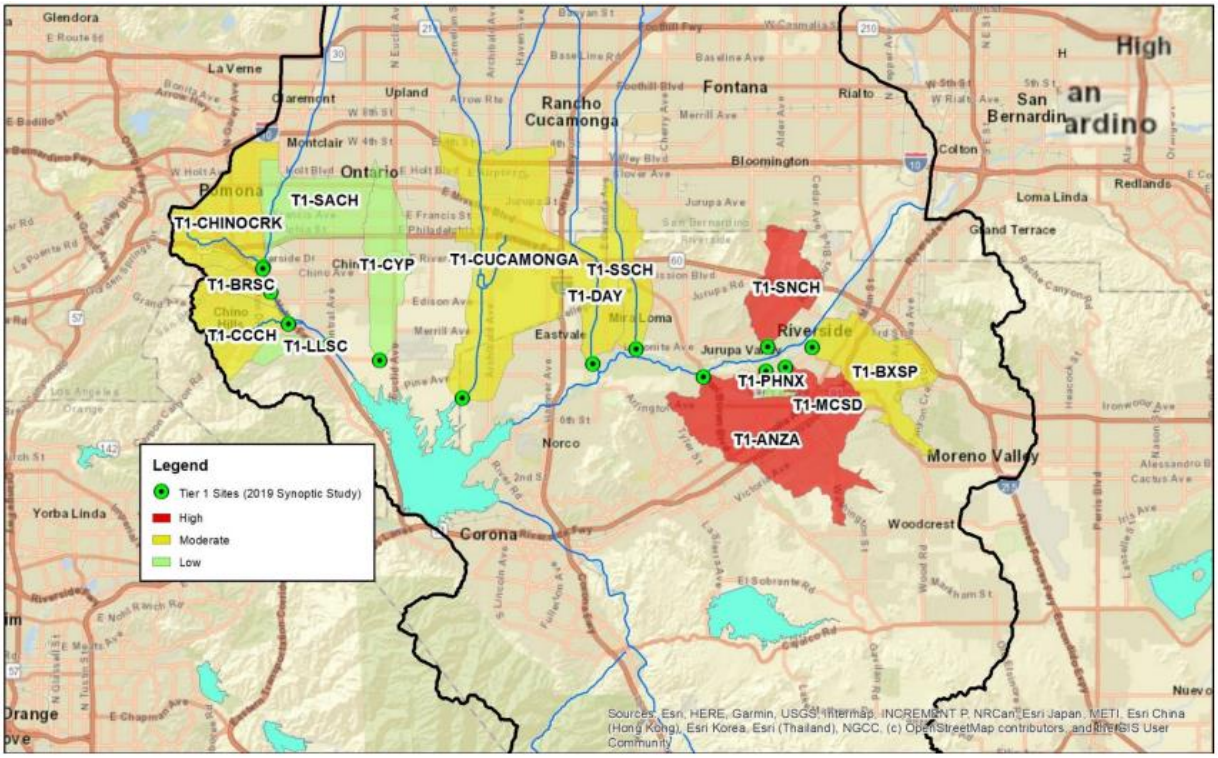

Figure 6-1. Map of Prioritized Tier 1 MS4 Drainage Areas

The sections below describe approaches used by MSAR MS4 permittees to conduct Tier 2 bacteria source evaluation activities within the MS4s upstream of prioritized Tier 1 sites. MS4s upstream of Tier 1 sites include many miles of underground drainage facilities, which would be nearly impossible to monitor at the same level as was done for the Tier 1 outfalls to receiving waters. Therefore, it was necessary to develop alternative approaches to source evaluation that can be effective at identifying specific MS4 sources of bacterial contamination with limited resources.

The sections below also provides details of two source evaluation approaches to guide individual MS4 permittees in the implementation of source evaluation activities. For each prioritized Tier 1 drainage area within the MSAR watershed, MS4 permittees select one of the two alternatives to implement. Table 6-1 provides a summary of the high priority MS4 drainage areas in the MSAR watershed as determined from Tier 1 monitoring in 2007, 2012, and 2019.

Table 6-1. Relative Rank Results for each Prioritization Criterion and the Final Composite Score for each Tier 1 Site

Tier 1 Site	Relative Rank (0 to 100) for Prioritization Criteria				Composite BFS
	Criterion 1 DWF (gal/acre/day) Weight = 0.3	Criterion 2 *E.Coli* Loading (MPN/Day) Weight = 0.3	Criterion 3 *Bacteroides Amplification Frequency (%) Weight = 0.3*	Criterion 4 Risk of Exposure Weight = 0.1	
T1-MCSD	38	85	100	100	77
T1-SNCH	77	62	67	100	72
T1-ANZA	100	69	17	100	66[1]
T1-CUCAMONGA	69	92	17	100	63
T1-SSCH	85	100	17	0	60
T1-BRSC	62	54	83	0	60
T1-BXSP	31	38	83	100	56
T1-CHINOCRK	54	77	17	0	44
T1-DAY	46	46	0	100	38
T1-CCCH	92	31	0	0	37
T1-PHNX	23	23	0	100	24
T1-SACH	8	15	0	0	7
T1-LLSC	15	8	0	0	7
T1-CYP	0	0	0	0	0

[1] Given the closeness of this score (66) to the high priority category (67-100), this site is categorized as high priority

6.1.2 Urban Source Evaluation Approach

Within an MS4, there is a vast drainage system that would be nearly impossible to completely monitor in a timely manner using water quality sample collection and analysis alone. To optimize resources, alternative monitoring methods have been identified that are recommended for use to track controllable sources of human fecal bacteria in prioritized MS4 drainage areas. Many of these methods are adapted from Center for Watershed Protection guidance documents and supporting memorandum [40].

Two bacteria source evaluation approaches are available for use by any MS4 permittee within any high priority drainage area, referred to as broad-brush or subregional approaches. The difference in these approaches involves the order of different types of investigation and the number of sites and frequency of water quality sample collection. Each approach is described below. Note that even the approaches described in the subsections below were originally developed based on the MSAR Bacteria TMDL implementation program, the approaches would be generally applicable to other bacteria TMDL implementation programs. Accordingly, the references to "Tier 1 sites" and "Tier 2 sites" have the same meaning as described above in Section 4.1.2.2. Specifically, Tier 1 are defined as sites where

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[40] Center for Watershed Protection. 2002. Techniques for Identifying and Correcting Illicit and Inappropriate Discharges. Task 2 Technical Memorandum prepared by Deb Caraco for submittal to USEPA; and Center for Watershed Protection. 2004. *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*. Available online at: http://cfpub.epa.gov/npdes/docs.cfm?program_id=6&view=allprog&sort=name#iddemanual

urban sources of dry weather flow may directly discharge to a downstream TMDL compliance site; and Tier 2 sites are outfalls that drain to a Tier 1 sites.

6.1.2.1 Broad-brush Approach

The broad-brush approach attempts to identify specific sources of human fecal bacteria by initially performing extensive field reconnaissance and screening investigations. These relatively low cost activities include field reconnaissance (Section 6.1.3.1) and deployment of secondary screening tools (see Section 6.1.3.2) and can be implemented at a large number of Tier 2 sites.

Results from field reconnaissance and secondary screening tool deployment will be used to identify Tier 2 sites for bacterial water quality sample collection. On days when samples are collected from Tier 2 sites within the MS4, samples will also be collected from downstream Tier 1 sites to assess the relative role of the Tier 2 measurements in downstream bacteria characteristics.

The broad-brush approach provides a spatially robust dataset and has the potential to pinpoint specific management actions at an individual property scale to eliminate bacteria sources. MS4 permittees will use results from field reconnaissance, secondary screening, and bacterial water quality analysis to guide implementation of short-term management actions that address bacteria sources of concern. At the end of the dry season, a follow-up snapshot survey will be performed to determine the effectiveness of any management actions implemented.

The risk associated with this approach stems from the temporal variability in human *Bacteroides* detection, which for the MSAR Bacteria TMDL implementation program was typically less than 40 percent of samples in the 2012 dry season at the downstream Tier 1 sites. Accordingly, there is a greater chance of missing the human fecal bacteria signal using an approach with a single snapshot survey.

6.1.2.2 Subregional Approach

The subregional approach attempts to develop a better understanding of dry weather flow and water quality from subareas within a prioritized Tier 1 MS4 drainage. This approach involves weekly sample collection from the downstream Tier 1 site and at one or more major trunk confluences within the MS4 drainage system (Tier 2 sites). Samples are analyzed for *E. coli* (see Section 6.1.3.3) and flow to develop a baseline longitudinal characterization. Secondary screening tools (see Section 6.1.3.2) are used to assess water quality in neighborhood scale subareas upstream of laterals with elevated *E.coli* loads. Field reconnaissance (Section 6.1.3.1) is important to identify the Tier 2 sites for baseline characterization in the initial weeks, and then to aid in selection of neighborhood scale Tier 2 sites for IC/ID source evaluation incorporating secondary screening tracer sample collection in the middle of the dry season. Samples may also be collected and analyzed for human *Bacteroides* at Tier 2 sites based on information gathered from secondary screening and field reconnaissance. MS4 permittees use results from all phases of the source evaluation effort to guide implementation of short-term management actions that address bacteria sources of concern.

The risk associated with this approach stems from the aggregation of large spatial areas, which may not provide the resolution needed to identify specific sources for focusing or targeting short-term management actions. However, if the Tier 2 source evaluations occur over two dry seasons, a subregional approach in the first year could be followed by adopting the broad-brush approach in smaller more manageable subareas in the second year of the program.

6.1.3 Urban Source Evaluation Methods

The methods described in the subsections below were originally developed based on the MSAR Bacteria TMDL implementation program. Regardless, these methods would be generally applicable to other bacteria TMDL implementation programs. Accordingly, the references to "Tier 1 sites" and "Tier 2 sites" have the same meaning as described above in Section 4.1.2.2. Specifically, Tier 1 are defined as sites where urban sources of dry weather flow may directly discharge to a downstream TMDL compliance site; and Tier 2 sites are outfalls that drain to a Tier 1 sites.

6.1.3.1 Field Reconnaissance

Field reconnaissance involves a passive inspection of MS4 facilities and their upstream drainage areas. The objective of field reconnaissance activities include:

- Identification of any obvious and significant sources of dry weather flow within the watershed (both permitted and illicit discharges will be documented).

- Locating points in MS4s where there is no dry weather flow and therefore portions of the drainage area can be excluded from further source evaluation.

Source evaluation tools that can be used during field reconnaissance include visual observations of watershed areas and major MS4 facilities. Sensory observations will be noted based on odor (e.g., rotten eggs), visual water quality (e.g., foamy), and watershed inspection for human behaviors (e.g., loitering). Table 6-2 describes the types of information that will be gathered during field reconnaissance source evaluation activities. Secondary screening tools can be used during field reconnaissance, if determined to be appropriate by the field team.

Dry weather flow assessments are conducted systematically to ensure correct conclusions are reached and to be as efficient as possible. Two systematic approaches to dry weather flow assessment are described below:

- *Upstream to downstream* – Similar to the method, "Moving Down the Watershed", detailed in the Center for Watershed Protection (CWP) technical memorandum titled *Techniques for Identifying and Correcting Illicit and Inappropriate Discharges* (CWP, 2002). This approach involves moving from headwaters downstream until dry weather flow is observed or evidence of intermittent dry weather flow is observed at a junction. Once observed, the laterals with dry weather flow are explored to determine the source of dry weather flow. Conversely, for junctions that have no evidence of dry weather flow, sandbags may be used as a tool at the outflow point to confirm absence of dry weather flow from these drainage areas.

- *Downstream to upstream* – This approach begins at the Tier 1 site and involves observation of dry weather flow at each junction. Laterals that are determined to have no evidence of dry weather flow are not investigated, and sandbags may be used as a tool at the outflow point to confirm absence of dry weather flow from these drainage areas. The reconnaissance continues to follow dry weather flow upstream until a junction with no evidence of dry weather flow is reached. All MS4 drainage area upstream of this junction would not be investigated.

The results of the field reconnaissance will provide the MS4 permittees with a map of MS4 facilities containing dry weather flow that require additional source evaluation. In addition, data collected from watershed inspections will be geospatially linked to downstream MS4 facilities to develop initial concepts for relationships between specific watershed sources and downstream water quality. Water quality data will be collected using a combination of secondary screening tools and water quality sample collection.

Table 6-2. Source Evaluation Activities during Field Reconnaissance

Activity	Method	Types of Observations
Watershed Inspection	Tour priority subwatersheds and observe human behavior and associated dry weather flows	▪ Leaks in irrigation systems and other water waste ▪ Ordinance violations ▪ Transient encampments and loitering ▪ Illegal dumping
Assess Odor of Dry Weather Flow	Stand close to dry weather flow in gutter, street inlet or open manhole and assess the odor	▪ *Rotten eggs* (raw sewage, decomposing organic matter/hydrogen sulfide) ▪ *Rancid/sour* (raw or partially treated sewage, livestock waste) ▪ *Petroleum/gas Sharp/pungent* (chemicals or pesticides) ▪ *Sweet/fruity* (commercial wash water, wastewater)
Assess Visual Water Quality of Dry Weather Flow	Stand close to dry weather flow in gutter, street inlet or open manhole and assess water quality	▪ *Suds* are rated based on their foaminess and staying power. Suds that travel several feet before breaking up should be considered as a possible illicit discharge. ▪ *Sheen* (naturally-produced or bacteria induced if sheet-like film breaks if disturbed, petroleum/oil) ▪ *Tan Foam* (churns water containing organic materials causing harmless foam) ▪ *White Foam* (soap) ▪ *Yellow, Brown, Black Film* (pine, cedar, and oak pollens form film on surface in slow moving water)

In several of the prioritized drainage areas, there are open channels which convey dry weather flow from underground drains to an impaired waterbody. Field reconnaissance in these areas will include driving or walking within the open channel to characterize dry weather flow at outfalls. These types of Tier 2 sites are well suited for assessments using secondary screening tools, because it would be simple to collect a water sample relative to a completely underground MS4.

6.1.3.2 Secondary Screening Tools

There are several useful monitoring procedures that can be used to conduct secondary screening to support bacteria source tracing. These are discussed in the sections below.

6.1.3.2.1 Dry Weather Flow Assessment

Determination of flow within a storm drain during dry weather can provide an understanding of the magnitude of an illicit discharge during dry weather. MS4 permittees will visually inspect inside the storm drain for the presence or absence of dry weather flow. If flow is present, other observations regarding the storm drain discharge may include an evaluation of the presence of staining, odors, floatable materials, or colors. Record observations on field sheet or log book. Where possible the MS4 permittees will measure the depth of flow using the following procedures while also following all safety procedures included in the QAPP Section 11.4.1.1:

- Manhole Sampling Method
  - Remove manhole cover.

  - Prepare steel measuring tape with lead weight at the end or telescoping survey rod for use by running carpenter chalk along the last few feet of the tape or survey rod.
  - Place the steel tape or survey rod into the manhole and ensure that they are completely submerged, reaching the bottom of the manhole. Care should be taken to ensure the steel tap or rod stay perpendicular to the bottom of the manhole and that the steel tape does not bend.
  - Pull the tape or rod back up to ground surface and observe the point at which a color change between dry and wet chalk occurs. This line denotes the length of tape/road that was immersed in water.
  - Record the depth measurement on field sheet or log book.

- Alternate Manhole Sampling
  - Attach pre-cleaned tubing to peristaltic pump, exercising caution to avoid allowing tubing ends to touch any surface.
  - Place one end of the tubing below the surface of the water. Avoid placing tubing near bottom of the channel where solids have settled.
  - Hold the other end of the tubing over the opening of the sample container, exercising care not to touch the sampling container.
  - Pump the necessary sample volume into the sample container and secure the lid.
  - Collect remaining samples including quality control samples.

6.1.3.2.2 Water Quality Screening Tools

There are several useful monitoring procedures that serve as a menu for MS4 permittees to use in conducting secondary screening for potential bacteria sources. Tracers may be monitored in the field with test strips or kits, or may be sent to a laboratory. Table 6-3 shows potential ranges for these tracers that may be indicative of a specific source of dry weather flow. Each of these chemical tracers is discussed in more detail below.

Section 6.1.3.3 describes additional methods that may be necessary to collect a water sample from Tier 2 sites to use these screening tools. It should also be noted that these tests may generate waste that is considered hazardous. This waste cannot be dumped into the sanitary sewer system but must be collected and disposed of properly.

- *Ammonia* - Nitrogen is a fundamental nutrient in the aquatic ecosystem and is required for survival by all plants and animals. In aquatic ecosystems, nitrogen is present in different forms: nitrate, nitrite, ammonia, and organic nitrogen. Of particular interest to storm drain systems is ammonia-nitrogen, which could indicate illegal wastewater connections to the sanitary sewer system, poorly functioning septic systems, or wildlife. If done in the field, this approach will require that field personnel be equipped with ammonia test strips by Hach or other manufacturer.

- *Chlorine* - Chlorine is used in water treatment and wastewater treatment processes to disinfect water. Presence of chlorine in storm drain discharges could indicate an illicit connection with the water supply system, wastewater effluent or another human source. There are different types of chlorine analyses available for use in the field. Test strips are available from Hach for chlorine residual (i.e., free chlorine); test kits are also available using the N,N-Diethylparaphenylenediamine (DPD) method which will cause a color change which can then be evaluate using color discs or field spectrophotometers.

- *Copper* - Copper is a metallic element essential to human growth and ubiquitous in the environment. Detection of copper during secondary screening may indicate an illicit discharge into the storm drain system from human sources, such as algaecides, copper pipes, or electrical components. There are different types of copper field analyses available for use. Test strips are available from Hach for copper providing readings between 0 and 3 mg/L while colorimetric test kits are also available and provide more precise readings between 0.2 and 5 mg/L.

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Table 6-3. Potential Ranges for Chemical Tracers that may be used by MSAR Permittees for Bacteria Source Evaluation Activities (Pitt 2001)[41]

Parameter	Natural	Tap	Sewage	Septage	Car Wash	Laundry
Ammonia (mg/L)	0 – 1	0.01 – 0.07	12 – 50	23 - 129		
Potassium (mg/L as K)	< 5		7 - 15	1 - 121		
Copper (mg/L)	< 0.1	< 0.01			0 – 0.86	
Detergents (mg/L MBAS)		< 0.01				12.6 – 101.3

- *Potassium* - Potassium should be useful in distinguishing natural waters from waters which have been used domestically, or commercial wash waters. Pitt (2001) suggests using potassium in combination with other tracers to identify specific types of human sources as follows:
  - If the surfactant concentrations are high, but the ammonia and potassium concentrations are low, then the contaminated source may be laundry wastewaters.
  - Conversely, if ammonia, potassium, and surfactant concentrations are all high, then sanitary wastewater is the likely source.
- *Surfactants/Detergents* - Many illicit discharges into storm drains will have elevated concentrations of surfactants and detergents. Industrial cleaning, commercial wash water and car washes may also be sources of surfactants and detergents in storm drains. Leaking sanitary sewers could also contribute detergents used in household cleaning. If done in the field, this approach will require that field personnel be equipped with Hach Detergents Test Kit or a similar product.
- *Sucralose* - Sucralose is an artificial sweetener that is used in Splenda®. With the widespread use of Splenda® as a sugar substitute, sucralose has the potential to serve as a tracer for

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[41] Pitt, R. 2001. *Methods for Detection of Inappropriate Discharges to Storm Drainage Systems: Background Literature and Summary of Findings*. Tuscaloosa, AL.

domestic wastewater. Studies have shown that sucralose is an excellent tracer for domestic wastewater because it is water soluble, has a long environmental half-life, and laboratory methods exist to detect the molecule at very low concentrations[42].

6.1.3.2.3 Canine Scent Tracking

The use of canines to track human sources of storm drain illicit discharges has been reported as an accurate method that results in very few false positives[43]. Canine scent tracking may be used by MS4 permittees to assist in locating specific sources of human-specific bacteria within MS4s. One of the benefits of canine scent tracking is the large number of MS4 facilities that can be evaluated during a monitoring event relative to other methods that require collection of a water sample and subsequent laboratory analysis.

6.1.3.3 Water Quality Sample Collection

Water quality sampling procedures that are unique to Tier 2 source evaluation activities are limited. The same constituents analyzed for in the original urban source evaluation work and in Tier 1 source evaluation activities will continue to be analyzed for in samples collected for a Tier 2 source evaluation. The primary difference between Tier 2 source evaluations versus other sample collection activities involves the nature of sample collection. Samples collected for Tier 2 source evaluation may require accessing underground MS4 facilities, which differs from receiving water and outfall monitoring where the sampler can easily access the water surface. The exception is for drainage areas with open channels that convey dry weather flow from underground drains to the impaired waterbody. In these areas, water quality sample collection is designed to focus on outfalls to these open channel tributaries, thereby avoiding the need to monitor from manholes.

Sample collection may involve opening manhole covers. The QAPP that accompanies this Monitoring Plan provides procedures for proper opening of manhole covers; in addition, individual permittees may also have standard operating procedures for accessing MS4 facilities that must be followed.

To avoid climbing down into the manholes, permittees may construct pole mounted sample collection devices (Figure 6-2). These devices should be constructed so that it is possible to collect dry weather flow that typically has limited depth. One option is to use sampling bags instead of bottles, as shown in the example shown in Figure 6-2. Samplers can also use the alternate manhole methodology using a peristaltic pump as described above.

If the manhole is within the road right-of-way, it will be important to divert road and foot traffic away from the manhole using traffic cones, following established jurisdictional procedures. Prior to fully uncovering the manhole, permittees will monitor for harmful gases to ensure safety of the field team.

6.2 Placeholder – Other Specialized Procedures

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[42] Oppenheimer, J., A. Eaton, M. Badruzzaman, A.W. Haghani, and J.G. Jacangelo. 2011. *Occurrence and suitability of sucralose as an indicator compound of wastewater loading to surface waters in urbanized regions*. Water Research 45: 4019-4027

[43] Murray, Jill, Scott Reynolds, Patricia Holden, Laurie Van De Werfhorst. 2011. *Canine Scent and Microbial Source Tracking in Santa Barbara, California*. Water Environment Research Foundation Report U2R09.

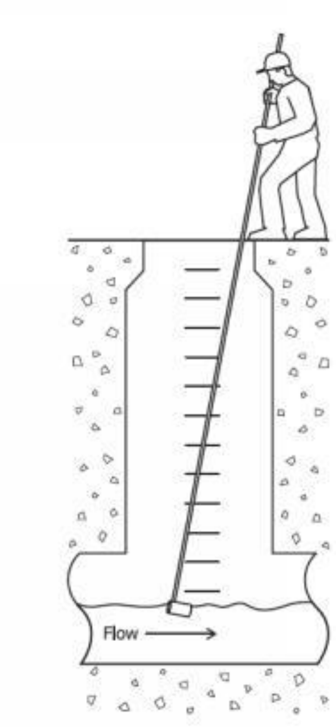

Figure 6-2. Sampling from Manhole with Extension Pole (Source: *How to do Stormwater Sampling: A guide for industrial facilities*. Washington State Department of Ecology. 2010.)

Section 7

Data Management and Reporting

This section establishes requirements for the management and reporting of data collected at any monitoring site included in this SAR Bacteria Monitoring Plan. Management of data includes, but may not be limited to: (a) incorporating sample results into an CEDEN format approved database; (b) archiving field and laboratory data sheets or electronic files, COC forms and laboratory QA/QC reports; (c) periodic QA/QC of the database; and (d) distribution of sample results to program participants, as needed. Reporting requirements are established to provide a mechanism for periodically documenting RMP and TMDL implementation findings. For the purposes of this section:

- Any agency/entity that collects field data or water samples to support implementation of the SAR Bacteria Monitoring Plan is a "Responsible Agency." A Responsible Agency may complete monitoring activities through use of its own personnel or use of a contractor. The QAPP identifies each Responsible Agency for implementation of this SAR Bacteria Monitoring Plan.

- The annual reporting and data management period is for the sample year that begins May 1 and ends April 30.[44] All samples/data collected during this period will be included in the Annual Report prepared after the end of the sample year.

- The Project Director is responsible for completing annual data management and reporting requirements and compiling/archiving data collected by all Responsible Agencies during a sample year (as required below).

Copies of this SAR Bacteria Monitoring Plan and corresponding QAPP will be distributed to all parties involved with the project. Copies will be sent to each Contract Laboratory QA Officer for distribution to appropriate laboratory staff. Any future amendments to these documents will be held and distributed in the same fashion.

7.1 Documents and Records

Each Responsible Agency will maintain a record of all field data collection activities and samples collected and analyzed. All samples delivered to contract laboratories for analysis will include completed Field COC forms (Attachment E). Upon request, all contracted laboratories will generate records for sample receipt and storage, analyses, and reporting.

Contract laboratories will submit the results of all laboratory analyses to the Responsible Agency that submitted the samples for analysis. Field data collected by each Responsible Agency will be maintained onsite and uploaded into a spreadsheet/database throughout the sampling season.

For each sample year (May 1 through April 30), electronic records of field data and laboratory sample results (see Section 7.2 regarding maintenance of electronic data), copies of COC (Attachment E) and

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[44] A sample year is the period from May 1 through April 30 and includes the following sample activity: (a) collection of dry weather samples from Priority 1, 2, 3, and 4 sites from May through September; (b) collection of dry weather samples from Priority 1, 2 and 3 sites in late October through November; and (c) collection of samples from one wet weather event in the MSAR watershed between November 1 and March 31. See Section 3 for specific sample schedules for each priority site.

original field data sheets (Attachment D) and flow measurement forms (Attachment F) for sites where a velocity cross section profile method was used to measure flow will be kept on file by the Responsible Agency. By January 15th of each reporting year, all forms, data sheets, or electronic files associated with non-wet weather event sampling will be provided to the Project Director to support preparation of the Annual Report. Within 15 days after completion of wet weather event sampling, all forms, data sheets, or electronic files associated with the sampling event will be provided to the Project Director to support preparation of the Annual Report. (See Section 7.4).

Contract laboratories will maintain electronic or paper records pertinent to the implementation of the SAR Bacteria Monitoring Program at the laboratory's main office for at least three years. By January 15th of each year, each contract laboratory will provide to the Project Director a QA/QC Report that assesses compliance with laboratory QA/QC protocols for dry weather samples processed during the previous sample year (generally May 1 through November 30). In addition, by April 15th of each year, each contract laboratory will provide to the Project Director a QA/QC Report that assesses compliance with laboratory QA/QC protocols for wet weather event samples processed during the previous sample year during the wet season (between November 1 and March 31). At any time, copies of records or QA/QC reports held by the contract laboratories will be provided to a Responsible Agency or Project Director upon request.

7.2 Database Management

Each Responsible Agency will manage field and laboratory data results by ensuring that all such data are uploaded into a database or spreadsheet template provided by the Project Director. By January 15th of each year, each Responsible Agency Project Manager will submit to the Project Director the database or spreadsheet file containing the previous sample year's field and laboratory data for dry weather samples collected during the previous sample year (generally May 1 through November 30). In 2021, CDM Smith in conjunction with the Task Force, created a visual dashboard[45] that updated quarterly with current RBMP data. In addition, by April 15th of each year, each Responsible Agency Project Manager will submit to the Project Director the database or spreadsheet file containing the previous sample year's field and laboratory data for wet weather event samples collected during the previous sample year during the wet season (between November 1 and March 31)

As part of the preparation of each Annual Report, the Project Director will ensure that all field data and laboratory data results (including QA/QC data) from each Responsible Agency are uploaded to the California Environmental Data Exchange Network (CEDEN). Data will be uploaded no later than 30 days after completion of the Final Annual Report.

7.3 Data Analysis

As required to meet the reporting requirements of the SAR Bacteria Monitoring Plan (see Section 7.4), water quality data analyses will be periodically conducted by the Project Director to evaluate water quality data collected from monitoring sites. At a minimum, water quality data collected under the SAR Bacteria Monitoring Plan will be evaluated to determine the following:

- Compliance with applicable water quality objectives for REC1;

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[45] Current version of the SAWPA RBMP dashboard can be found at: https://sawpa.cdmsmith.com/

- Compliance with applicable antidegradation targets for waters classified as REC2 only;
- Progress towards achieving attainment of MSAR Bacteria TMDL WLAs for *E. coli*; and
- Impairment status of waterbodies listed as impaired in the watershed but a TMDL has not been adopted.

As part of the effort to evaluate the above, water quality analyses will include descriptive statistics such as geometric mean and percentile calculations. In addition where appropriate, water quality results may be compared to historical data collected through this plan or previous monitoring efforts to assess temporal trends at monitoring sites.

7.4 Reporting Requirements

The SAR Bacteria Monitoring Plan reporting requirements included in this section replace any bacteria monitoring requirements that existed prior to the adoption of this Plan, including the seasonal water quality reports currently developed twice each year for the MSAR Bacteria TMDL.

The Project Director will be responsible for the development of the Draft and Final Annual Reports and submittal of the Final Annual Report to the Santa Ana Water Board. After the completion of dry weather sampling each sample year (generally May 1 through November 30, see Section 10), the Project Director will send out a reminder to each Responsible Agency and Contract Laboratory to submit all program-related information described above to the Project Director by January 15th. After the completion of wet weather event sampling that will occur each sample year sometime between November 1 and March 31, the Project Director will send out a reminder to any Responsible Agency and Contract Laboratory that participated in wet weather event sampling to submit all program-related information described above to the Project Director by April 15th.Under this SAR Bacteria Monitoring Plan, the Project Director will prepare a Draft Annual Report by April 30 of each year to reflect findings from sampling conducted during the previous sample year (May 1 through April 30). Findings will include a presentation of the data results and any data analyses completed, e.g., descriptive statistics or trend analyses (see Section 7.3). Each Annual Report will include (a) findings from all RMP sites (See Section 3.3); and (b) findings from any additional required monitoring conducted to support implementation of a bacteria TMDL (e.g., see Section 4.1.1.2).

At a minimum, the Draft Annual Report will be submitted to each Responsible Agency and the Santa Ana Water Board for review. A Final Annual Report will be prepared based on the comments received on the Draft Annual Report. The Final Annual Report will be submitted electronically to each Responsible Agency and the Santa Ana Water Board by June 30 of each year. The Final Annual Report will be made available to the public on either the Santa Ana Water Board or Project Director's website.

Attachment A

Priority Monitoring Site Descriptions

Attachment A describes each of the priority monitoring sites included in the RMP. Each description includes information regarding the monitoring site, where sampling will occur, site access and site photographs. Within each priority category, the sites are presented in alphabetical order by County.

A.1 Priority 1 Monitoring Sites

No Priority 1 sites are located in Orange County. The following subsections provide site descriptions for sites in Riverside and San Bernardino County (See Figure 3-1 for map of locations).

A.1.1 Riverside County

Four Priority 1 waterbodies are located in Riverside County: Canyon Lake, Lake Elsinore, Lake Perris and Santa Ana River Reach 3. The RMP includes the following monitoring sites for these waterbodies:

Canyon Lake

Monitoring Site (P1-1)

Canyon Lake at Holiday Harbor is the monitoring site for this waterbody. Coordinates: 33.6808, -117.2724.

Sampling

Sampling for this site will be conducted from the floating dock at the holiday harbor Boat launch.

Site Access

This site is accessed from Railroad Canyon Road by turning north onto Canyon Lake Drive. Canyon Lake is a gated community, therefore upon turning unto Canyon lake Drive you will have to check in with the guard station and let them know you are there to conduct sampling (prior to initiating monitoring program, coordination with the Property Owner's Association will need to occur to establish a sampling schedule). Drive north along Canyon Lake Drive to Village Way drive, and then make a left to head west for approximately 1000 feet. Holiday Harbor will be on right. Drive to the second driveway and make a right. Drive straight to the back and park vehicle near the floating dock. Walk to the end of the dock to sampling location.

Canyon Lake -looking to the parking lot from the floating dock at Holiday Harbor

Aerial view of Canyon Lake at Holiday Harbor monitoring site

Lake Elsinore

Monitoring Site (P1-2)

Lake Elsinore at Elm Grove Beach is the monitoring site for this waterbody. Coordinates: 33.6664, -117.3356.

Sampling

Sampling for this site will be conducted generally north of the boat launch near the parking lot.

Site Access

This site is accessed from Temecula Valley Fwy (Fwy 15). Drive along Lakeshore Dr. and turn south into Elm Grove Beach parking lot.

Aerial view of monitoring site in Lake Elsinore at City of Lake Elsinore

Perris Lake

Monitoring Site (P1-3)

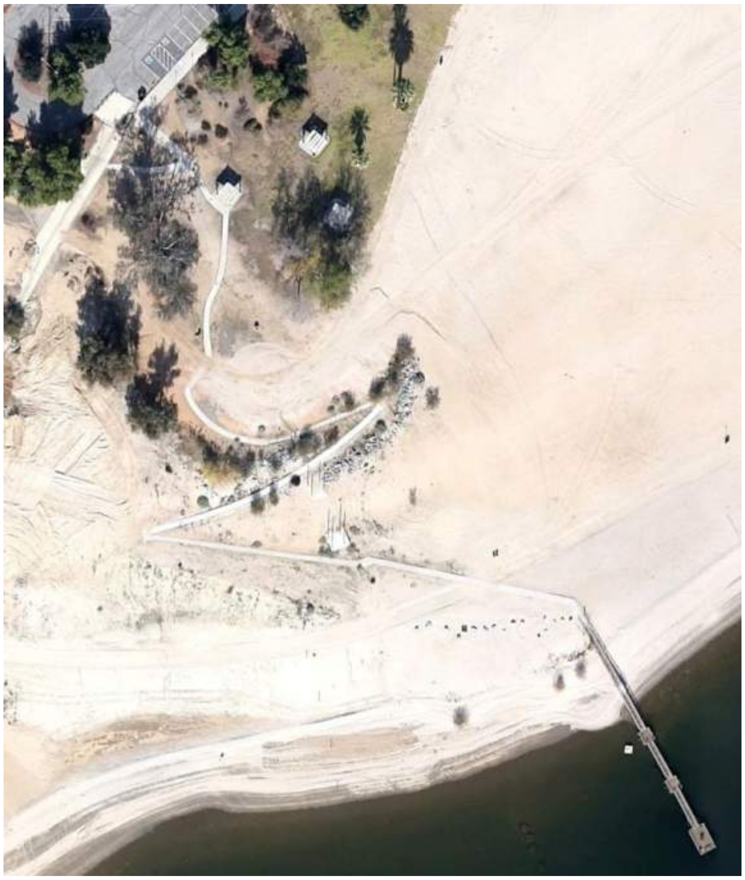
Lake Perris at Boat Launch is the monitoring site for this waterbody. Coordinates: 33.8614, -117.1908.

Sampling

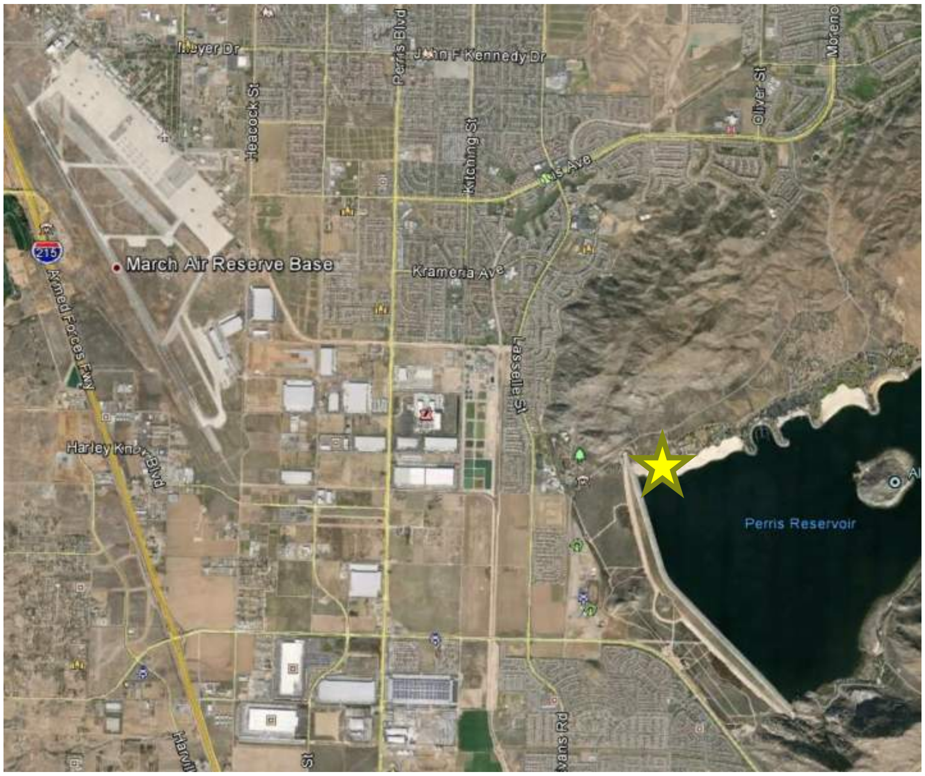
Sampling for this site will be conducted from the dock at the Lake Perris West Beach.

Site Access

This site is accessed from Lake Perris Drive. Drive along Lake Perris into the Lake Perris State Recreation area. Check in with the guard. Continue along Lake Perris Drive to Via Del Lago and Make a right. Follow Via Del Lago for approximately 600 feet until the second street on the right and turn into this street. After approximately 350 feet on this street you will come to the parking lot. Park the vehicle on the parking lot on the right side (West) and follow the side walk and path down to the dock to the sampling location.



Aerial Close up of the dock at Lake Perris West Beach



Aerial view of Lake Perris at West Beach monitoring site

Santa Ana River Reach 3 at MWD Crossing

Monitoring Site (WW-S1)

Sampling for this site will be conducted on the south side of the SAR, east of the MWD aqueduct crossing. Coordinates: 33.9681, -117.4479.

Location of Santa Ana River at MWD Crossing monitoring site.

Site Access

This site is accessed via the City of Riverside Wastewater Treatment Plant, located at 5950 Acorn Street, in the City of Riverside. With prior coordination with the Plant Senior Operator, sampling teams can access the "De Anza Gate" located within the plant. This gate exits to a bike trail that parallels the Santa Ana River for about ¼ mile west to the MWD aqueduct. Park on the left side of the bike path between the Santa Ana River and the bike path and follow the sandy path to the southern bank of the Santa Ana River.

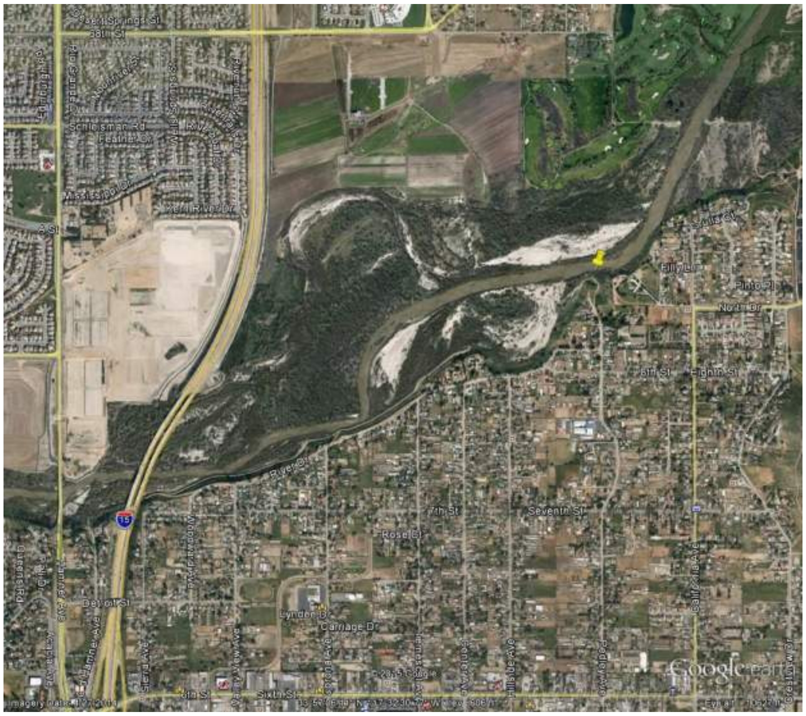
A secondary access location would be to park at the end of Wilderness Avenue, north from Jurupa Ave and walk for about ¼ mile past the MWD gate and proceed toward the Santa Ana River. This access approach will be used when the Plant Operators are unable to meet.

Looking north from under MWD aqueduct crossing towards the Santa Ana

Santa Ana River Reach 3 at Pedley Ave

Monitoring Site (WW-S4)

Sampling at this site will be conducted approximately ½ mile upstream of the Hamner Avenue Bridge. Samples will be collected on the south side of the Santa Ana River. Coordinates: 33.9552, -117.5327.



Location of Santa Ana River at Pedley Avenue monitoring site.

Site Access

Drive north along Pedley Avenue and proceed across River Drive onto the Santa Ana Trails access road. Samples will be collected where the dirt access road meets the southern shore of the Santa Ana River.

Santa Ana River at Pedley Avenue: (a) Left – looking downstream from Pedley Avenue site; (b) Right – View of Santa Ana River from access road.

A.1.2 San Bernardino County

Three Priority 1 waterbodies are located in San Bernardino County: Big Bear Lake, Mill Creek Reach 2, and Lytle Creek, North Fork. The RMP includes the following monitoring sites for these waterbodies:

Big Bear Lake at Swim Beach

Monitoring Site (P1-4)

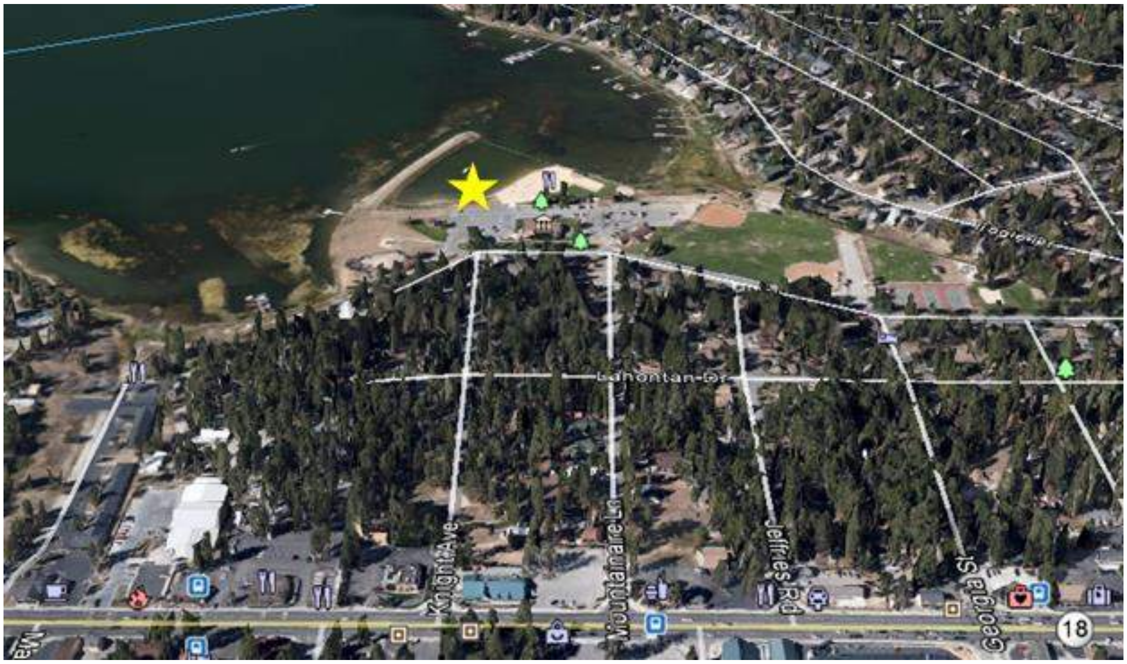
The RMP site for Big Bear Lake is at Swim Beach, which is close to the village center and is the most popular swimming beach on the lake. Coordinates: 34.2482, -116.9034.

Sampling

Sampling at this site will be conducted by wading into Big Bear Lake at Swim Beach 15 feet from the edge of the shoreline or 2 feet water depth, whichever is closest to the shoreline.

Site Access

Drive northeast on Route 18 Big Bear Boulevard and go north on Knight Avenue towards Swim Beach/Meadow Park at the intersection of Park Avenue and Knight Avenue. Park in the Meadow's Park parking lot and walk to the Swim Beach shoreline.



Aerial view of the Big Bear Lake at Swim Beach monitoring site.

Big Bear Lake at Swim Beach monitoring site.

Mill Creek Reach 2

Monitoring Site (P1-5)

The RMP site for Mill Creek is east of Hwy 38 at the Torrey Pines Dr. Bridge crossing in the Forest Falls area. Coordinates: 34.0891, -116.9247.

Sampling

Sampling at this site will be conducted immediately upstream of the Torrey Pines Dr. Bridge from the edge of the creek.

Site Access

Drive east on Mill Creek Road (Hwy 38) past Mountain Home Village. Where Hwy 38 turns sharply northwest, turn east on Valley of the Falls Drive. Turn north on Torrey Pines Dr. before the community of Forest Falls. Park on the south side of the Torrey Pines Dr. Bridge over Mill Creek. Sampling will be conducted from the south bank of Mill Creek upstream of the bridge crossing.

Location of Mill Creek Reach 2 monitoring site east of Hwy 38 and near Forest Falls.

Close of sample site immediately upstream of the Torrey Pines Dr. Bridge crossing on Mill Creek Reach 2

Lytle Creek, Middle Fork

Monitoring Site (P1-6)

The RMP site for Lytle Creek is located on the North Fork upstream of the community of Lytle Creek. This site is upstream of known potential water quality impacts from septic systems. Coordinates: 34.2480, -117.5110.

Sampling

Sampling at this site will be conducted from the north bank of Middle Fork of Lytle Creek.

Site Access

After reaching the community of Lytle Creek, drive to the western end of town past last private properties and park in the first turnout on the right. Walk down dirt path to Lytle Creek to sample from the north bank; sample site is within the stream reach where riparian vegetation becomes more developed.

Location of Lytle Creek monitoring site on the North Fork just west of the Community of Lytle Creek.

Close-up of the monitoring site on the Middle Fork of Lytle Creek just northwest of the where Middle Fork Drive meets Middle Fork Road.

A.2 Priority 2 Monitoring Sites

Priority 2 sites, which are related to the implementation of the MSAR Bacteria TMDL, are only located in San Bernardino County. The following subsections provide site descriptions for these sites (See Figure 3-2 for map of monitoring locations).

A.2.1 San Bernardino County

The MSAR Bacteria TMDL identifies five waterbodies within San Bernardino County (Chino Creek Reach 1A, Chino Creek Reach 1B, Chino Creek Reach 2, Mill Creek [Prado Area] and Prado Park Lake). However, the monitoring program established under the MSAR Bacteria TMDL combined the three Chino Creek reaches into a single monitoring site. As a result there are three monitoring sites included in the RMP as described below.

Chino Creek at Central Avenue

Monitoring Site (WW-C7)

Sampling at this site will be conducted in the creek on the upstream side of the Central Avenue Bridge. Coordinates: 33.9737, -117.6889.

Site Access

Park in the commercial parking lot (Coldwell Banker) on Central Avenue north of Chino Creek and walk south on Central Ave along guardrail and enter Chino Creek via rocks that line the creek side slopes. Collect sample by standing on the rocks and using a sampling pole.

Location of Chino Creek at Central Avenue site

Chino Creek at Central Avenue monitoring site from point of access.

Mill-Cucamonga Creek below Treatment Wetlands

Monitoring Site (WW-M6)

This location has been sampled as part of the watershed-wide compliance program for the MSAR Bacteria TMDL since 2007. The original monitoring location designated Mill-Cucamonga Creek at Corona Road (WW-M5) was located on the upstream side of Mill Creek and Chino Corona Road. The Mill Creek Wetlands, which is a regional BMP that receives a portion of runoff diverted from Cucamonga Creek near the transition from the concrete lined segment to the natural channel at Hellman Avenue, was recently completed. The diversion to the wetlands is upstream of Chino-Corona Road; the outflow to Mill-Cucamonga Creek is downstream of Chino-Corona Road. Thus, monitoring at the WW-M5 site does not reflect the full volume of runoff nor does it account for expected reductions in bacteria resulting from treatment in the Mill Creek Wetland BMP. Accordingly, with the implementation of this SAR Bacteria Monitoring Plan, the existing sample site is being moved to a location downstream of the outlet of the constructed wetland system at Mill Creek Wetlands Park. Coordinates: 33.9268, -117.6250. The selected site is the most accessible location downstream of the treatment wetlands.

Sampling

Sampling at this site will be conducted along the bank of Cucamonga Creek approximately 1.2 miles downstream of the outlet of the constructed wetland system at Mill Creek Wetlands Park.

Site Access

Drive west on Chino-Corona Road until it dead ends at Cucamonga Avenue. Turn left and drive south on Cucamonga Avenue past where McCarty Road veers off to the right. Drive 0.1 to 0.15 miles past the McCarty turnoff to where the road (dirt) turns left (90 degree turn). Drive east on the dirt road until it ends at Cucamonga Creek. Walk down to the creek to sample. Note the last portion of the drive to the site is along an orchard.

During wet weather events, dirt surfaces can flood in certain areas and areas off of the main road are saturated and muddy, leading to bogged conditions. Stay on the main road with gravel or place gravel at the end of the road to allow 4WD vehicles to get traction. Off of the main road, mud can cover wheels and vehicles may get stuck.

Aerial view of monitoring site for Mill-Cucamonga Creek below Treatment Wetlands (Prado Area).

Prado Park Lake

Monitoring Site (WW-C3)

Sampling will be conducted at the outlet of Prado Park Lake. Coordinates: 33.9400, -117.6473.

Site Access

Enter the Prado Regional Park entrance (inform the gate operator that you are working on the MSAR Bacteria TMDL implementation project to avoid paying the fee) and proceed along the roadway driving eastward around the lake until you reach the southeastern end of the lake. Drive along maintenance road until you reach the spillway. Proceed to the sampling area located at the lake outlet area.

During wet weather events, stay off of the dirt road due to muddy conditions that can lead to vehicles getting stuck. The dirt road goes to a steep hill, on which a 4WD vehicle can lose traction due to the mud. It may be safer to park farther away and walk to the site. However, walking conditions can be compromised by rain and mud so care must be taken to approach site safely.

Aerial View of Prado Park Lake

Prado Park Lake site: (a) Left - Looking downstream from Prado Park Lake outflow channel; (b) Right - Outlet Structure from Prado Park Lake spillway; collect sample downstream from berm

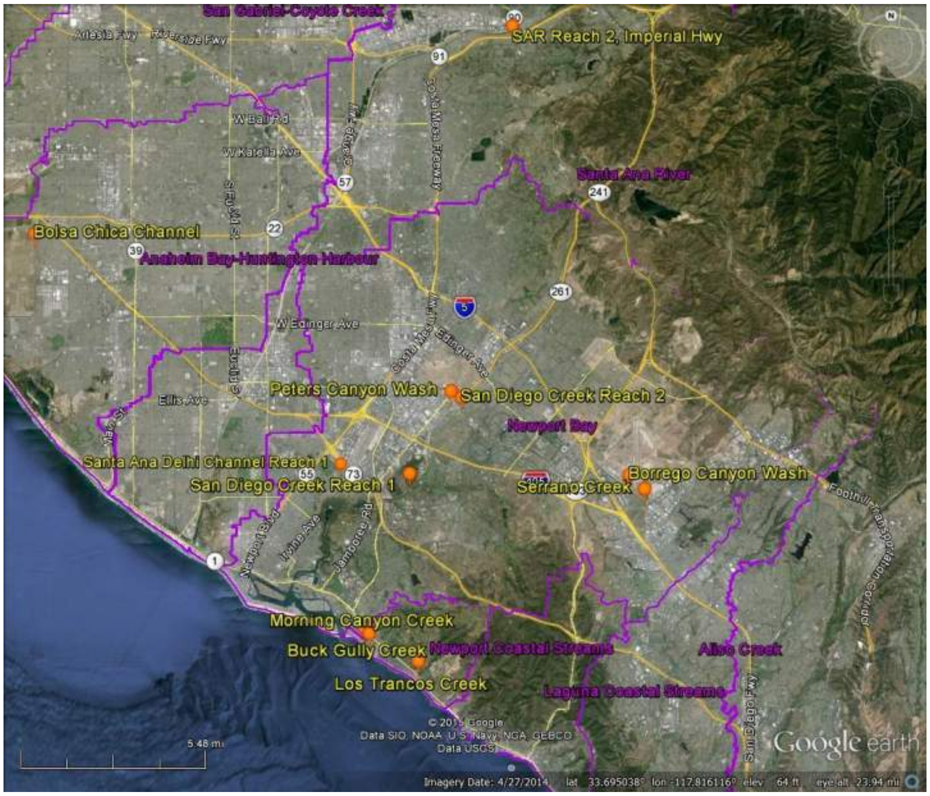
A.3 Priority 3 Monitoring Sites

Priority 3 sites, which are those where the waterbody is listed as impaired on the 303(d) list but a TMDL has not been adopted. Priority 3 monitoring sites are located in Orange, Riverside and San Bernardino Counties (See Figure 3-3 for map of monitoring locations).

A.3.1 Orange County

There are 10 Priority 3 waterbodies identified by the RMP in Orange County. The description of the monitoring sites for each of these waterbodies is described below. The map below shows the locations of the Orange County monitoring sites and the watershed boundaries. The monitoring sites are located in the following watersheds:

- Anaheim Bay-Huntington Harbour (Bolsa Chica);
- Santa Ana River (SAR Reach 2);
- Newport Bay (San Diego Creek Reach 1, Peters Canyon Wash, San Diego Creek Reach 2, Borrego Canyon Wash, and Serrano Creek); and
- Newport Coastal Streams (Buck Gully, Los Trancos Creek, Morning Canyon Creek)



Aerial view of Priority 3 monitoring sites in Orange County.

Bolsa Chica Channel

Monitoring Site (P3-OC1 (RMP), BCC02 (OCPW)

Bolsa Chica Channel upstream of Westminster Blvd/Bolsa Chica Road. The site is located in the Anaheim Bay-Huntington Harbour watershed. Coordinates: 33.75958, -118.04295.

Sampling

Sampling for this site will be conducted in Bolsa Chica Channel next to intersection of Bolsa Chica Rd and Westminster Blvd, just beneath Westminster overpass.

NOTE: This site is sometimes tidally influenced during astronomical high tides. Bacteria concentrations may not be representative of freshwater flows.

Site Access

The site is accessed via southbound on Bolsa Chica Rd from CA 22 (Garden Grove Freeway). Before reaching Westminster Blvd, pull onto curb on right side of the street and park behind bus stop bench. Access to sampling location requires an Orange County Flood Control District (OCFCD) key to open the gate. The channel can be approached by the rip-rap bank, or by walking across the catwalk next to the overpass to the opposite bank (the stream sometimes meanders between storms).

Looking upstream at Bolsa Chica Channel from access gate. Channel runs parallel to Bolsa Chica Rd here.

Looking southbound on Bolsa Chica Rd toward intersection with Westminster Blvd. Access and parking are indicated by arrow.

Aerial view of Bolsa Chica Channel monitoring site at Westminster Blvd.

Borrego Canyon Wash

Monitoring Site (P3-OC2 (RMP), BORF20 (OCPW))

Borrego Channel u/s of Barranca Parkway. The site is located in the Newport Bay Watershed. Coordinates: 33.65457, -117.73213.

Sampling

Sampling location is at Barranca Parkway, upstream of the confluence with Agua Chinon Wash, next to the Irvine Train Station.

Site Access

The site is accessed via Barranca Parkway north bound, just after Alton Parkway. The site may be accessed either from the dirt road or the driveway to the parking lot of the train station. There is no gate at the site, and the channel bank is stabilized with rip-rap.

Borrego Canyon Wash: Left - Looking downstream at Borrego Canyon Wash from the train station parking lot; Right - Looking upstream (left side is the parking lot, right side is the dirt road) at Borrego Canyon Wash.

Sample site can be accessed via the dirt road (red arrow) or the train station parking lot (yellow arrow).

Aerial view of Borrego Canyon monitoring site, upstream of Barranca Parkway.

Buck Gully Creek

Monitoring Site (P3-OC3 (RMP), BGC (OCPW))

Little Corona Beach at Poppy Ave/Ocean Blvd. The site is located in the Newport Coastal Streams watershed. Coordinates: 33.59000, -117.86841.

Sampling

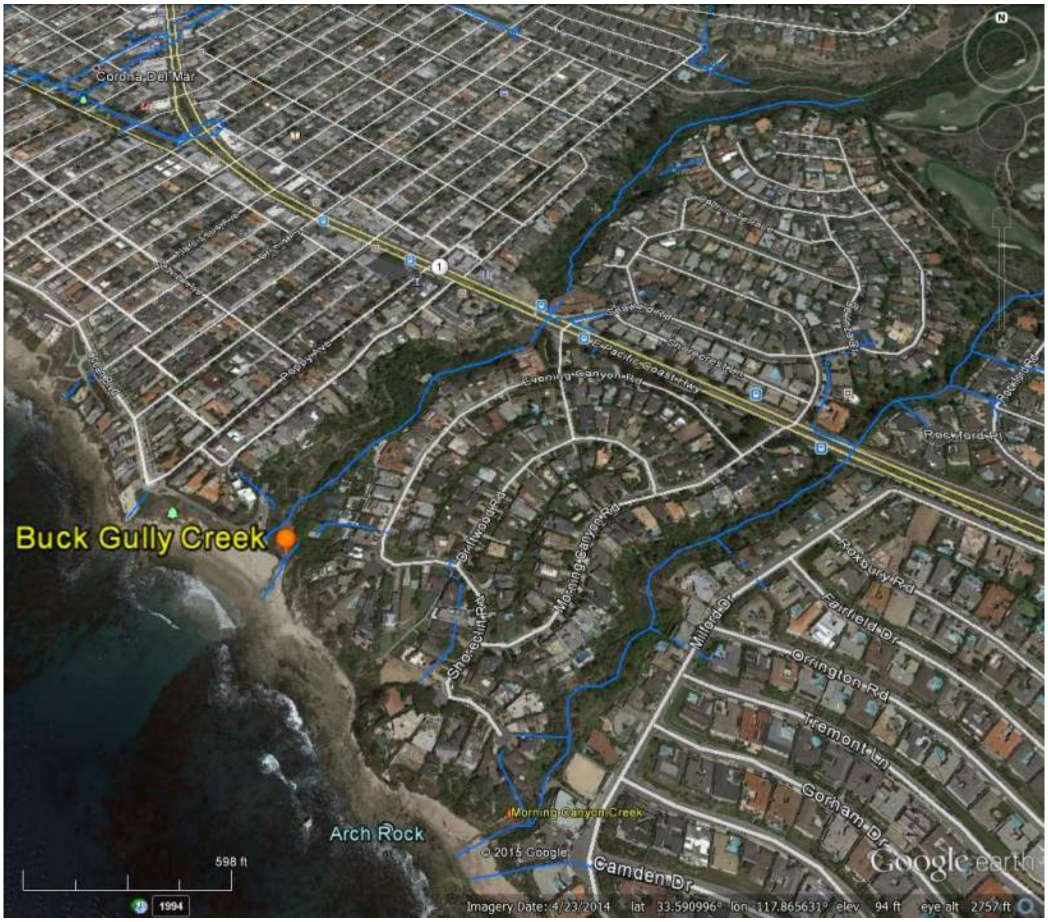
Sampling for this site will be conducted from the concrete spillway, upstream of the scour pond on the beach.

Site Access

The outlet of Buck Gully Creek is accessed via a steep path near the intersection of Poppy Ave/Ocean Blvd. From Pacific Coast Highway, turn west onto Poppy Ave, and then approach the intersection with Ocean Blvd. An OCFCD key is not needed to access the sampling location.

Sample site at concrete spillway down the paved path from Poppy Ave/Ocean Blvd.

Entry to paved path at Poppy Ave/Ocean Blvd to the Buck Gully Creek monitoring site.



Aerial view of Buck Gully Creek monitoring site.

Los Trancos Creek

Monitoring Site (P3-OC5 (RMP), CNBCU (OCPW))

Los Trancos Creek at Crystal Cove State Park. Coordinates: 33.57601, -117.84062. This monitoring site is within a watershed that is entirely private or state land.

Sampling

Sampling will occur Creek on the concrete spillway, just downstream of the tunnel before it flows into the earthen creek.

Site Access

The site is accessed via Crystal Cove State Park at the Los Trancos entry (west side of PCH). There is a gated entry at the kiosk and requires permission to enter (to be secured by state personnel or their designee). There is a dirt area to temporarily park a vehicle, located up the hill from Los Trancos Creek. Access the creek by walking down the steep paved path.

Aerial view of Los Trancos Creek at Crystal Cove State Park sample site.

Los Trancos Creek looking upstream from monitoring site.

Morning Canyon Creek

Monitoring Site (P3-OC6)

Morning Canyon Creek at coordinates: 33.58759, -117.86575. This monitoring site is within a watershed that is entirely private or state land.

Sampling

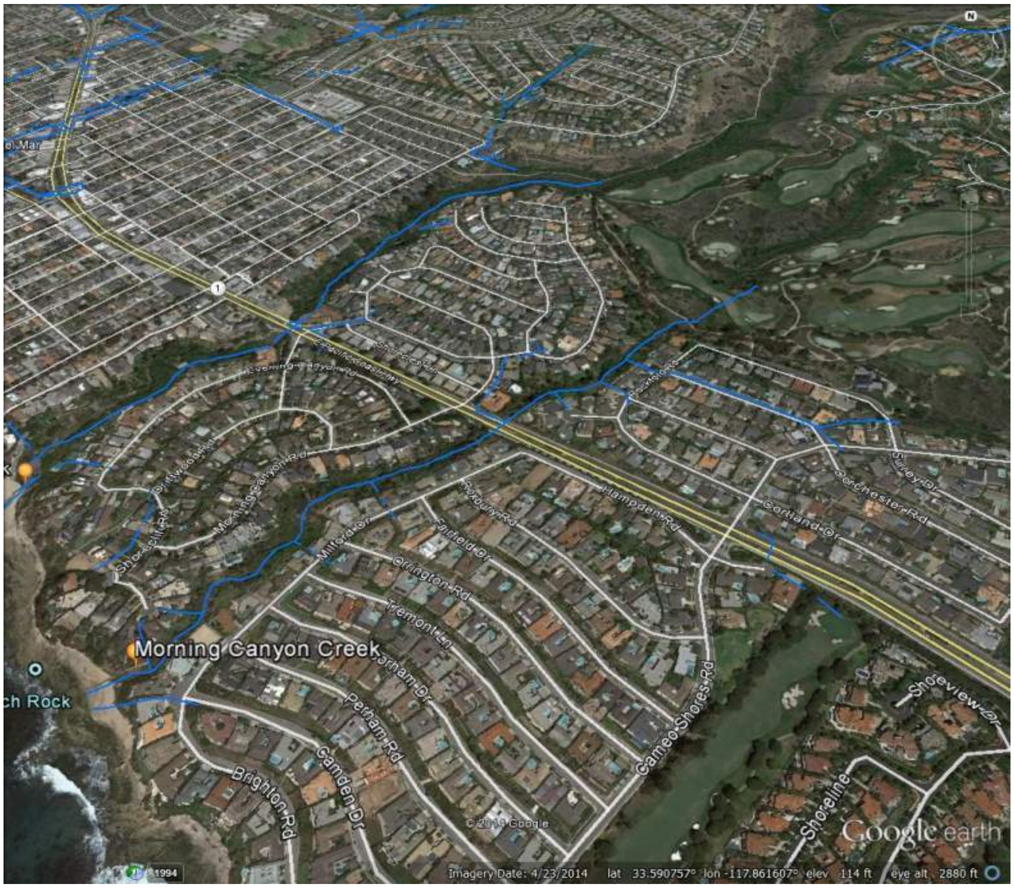
Sample site is in lower Morning Canyon Creek before it discharges onto the beach.

Site Access

The site is accessed via a private coded entry gate from Milford Ave. Turn west onto Cameo Shores Dr. from Pacific Coast Highway. Turn right onto Milford and travel downhill to the gate between Perham Rd and Camden Dr. Access to the outlet of Morning Canyon Creek requires opening two security gates with a digital key.

Alternatively, the creek may be accessed via a path at the bottom of Morning Canyon Rd., west of the intersection of Morning Canyon Rd and Shorecliff Rd. There is a community gate, next to a mushroom shaped house, requiring a digital key to access the path down to a beach.

Access to locked gates to be secured by state personnel or their designee.



Aerial view of Morning Canyon Creek at downstream sample site.

Secure community gate to access the path to Morning Canyon Beach.

Morning Canyon Creek upstream of sample site.

Peters Canyon Wash

Monitoring Site (P3-OC7 (RMP), BARSED (OCPW))

Peters Canyon Wash downstream of Barranca Parkway. The site is located in the Newport Bay watershed. Coordinates: 33.69076, -117.82404.

Sampling

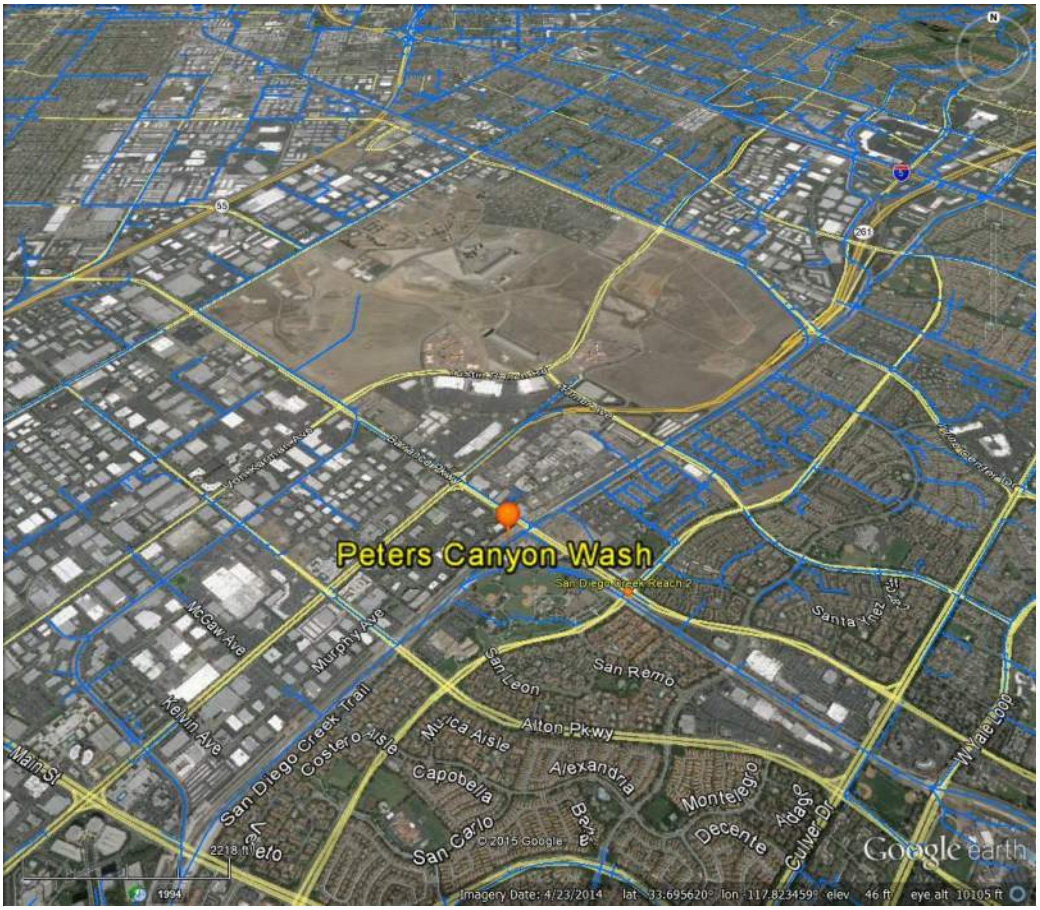
Sampling for this site will be conducted downstream of Barranca Parkway.

Site Access

Access the sampling location via Peters Canyon Trail off of southbound Barranca Parkway. The sample site is approximately 110 meters downstream from Barranca Parkway. A key is not needed to access the sample site.

Sample site at Peters Canyon Wash downstream of Barranca Parkway.

Entry to paved path at Peters Canyon Trail from Barranca Parkway.



Aerial view of Peters Canyon Wash sample site, downstream of Barranca Parkway.

San Diego Creek Reach 1

Monitoring Site (P3-OC8 (RMP), SDMF05 (OCPW), CNBCD (HCA))

San Diego Creek Reach 1 downstream of Campus Drive. Coordinates*:* 33.6880, -117.8187.

Sampling

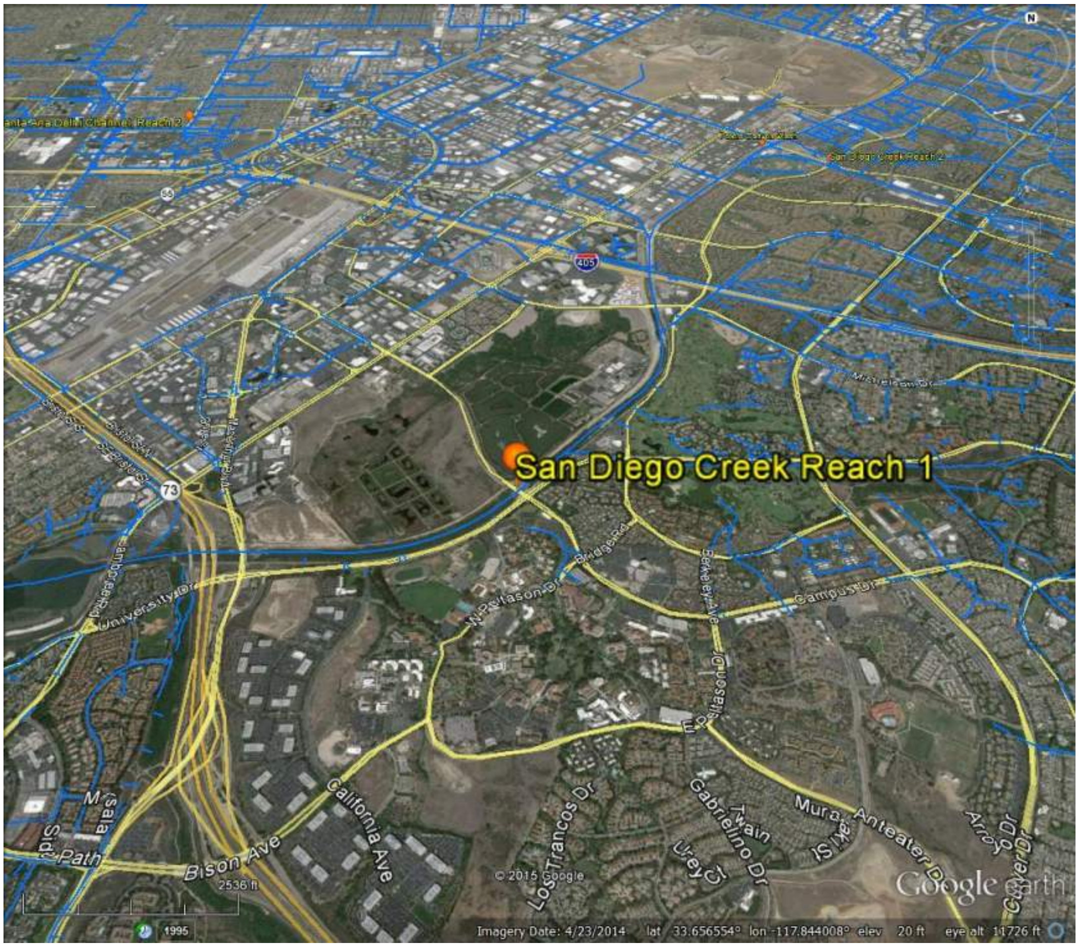
Sampling for this site will be conducted in San Diego Creek, in the low flow notch downstream of Campus Drive, before it discharges into in-channel Basin No. 1.

Site Access

The site is accessed via the Mountains to Sea bike trail westbound from University Ave. Just past the Fashion Island sign is an entry to the bike path. Parking is in the dirt area on the right hand side of the trail. It is a short hike through loose rock and vegetation to the sampling site at San Diego Creek in the low flow notch.

Looking upstream at the sample site at San Diego Creek Reach 1, downstream of Campus Drive.

San Diego Creek Reach 1: Left –View from the San Diego Creek low-flow notch up to the access area; Right - Parking area on dirt adjacent to the paved bike trail.



Aerial view of San Diego Creek Reach 1 sample site.

San Diego Creek Reach 2

Monitoring Site (P3-OC9 (RMP), WYLSED (OCPW))

San Diego Creek at Harvard Avenue (location is in Reach 1 but has been used to represent Reach 2 for several years). The site is located in the Newport Bay Watershed. Coordinates: 33.687992, -117.818685.

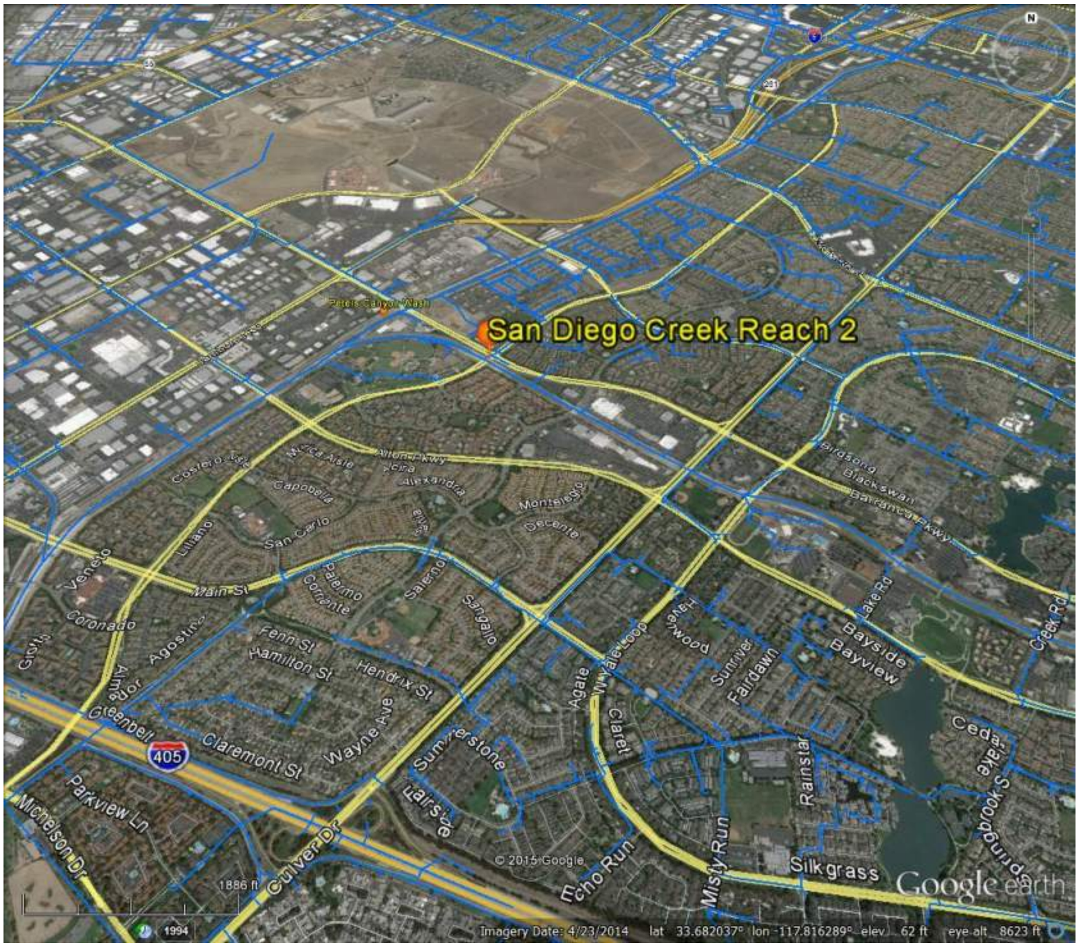
Sampling

Sampling for this site will be conducted in San Diego Creek near the intersection of Harvard Drive and Barranca Parkway.

Site Access

The site is accessed via a gate to the levee road from Harvard Avenue, west of Barranca Parkway. An OCFCD key is needed to open the gate to access the monitoring site.

San Diego Creek Reach 2: Left - Looking down into San Diego Creek Reach 2 sample site; Right – Entry to levee road at San Diego Creek Reach 2, adjacent to Harvard Avenue.



Aerial view of San Diego Creek Reach 2 monitoring site, downstream Barranca Parkway

Serrano Creek

Monitoring Site (P3-OC11 (RMP), UBPF19 (OCPW))

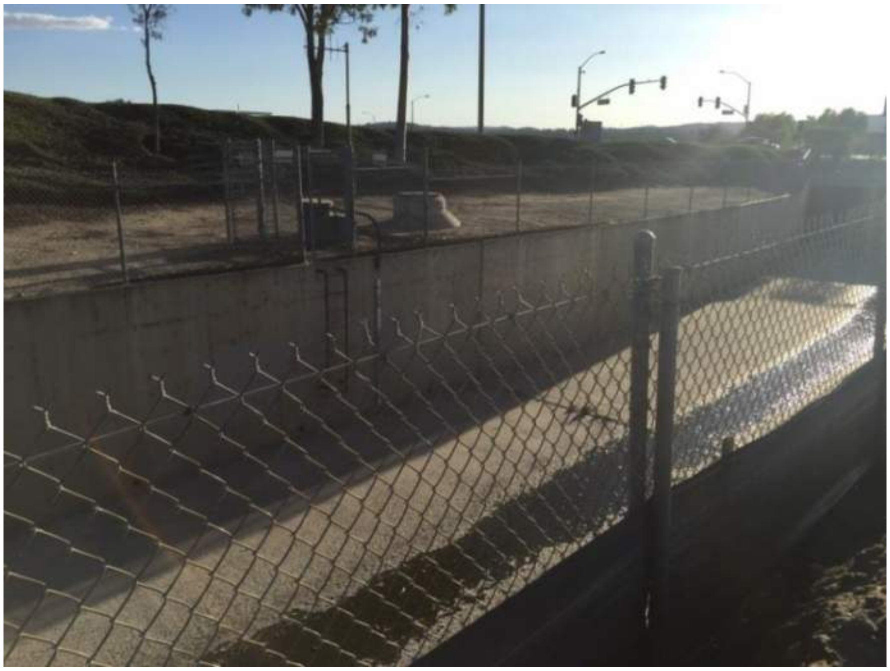
Serrano Creek upstream of Barranca/Alton Parkway. The site is located in the Newport Bay Watershed. Coordinates: 33.6483, -117.7248.

Sampling

Sampling for this site is located in Irvine in the lower reach of Serrano Creek, north of the intersection of Alton and Muirlands Blvd./Barranca Parkway (street changes names).

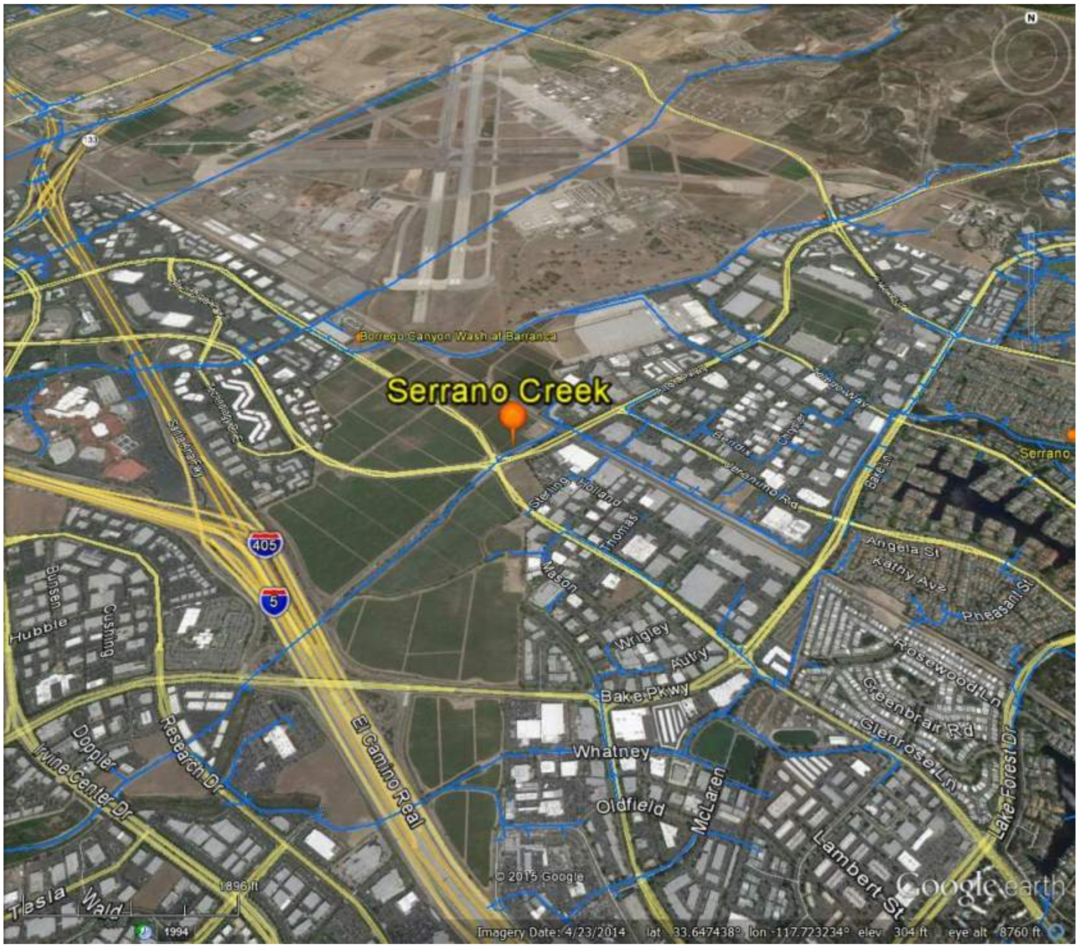
Site Access

Heading northbound on Alton Parkway, take a sharp right turn onto the paved trail and drive down to the dirt levee road. There is a ladder to access the channel on the left hand side of the channel (facing downstream). An OCFCD key is needed to access the ladder down to the monitoring site.



Looking across the channel to the sample site.

Access to the monitoring site at Serrano Creek from Alton Parkway.



Aerial view of Serrano Creek monitoring site, upstream of Barranca Parkway.

A.3.2 Riverside County

There are two Priority 3 waterbodies identified by the RMP in Riverside County. The description of the monitoring sites for each of these waterbodies is described below.

Goldenstar Creek

Monitoring Site (P3-RC1)

Golden Star Creek at Ridge Canyon Drive is the monitoring site for this waterbody. Coordinates: 33.9864, -117.3586.

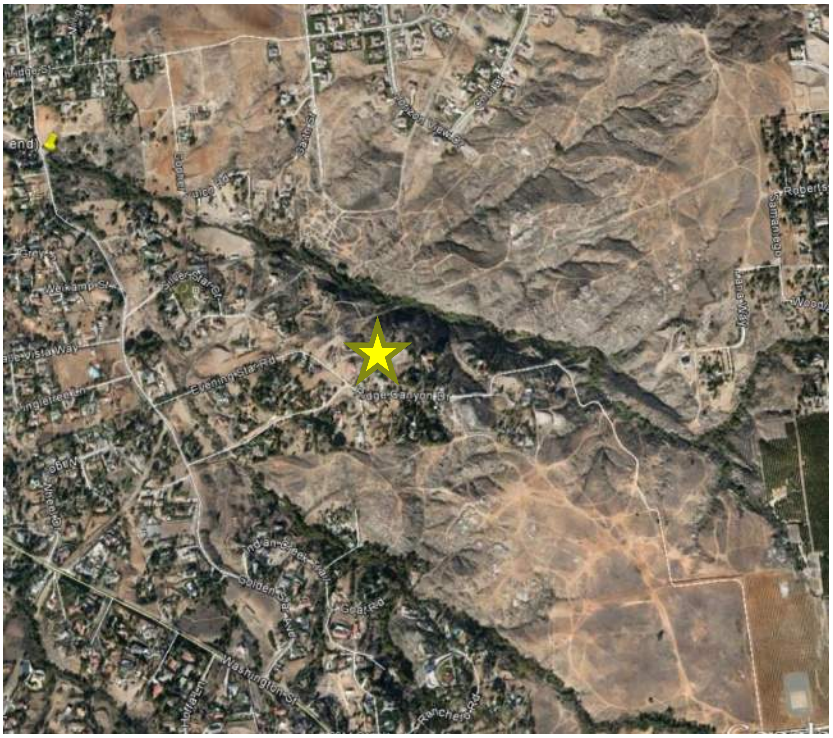
Sampling

Sampling for this site will be conducted on the southern bank of Golden Star Creek near end of paved section of Ridge Canyon Drive.

Site Access

This site is accessed from Golden Star Avenue by making a turn to head east along Ridge Canyon Drive. Park the vehicle at the end of the paved portion of Ridge Canyon Drive. Walk down a dirt trail to the west bank of Golden Star Creek.

Golden Star Creek looking downstream from end of dirt trail to Golden Star Creek.



Aerial view of Golden Star Creek at Ridge Canyon Drive monitoring site.

San Timoteo Creek Reach 3

Monitoring Site (P3-RC3)

San Timoteo creek below Live Oak Canyon Rd. bridge. Coordinates: 34.002510, - 117.164512.

Sampling Site

Sampling will by dropping a collection bucket or sampling stick off of Live Oak Canyon Rd bridge into San Timoteo creek below.

Site Access

Site is accessed by parking vehicle off of the curb on the South side of the bridge or parking in the pull off area on the North East side closer to the train tracks running adjacent to the creek.

Aerial view of monitoring site on San Timoteo creek Reach 3 below Live Oak Canyon Rd bridge

View of San Timoteo Creek Reach 3 below Live Oak Canyon Rd bridge

A.3.3 San Bernardino County

There is one Priority 3 waterbody identified by the RMP in San Bernardino County. The description of the monitoring site for this waterbody is described below.

Santa Ana River above S. Riverside Avenue Bridge

Monitoring Site (P3-SBC1)

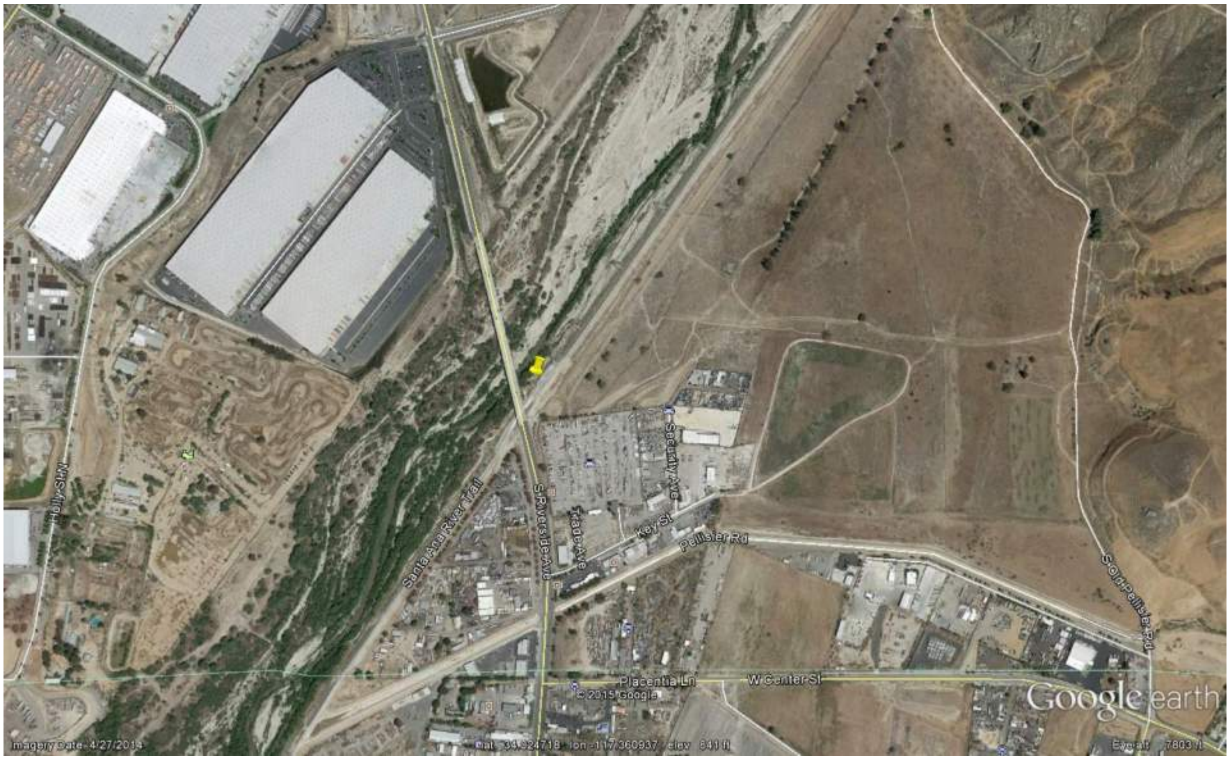
Santa Ana River at Santa Ana River Reach 4 above S. Riverside Avenue Bridge is the monitoring site for this waterbody. Coordinates: 34.0248, -117.3628.

Sample Site

Sampling will occur on the north side of the bridge crossing from the east bank of the river.

Site Access

Site is accessed from S. Riverside Avenue from the east side before the bridge crossing. Turn off of S. Riverside Avenue before crossing the bridge and park along Santa Ana River Trail. Cross the trail and walk down to the Santa Ana River. Sample just upstream of the bridge.



Aerial view of the monitoring site upstream of the S. Riverside Avenue Bridge.

San Timoteo Creek Reach 1A at Anderson St.

Monitoring Site (P3-SBC2)

San Timoteo creek west of Anderson St. and upstream of confluence with Santa Ana River. Coordinates: 34.061494, -117.262907.

Sampling Site

Sampling will occur west of concrete wall diverting flow underneath Anderson St. crossing.

Site Access

Site is accessed from the gate on the south west side Anderson street crossing. Sampler can park car at top of the ramp and walk down to sampling location.

Aerial view of monitoring site on San Timoteo creek west of Anderson street crossing

View of San Timoteo sampling site looking towards Anderson street

San Timotea Creek Reach 2 at San Timoteo Canyon Rd

Monitoring Site (P3-SBC3)

San Timoteo creek west of San Timoteo Canyon Rd . Coordinates: 34.03281, - 117.2089.

Sampling Site

Sampling will occur west of San Timoteo Canyon Rd after confluence of agricultural flows from hillside north.

Site Access

Site is accessed from the gate on the south west side San Timoteo Canyon Rd. Car can be parked near top of ramp in large dirt field. Ramp allows for foot traffic to creek where sample can be taken after confluence of flow inputs.

Aerial view of monitoring site on San Timoteo creek west of San Timoteo Canyon Rd

View of San Timoteo sampling site looking San Timoteo Canyon Rd

Warm Creek below Fairway Dr.

Monitoring Site (P3-SBC4)

Warm Creek below confluence of Lytle creek and Warm creek W and above confluence with Santa Ana River. Coordinates: 34.064636, -117.307211.

Sampling Site

Sampling will occur south of San Bernardino Fwy where concrete turns to naturalized channel.

Site Access

Site is accessed from west side of the Fairway Dr. bridge crossing. Turn south off Fairway Dr. and enter creek via gate and ramp. During dry weather, a car can be driven along sheet flow in creek South of San Bernardino Fwy where sheet flow enters naturalized channel and vegetation.

Aerial view of monitoring site on warm creek south of San Bernardino Fwy

View of Warm creek sample site looking south toward Santa Ana River

A.4 Priority 4 Monitoring Sites

Priority 4 sites are waterbodies designated only REC-2 as a result of an approved Use Attainability Analysis. There are five Priority 4 waterbodies included in the RMP, as described below (See Figure 3-4 for map of monitoring locations).

A.4.1 Orange County

The RMP includes three REC-2 only waterbody in Orange County, as described below.

Santa Ana Delhi Channel Upstream of Irvine Avenue

Monitoring Site (P4-OC1 (RMP, SADF01 (OCPW))

Santa Ana Delhi Channel upstream of Irvine Avenue. Coordinates: 33.6602, -117.8810.

Sampling

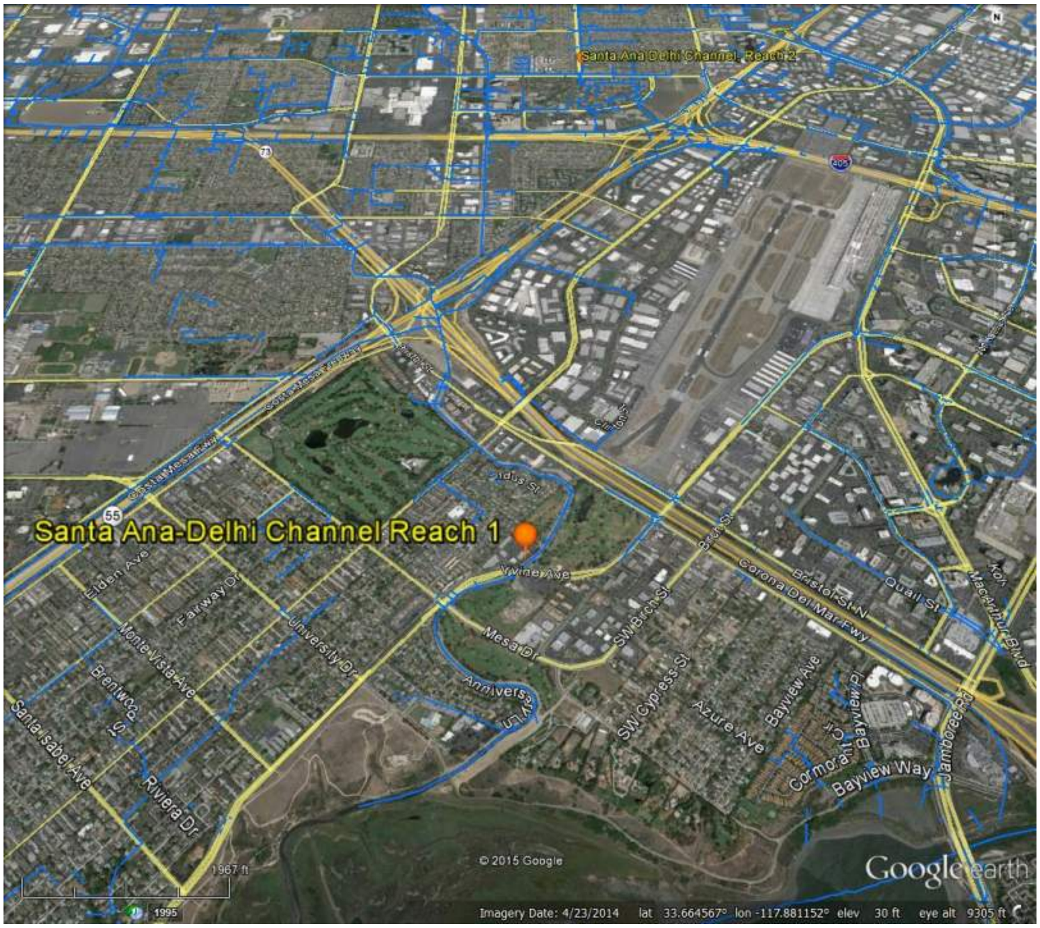
Sampling for this site will be conducted in the Santa Ana Delhi Channel, adjacent to the Newport Beach golf course, upstream of Irvine Avenue.

Site Access

The site is accessed via a levee road from Irvine Ave, just before a business complex, and a blue sign. Use an OCFCD key to open the gate to access the ramp (at the wooden posts) down to the sample site.

View of Santa Ana Delhi Channel sample site from Irvine Avenue.

Santa Ana Delhi Channel: Left - Access to levee road at Santa Ana-Delhi Channel from Irvine Avenue; Right – Levee road entrance at Santa Ana-Delhi Channel.



Aerial view of Santa Ana-Delhi Channel monitoring site, upstream of Irvine Avenue.

Santa Ana Delhi Channel in Tidal Prism

Monitoring Site (P4-OC2; also HCA site)

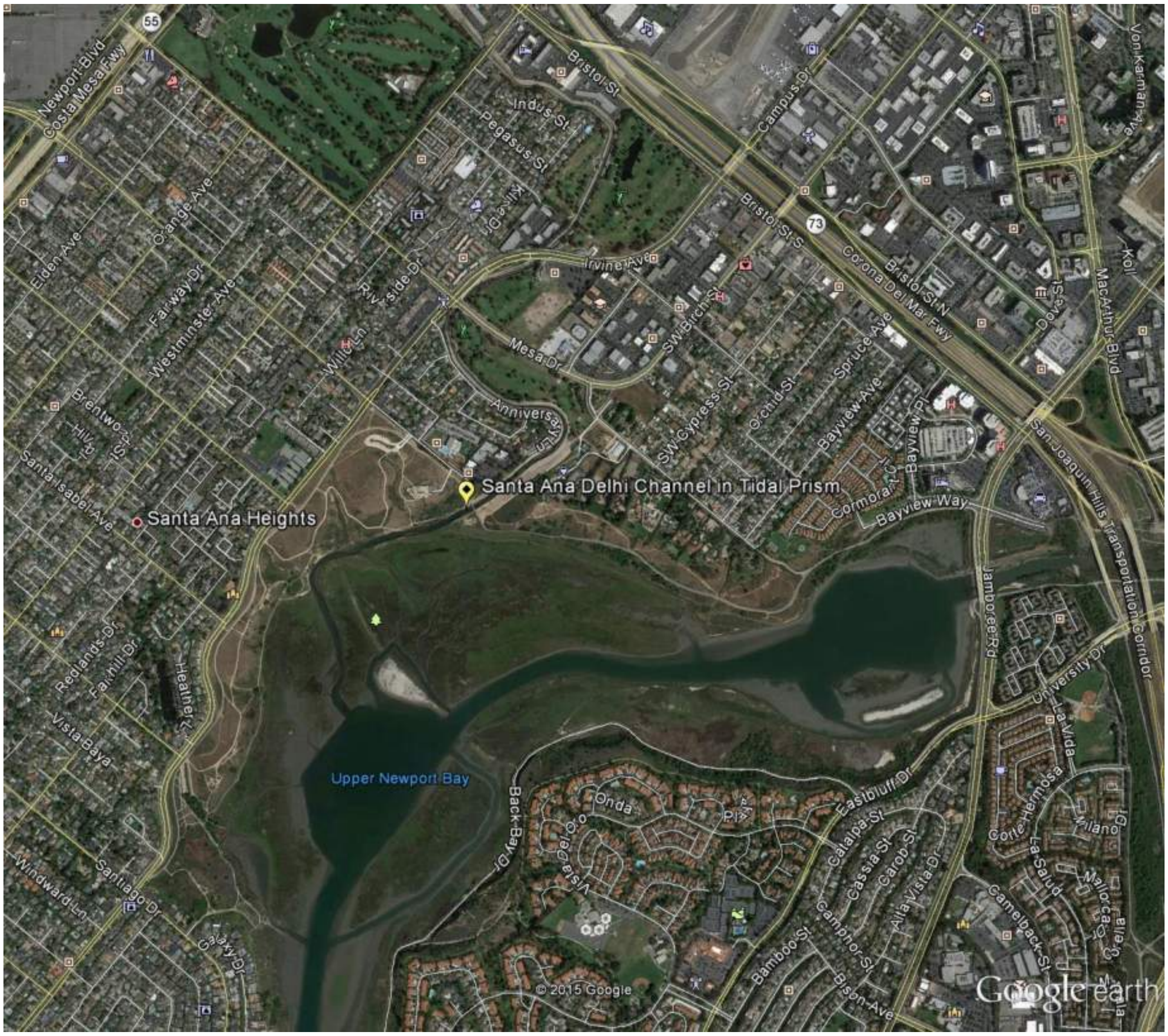
Santa Ana Delhi Channel in tidal prism. Coordinates: 33.6529, -117.8837.

Sampling

Sampling for this site will be done immediately downstream of the Bicycle Bridge that crosses the tidal prism near the end of University Drive. Site is at same location where the Health Care Agency collects weekly samples.

Site Access

The site is accessed via University Drive where it dead ends near the Peter and Mary Muth Interpretive Center at 2301 University Drive in Newport Beach, CA. Park and walk down dirt path to channel just below Bicycle Bridge.



Aerial view of Santa Ana-Delhi Channel in Tidal Prism monitoring site.

Greenville-Banning Channel in Tidal Prism

Monitoring Site (P4-OC3)

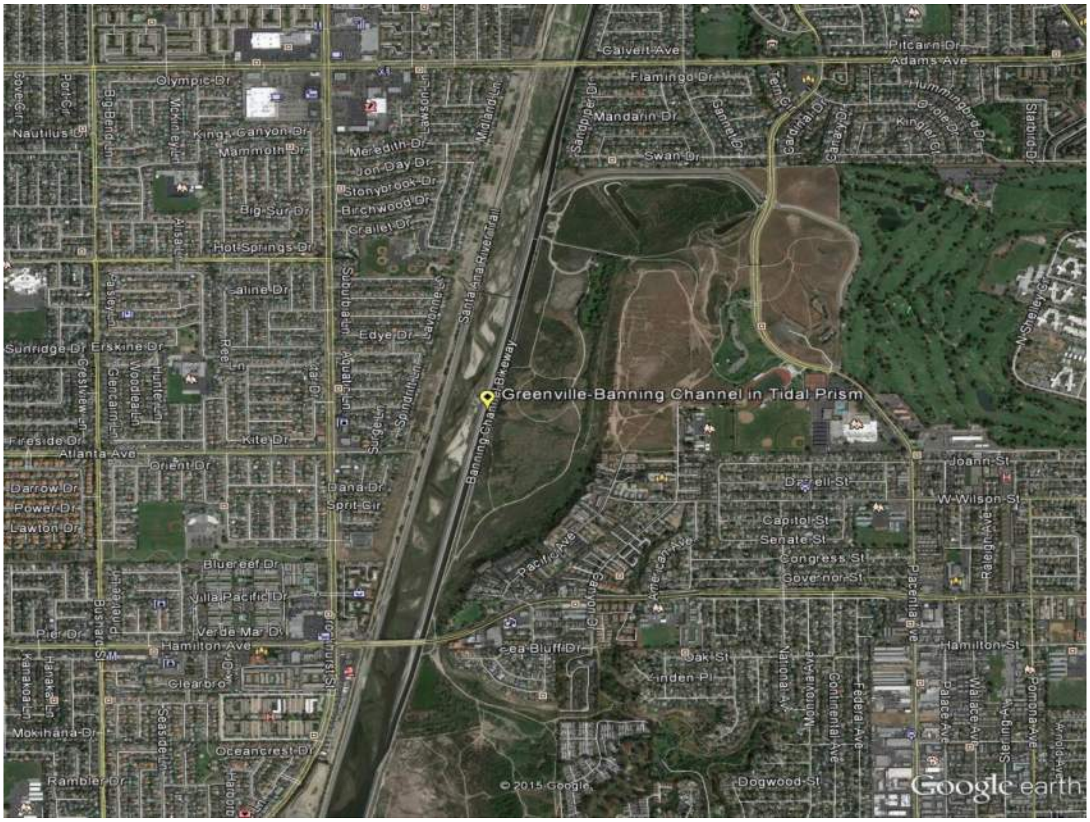
Greenville-Banning Channel in tidal prism. Coordinates: 33.6594, -117.9479.

Sampling

Sampling will be done at an access ramp at the trash boom downstream from the rubber diversion dam.

Site Access

The site is accessed via the Banning Channel Bikeway. Access to the water is via a ramp. Collect sample at the trash boom so the sample is not influenced by debris that builds up at the boom. Sample collection should be timed to coincide with higher tides so that there is a stronger influence from freshwater at the site. It is unsafe to trudge through the channel 60 meters downstream as the mud is very deep and it is difficult to walk far downstream without stirring up the mud.



Aerial view of Greenville-Banning Channel in Tidal Prism monitoring site.

A.4.2 Riverside County

The RMP includes one REC2 only waterbody in Riverside County, as described below.

Temescal Creek at Lincoln Avenue

Monitoring Site (P4-RC2)

Temescal Channel at Lincoln Avenue is the monitoring location for this waterbody. Coordinates: 33.89412, -117.57723.

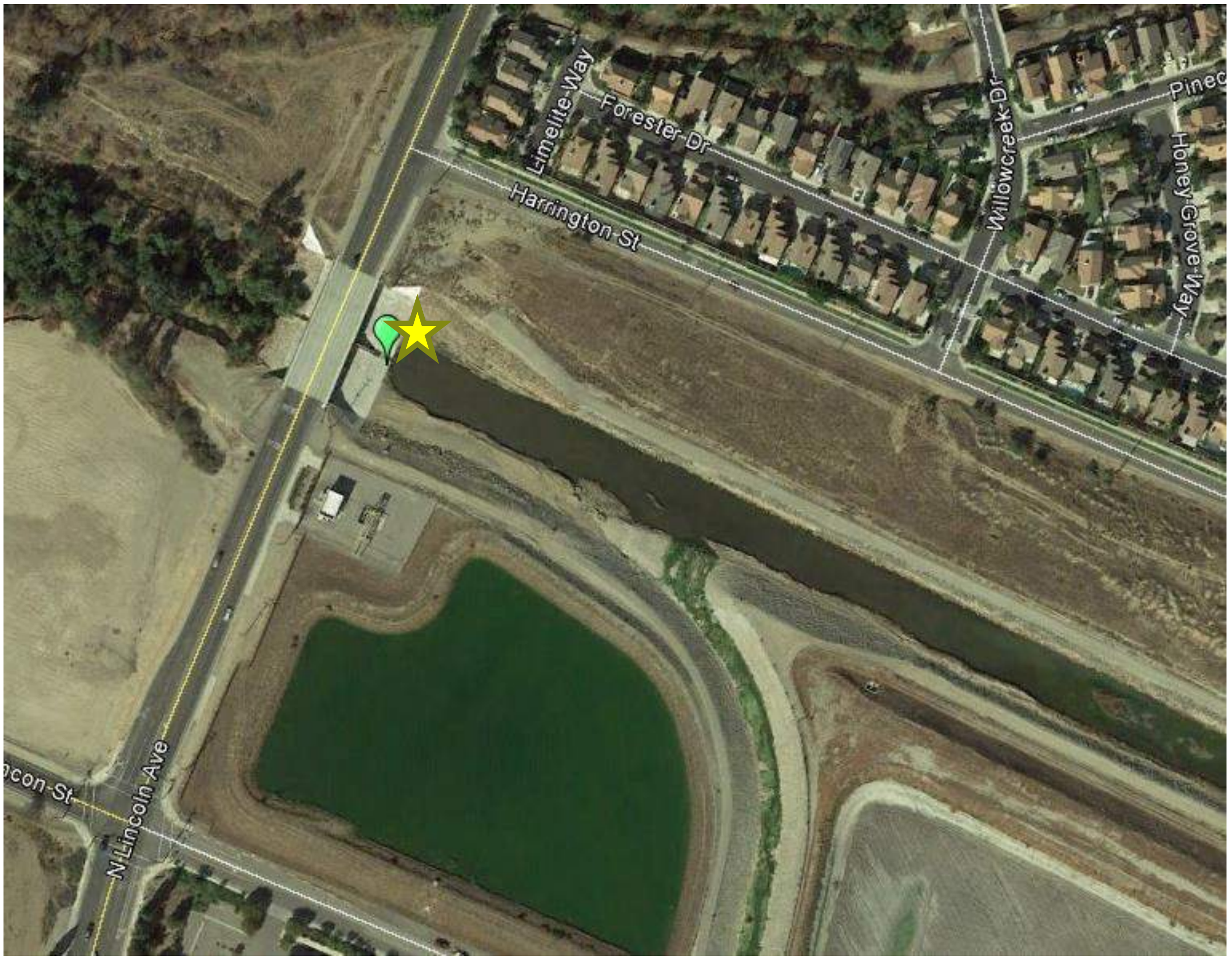
Sampling

Sampling for this site will be conducted on the concrete section of Temescal Channel just upstream of the Lincoln Avenue Bridge.

Site Access

This site is accessed from Lincoln Avenue by turning into a driveway apron located immediately north of the bridge which crosses Temescal channel. Open the Riverside County Flood Control & Water Conservation District (RCFC&WCD) gate and drive into access road. Park vehicle along access road.

Aerial view of Temescal Creek Reach 1a monitoring site upstream of bridge and downstream of natural bottom section.



Aerial view of Temescal Creek Reach 1a at Lincoln Avenue monitoring site.

A.4.3 San Bernardino County

The RMP includes one REC2 only waterbody in San Bernardino County, as described below.

Cucamonga Creek at Hellman Avenue

Monitoring Site (P4-SBC1)

Cucamonga Creek at Hellman Avenue is the monitoring site for this waterbody. Coordinates: 33.9493, -117.6104.

Sampling

Samples for this site will be collected from the western channel wall of Cucamonga Creek approximately 200 feet upstream of the Hellman Avenue Bridge.

Site Access

This site is accessed from Hellman Avenue by turning into a driveway on the east side of the road immediately north of the bridge which crosses Cucamonga Creek. Open the San Bernardino County Flood Control District (SBCFCD) gate and walk or drive onto access road. Collect samples from the midpoint of channel, within the low flow section.

Cucamonga Creek Reach 1 looking upstream toward sampling site.

Attachment B

Priority 5 & 6 Waterbodies

Table B-1 summarizes waterbodies classified as Priority 5 or 6 under the RMP. See Section 3.4 for definitions of the waterbody categories.

Table B-1. Priority 5 and 6 waterbodies in the Santa Ana River Watershed by County (NA = not defined by BPA)

Waterbody	Tier[1, 2]	Priority	County	Basin Plan Amendment Notes
Bolsa Chica Channel	NA	3	Orange	
Borrego Canyon Wash (Borrego Creek)	D	3	Orange	Low flow, limited access
Buck Gully Creek	NA	3	Orange	
Coyote Creek	D	3	Orange	Low flow/access prohibited - listed by Los Angeles Board
Los Trancos Creek	NA	3	Orange	
Morning Canyon Creek	NA	3	Orange	
Peters Canyon Wash	D	3	Orange	Low flow, limited access
San Diego Creek Reach 1	C	3	Orange	Low flow, no observed REC1 use3; however fishing and children observed near water
San Diego Creek Reach 2	D	3	Orange	Low flow, limited access
Santa Ana River Reach 2	C	3	Orange	Low flows, limited access
Serrano Creek	D	3	Orange	Low flow, limited access
Silverado Creek	D (N)	3	Orange	Low flow
Santa Ana Delhi Reach 2	NA	4	Orange	UAA to remove REC1 - if approved need to delist from 303(d)
Agua Chinon Wash	D	5	Orange	Low flow, limited access
Anaheim Lake	C	5	Orange	Fishing, GW recharge basin, water contact REC activities prohibited
Bee Canyon Wash	D	5	Orange	Low flow, limited access
Bonita Creek	D	5	Orange	Low flow, limited access
Carbon Canyon Creek	D	5	Orange	Low, intermittent flow, limited access
Hicks Canyon Wash	D	5	Orange	Low flow, limited access
Irvine Lake	B	5	Orange	Fishing Lake, water contact REC activities prohibited. Float tube fishing allowed.
Laguna Canyon Wash	D	5	Orange	Low flow, limited access
Peters Canyon Reservoir	D	5	Orange	Water contact REC activities and/or access prohibited
Rattlesnake Canyon	D	5	Orange	Low flow, limited access

Table B-1. Priority 5 and 6 waterbodies in the Santa Ana River Watershed by County (NA = not defined by BPA)

Waterbody	Tier[1, 2]	Priority	County	Basin Plan Amendment Notes
Rattlesnake Reservoir	D	5	Orange	Water contact REC activities and/or access prohibited
Sand Canyon Reservoir	D	5	Orange	Water contact REC activities and/or access prohibited
Sand Canyon Wash	D	5	Orange	Low flow, limited access
Santiago Creek Reach 1	D	5	Orange	Intermittent flow
Santa Ana River Reach 1	D	5	Orange	Intermittent, low flow1 limited access
Syphon Reservoir	D	5	Orange	Water contact REC activities and/or access prohibited
Aliso Creek	D (N)	6	Orange	Natural condition, limited access
Black Star Creek	D (N)	6	Orange	Low flow
Ladd Creek	D (N)	6	Orange	Low flow, limited access
Santiago Creek Reach 3	D (N)	6	Orange	Low flow
Santiago Creek Reach 4	D (N)	6	Orange	Low flow
Anza Park Drain	C	5	Riverside	Low flow
Cactus Valley Creek	D	5	Riverside	Low / ephemeral flow, remote
Evans Lake	D	5	Riverside	Swimming prohibited by City Park officials
Goodhart Canyon Creek	D	5	Riverside	Low / ephemeral flow, remote
Lake Hemet	C	5	Riverside	Fishing Lake, float tube fishing and water contact REC activities prohibited.
Lake Mathews	D	5	Riverside	Drinking water reservoir, access prohibited
Lake Norconian	D	5	Riverside	Access prohibited by U.S. Navy, no water contact REC activities allowed
Lee Lake	C	5	Riverside	Swimming prohibited, float tube fishing allowed
Mockingbird Reservoir	D	5	Riverside	Limited access/ fenced and locked
Mystic Lake	C	5	Riverside	Ephemeral lake, water fowl hunting allowed
Prado Basin Management Zone	C	5	Riverside	Access prohibited, thick vegetation limits accessibility
Salt Creek	D	5	Riverside	Low / ephemeral flow

Table B-1. Priority 5 and 6 waterbodies in the Santa Ana River Watershed by County (NA = not defined by BPA)

Waterbody	Tier[1, 2]	Priority	County	Basin Plan Amendment Notes
San Jacinto River Reach 1 – Lake Elsinore to Canyon Lake	C	5	Riverside	Low flow
San Jacinto River Reach 3 – Canyon Lake to Nuevo Rolad	D	5	Riverside	Low / ephemeral flow, limited
San Jacinto River Reach 4 – Nuevo Road to North-South Mid-Section Line, T4S/R1W-S8	D	5	Riverside	Low / ephemeral flow, limited access
San Jacinto River Reach 5 – North-South Mid-Section Line, T4S/R1W-S8, to Confluence with Poppet Creek	D	5	Riverside	Low / ephemeral flow, limited access
San Jacinto River Reach 6 – Poppet Creek to Cranston Bridge	C	5	Riverside	Low flow
San Jacinto Wildlife Preserve	C	5	Riverside	Hunting ponds filled with treated effluent
San Joaquin Freshwater Marsh	D	5	Riverside	Access prohibited
San Timoteo Creek Reach 3 – Confluence with Yucaipa Creek to confluence with little San Gorgonio and Noble Creeks	C	5	Riverside	Low flow, limited access
St. John's Canyon Creek	D	5	Riverside	Low / ephemeral flow, remote
Sunnyslope Channel	C	5	Riverside	Low flow, limited access, Santa Ana sucker habitat
Temescal Creek Reach 2 – 1400 ft. upstream of Magnolia Ave. to Lee Lake	D	5	Riverside	Low flow, limited access
Temescal Creek Reach 4 – Lee Lake to Mid-section Line of Section 17	D	5	Riverside	Low flow, limited access
Temescal Creek Reach 5 – Mid-section line of Section 17 to Elsinore Groundwater Management Zone Boundary	D	5	Riverside	Low flow, limited access
Tequesquite Arroyo (Sycamore Creek)	C	5	Riverside	Low flow, limited access
Bautista Creek - Headwaters to Debris Dam	D (N)	6	Riverside	Low flow, agricultural lands in lower section
Bedford Canyon Creek	C (N)	6	Riverside	Natural condition, limited access, remote
Black Mountain Creek	D (N)	6	Riverside	Low flow, limited access, remote
Coldwater Canyon Creek	C (N)	6	Riverside	Natural condition, limited access, remote
Dawson Canyon Creek	C (N)	6	Riverside	Natural condition, limited access, remote
Fuller Mill Creek	C (N)	6	Riverside	Low flow, limited access, remote
Herkey Creek	D (N)	6	Riverside	Low flow, limited access, remote

Table B-1. Priority 5 and 6 waterbodies in the Santa Ana River Watershed by County (NA = not defined by BPA)

Waterbody	Tier[1, 2]	Priority	County	Basin Plan Amendment Notes
Indian Creek	D (N)	6	Riverside	Low flow, limited access, remote
Juaro Canyon Creek	D (N)	6	Riverside	Low flow, limited access, remote
Logan Creek	D (N)	6	Riverside	Low flow, limited access, remote
Poppet Creek	D (N)	6	Riverside	Low flow, limited access, remote
Potrero Creeks	D (N)	6	Riverside	Low flow, limited access, remote
San Jacinto River North Fork	C (N)	6	Riverside	Low flow, limited access, some areas remote
San Jacinto River Reach 7 – Cranston Bridge to Lake Hemet	C (N)	6	Riverside	Natural condition, limited access, remote
Stone Creek	C (N)	6	Riverside	Low flow, limited access, remote
Strawberry Creek	C (N)	6	Riverside	Low flow, limited access, some areas remote
Erwin Lake	D	5	San Bernardino	Ephemeral / intermittent
Glen Helen	C	5	San Bernardino	Low flow, County Park
San Timoteo Creek Reach 1A – Santa Ana River Confluence to Barton Road	D	5	San Bernardino	Low flow, limited access
San Timoteo Creek Reach 1B – Barton Road to Gage at San Timoteo Canyon Rd.	D	5	San Bernardino	Low flow, limited access
San Timoteo Creek Reach 2 – gage at San Timoteo to confluence with Yucaipa Creek	C	5	San Bernardino	Low flow, limited access
SAR Reach 5	D	5	San Bernardino	Low/intermittent flow
Stanfield Marsh	D	5	San Bernardino	Access prohibited
Yucaipa Creek	D	5	San Bernardino	Low flow, limited access
Alder Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Alger Creek	D (N)	6	San Bernardino	Natural condition, remote/low flow, light to infrequent water contact REC use
Ames Canyon and	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Angalls Creek	C (N)	6	San Bernardino	Natural condition, low flow, limited access, most creeks in remote areas
Badger Canyon Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote

Table B-1. Priority 5 and 6 waterbodies in the Santa Ana River Watershed by County (NA = not defined by BPA)

Waterbody	Tier[1, 2]	Priority	County	Basin Plan Amendment Notes
Bailey Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Baldwin Lake	D (N)	6	San Bernardino	Ephemeral / intermittent
Barton Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Bear Creek	C (N)	6	San Bernardino	Natural condition, remote, light to infrequent water contact REC use. Fishing streams
Birch Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access
Bledsoe Gulch Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Borea Canyon Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Breakneck Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Bridal Veil Creek	D (N)	6	San Bernardino	Natural condition, remote/low flow, light to infrequent water contact REC use
Bull Creek	C (N)	6	San Bernardino	Natural condition, low flow, limited access, most creeks in remote areas
Cable Canyon Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Cajon Canyon Creek	C (N)	6	San Bernardino	Natural condition, low flow
Caribou Canyon Creeks	D (N)	6	San Bernardino	Natural condition, low flow, remote
Cascade Canyon Creek	C (N)	6	San Bernardino	Natural condition, low flow, limited access, most creeks in remote areas
Cedar Creek	C (N)	6	San Bernardino	Natural condition, low flow, limited access, most creeks in remote areas
Cherry Creek	C (N)	6	San Bernardino	Natural condition, low flow, limited access, most creeks in remote areas
Cienaga Seca Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
City Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Cold Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Coldwater Canyon Creek	D (N)	6	San Bernardino	Natural condition, low flow
Converse Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote

Table B-1. Priority 5 and 6 waterbodies in the Santa Ana River Watershed by County (NA = not defined by BPA)

Waterbody	Tier[1, 2]	Priority	County	Basin Plan Amendment Notes
Coon Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Cove Creek	D (N)	6	San Bernardino	Natural condition, remote/low flow, light to infrequent water contact REC use
Crystal Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Cucamonga Creek / Reach 2 (Mountain Reach) – 23rd St. in Upland to headwaters	B (N)	6	San Bernardino	Natural condition, limited access
Day Canyon Creek	D (N)	6	San Bernardino	Natural condition, low flow, remote, limited access
Deer Canyon Creek	C (N)	6	San Bernardino	Natural condition, low flow, limited access, most creeks in remote areas
Deer Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Demens Creek	C (N)	6	San Bernardino	Natural condition, low flow, limited access, most creeks in remote areas
Devil Canyon Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Duncan Canyon Creek	C (N)	6	San Bernardino	Natural condition, low flow, limited access, most creeks in remote areas
East Etiwanda Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
East Fork Kimbark Canyon	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
East Twin and Strawberry Creeks	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Elder Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Falling Rock Creek	C (N)	6	San Bernardino	Natural condition, low flow, limited access, most creeks in remote areas
Falls Creek	D (N)	6	San Bernardino	Natural condition, remote/low flow, light to infrequent water contact REC use
Fan Creek	C (N)	6	San Bernardino	Natural condition, low flow, limited access, most creeks in remote areas
Fish Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Forsee Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Fredalba Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Frog Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote

Table B-1. Priority 5 and 6 waterbodies in the Santa Ana River Watershed by County (NA = not defined by BPA)

Waterbody	Tier[1, 2]	Priority	County	Basin Plan Amendment Notes
Government Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Green Creek	D (N)	6	San Bernardino	Natural condition, remote/low flow, light to infrequent water contact REC use
Green Creek	D (N)	6	San Bernardino	Natural condition, low flow, remote
Grout Creek	D (N)	6	San Bernardino	Natural condition/low flows, infrequent water contact REC activities
Hamilton Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Hatchery Creek	D (N)	6	San Bernardino	Natural condition, remote/low flow, light to infrequent water contact REC use
Heart Bar Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Hemlock Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Henderson Canyon Creek	C (N)	6	San Bernardino	Natural condition, low flow, limited access, most creeks in remote areas
High Creek	D (N)	6	San Bernardino	Natural condition, remote/low flow, light to infrequent water contact REC use
Icehouse Canyon Creek	C (N)	6	San Bernardino	Natural condition, low flow, limited access, most creeks in remote areas
Jenks Lake	B (N)	6	San Bernardino	Mt. fishing lake, REC body contact activities discouraged
Johnson Creek	C (N)	6	San Bernardino	Natural condition, remote, light to infrequent water contact REC use. Fishing streams
Keller Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Kerkhoff Creek	C (N)	6	San Bernardino	Natural condition, low flow, limited access, most creeks in remote areas
Kilpecker Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Kimbark Canyon	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Knickerbocker Creek Reach 2	D (N)	6	San Bernardino	Natural condition, low flow
Little Mill Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Little San Gorgonio Creeks	C (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Little Sand Canyon Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote

Table B-1. Priority 5 and 6 waterbodies in the Santa Ana River Watershed by County (NA = not defined by BPA)

Waterbody	Tier$^{1, 2}$	Priority	County	Basin Plan Amendment Notes
Lost Creek	D (N)	6	San Bernardino	Natural condition, remote/low flow, light to infrequent water contact REC use
Lost Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Lytle Creek (Middle Fork)	A (N)	6	San Bernardino	Natural condition, wading and soaking in summer months, fishing streams
Lytle Creek (North Fork)	A (N)	6	San Bernardino	Natural condition, wading and soaking in summer months, fishing streams
Lytle Creek South Fork	D (N)	6	San Bernardino	Natural condition, low flow
Meadow Creek	D (N)	6	San Bernardino	Natural condition/low flows, infrequent water contact REC activities
Metcalf Creek	D (N)	6	San Bernardino	Natural condition/low flows, infrequent water contact REC activities
Meyer Canyon Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Mile Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Mill Creek Reach 2	A (N)	6	San Bernardino	Natural condition, wading and soaking
Minnelusa Canyon	D (N)	6	San Bernardino	Natural condition, low flow
Monkeyface Creek	D (N)	6	San Bernardino	Natural condition, remote/low flow, light to infrequent water contact REC use
Monroe Canyon Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Mountain Home Creek	D (N)	6	San Bernardino	Natural condition, infrequent water contact REC use
Mountain Home Creek, East Fork	D (N)	6	San Bernardino	Natural condition, remote
North Creek	D (N)	6	San Bernardino	Natural condition/low flows, infrequent water contact REC activities
Oak Creek	D (N)	6	San Bernardino	Natural condition, remote/low flow, light to infrequent water contact REC use
Oak Creek	D (N)	6	San Bernardino	Natural condition, remote/low flow, light to infrequent water contact REC use
Oak Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Oak Glen Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access

Table B-1. Priority 5 and 6 waterbodies in the Santa Ana River Watershed by County (NA = not defined by BPA)

Waterbody	Tier[1, 2]	Priority	County	Basin Plan Amendment Notes
Plunge Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Poligue	D (N)	6	San Bernardino	Natural condition, low flow, remote
Potato Canyon Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access
Rathbone Creek	D (N)	6	San Bernardino	Natural condition/low flows, infrequent water contact REC activities
Rattlesnake Creek	D (N)	6	San Bernardino	Natural condition, remote/low flow, light to infrequent water contact REC use
Red Ant Creek	D (N)	6	San Bernardino	Natural condition, low flow, remote
Round Cienega Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
San Antonio Creek	A (N)	6	San Bernardino	Natural condition, wading and soaking in summer months
San Sevaine Canyon Creek	C (N)	6	San Bernardino	Natural condition, low flow, limited access, most creeks in remote areas
Sand Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
SAR Reach 6	B (N)	6	San Bernardino	Natural condition, fishing stream
Sawmill Creek	D (N)	6	San Bernardino	Natural condition, low flow, remote
Schneider Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Shay Meadows	D (N)	6	San Bernardino	Natural conditions, low flows
Siberia Creek	C (N)	6	San Bernardino	Natural condition, remote, light to infrequent water contact REC use. Fishing streams
Skinner Creek	D (N)	6	San Bernardino	Natural condition, remote/low flow, light to infrequent water contact REC use
Slide Creek	C (N)	6	San Bernardino	Natural condition, remote, light to infrequent water contact REC use. Fishing streams
Snow Creek	D (N)	6	San Bernardino	Natural condition, remote/low flow, light to infrequent water contact REC use
Staircase Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Stoddard Canyon Creek	C (N)	6	San Bernardino	Natural condition, low flow, limited access, most creeks in remote areas

Table B-1. Priority 5 and 6 waterbodies in the Santa Ana River Watershed by County (NA = not defined by BPA)

Waterbody	Tier[1, 2]	Priority	County	Basin Plan Amendment Notes
Summit Creek	D (N)	6	San Bernardino	Natural condition/low flows, infrequent water contact REC activities
Telegraph Canyon Creek	C (N)	6	San Bernardino	Natural condition, low flow, limited access, most creeks in remote areas
Thorpe Creek	C (N)	6	San Bernardino	Natural condition, low flow, limited access, most creeks in remote areas
Vivan Creek	D (N)	6	San Bernardino	Natural condition, remote/low flow, light to infrequent water contact REC use
Warm Springs Canyon Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Waterman Canyon Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
West Fork Cable Canyon	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote
Wild Horse Creek	D (N)	6	San Bernardino	Natural condition, low flow, limited access, remote

[1] See BPA Table 5 REC-1 Tiers (Attachment 2 to the Santa Ana Water Board Resolution R8-2012-0001, as corrected);

[2] An “N” designation means “Natural Conditions” and per the BPA, “includes freshwater lakes and streams located in largely undeveloped areas where ambient water quality is expected to be better than necessary to protect primary contact recreational activities regardless of whether such activities actually occur in these waterbodies” (Page 56 in Attachment 2 to the Santa Ana Water Board Resolution R8-2012-0001, as corrected).

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Attachment C

Tier 1 Source Evaluation Site Descriptions

Attachment C describes each of the source evaluation monitoring sites included in the TMDL Monitoring Program to support implementation of the MSAR Bacteria TMDL (see Section 4). Each site description includes information regarding sample site, site access and site photographs.

C.1 – Riverside County

Site description an access information is provided below for each of the Tier 1 sites included in the TMDL Monitoring Program to support the MSAR Bacteria TMDL.

64th Street Storm Drain (T1-64ST)

Monitoring Site

Sampling at this site will be conducted at the mouth of the storm drain pipe if flowing into the Santa Ana River. Trickle flow was observed the day after a storm so it is likely this site is dry in the summer months. GPS location NAD 83 N 33.970798 W 117.488532

Site Access

This Site is accessed through Santa Ana River Regional Park at the intersection of 64th Street and Downey Street. Park on the dirt pull off area then walk approximately 3,000 feet along the path to the riprap berm.

Outfall structure on the Santa Ana River.

Looking up into outfall pipe.

Pathway to access riprap berm and sample site.

Anza Drain (T1-ANZA)

Monitoring Site

Monitoring of the Anza Drain will be conducted downstream of the Hole Lake outflow and upstream of the confluence with the City of Riverside WWTP effluent channel. The best location for collection of water samples and flow measurements is approximately 1,000 feet upstream (southeast) of the confluence. This segment of the Anza Drain is unlined and there is a sufficient depth of flow during dry weather to collect samples. Collection of a cross section velocity profile for measurement of flow is feasible at this location. GPS location NAD 83 N 33.958689, W 117.4631.

Site Access

Drive southbound on Van Buren Boulevard, turn right onto Jurupa (closed road) and make an immediate right onto the sidewalk and follow the paved bike path downhill. Unlock the City of Riverside Gate to access the bike trail. Take a right turn onto a dirt road along the perimeter of the field. The monitoring site is west of the bike trail approximately 1,000 feet upstream of the confluence with the City of Riverside WWTP effluent channel.

Approximate monitoring site 1,000 feet upstream of confluence with City of Riverside WWTP effluent channel.

Downstream view of Anza Drain at monitoring site.

Anza Drain confluence with the City of Riverside WWTP effluent channel.

Box Springs Channel (T1-BXSP)

Monitoring Site

Monitoring on the Box Springs Channel will be conducted downstream from the Tequesquite Avenue crossing (top picture) and will avoid stagnant water. Prior to sample collection, sampling team will assess flow connectivity with the Santa Ana River by determining if there is flow over a sand bar approximately 200 feet south of the Tequesquite Ave crossing. If flow is present over the sand bar (bottom picture), then a flow measurement will be taken using the cross section velocity profile method on the downstream side of the sand bar. If no flow is observed over the sand bar, then samples will not be collected at the upstream location. GPS location NAD 83 N 33.97580, W 117.39925.

Site Access

Temporary fencing for construction has blocked the previously used RCFC&WCD gate. Unlock and open City of Riverside gate and drive to the end of Tequesquite Ave, open RCFC&WCD gates. New monitoring site is just downstream of Tequesquite Avenue crossing. Flowing water was observed there and an alternate sample point at that location will be used while construction is ongoing.

Box Springs Channel looking upstream from Tequesquite Avenue.

Flowing water on downstream side of Tequesquite Avenue; alternate monitoring site.

Box Springs Channel 200 feet downstream from Tequesquite Avenue.

City of Riverside Outfall near Crest and Ontario (T1-CREST)

Monitoring Site

Monitoring of the City of Riverside's Outfall located near the intersection of Crest and Ontario will be conducted downstream where the flow crosses the Santa Ana River Trail bike path. Outfall is located approximately 1500 feet from the Santa Ana River and is probably not hydraulically connected in the summer months. GPS location NAD 83 N 33.963361, W 117.47629.

Site Access

Open City of Riverside Gate to access Santa Ana River Trail bike path at Tyler and Jurupa Ave. Follow bike path downhill, going through a second City of Riverside gate. The monitoring site is at a fenced bridge where the bike path goes over the drainage from the city outfall.

Riparian drainage area.

Bike path bridge crossing over drainage area.

Culvert pipe underneath bike path.

Drainage area meeting Santa Ana River.

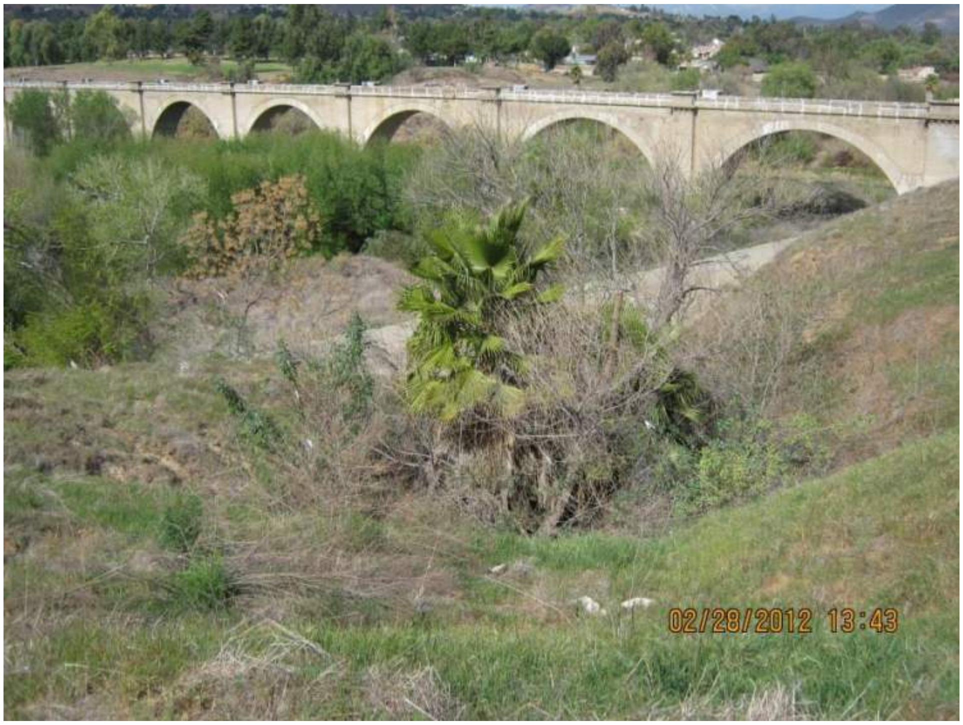
City of Riverside Outfall near Industrial and Freemont (T1-IDST)

Monitoring Site

Monitoring of the City of Riverside's Outfall located near the intersection of Crest and Ontario will be conducted at the outfall crossing of the Santa Ana River Trail bike path. Outfall is located approximately 300 feet from the Santa Ana River however construction appears to be ongoing possibly affecting the outfall drainage. GPS location NAD 83 N 33.96733, W 117.43611.

Site Access

Access is from the Santa Ana River bike path from the Martha McLean Anza Narrows Park. Open the City of Riverside swing gate near the entrance to the park then follow the bike path approximately ¼-mile. Outfall drainage is just past the railroad track bridge (above picture).



View of vegetation surrounding outfall, bike path, and railroad bridge in background.

Outfall pipe with trickle flow.

Looking up to outfall pipe location and ongoing construction.

View of ongoing construction and new monitoring site.

City of Riverside Outfall at Lake Evans (T1-EVAN)

Monitoring Site

Monitoring of the City of Riverside's Outfall located off of Dexter Drive, near Lake Evans will be conducted at the outfall or just downstream of the outfall where water is flowing. Outfall is located approximately 4,000 feet from the Santa Ana River and may not be hydraulically connected in the summer months. GPS location NAD 83 N 33.997002, W 117.381757.

Site Access

Outfall can be accessed from the parking lot outside the American Legion Hall on Dexter Drive. Outfall is located approximately 25 feet down a small slope in vegetation.

Ponded water from outfall, visible structure assumed to be ceiling of outfall.

View from parking lot of vegetation surrounding outfall.

City of Riverside Outfall at Rubidoux Avenue (T1-RBDX)

Monitoring Site

Monitoring of the City of Riverside's Outfall, located near the intersection of Rubidoux Avenue and Old Ranch Road, will be conducted at the outfall. Outfall is located approximately 3,000 feet away from the Santa Ana River and is probably not hydraulically connected in the summer months. GPS location NAD 83 N 33.96806, W 117.41022.

Site Access

Outfall can be accessed from the parking lot located at the end of Rubidoux Avenue. Samplers must walk 100 feet to the outfall structure.

Outfall structure.

Outfall structure.

Day Creek (T1-DAY)

Monitoring Site

Construction at the section of Day Creek (that was previously sampled as part of USEP Monitoring conducted in 2007-08) was scheduled to begin April 2012. To ensure a representative water quality sample, the relocated monitoring site was moved upstream within Day Creek to the concrete lined section where construction activities would not interfere with sampling. The new monitoring site is on the downstream side of Limonite Avenue crossing. Flow measurements are taken downstream of Limonite Avenue by cross section velocity profile measurement. GPS location NAD 83 N 33.97501, W -117.53298

Site Access

This site is accessed at the Limonite Avenue crossing of Day Creek using the RCFC&WCD Gate and access road.

Day Creek looking upstream from Limonite Avenue crossing.

View of Day Creek looking downstream toward future construction area.

Eastvale MDP Line A (T1-EVLA)

Monitoring Site

Sampling at this site will be conducted at the mouth of the storm drain if flowing into Cucamonga Creek Channel. Only trickle flow was observed the day after a storm so it is likely this site is dry in the summer months. GPS location NAD 83 N 33.967602, W 117.602032.

Site Access

Go through the SBCFCD access gate has a RCFC&WCD lock on it. Gate is located near the intersection of Schleisman Rd and Gypsum Creek Drive. Can then access Cucamonga Channel from County Line Channel access ramp. Drive along access road down ramp into the channel then approximately 0.3 miles to outfall. Alternatively, it is possible to drive into the channel from County Line Channel which is accessed from the SBCFCD access gate with a RCFC&WCD lock on it, located at Remington Ave, approximately 1,000 feet from the intersection of Archibald and Limonite in Corona, CA.

Outfall structure.

Looking downstream from outfall structure.

Eastvale MDP Line B (T1-EVLB)

Monitoring Location

Sampling at this site will be conducted at the mouth of the storm drain if flowing into Cucamonga Creek Channel. Only trickle flow was observed the day after a storm so it is likely this site is dry in the summer months. GPS location NAD 83 N 33.960098, W 117.601892.

Site Access

Go through the SBCFCD access gate with a RCFC&WCD lock on it. Gate is located along Schleisman Road near the intersection with Gypsum Creek Drive. There is a cord gate to the access road then a person-gate to enter into the channel. Alternatively, it is possible to drive into the channel from County Line Channel which is accessed from Remington Ave, approximately 1,000 feet from the intersection of Archibald and Limonite in Corona, CA.

Outfall structure.

Looking downstream from outfall structure.

Eastvale MDP Line D (T1-EVLD)

Monitoring Site

Sampling at this site will be conducted where water is flowing, approximately 25 feet downstream of the mouth of the storm drain pipe due to thick vegetation and ponding conditions. Sample site is approximately 2,500 feet from the Santa Ana River. GPS location NAD 83 N 33.946701, W 117.579781.

Site Access

Site is located at the end of Cobble Creek Drive within River Walk Park. Car can be parked on the street then samplers must walk approximately 100 feet to outfall structure and an additional 100 feet around the left side, to access the flow of water.

Outfall structure.

Water flow, 25 feet downstream of outfall.

Eastvale MDP Line E (T1-EVLE)

Monitoring Site

Sampling at this site will be conducted where water is flowing, approximately 5-10 feet downstream of end of the concrete channel. Sample site is approximately 1,000 feet from the Santa Ana River. GPS location NAD 83 N 33.950298, W 117.553434.

Site Access

Site is located at the end of Eastvale Line E's concrete channel. Access through two RCFC&WCD gates located at the corner of Kern River Drive and Rivertails Drive. Samplers will drive down the right side of the channel until the end of the concrete channel is reached.

Line E Channel looking downstream.

Line E Channel looking upstream.

Magnolia Center SD (T1-MCSD)

Monitoring Site

Sampling at this site will be conducted where water is flowing by the access ramp into the channel. GPS location NAD 83 N 33.965599, W 117.415473.

Site Access

Access through two RCFC&WCD gates located at the end of an unnamed street. Site is located on unnamed street between Old mill Road and Carling ford Avenue off of Grand Avenue.

Access ramp into channel.

Storm drain outlet.

Phoenix Storm Drain (T1-PHNX)

Monitoring Site

Sampling at this site will be conducted where water is flowing, approximately 5-10 feet downstream of end of the outfall pipe. Sample site is approximately 2,100 feet from the Santa Ana River and is unlikely to be hydraulically connected during the summer months. GPS location NAD 83 N 33.963600, W 117.427128.

Site Access

Site is located downhill from the Martha Mclean Anza Narrows Park. Can park car in Anza Narrows park and walk approximately 100 feet downhill along paved path to outlet structure.

Outlet structure.

Outfall structure.

San Sevaine Channel (T1-SSCH)

Monitoring Site

Monitoring on the San Sevaine Channel will be conducted downstream from the Limonite Ave crossing at the end of the concrete lined section. Prior to collection of water samples, the sampling team will assess flow connectivity with the Santa Ana River by determining if there is flow over a small concrete berm approximately 100 feet south of the end of the lined section (top picture). If flow is present over the berm, then a flow measurement will be taken by developing a cross section velocity profile 10 feet upstream of the berm. If no flow is observed over the berm, then samples will not be collected at the upstream location. GPS location NAD 83 N 33.974300, W -117.506433.

Site Access

This site is accessed by the RCFC&WCD access gate on Limonite Avenue. Unlock the gate off of Limonite Avenue to access the west side of San Sevaine Channel and park in large unpaved parking area, then walk down path to sampling location.

San Sevaine Channel looking upstream from a concrete berm; water in foreground is part of a Santa Ana River backwater area.

San Sevaine Channel looking downstream.

San Sevaine Channel looking upstream.

Sunnyslope Channel

Monitoring Site

Monitoring on Sunnyslope Channel will be conducted upstream of a small broad crested weir located about 100 feet downstream of the transition from a lined concrete trapezoidal channel to a channel with natural banks and substrate. While samples are collected upstream of the weir, flow can be measured using volumetric methods due to the free outfall over the weir control structure during dry weather conditions. During wet-weather, a cross section velocity profile approach upstream of the weir will be conducted if conditions are safe. GPS location NAD 83 N 33.9762, W -117.42718.

Site Access

This site is accessed by the RCFC&WCD access road on the west side of Sunnyslope Channel at the junction of Rio Road and Calle Hermosa. There is an access gate at this intersection. Continue along the west side of the concrete lined trapezoidal channel, through a second set of gates to the end of the lined section.

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Sunnyslope Channel downstream from transition of lined trapezoidal channel to a channel with natural banks and substrate.

Wilson Storm Drain (T1-WISD)

Monitoring Site

Sampling at this site will be conducted where water is flowing, approximately 5-10 feet downstream of end of the outfall pipe. Sample site location is approximately 900 feet from the Santa Ana River. GPS location NAD 83 N 34.018700, W 117.372187.

Site Access

Site access is through a RCFC&WCD metal swing gate at the corner of Holly Street and Wilson Street. Outfall structure is approximately 150 feet downhill from intersection.

Outfall structure.

Outfall pipe.

Outfall looking downstream.

C.2 – San Bernardino County

Lake Los Serranos Channel

Monitoring Site

Site ID: T1-LLSC; GPS: 33.97542, -117.69106; Thomas Brothers: 681-G6

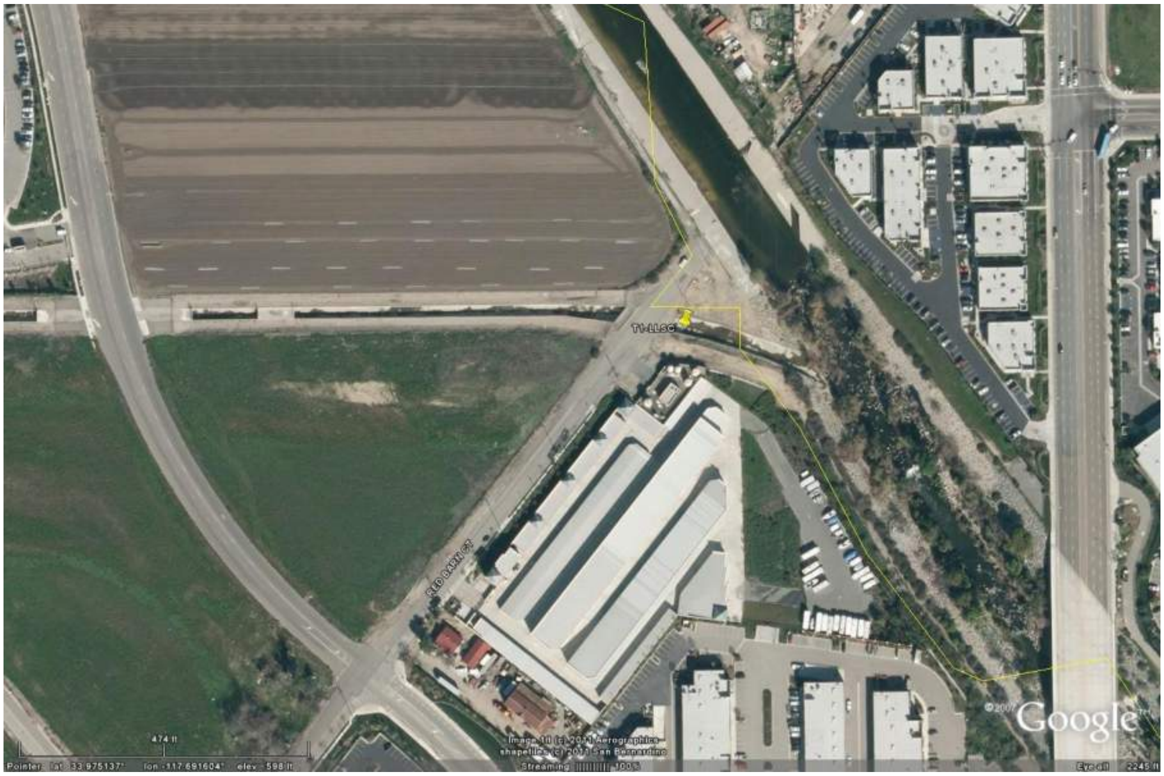
Sampling

- Monitoring will take place: on Lake Los Serranos Channel upstream of the confluence with Chino Creek/San Antonio Channel.
- The best location for collection of water samples and flow measurements is Downstream end of the concrete invert, where it connects to the grouted rock rip-rap in the main channel.
- Composition/shape of facility: Concrete vertical wall channel.
- Location/description of low flow for site: flows tend to flow in a thin sheet along the invert and south side of the channel.
- Likely dry weather flow measurement methodology: Volumetric (time to fill a bucket); flows may be sampled at more than one location and reported separately.

Site Access

Exit 71 freeway @ Central Ave. Drive east to Fairfield Ranch Rd, turn left. Drive north on Fairfield Ranch to Red Barn Ct, turn right. Drive west on Red Barn to Chino Creek/San Antonio Channel. There is an Army Corps of Engineers (COE) down ramp to the channel. The outlet of Lake Los Serranos Channel is 200’ downstream of Red Barn, on the west side of Chino Creek/San Antonio Channel.

Lake Serranos Channel monitoring site.



Aerial view of Los Serranos Channel site.

Chino Creek @ Yorba Ave Extension

Monitoring Site

Site ID: T1-YRBA; GPS: 33.98362, -117.70192; Thomas Brothers: 681-F5

Sampling

- Monitoring will take place: in the 4.5' x 12' double reinforced concrete box (RCB) storm drain that enters Chino Creek/San Antonio Channel on the east side at the extension of Yorba Avenue.
- The best location for collection of water samples and flow measurements is in the storm drain effluent. Actual measurements and sample sites may vary, depending on the access due to vegetation and debris build-up.
- Composition/shape of facility: 4.5' x 12' double RCB storm drain.
- Location/description of low flow for site? Flows downstream of double box, before flows reach the main channel.
- Likely dry weather flow measurement methodology: Flowmate, if sufficient flows present (and vegetation allows), otherwise calculated (Cross-section velocity profile).

Site Access

Exit 71 freeway @ Central Ave. Drive east to Fairfield Ranch Rd, turn left. Drive north on Fairfield Ranch to Red Barn Ct, turn right. Drive west on Red Barn to Chino Creek/San Antonio Channel. There is a COE down ramp to the channel. Drive upstream in the channel approximately 0.8 miles (Approximately 0.8 miles upstream of T1-LLSC). On the right side (east) you will see a double 4.5' high by 12' wide RCB storm drain.

Chino Creek @ Yorba Ave Extension monitoring site.

Aerial view of Chino Creek @ Yorba Ave Extension site.

Chino Creek @ Pipeline Avenue

Monitoring Site

Site ID: T1-PPLN; GPS: 33.9893, -117.71506; Thomas Brothers: 681-D4

Sampling

- Monitoring will take place in the 84" storm drain that enters Chino Creek/San Antonio Channel from the north, approximately 10 feet downstream of the southeast corner of the double box opening that crosses under Pipeline Avenue bridge.
- The best location for collection of water samples and flow measurements is: Inside of the 84" storm drain, approximately 20' upstream, until you are above the backflow water level in San Antonio Channel. Samples may need to be collected with a syringe to ensure that you do not collect the algae in the flowline.
- Composition/shape of facility: 84" reinforced concrete pipe (RCP).
- Location/description of low flow for site: Flows from the pipe comingle with flows from San Antonio channel, backing into the storm drain a few feet. A floating item can be used to determine the direction of flow, so that you can be sure you are in the storm drain flows. Sampling and measurements need to take place above the water line of the main channel.
- Likely dry weather flow measurement methodology: Calculated (Cross-section velocity profile).

Site Access

Exit 71 freeway @ Central Ave. Drive east to Fairfield Ranch Rd, turn left. Drive north on Fairfield Ranch to Red Barn Ct, turn right. Drive west on Red Barn to Chino Creek/San Antonio Channel. There is a COE down ramp to the channel. Drive upstream in the channel approximately 1.7 miles (Approximately 0.9 miles upstream of T1-YRBA). On the right side (east) you will see an 84" RCP storm drain.

Chino Creek @ Pipeline Avenue monitoring site.

Aerial view of Chino Creek @ Pipeline Avenue monitoring site.

Boys Republic South Channel @ Chino Creek

Monitoring Site

Site ID: T1-BRSC; GPS: 34.00208, -117.72611; Thomas Brothers: 681-C2

Sampling

- Monitoring will take place: at the 9'h x 12'w RCB outlet that enters Chino Creek/San Antonio Channel on the west side, between Grand/Edison Avenue and the old Schaefer Avenue Bridge.
- The best location for collection of water samples and flow measurements is: In the box invert, before it reaches the San Antonio Channel flows.
- Composition/shape of facility: 9'h x 12'w RCB.
- Location/description of low flow for site: Flow from the box collects across a wide apron with a shallow invert, which flows into San Antonio Channel. Due to constant low level flow, a significant amount of algae exists on the invert.
- Likely dry weather flow measurement methodology: Calculated (Cross-section velocity profile), however flows will need to be concentrated using a diversion, in order to be able to make measurements.

Site Access

Exit 71 freeway @ Central Ave. Drive east to Fairfield Ranch Rd, turn left. Drive north on Fairfield Ranch to Red Barn Ct, turn right. Drive west on Red Barn to Chino Creek/San Antonio Channel. There is a COE down ramp to the channel. Drive upstream in the channel approximately 2.8 miles (Approximately 1.1 miles upstream of T1-PPLN). On the left side (west) you will see the 9'h x 12'w RCB.

Boys Republic South Channel @ Chino Creek monitoring site.

Aerial view of Boys Republic South Channel @ Chino Creek.

San Antonio Channel @ Walnut Avenue

Monitoring Site

Site ID: T1-SACH; GPS: 34.02442, -117.72815; Thomas Brothers: 641-C6

Sampling

- Monitoring will take place: in San Antonio Channel on the downstream (south) side of Walnut Avenue Bridge, along the east wall.
- The best location for collection of water samples and flow measurements is: Downstream of Chino Storm Drain outlets.
- Composition/shape of facility: Vertical wall concrete channel.
- Location/description of low flow for site: Flows are on both sides of channel, but we will collect the east wall flows that reflect the runoff from Chino Storm Drain.
- Likely dry weather flow measurement methodology estimated using visual methods: Calculated (Cross-section velocity profile).

Site Access

Exit 71 freeway @ Central Ave. Drive east to Fairfield Ranch Rd, turn left. Drive north on Fairfield Ranch to Red Barn Ct, turn right. Drive west on Red Barn to Chino Creek/San Antonio Channel. There is a COE down ramp to the channel. Drive upstream in the channel approximately 4.5 miles (Approximately 1.7 miles upstream of T1-BRSC) to the Walnut Avenue Bridge, just upstream of the 60 freeway crossing. To exit channel, drive 1.7 miles upstream, and exit channel on the right at Grand Avenue access ramp. You will need an SBCFCD key to open gate. Make sure it is locked behind you.

To go to next sampling site, T1-CCCH, turn left on Grand Avenue, and drive east to East End Avenue. Turn right, drive south on East End Avenue to Schaefer Ave. Turn left, and drive east on Schaefer to Pipeline Avenue. Turn right, then drive south on Pipeline Avenue, crossing under the 71 freeway. Veer left, continuing south on Pipeline approximately 0.2 miles to Carbon Canyon Creek.

San Antonio Channel @ Walnut Avenue monitoring site.

Aerial view of San Antonio Channel @ Walnut Avenue.

Carbon Canyon Creek

Monitoring Site

Site ID: T1-CCCH; GPS: 33.98620, -117.71561; Thomas Brothers: 681-D4

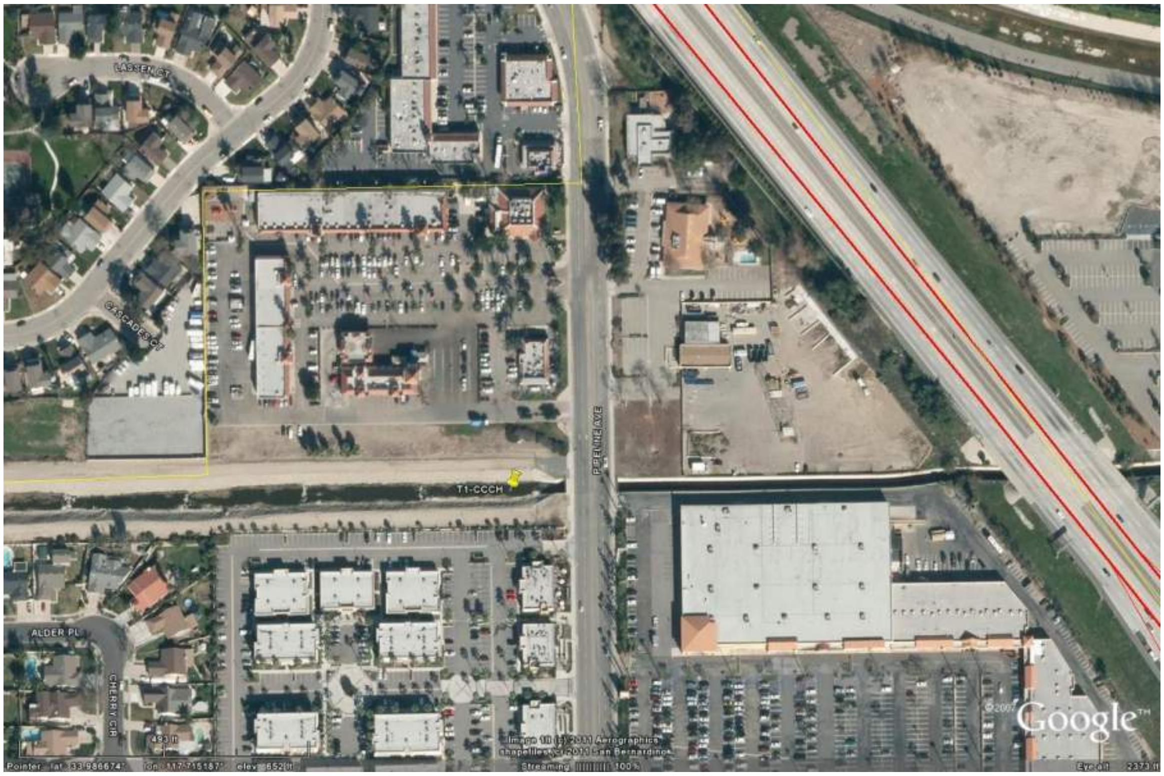
Sample Site

- Monitoring will take place: on the upstream (west) side of Pipeline Avenue.
- The best location for collection of water samples and flow measurements is: Approximately 200 feet west of the road crossing, in the center of the channel.
- Composition/shape of facility: Trapezoidal channel, with earth bottom and grouted rock slopes. Rock gabions are entrenched every 100 feet or so along the length of the channel to impede erosion.
- Location/description of low flow for site: There is flow during dry weather, along the center of the channel.
- Likely dry weather flow measurement methodology: Flowmeter, if there is sufficient depth, or calculated (Cross-section velocity profile).

Site Access

From San Antonio Channel @ Walnut (T1-SACH), take Grand Avenue east to East End Avenue. Turn right, drive south on East End Avenue to Schaefer Ave. Turn left, and drive east on Schaefer to Pipeline Avenue. Turn right, then drive south on Pipeline Avenue, crossing under the 71 freeway. Veer left, continuing south on Pipeline approximately 0.2 miles to Carbon Canyon Creek. There is an access gate at this location that can be opened with an SBCFCD master key. The site is accessed by parking on the Carbon Canyon Creek SBCFCD access road on the west side of Pipeline Avenue.

Carbon Canyon Creek monitoring site.



Aerial view of Carbon Canyon Creek.

Chino Creek @ Big League Dreams

Monitoring Site

Site ID: T1-CBLD; GPS: 33.95864, -117.67493; Thomas Brothers: 711-J1

Sampling

- Monitoring will take place: in the 48" RCP outlet structure which empties into the west side of Chino Creek, across from the extension of Flowers Street, east of the Big League Dreams ballparks.
- The best location for collection of water samples and flow measurements is: The 48" pipe outfall.
- Composition/shape of facility: 48" RCP.
- Location/description of low flow for site: The 48" pipe outfall invert.
- Likely dry weather flow measurement methodology: Volumetric (time to fill a bucket).

Site Access

From Carbon Canyon Creek at Pipeline (T1-CCCH), drive south on Pipeline to Chino Hills Parkway. Turn left, then drive east on Chino Hills Parkway to the 71 freeway. Turn right onto the 71 freeway, and drive south to Central Avenue. Take the Central Avenue exit and turn left onto Central Avenue. Drive east on Central Avenue to Chino Creek. Just before you reach the creek, turn right onto the access road on the southwest side of the channel. Drive southerly on the access road approximately 1.3 miles. On your right (west) you will see the backside of the Big League Dreams ballparks. You should see a 48" RCP on the west (right) side of the channel, which would enter along the extension line of Flowers Street (on the east).

Chino Creek @ Big League Dreams monitoring site.

Aerial view of Chino Creek @ Big League Dreams.

Cypress Channel

Monitoring Site

Site ID: T1-CYP; GPS: 33.96821, -117.66039; Thomas Brothers: 682-B7

Sampling

- Monitoring will take place: in Cypress Channel just below Kimball Avenue.
- The best location for collection of water samples and flow measurements is: A few feet downstream of the Kimball Avenue crossing double RCB, but upstream of the where the street side drains enter.
- Composition/shape of facility: Concrete trapezoidal channel.
- Location/description of low flow for site: Flows tend towards the west side of the channel, along the invert. Flows may vary greatly, as they are primarily field irrigation runoff, usually in the early morning.
- Likely dry weather flow measurement methodology: calculated (Cross-section velocity profile).

Site Access

From T1-CBLD site, return north on the channel access road to Central Avenue and turn right. Drive east on Central to El Prado Road. Turn right on El Prado, and drive south to Kimball. Turn left on Kimball, and drive east about 1.2 miles to Cypress Channel. Turn right onto the west access road, and drive south about 0.2 miles to the channel access down ramp. You will need a key for access. Drive upstream (north) in the channel about 0.2 miles to the sampling site, just before you reach Kimball Avenue Bridge.

Cypress Channel monitoring site.

Aerial view of Cypress Channel.

County Line Channel

Monitoring Site

Site ID: T1-CLCH; GPS: 33.97501, -117.60044; Thomas Brothers: 682-J6

Sampling

- Monitoring will take place: in County Line Channel, several feet upstream of where it confluences with Cucamonga Creek Channel.
- The best location for collection of water samples and flow measurements is: Approximately 10 feet upstream of where the down ramp wall meets the channel invert.
- Composition/shape of facility: vertical concrete wall channel.
- Location/description of low flow for site: Flows are flat across the channel, and may be stagnant in places. Do not sample if water is not flowing to Cucamonga Creek Channel.
- Likely dry weather flow measurement methodology: FloMate, if enough flow, otherwise, calculated (Cross-section velocity profile).

Site Access

From Cypress Channel (T1-CYP), drive east on Kimball Avenue. Turn left on Euclid, and drive north to Merrill Ave. Turn right onto Merrill, and travel east to Archibald Avenue. Turn right on Archibald, and drive south about 0.3 miles to the northerly access road for County Line Channel (angled extension of Remington Avenue). Turn right onto the access road, and drive southwesterly about 0.1 miles to the access road gate (almost at Cucamonga Creek Channel). You will need a key to unlock the gate. Lock it behind you, as you will be exiting the channel about 10 miles upstream after you have finished sampling the next few sites. Stop near the base of the access road to sample for this location. Approach County Line Channel flows from below where you will be sampling, so you don't contaminate the flows by driving through them.

Alternate access would be from Archibald, continue about 0.6 miles more south, past the channel, and turn right onto 65th Street. Drive west to where the paved street makes a left turn, then veer to the right, off the pavement onto a short dirt path. This path will bring you to the east side of Cucamonga Creek Channel. Turn right, and drive north along the channel access road for about 0.5 miles. The road jogs left to cross County Line Channel. Turn right immediately after the channel, and drive a few dozen feet northeasterly to the access gate (on the right). Make a U-turn to access the gate and drive down the ramp.

County Line Channel monitoring site.

Aerial view of County Line Channel monitoring site.

Chris Basin (Lower Deer Creek Channel)

Monitoring Site

Site ID: T1-CHRS; GPS: 34.00277, -117.59906; Thomas Brothers: 682-J2

Sampling

- Monitoring will take place: at the outlet for Chris Basin. Chris Basin is a detention basin located at the terminus of Lower Deer Creek Channel, where it confluences with Cucamonga Creek Channel.
- The best location for collection of water samples and flow measurements is: At the outlet structure where it discharges to Cucamonga Creek Channel.
- Composition/shape of facility: 2.8' x 3.4' concrete outlet tunnel.
- Location/description of low flow for site: Flows from Lower Deer Creek enter Chris Basin, and are conducted via a low flow channel through the basin, to a low flow discharge structure, which then outfalls to Cucamonga Creek Channel.
- Likely dry weather flow measurement methodology: Flowmate, unless there is insufficient flow, in which case the flow will be calculated (Cross-section velocity profile).

Site Access

Enter Cucamonga Channel from the south, using County line Channel (T1-CLCH) site access ramp. Drive 2.0 miles north in Cucamonga Creek Channel (upstream) from County line Channel to the 2.8' x 3.4' box outlet just downstream of the Chris Basin spillway, on the east (right) side of Cucamonga Creek Channel. Chris basin can be accessed directly, however the outflow tunnel is easier to access during dry weather from Cucamonga Creek Channel.

Chris Basin (Lower Deer Creek Channel) monitoring site.

Aerial view of Chris Basin (Lower Deer Creek Channel).

Cucamonga Creek Channel upstream of State Highway 60

Monitoring Site

Site ID: T1-SH60; GPS: 34.03098; -117.59887; Thomas Brothers: 642-J5

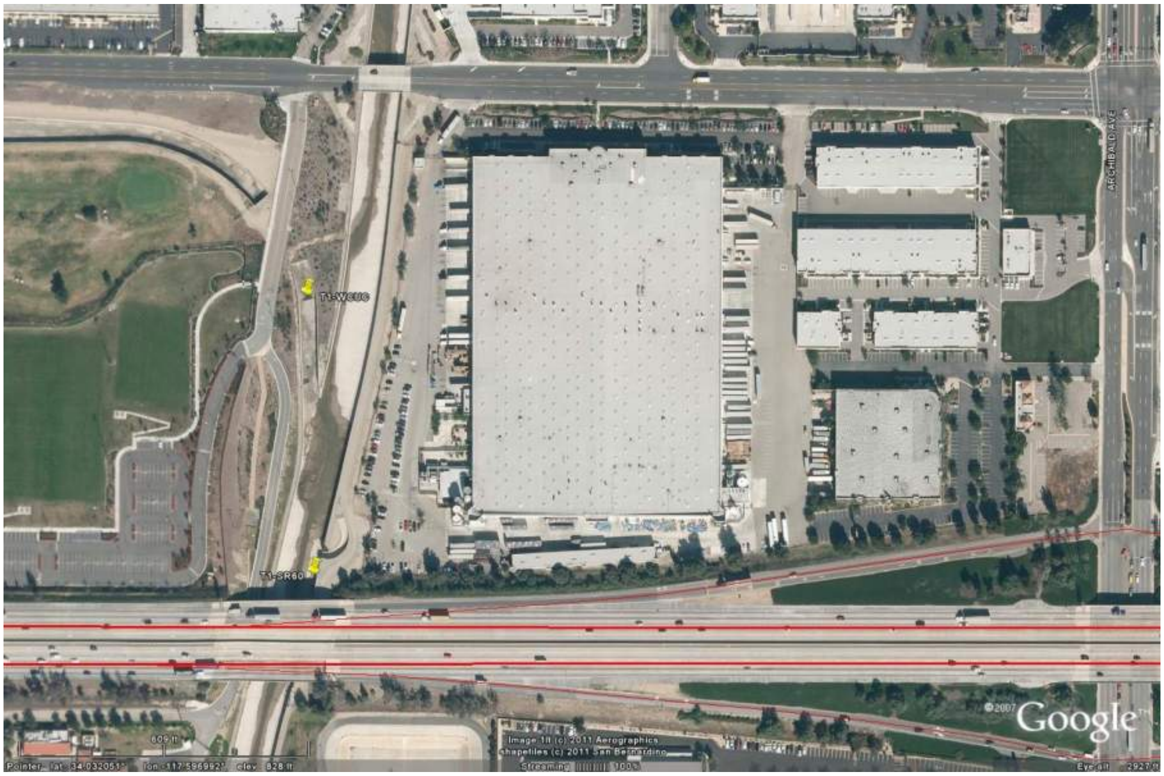
Sample Site

- Monitoring will take place: in the 54" RCP that enters Cucamonga Creek Channel on the east side, about 50 feet upstream of the 60 Freeway overpass, at approximately Station 545+ 58.40.
- The best location for collection of water samples and flow measurements is: At the pipe outfall.
- Composition/shape of facility: 54" RCP.
- Location/description of low flow for site: Invert of pipe.
- Likely dry weather flow measurement methodology: Volumetric (time to fill a bucket).

Site Access

Enter Cucamonga Channel from the south, using County line Channel (T1-CLCH) site access ramp. Drive 3.9 miles north in channel (1.9 miles upstream from previous site, T1-CHRS) to approximately 50 feet upstream of the 60 Freeway, on the right side. Site is almost directly across Cucamonga Creek Channel from T1-WCUC.

Cucamonga Creek Channel upstream of State Highway 60 monitoring site.



Aerial view of Cucamonga Creek Channel upstream of State Highway 60.

West Cucamonga Creek Channel

Monitoring Site

Site ID: T1-WCUC; GPS: 34.03257, -117.59893; Thomas Brothers: 642-J5

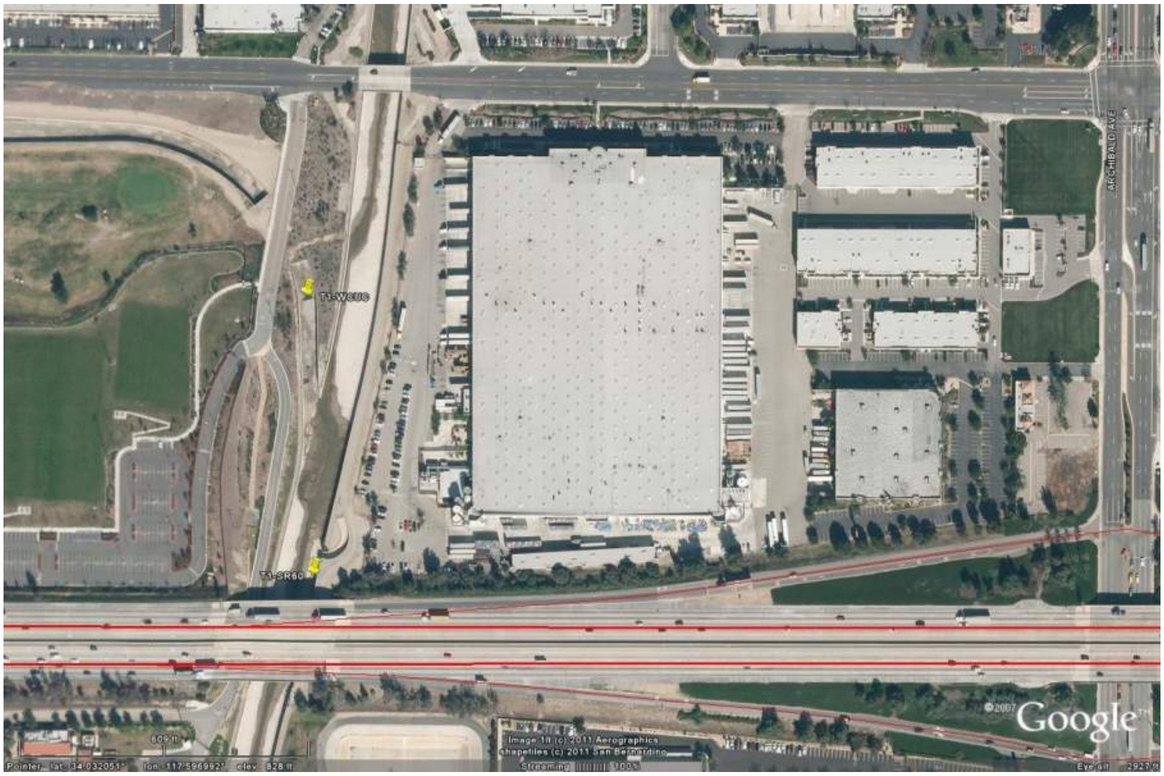
Sampling

- Monitoring will take place: in West Cucamonga Creek Channel, downstream of the 3 barrel RCB (street crossing to access the Inland Empire Utility Agency property).
- The best location for collection of water samples and flow measurements is: About 40 feet downstream of the RCB structure. Flow is very flat, so actual location may vary depending on conditions.
- Composition/shape of facility: Concrete vertical wall channel.
- Location/description of low flow for site: Wide apron invert conducts shallow sheet flow. There may be no well-defined flow line.
- Likely dry weather flow measurement methodology: calculated (Cross-section velocity profile).

Site Access

Enter Cucamonga Channel from the south, using County Line Channel (T1-CLCH) site access ramp. Drive 3.9 miles north in channel (about 250 feet upstream from previous site, T1-SH60) to West Cucamonga Creek confluence on left (west) side of channel. Site is almost directly across Cucamonga Creek Channel from T1-SH60.

West Cucamonga Creek Channel monitoring site.



West Cucamonga Creek Channel.

Francis Street @ Cucamonga Creek Channel

Monitoring Site

Site ID: T1-CFRN; GPS: 34.04077, -117.59848; Thomas Brothers: 642-J4

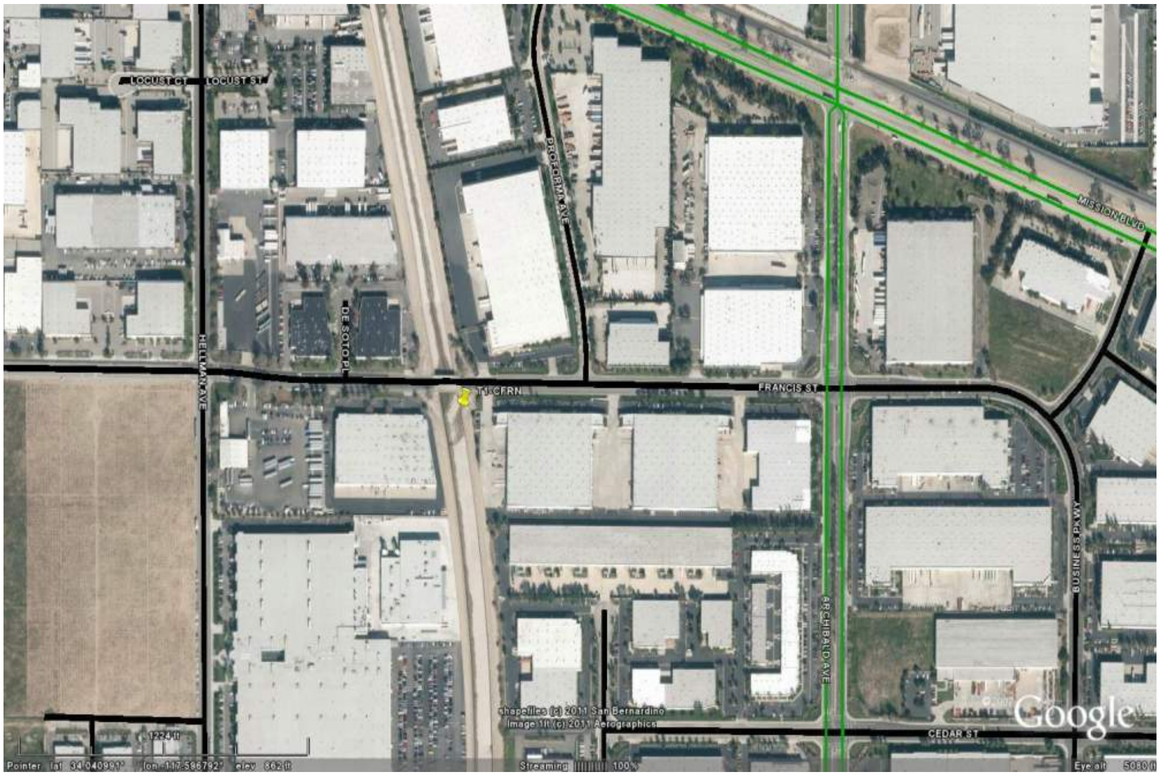
Sampling

- Monitoring will take place: in a 60" RCP, entering the east side of Cucamonga Creek Channel about 100 feet south of Francis Street Bridge, approximately at station 581+26.
- The best location for collection of water samples and flow measurements is: From the pipe outfall.
- Composition/shape of facility: 60" RCP.
- Location/description of low flow for site: Invert of pipe.
- Likely dry weather flow measurement methodology: Volumetric (time to fill a bucket).

Site Access

Enter Cucamonga Channel from the south, using County Line Channel (T1-CLCH) site access ramp. Drive 4.5 miles north in channel (0.6 miles upstream from previous site, T1-WCUC) to 60" pipe on right (east) side of channel.

Francis Street @ Cucamonga Creek Channel monitoring site.



Aerial view of Francis Street @ Cucamonga Creek Channel.

North Runway @ Cucamonga Creek Channel

Monitoring Site

Site ID: T1-CNRW; GPS: 34.05930, -117.60072; Thomas Brothers: 642-H1

Sampling

- Monitoring will take place: in quadruple 8.4' x 4' RCBs, entering the east side of Cucamonga Creek Channel about 400 feet north of the north runway tunnel, approximately at station 650+05.
- The best location for collection of water samples and flow measurements is: A reading/sample in the centerline of each box that is flowing. There could be up to 4 separate sets of measurements and samples.
- Composition/shape of facility: Quadruple 8.4' x 4' RCBs.
- Location/description of low flow for site: centerline of each box outfall.
- Likely dry weather flow measurement methodology: Volumetric (time to fill a bucket).

Site Access

Enter Cucamonga Channel from the south, using County Line Channel (T1-CLCH) site access ramp. Drive 5.8 miles north in channel 1.3 miles upstream from previous site, T1-CFRN) to quadruple RCBs on right (east) side of channel.

North Runway @ Cucamonga Creek Channel monitoring site.

Aerial view of North Runway @ Cucamonga Creek Channel.

Airport Drive @ Cucamonga Creek Channel

Monitoring Site

Site ID: T1-CAPT; GPS: 34.06294, -117.60123; Thomas Brothers: 642-H1

Sampling

- Monitoring will take place: in 96" RCP, entering the west side of Cucamonga Creek Channel about 120 feet north of Airport Drive Bridge, approximately at station 663+19.
- The best location for collection of water samples and flow measurements is: At the pipe outfall.
- Composition/shape of facility: 96" RCP.
- Location/description of low flow for site: Invert of pipe outfall.
- Likely dry weather flow measurement methodology: Volumetric (time to fill a bucket).

Site Access

Enter Cucamonga Channel from the south, using County Line Channel (T1-CLCH) site access ramp. Drive 6.0 miles north in channel (0.2 miles upstream from previous site, T1-CNRW). To exit channel, continuing north in Cucamonga Creek Channel (bear left at the Deer Creek confluence), drive about 0.5 miles upstream and exit channel via the access ramp on the left, right before you reach the Inland Empire Boulevard bridge. You will need an SBCFCD key to open gate. Make sure it is locked behind you.

Turn right on Inland Empire Boulevard driving east to Archibald Avenue. Turn right on Archibald, and drive south to access the I-10 for your next destination.

Airport Drive @ Cucamonga Creek Channel monitoring site.

Aerial view of Airport Drive @ Cucamonga Creek Channel.

Rialto Storm Drain

Monitoring Site

Site ID: T1-RISD; GPS: 34.02774, -117.36447; Thomas Brothers: 645-J2

Sampling

- Monitoring will take place: where the two Rialto Storm Drains outlet into the Santa Ana River. There are two outlets, 10’ RCP and 6.5’ RCP side by side, that confluence, approximately 15’ downstream of the outfalls, below some rock riprap, into an earth channel.

- The best location for collection of water samples and flow measurements is: Where the flowlines from the two RCPs confluence, approximately 15’ downstream of the outfalls.

- Composition/shape of facility: 10’ RCP and 6.5’ RCP.

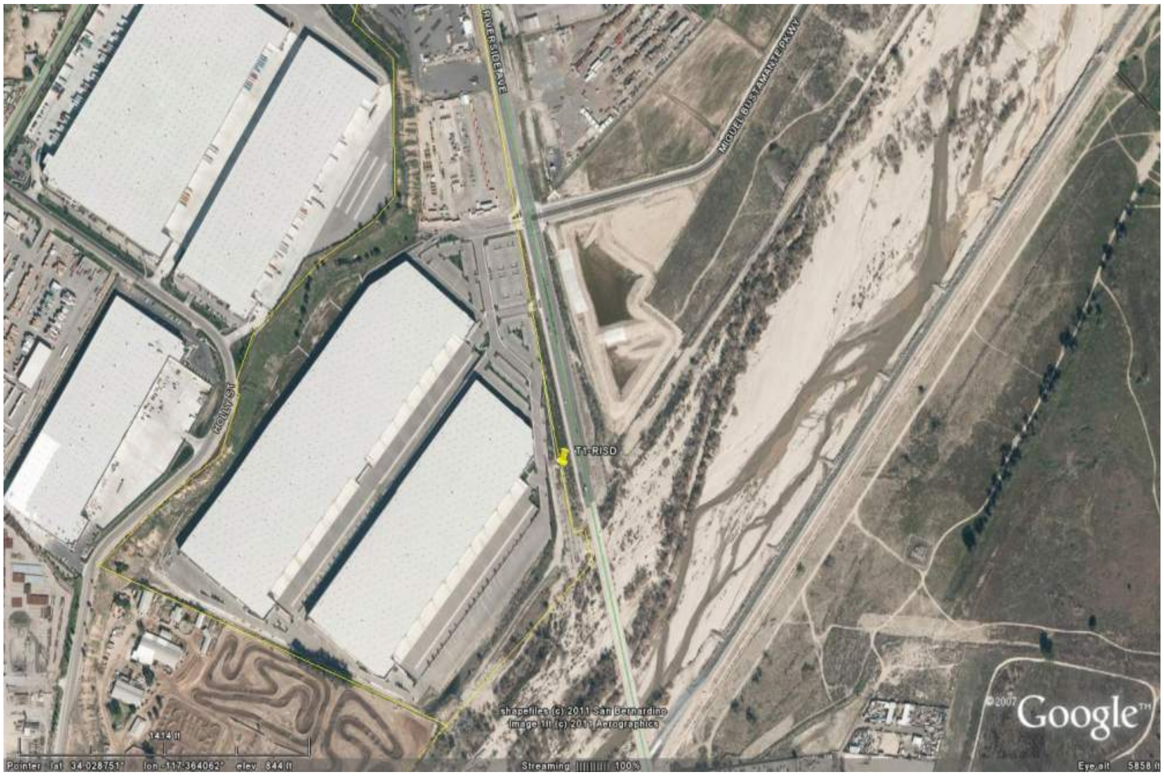
- Location/description of low flow for site: Flows outlet onto a riprap area, then down the earth channel. Site is likely to be dry during dry weather.

- Likely dry weather flow measurement methodology: Flowmate, if there is sufficient flow, or calculated (Cross-section velocity profile) if not.

Site Access

From the 10 freeway, exit at Riverside Avenue, and drive south 2.7 miles on Riverside Avenue to Kline Ranch Road (entrance to “Living Spaces” complex). Turn right onto Kline Ranch Road, and follow the road approximately 200 feet, then turn left, and follow the driving aisle southerly to the chopped off east corner of Building 3996. There is some pavement parking on the east (left) side of the road, and on the southeast side of the building. Walk down the dirt ramp on the south end of the east side parking strip. The double pipe structure is approximately 40 feet south easterly from the parking areas, parallel to Riverside Avenue.

Rialto Storm Drain monitoring site.



Aerial view of Rialto Storm Drain.

Attachment D

Field Data Sheets

Santa Ana River Watershed Bacteria Monitoring Program - Field Data Sheet

General Information:

Site Name: ____

Site ID: ____

Date: _________/_____/______

Time (24-hr clock): ____________________________________

Sampling Team:_______________________________________/_______________________________________

Field Measurements: *(average of three readings)*

	Reading #1	Reading #2	Reading #3	Average
Conductivity: mS/cm ☐ uS/cm ☐				
Dissolved Oxygen: (mg/L)				
pH:				
Turbidity: (NTU)				
Temp (water): (°C)				
Other _______________				

Flow Connectivity: Y/N (Describe) ____

Flow measurements *(check boxes for units of measure)*:

Total Section Width (*W*):_______feet ☐ meters ☐

Cross-section:	Depth (*D*)	Velocity (*V*)	Comments
10% across	_________in ☐ cm ☐	__________ ft/sec ☐ m/sec ☐	__________________
50% across	_________in ☐ cm ☐	__________ ft/sec ☐ m/sec ☐	__________________
90% across	_________in ☐ cm ☐	__________ ft/sec ☐ m/sec ☐	__________________

Estimated Flow _________ft^3/sec ☐ m^3/sec ☐ $Q\ (ft^3/sec) = (0.2*W*D_{10}/12*V_{10}) + (0.6*W*D_{50}/12*V_{50}) + (0.2*W*D_{90}/12*V_{90})$

Grab Sampling:

Filled and labeled *(check if applicable)*

1 – 100 or 125 mL polyethylene bottle (w/ $NaSO_4$ preservative) for ***E. coli*** or ***Enterococcus***: .... ______

1 – 1,000 mL polyethylene bottle for **TSS**: ....______

1 – 1,000 mL polyethylene bottle for ***Bacteroides:*** ....______

1 – 100 mL polyethylene bottle for **Ammonia:** ....______

1 – 500 mL polyethylene bottle for **Potassium:** ....______

1 – 500 mL polyethylene bottle for **Surfactants:**...______

Additional bottle sets are included for field duplicates and trip blanks...______

Site Observations:

Weather: ____

Visual Evidence of REC-1 Activity: ____

____

Other: ____

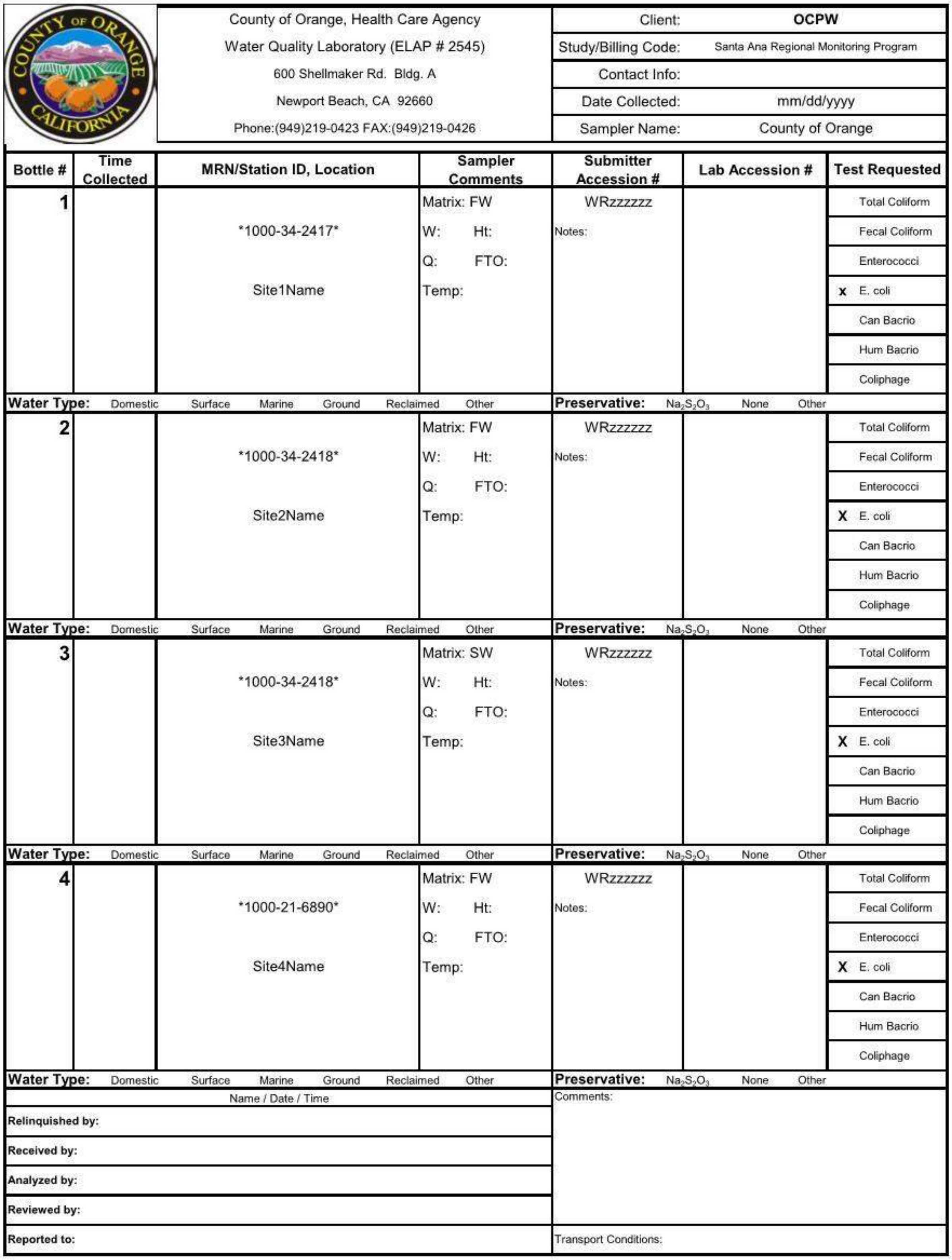
____

____

Attachment E

Example Chain of Custody Forms

Chain of Custody (COC) forms are provided by the laboratory receiving the samples. Following are examples of COC forms from key laboratories to be used for this project.

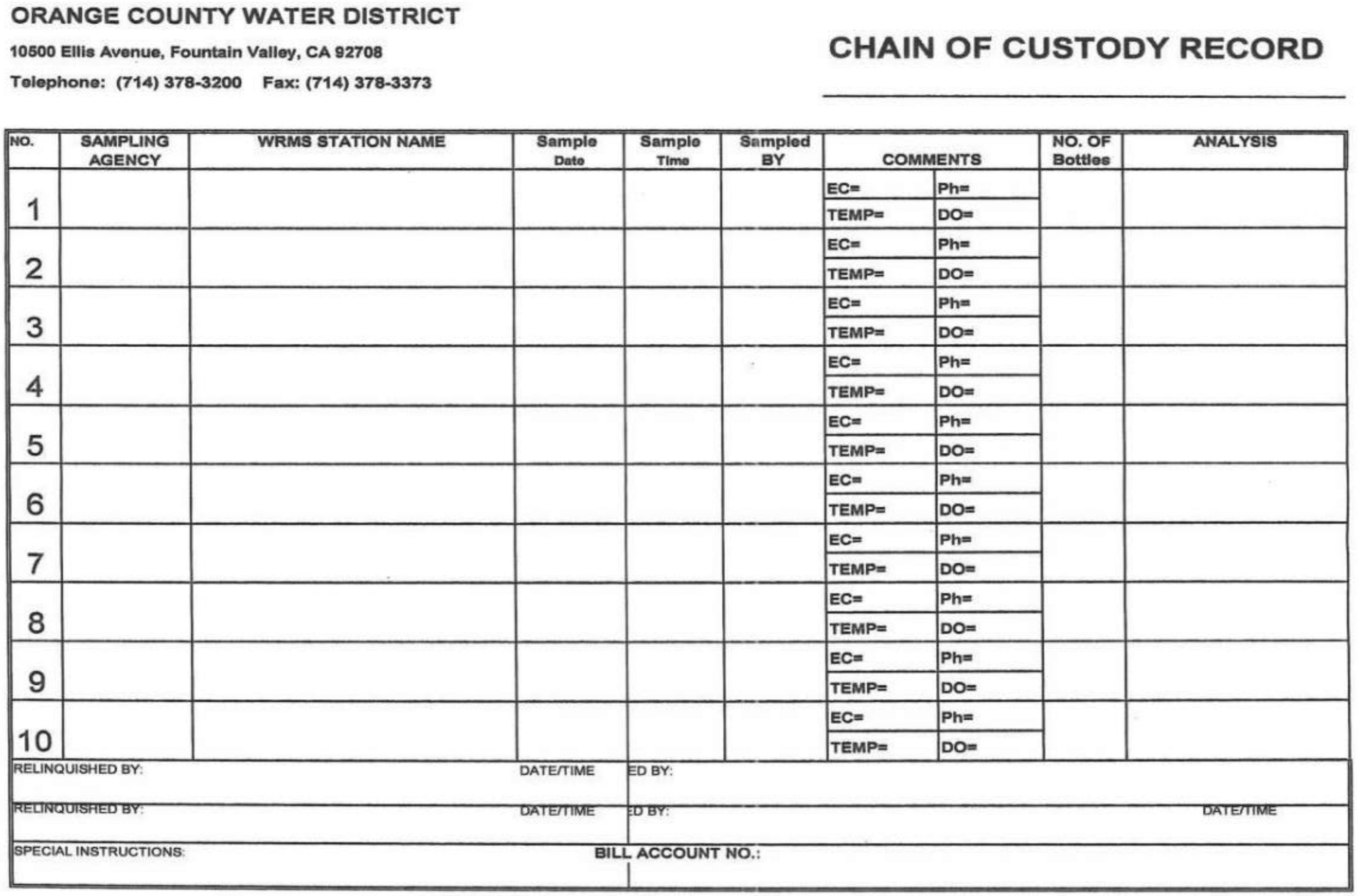


County of Orange, Health Care Agency
Water Quality Laboratory (ELAP # 2545)
600 Shellmaker Rd. Bldg. A
Newport Beach, CA 92660
Phone:(949)219-0423 FAX:(949)219-0426

Client:	**OCPW**
Study/Billing Code:	Santa Ana Regional Monitoring Program
Contact Info:	
Date Collected:	mm/dd/yyyy
Sampler Name:	County of Orange

Bottle #	**Time Collected**	**MRN/Station ID, Location**	**Sampler Comments**	**Submitter Accession #**	**Lab Accession #**	**Test Requested**
1		*1000-34-2417* Site1Name	Matrix: FW W: Ht: Q: FTO: Temp:	WRzzzzzz Notes:		Total Coliform Fecal Coliform Enterococci x E. coli Can Bacrio Hum Bacrio Coliphage
Water Type:	Domestic	Surface Marine Ground Reclaimed	Other	**Preservative:** $Na_2S_2O_3$	None Other	
2		*1000-34-2418* Site2Name	Matrix: FW W: Ht: Q: FTO: Temp:	WRzzzzzz Notes:		Total Coliform Fecal Coliform Enterococci X E. coli Can Bacrio Hum Bacrio Coliphage
Water Type:	Domestic	Surface Marine Ground Reclaimed	Other	**Preservative:** $Na_2S_2O_3$	None Other	
3		*1000-34-2418* Site3Name	Matrix: SW W: Ht: Q: FTO: Temp:	WRzzzzzz Notes:		Total Coliform Fecal Coliform Enterococci X E. coli Can Bacrio Hum Bacrio Coliphage
Water Type:	Domestic	Surface Marine Ground Reclaimed	Other	**Preservative:** $Na_2S_2O_3$	None Other	
4		*1000-21-6890* Site4Name	Matrix: FW W: Ht: Q: FTO: Temp:	WRzzzzzz Notes:		Total Coliform Fecal Coliform Enterococci X E. coli Can Bacrio Hum Bacrio Coliphage
Water Type:	Domestic	Surface Marine Ground Reclaimed	Other	**Preservative:** $Na_2S_2O_3$	None Other	

Name / Date / Time	Comments:
Relinquished by:	
Received by:	
Analyzed by:	
Reviewed by:	
Reported to:	Transport Conditions:



ORANGE COUNTY WATER DISTRICT

10500 Ellis Avenue, Fountain Valley, CA 92708

Telephone: (714) 378-3200 Fax: (714) 378-3373

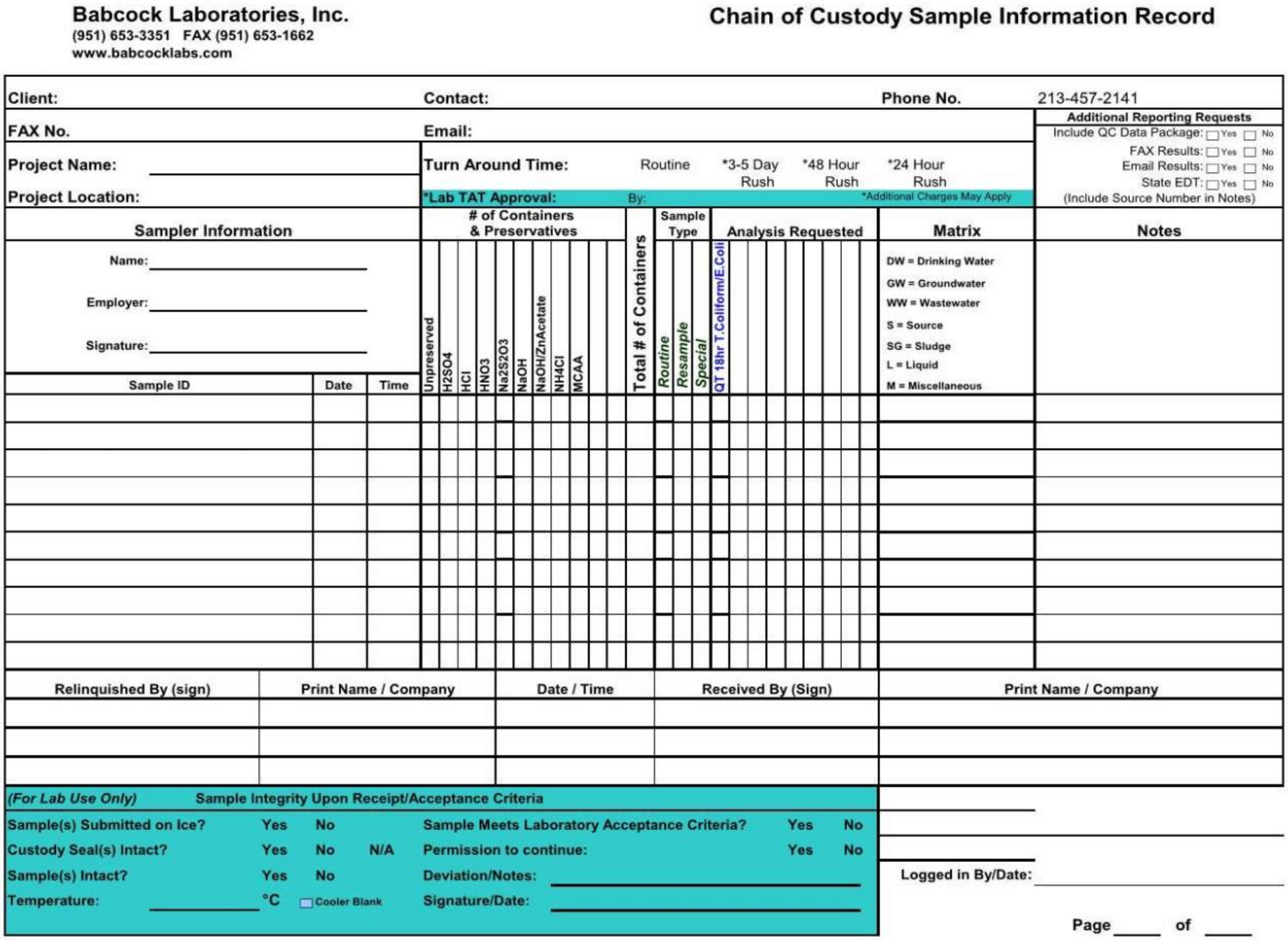
CHAIN OF CUSTODY RECORD

NO.	SAMPLING AGENCY	WRMS STATION NAME	Sample Date	Sample Time	Sampled BY	COMMENTS		NO. OF Bottles	ANALYSIS
1						EC= TEMP=	Ph= DO=		
2						EC= TEMP=	Ph= DO=		
3						EC= TEMP=	Ph= DO=		
4						EC= TEMP=	Ph= DO=		
5						EC= TEMP=	Ph= DO=		
6						EC= TEMP=	Ph= DO=		
7						EC= TEMP=	Ph= DO=		
8						EC= TEMP=	Ph= DO=		
9						EC= TEMP=	Ph= DO=		
10						EC= TEMP=	Ph= DO=		

RELINQUISHED BY: DATE/TIME ED BY:

RELINQUISHED BY: DATE/TIME ED BY: DATE/TIME

SPECIAL INSTRUCTIONS: BILL ACCOUNT NO.:



Babcock Laboratories, Inc.
(951) 653-3351 FAX (951) 653-1662
www.babcocklabs.com

Chain of Custody Sample Information Record

Client:
Contact:
Phone No. 213-457-2141
FAX No.
Email:
Project Name: ____________
Project Location:
Turn Around Time: Routine *3-5 Day Rush *48 Hour Rush *24 Hour Rush
***Lab TAT Approval:** By: *Additional Charges May Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: ____________
Employer: ____________
Signature: ____________

Sample ID	**Date**	**Time**	**# of Containers & Preservatives** Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA			**Total # of Containers**	**Sample Type** Routine	Resample	Special	**Analysis Requested** QT 18hr T.Coliform/E.Coli									**Matrix** DW = Drinking Water GW = Groundwater WW = Wastewater S = Source SG = Sludge L = Liquid M = Miscellaneous	**Notes**

Relinquished By (sign)	**Print Name / Company**	**Date / Time**	**Received By (Sign)**	**Print Name / Company**

(For Lab Use Only) **Sample Integrity Upon Receipt/Acceptance Criteria**

Sample(s) Submitted on Ice? Yes No
Custody Seal(s) Intact? Yes No N/A
Sample(s) Intact? Yes No
Temperature: ________ °C ☐ Cooler Blank

Sample Meets Laboratory Acceptance Criteria? Yes No
Permission to continue: Yes No
Deviation/Notes: ____________
Signature/Date: ____________

Logged in By/Date: ____________

Page _____ **of** _____

Attachment F

Flow Measurement Forms

FLOW MEASUREMENTS

Location ________

Portable Flowmeter Used __________________ Recorder ________

Date ________

Time ________

Left Bank ________________ Right Bank ____________ Page ____ of ____

	Distance from IP	Width	Total Depth	Flow Velocity				Average V*	Area A**	Discharge (avg VXA)
				VO.6	VO.2	VO.8	VO.9			
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
									Total Discharge	

Stream Flow Conditions (I.e., muddy, clear, debris, etc…): ____________________

* Average Velocity =VO.6 for stream depths between 0.3 and 2.5 feet (six-tenths method).
=(VO.2 + VO.8)/2 for stream depths greater than 2.5 feet (two-point method).
=VO.9 if flow is less than 0.3 feet deep (maximum velocity X 0.9).
** Area =total depth x width
IP =Initial Point