California Regional Water Quality Control Board
San Diego Region

Revised Total Maximum Daily Loads for Indicator Bacteria Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)

REVISED DRAFT FINAL
TECHNICAL REPORT
November 25, 2009

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Revised Total Maximum Daily Loads For Indicator Bacteria Project I – Twenty Beaches and Creeks in The San Diego Region (Including Tecolote Creek)

Revised Draft Final
Technical Report

Adopted by the
California Regional Water Quality Control Board
San Diego Region
On Month Day, 2010

Approved by the
State Water Resources Control Board
on _______________, 201x
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and the
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on _________________. 201x

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List of Acronyms and Abbreviations

ac	Acre
AGR	Agricultural supply
ALERT	Automatic Local Evaluation in Real-Time
AQUA	Aquaculture
Basin Plan	Water Quality Control Plan for the San Diego Basin (9)
BASINS	Better Assessment Science Integrating Point and Nonpoint Sources
BIOL	Preservation of biological habitats of special significance
BLRP	Bacteria Load Reduction Plan
BMP(s)	Best Management Practice(s)
CAFOs	Concentrated animal feeding operations
Caltrans	California Department of Transportation
CAMMPR	California's Management Measures for Polluted Runoff
CASQA	California Stormwater Quality Association
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	Cubic feet per second
CIMIS	California Irrigation Management Information System
CLRP	Comprehensive Load Reduction Plan
COLD	Cold freshwater habitat
COMM	Commercial and sport fishing
CWA	Clean Water Act
DEH	San Diego County Department of Environmental Health
DHS	Department of Health Services
EST	Estuarine habitat
EQIP	Environmental Quality Incentives Program
FRSH	Freshwater replenishment
GWR	Ground water recharge
HA	Hydrologic Area
HSA	Hydrologic Sub Area
HSPF	Hydrological Simulation Program–FORTRAN
HU	Hydrologic Unit
IND	Industrial water supply
LA	Load allocations
LAX	Los Angeles Airport
Los Angeles Water Board	California Regional Water Quality Control Board, Los Angeles Region
LSPC	Loading Simulation Program in C++

MEP	Maximum extent practicable
MAR	Marine habitat
MIGR	Migration of aquatic organisms
mL	milliliter
MM	Management measure
MOS	Margin of safety
MP	Management practice
MPN	Most probable number of bacteria colonies
MRLC	Multi-Resolution Land Characteristic
MS4	Municipal separate storm sewer systems
MUN	Municipal and domestic supply
Municipal Dischargers	Persons owning and/or operating MS4s other than Caltrans
NAV	Navigation
NCDC	National Climatic Data Center
NHD	National Hydrography Dataset
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of intent
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint source
NRCS	Natural Resources Conservation Service
OAL	Office of Administrative Law
Ocean Plan	Water Quality Control Plan for Ocean Waters of California
POTW(s)	Publicly owned treatment work(s)
POW	Hydropower generation
PROC	Industrial process supply
RARE	Rare and endangered species
REC-1	Water contact recreation
REC-2	Non-contact water recreation
RWD	Report of waste discharge
San Diego Water Board	California Regional Water Quality Control Board, San Diego Region
SAL	Inland saline water habitat
SAG	Stakeholder Advisory Group
SANDAG	San Diego Regional Planning Agency
SCAG	Southern California Association of Governments
SCCWRP	Southern California Coastal Water Research Project
SHELL	Shellfish harvesting
SPWN	Spawning, reproduction, and/or early development
State Water Board	State Water Resources Control Board
STATSGO	State soil geographic

TBEL(s)	Technology based effluent limitation(s)
TMDL(s)	Total maximum daily load(s)
U.S.	United States
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WARM	Warm freshwater habitat
WDR(s)	Waste discharge requirement(s)
WILD	Wildlife habitat
WLA(s)	Wasteload allocation(s)
WQBEL(s)	Water quality based effluent limitation(s)
WQO(s)	Water quality objective(s)
WQS	Water quality standards
yr	Year

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Many dedicated professionals contributed to this Technical Report through their service on the Stakeholder Advisory Group (SAG) for this indicator bacteria Total Maximum Daily Load project. The SAG provided insightful technical comments on early drafts of this report, suggested issues for technical peer review, raised important policy issues, and assisted with drafting the Implementation Plan. The California Regional Water Quality Control Board, San Diego Region, would like to thank the individuals who served on the SAG for their significant contributions to this project.

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1 Executive Summary

The purpose of this technical report is to present the development of the Total Maximum Daily Loads (TMDLs) for 20 beaches and creeks impaired by indicator bacteria (fecal coliform, total coliform, and/or enterococcus) in the San Diego Region. A TMDL represents the maximum amount of the pollutant of concern that the waterbody can receive and still attain water quality standards. Once this maximum pollutant amount has been calculated, it is then divided up and allocated among all of the contributing sources in the watershed. For each of the 20 waterbodies addressed by this TMDL project, separate wet weather TMDLs and dry weather TMDLs were developed for each of the three indicator bacteria.

This technical report is a revised version of the technical report for the Total Maximum Daily Loads for Indicator Bacteria, Project I – Beaches and Creeks in the San Diego Region (or Bacteria TMDLs Project I) adopted by the California Regional Water Quality Control Board, San Diego Region (San Diego Water Board) on December 12, 2007. Bacteria TMDLs Project I addressed 19 beaches and creeks listed as impaired by indicator bacteria on the 2002 Clean Water Act Section 303(d) List of Water Quality Limited Segments (303(d) List). Because the State Water Board had not yet considered and approved Bacteria TMDLs Project I, and revisions to Bacteria TMDLs Project I would likely be required soon after its anticipated approval, the San Diego Water Board withdrew Bacteria TMDLs Project I from State Water Board consideration for approval on December 17, 2008.

Significant revisions have been made to the Bacteria Project I technical report, but the underlying technical approach and assumptions used for calculating the TMDLs have not been changed. The revisions are primarily associated with revisions that are required due to the adoption and approval of the Reference System and Antidegradation Approach/Natural Sources Exclusion Approach (RSAA/NSEA) Basin Plan amendment.[1] The "final" TMDLs have been removed and the "interim" TMDLs, which incorporate a reference system approach as discussed below, are the only TMDLs included in the project. Additionally, because the same modeling approaches can be used, and the resources available for the development of TMDLs have become more limited, the bacteria TMDL for Tecolote Creek that was being developed under a separate project has been incorporated in to these bacteria TMDLs for beaches and creeks in the San Diego Region. Finally, the TMDL Implementation Plan has been revised to provide additional guidance on potential actions that may be taken by the San Diego Water Board and/or other entities to implement the TMDLs, minimum monitoring that will be required to assess the implementation of the TMDLs, and the potential for alternative compliance schedules.

The 20 beaches and creeks addressed by this revised TMDL project (Table 1-1) are located within or hydraulically downstream of five watersheds in Orange County (with a small portion in Riverside County) and eight watersheds in San Diego County. Most of the waterways flow directly to the Pacific Ocean, except Tecolote Creek, which flows to Mission Bay, and Chollas Creek, which flows to San Diego Bay. The combined watersheds cover roughly 1,740 square miles (4,500 square kilometers).

[1] Resolution No. R9-2008-0028, *Implementation Provisions for Indicator Bacteria Water Quality Objectives to Account for Loading from Natural Uncontrollable Sources Within the Context of a TMDL,* adopted by the San Diego Water Board on May 14, 2008, approved by the State Water Board on March 17, 2009, approved by OAL on June 25, 2009, and approved by USEPA on September 16, 2009, 2009.

Table 1-1. Bacteria-Impaired Water Quality Limited Segments Addressed in This Analysis

Watershed	Type of Listing	Impaired Waterbody Name [a]	Drainage Area (mi^2)[b]	Number of Listings
San Joaquin HSA/ Laguna Beach HSA	Shoreline	Pacific Ocean Shoreline	13.94	2 [b]
Aliso HSA	Creek Estuary Shoreline	Aliso Creek Aliso Creek (mouth) Pacific Ocean Shoreline	35.74	3
Dana Point HSA	Shoreline	Pacific Ocean Shoreline	8.89	1
Lower San Juan HSA	Creek Estuary Shoreline	San Juan Creek San Juan Creek (mouth) Pacific Ocean Shoreline	177.18	3
San Clemente HA	Shoreline	Pacific Ocean Shoreline	18.78	1
San Luis Rey HU	Shoreline	Pacific Ocean Shoreline (at San Luis Rey River mouth)	560.42 (354.12)	1
San Marcos HA	Shoreline	Pacific Ocean Shoreline	1.43	1
San Dieguito HU	Shoreline	Pacific Ocean Shoreline (at San Dieguito Lagoon mouth)	346.22 (292.24)	1
Miramar Reservoir HA	Shoreline	Pacific Ocean Shoreline	93.73	1
Scripps HA	Shoreline	Pacific Ocean Shoreline	8.75	1
Tecolote HA	Creek	Tecolote Creek	10.00	1
Mission San Diego HSA/ Santee HSA	Creek Creek Shoreline	Forester Creek San Diego River (Lower) Pacific Ocean Shoreline	436.48 (173.95)	3
Chollas HSA	Creek	Chollas Creek	26.80	1
TOTAL NUMBER OF LISTINGS				**20**

Note: HSA = hydrologic subarea; HA = hydrologic area; HU = hydrologic unit
[a] Listed as impaired on the 2002 Clean Water Act Section 303(d) List of Water Quality Limited Segments due to exceedances of the water contact recreation (REC-1) water quality objectives (WQOs) for fecal coliform, and/or total coliform, and/or enterococci indicator bacteria.
[b] Two separate segments of the Pacific Ocean Shoreline are included in the listings for the San Juan Hills/Laguna Beach watershed.

Fecal bacteria originate from the intestinal biota of warm-blooded animals, and their presence in surface water is used as an indicator of human pathogens. Pathogens can cause illness in recreational water users. Bacteria have been historically used as indicators of human pathogens because bacteria are easier and less costly to measure than the pathogens themselves. As required by section 303(d) of the Clean Water Act, TMDLs for indicator bacteria were developed to address these 20 bacteria-impaired waterbodies in the San Diego Region.

Bacteria densities in these waterbodies have historically exceeded the numeric water quality objectives (WQOs) for total coliform (TC), fecal coliform (FC), and/or *Enterococcus* (ENT) indicator bacteria as defined in the San Diego Water Board's *Water Quality Control Plan for the San Diego Basin (9)* (Basin Plan) and/or State Water Board's *Water Quality Control Plan for Ocean Waters for California* (Ocean Plan). These exceedances threaten or impair the recreational water contact (REC-1) and non-water contact (REC-2) beneficial uses of these waterbodies.

Because the climate in southern California has two distinct hydrological patterns, two modeling approaches were developed for estimating existing bacteria loads and allowable bacteria loads (i.e., TMDLs) to account for seasonal variations. One modeling approach specifically quantified loading during wet weather events (storms), which tend to be episodic and short in duration, and characterized by rapid wash-off and transport of very high bacteria loads from all land use types. The other modeling approach quantified bacteria loading during dry weather conditions, which tend to have flows and loads much smaller in magnitude than wet weather conditions, do not occur from all land use types, and are more uniform than stormflow.

Different numeric targets were selected for calculating the allowable bacteria loads (i.e., TMDLs) under wet weather and dry weather conditions. Single sample maximum WQOs were used as the basis of the wet weather numeric targets. Geometric mean WQOs were used as the basis of the dry weather numeric targets. Although the dry weather TMDLs were calculated based on the geometric mean WQOs, the single sample maximum WQOs must also be met pursuant to the Ocean Plan and Basin Plan. Likewise, even though the wet weather TMDLs were calculated based on the single sample maximum WQOs, the geometric mean WQOs must also be met.

Another difference between the wet weather and dry weather TMDL calculations, besides the use of single sample maximum WQOs versus geometric mean WQOs, is the frequencies that the WQOs are allowed to be exceeded. Allowable exceedance frequencies are based on a reference system approach.[2] The purpose of the reference system approach is to account for the natural, and largely uncontrollable sources of bacteria (e.g., bird and wildlife feces) in the loads generated in the watersheds and at the beaches that can, by themselves, cause exceedances of WQOs. The reference system approach is utilized in the calculation of the wet weather TMDLs by allowing a 22 percent exceedance frequency of the single sample maximum WQOs for REC-1. The dry weather TMDLs are calculated using a 0 percent allowable exceedance frequency.

Bacteria sources were quantified by land-use type since bacteria loading can be highly correlated with land-use practices. Bacteria loads attributable to point sources are primarily discharged from land uses associated with municipal separate storm sewer systems (MS4s). The principal MS4s contributing bacteria to receiving waters are owned or operated by either municipalities located throughout the watersheds or Caltrans. Additionally, there are wastewater treatment plants located in the watersheds addressed by these TMDLs. However, most of the effluent from these facilities is discharged to the Pacific Ocean through offshore ocean outfalls, and was therefore not included in the TMDL calculations. The only exception is Padre Dam, which discharges effluent to the San Diego River via a series of ponds that feed the Santee Lakes.

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[2] Allowing exceedances of the bacteria water quality objectives is authorized within the context of a TMDL pursuant to Resolution No. R9-2008-0028, *Implementation Provisions for Indicator Bacteria Water Quality Objectives to Account for Loading from Natural Uncontrollable Sources Within the Context of a TMDL,* adopted by the San Diego Water Board on May 14, 2008, approved by the State Water Board on March 17, 2009, approved by OAL on June 25, 2009, and approved by USEPA on September 16, 2009.

Nonpoint sources were separated into controllable and uncontrollable categories. Controllable nonpoint sources are identified by land use types and coverages. Controllable nonpoint sources include land uses associated with agriculture, dairy/intensive livestock, and horse ranches (collectively referred to as agriculture land uses). These were considered controllable because the land uses are anthropogenic in nature, and load reductions can be reasonably expected with the implementation of suitable management measures. Uncontrollable nonpoint sources include loads from open recreation, open space, and water land uses (collectively referred to as open space land uses). Loads from these areas are considered uncontrollable because they come from mostly natural sources (e.g. bird and wildlife feces).

The TMDL is divided up and assigned among the known point sources as wasteload allocations (WLAs) and nonpoint sources as load allocations (LAs). Portions of the TMDLs were assigned as WLAs to Municipal MS4s and Caltrans, and as LAs to Agriculture and Open Space land uses. Discharges from Municipal MS4s, Caltrans, and Agriculture land uses are considered controllable. Discharges from Open Space land uses are considered uncontrollable.

In general, controllable point and nonpoint sources generating less than 5 percent of the total loads (e.g., Caltrans and/or Agriculture) were assigned WLAs and LAs equal to their existing loads, resulting in no load reduction requirements. While they are not required to reduce their existing loads, this means, however, that these sources are not allowed to increase their loads over time, and cannot cause exceedances of the numeric WQOs in the receiving waters.

For the wet weather TMDLs, the Caltrans WLAs (which generates less than 5 percent of the total load in all watersheds) and Open Space LAs (which are uncontrollable) were set equal to the existing wet weather loads, thus load reductions are not required. The remaining portions of the TMDLs were assigned to Municipal MS4s WLAs and Agriculture LAs. In watersheds where the bacteria load from Agriculture land uses were less than 5 percent of the total existing wet weather load, the wet weather Agriculture LAs were set equal to the existing wet weather load, and no load reductions were required. Required load reductions were calculated for Municipal MS4s to achieve the wet weather MS4 WLAs, and for Agriculture land uses, in watersheds where the existing wet weather loads for all indicator bacteria were more than 5 percent of total existing wet weather load, to achieve the wet weather Agriculture LAs.

For the dry weather TMDLs, the discharges and bacteria loads from land uses associated with Caltrans, Agriculture, and Open Space land uses are expected to be zero. This is because there is no flow source that is expected during dry weather to wash bacteria off of these land uses. Thus the dry weather Caltrans WLAs, Agriculture LAs, and Open Space LAs were set equal to zero. The total dry weather TMDLs were assigned to the Municipal MS4s WLAs. Required load reductions were calculated for Municipal MS4s to achieve the dry weather MS4 WLAs.

For both wet weather and dry weather TMDLs, any controllable point source or nonpoint sources that has not been assigned a WLA or LAs, or has a WLA or LA of zero (i.e., WLA or LA = 0) is not expected or allowed to discharge a pollutant load as part of the TMDL. Sources that are assigned an allowable mass load equal to the existing mass load (i.e., WLA or LA = existing mass load) are not allowed to increase their pollutant loads over time.

In order to ensure that the TMDLs are achieved in the receiving waters, and as required under state law, an Implementation Plan was developed. The goal of the Implementation Plan is restore the impaired beneficial uses of the waterbodies addressed by these TMDLs. TMDLs are not self-implementing or directly enforceable against sources in the watershed. Instead, TMDLs must be implemented through the programs or authorities of the San Diego Water Board and/or other entities to compel dischargers responsible for controllable sources to achieve the pollutant load reductions identified by a TMDL analysis to restore and protect the designated beneficial uses of a waterbody.

The San Diego Water Board uses its authorities and programs to regulate discharges from the controllable sources in the Region. The controllable sources that are subject to regulation are, in turn, responsible for complying with the requirements issued the San Diego Water Board. Ultimately, the dischargers subject to regulation are responsible for reducing their pollutant loads in order for the TMDLs, WLAs, and LAs to be achieved. When all discharges from controllable sources meet their assigned WLAs and LAs, and the numeric targets (i.e., numeric WQOs and allowable exceedance frequencies) are also met in the receiving waters, compliance with the TMDLs will be achieved.

The authorities that are available to the San Diego Water Board to regulate dischargers are given under the Porter-Cologne Water Quality Control Act (Division 7 of the Water Code). The available regulatory authorities include incorporating discharge prohibitions in to the Basin Plan, issuing individual or general waste discharge requirements (WDRs), or issuing individual or general conditional waivers of WDRs. The San Diego Water Board has the authority to enforce Basin Plan prohibitions, WDRs, or conditional waivers of WDRs through the issuance of enforcements actions (e.g., time schedule orders, cleanup and abatement orders, cease and desist orders, administrative civil liabilities). The San Diego Water Board also has the authority to require monitoring and/or technical reports from dischargers, which may be used to support the development, refinement, and/or implementation of TMDLs, WLAs, and/or LAs.

The TMDLs will be implemented primarily by revising and re-issuing the existing WDRs and National Pollutant Discharge Elimination System (NPDES) requirements that have been issued for discharges from Phase I MS4s and Caltrans MS4s. Federal regulations require that NPDES requirements incorporate water quality based effluent limitations (WQBELs) that must be consistent with the requirements and assumptions of any available WLAs,[3] which may be expressed as numeric effluent limitations, when feasible, and/or as a best management practice (BMP) program of expanded or better-tailored BMPs.[4]

When developing WQBELs to be incorporated in to NPDES requirements, the following summarizes the requirements and assumptions included in the calculation of the TMDLs, WLAs, and LAs that should be considered:

<u>Numeric Targets</u>

- The numeric targets consist of the numeric WQOs from the Basin Plan and/or Ocean Plan and an allowable exceedance frequency.

[3] Code of Federal Regulations Title 40 section 122.44(d)(1)(vii)(B)
[4] Code of Federal Regulations Title 40 section 122.44(k)(2)&(3)

- The numeric targets for the wet weather TMDLs consist of the REC-1 single sample maximum WQOs and a 22 percent allowable exceedance frequency.
- The numeric targets for dry weather TMDLs consist of the REC-1 30-day geometric metric mean WQOs and a 0 percent allowable exceedance frequency.
- The TMDL calculations are based on either the single sample maximum WQO (for wet weather) or 30-day geometric mean WQOs (for dry weather), but both the single sample maximum and 30-day geometric mean numeric WQOs must be met in the receiving waters.
- The TMDLs, and in turn the WLAs for point sources and LAs for nonpoint sources, are assumed to be met when the numeric targets for all three indicator bacteria (fecal coliform, total coliform, and *Enterococcus*) are met in the receiving waters.

Critical Conditions

- The mass-load based TMDLs were calculated under critical conditions consisting of flows generated during a critical wet year and estimation of existing and allowable loads at a critical location.
- The flow from the critical wet year is a "worst case" annual wet weather flow and loading scenario. Actual annual wet weather flow and loading will vary from year to year.
- The mass-load based TMDLs calculated at the critical location are dependent on the flow, which can vary from year to year, but the numeric targets will not vary. When the numeric targets are met in the receiving water, the TMDLs are assumed to be met.
- The mass-load based TMDLs, WLAs, and LAs are calculated for the critical location, but the appropriate numeric targets (based on freshwater and/or saltwater REC-1 WQOs and allowable exceedance frequencies) must be met throughout the waterbodies addressed by these TMDLs.

Linkage Analysis

- The linkage analysis was performed by utilizing calibrated and validated models to predict flow from surface runoff and predict bacteria densities under the critical conditions (i.e., during the critical wet year at the critical location). Existing mass loads and allowable mass loads (i.e., TMDLs) were calculated for each watershed. The existing mass loads were calculated based on model-predicted flow and model-predicted bacteria densities. The allowable mass loads (i.e., TMDLs) were calculated based on model-predicted flow and the numeric targets (i.e., numeric WQOs and allowable exceedance frequencies).
- The wet weather existing mass loads and allowable mass loads (i.e., wet weather mass-load based TMDLs) are calculated assuming surface runoff is generated by rainfall from storm events and discharged from all land use categories to receiving waters.
- The dry weather existing mass loads and allowable mass loads (i.e., dry weather mass-load based TMDLs) are calculated assuming surface runoff is generated only by anthropogenic activities and discharged from specific land use categories to receiving waters.

<u>Allocations</u>

- Each mass-load based TMDL is allocated to known point sources and nonpoint sources. Wasteload allocations (WLAs) are assigned to point sources, and load allocations (LAs) are assigned to nonpoint sources. WLAs and LAs are the maximum load a source can discharge and still achieve the TMDL in the receiving water.
- The TMDLs, and in turn the WLAs for point sources and LAs for nonpoint sources, are assumed to be met when the numeric targets are met in the receiving waters.
- The sources were identified based on land use and grouped in to Municipal MS4, Caltrans MS4 (Caltrans), Agriculture, and Open Space categories. The Municipal MS4 and Caltrans land use categories are point sources, and the Agriculture and Open Space land use categories are nonpoint sources.
- Sources that are not identified are assumed to be assigned a zero allowable load as part of the mass-load based TMDL (i.e., WLA = 0 or LA = 0). In other words, discharges of pollutant loads from these sources are not expected or allowed as part of the TMDLs.
- Sources that are assigned an allowable load equal to the existing mass load as part of the mass-load based TMDL (i.e., WLA or LA = existing mass load) are not expected or allowed to increase their mass load in the future. In other words, discharges of pollutant loads (i.e., flows and bacteria densities) from these sources are not allowed to increase.
- The allocation of the dry weather mass-load based TMDLs assumes that no surface runoff discharge to receiving waters occurs from Caltrans, Agriculture, or Open Space land use categories (i.e., $WLA_{Caltrans} = 0$, $LA_{Agriculture} = 0$, and $LA_{OpenSpace} = 0$), meaning the entire dry weather mass-load based TMDL (i.e., allowable mass load) is allocated to Municipal MS4 land use categories (i.e., $WLA_{MS4} = TMDL$).
- The allocation of the wet weather mass-load based TMDLs assumes surface runoff discharge occurs from all land use categories, and allocated according to the following steps:
    1) Sources are separated in to controllable and uncontrollable sources. Discharges from Municipal MS4, Caltrans, and Agriculture land use categories are assumed to be controllable (i.e., subject to regulation), and discharges from Open Space land use categories are assumed to be uncontrollable (i.e., not subject to regulation).
    2) Because discharges from Open Space land use categories are uncontrollable (i.e., not subject to regulation), the LAs for Open Space land use categories are set equal to the existing mass loads calculated under the critical conditions.
    3) For discharges from controllable land use categories that do not contribute more than 5 percent of the total existing mass load for all three indicator bacteria, the WLA or LA is set equal to the existing mass loads from those land uses calculated under the critical conditions.
    4) After the WLAs and LAs are assigned based on steps 2 and 3, the remaining portion of the mass-load based TMDL is assigned to discharges from controllable land use categories that contribute more than 5 percent of the total existing mass load for all three indicator bacteria. The allowable mass load for each source (WLA or LA) is calculated based on the ratio of the existing mass loads from those sources relative to each other.

Load Reductions

- The load reductions required to meet the mass-load based TMDLs, WLAs, and LAs are based on reducing the loads compared to pollutant loads from 2001 to 2002.
- Load reductions for each source are calculated based on the difference between the existing mass load and the mass-load based WLA or LA for each source.
- WLAs and LAs that are set equal to the existing mass loads do not require load reductions to be calculated, but this also means that existing mass loads from those sources cannot increase over time (i.e., pollutant loads should be less than or equal to pollutant loads relative to 2001 to 2002).
- The load reductions needed to meet the WLAs for point sources and LAs for nonpoint sources are assumed to be achieved when the numeric targets are met in the receiving waters.

The WQBELs will likely consist of receiving water limitations (based on the numeric targets) and require the implementation of a BMP program to achieve the TMDLs in the receiving waters. The Phase I MS4s and Caltrans will be required to submit Bacteria Load Reduction Plans (BLRPs) or Comprehensive Load Reduction Plans (CLRPs) outlining a proposed BMP program that will be capable of achieving the necessary load reductions required to attain the TMDLs in the receiving waters, acceptable to the San Diego Water Board, within 18 months after the effective date of these TMDLs. The San Diego Water Board will require the BLRPs or CLRPs to be developed on a watershed or region wide scale. BLRPs will only address bacteria. CLRPs will address other pollutant constituents (e.g. metals, pesticides, trash, nutrients, sediment, etc.) together with the bacteria load reduction requirements in these TMDLs. Ideally, the Phase I MS4s and Caltrans will develop and submit their BLRPs or CLRPs together.

The TMDLs and LAs for controllable nonpoint sources will be implemented primarily by utilizing and enforcing conditional waivers of WDRs. Currently, discharges from the identified controllable nonpoint sources may be eligible for one of the general conditional waivers of WDRs, which are provided in the Basin Plan. Conditional waivers of WDRs may not exceed 5 years in duration, but may be revised and renewed, or may be terminated at any time. The San Diego Water Board will implement the conditional waivers of WDRs applicable to the Agriculture land uses to be consistent with the TMDLs and Agriculture LAs.

The San Diego Water Board shall consider enforcement actions, as necessary, for any discharger failing to comply with applicable waiver conditions, WDRs, or Basin Plan waste discharge prohibitions. Enforcement actions can also be taken, as necessary, to control the discharge of bacteria to impaired beaches and creeks, to attain compliance with the assumptions and requirements of the TMDLs, WLAs, and LAs.

The bacteria TMDLs are expected to be implemented in a phased approach with a monitoring component to determine the effectiveness of each phase and guide the selection of BMPs. The Implementation Plan includes a compliance schedule that may be used by the San Diego Water Board if the BLRPs or CLRPs do not include a proposed compliance schedule. The compliance schedule for the Phase I MS4s and Caltrans to attain their respective WLAs will likely be based on the BMP program and compliance schedules proposed in the BLRPs or CLRPs. If the Phase I MS4s and Caltrans choose to submit BLRPs to address only bacteria, the schedule for compliance with the TMDLs cannot extend beyond 10 years. If the Phase I MS4s and Caltrans choose to submit CLRPs to address all constituents of concern in lieu of the BLRP, the schedule for compliance with the TMDLs cannot extend beyond 20 years. If appropriate, the proposed compliance schedules will be incorporated into the various TMDL implementing orders.

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2 Introduction

According to Clean Water Act section 303(d)(1)(A), "Each state shall identify those waters within its boundaries for which the effluent limitations…are not stringent enough to implement any water quality standard (WQS) applicable to such waters." The waters identified as not meeting water quality standards, or impaired waters, are placed on a list known as the Clean Water Act Section 303(d) List of Water Quality Limited Segments (a.k.a. the "303(d) List"). The Clean Water Act also requires states to establish a priority ranking of Water Quality Limited Segments and to establish Total Maximum Daily Loads (TMDLs) for such waters.

On the 2002 303(d) List, a significant number of waterbodies throughout the San Diego Region were identified and listed as impaired by bacteria. Elevated bacteria levels in the waters in the San Diego Region were resulting in frequent beach closures. At the time, identifying the sources and reducing the discharges of bacteria to the coastal shorelines was set as a very high priority for the Regional Water Quality Control Board, San Diego Region (San Diego Water Board). For this reason, and to maximize the efficiency in TMDL development to address bacteria in the San Diego Region, the San Diego Water Board initiated a TMDL project to address all the waterbodies listed as impaired by bacteria on the 2002 303(d) List. Due to different TMDL modeling approaches required for different types of waterbodies, the initial TMDL project had to be separated in to several smaller projects by waterbody type.

The first of the bacteria TMDL projects developed was known as "*Bacteria TMDLs Project I-Beaches and Creeks in the San Diego Region*" or "*Bacteria TMDLs Project I*." Bacteria TMDLs Project I included TMDLs that addressed 19 beaches and creeks in the San Diego Region, including 9 segments of Pacific Ocean shoreline, 5 creek/lagoon mouths, and 5 creeks. The TMDLs developed for these 19 beaches and creeks included "interim" and "final" wet weather TMDLs. "Interim" wet weather TMDLs included an allowance for exceedances of bacteria water quality objectives due to natural sources, whereas the "final" wet weather TMDLs did not. Bacteria TMDLs Project I was adopted by the San Diego Water Board on December 12, 2007.

The San Diego Water Board adopted Bacteria Project I contingent upon the adoption of a Reference System and Antidegradation Approach/Natural Sources Exclusion Approach (RSAA/NSEA) Basin Plan amendment that would allow for exceedances of bacteria water quality standards within the context of a TMDL. Adoption of the RSAA/NSEA Basin Plan amendment would require Bacteria TMDLs Project I to be revised to remove the "final" wet weather TMDLs.

The RSAA/NSEA Basin Plan amendment was adopted by the San Diego Water Board on May 14, 2008 and appeared likely to be approved by the State Water Board, OAL, and USEPA before or very soon after Bacteria TMDLs Project I. Because the State Water Board had not yet considered and approved Bacteria TMDLs Project I, and it appeared the RSAA/NSEA Basin Plan amendment would be approved and require the revision of Bacteria TMDLs Project I soon after its anticipated approval, the San Diego Water Board withdrew Bacteria TMDLs Project I from State Water Board consideration for approval on December 17, 2008.

This technical report is a revised version of the technical report for Bacteria TMDLs Project I. Significant revisions have been made to the Bacteria TMDLs Project I technical report, but the underlying technical approach and assumptions used for calculating the TMDLs have not been changed. The revisions are primarily associated with revisions that are required due to the adoption and approval of the RSA/NSEA Basin Plan amendment.[5] The "final" TMDLs have been removed and the "interim" TMDLs, which incorporate a reference system approach as discussed below, are the only TMDLs included in the project. Additionally, because the same modeling approaches can be used, and the resources available for the development of TMDLs have become more limited, the bacteria TMDLs for Tecolote Creek that were being developed under a separate project have been incorporated in to these bacteria TMDLs for beaches and creeks in the San Diego Region. Finally, the TMDL Implementation Plan has been revised to provide additional guidance on potential actions that may be taken by the San Diego Water Board and/or other entities to implement the TMDLs, minimum monitoring that will be required to assess the implementation of and compliance with the TMDLs, and the potential for alternative compliance schedules. Hereafter this project will be referred to in this revised technical report as "*Revised Bacteria TMDLs Project I- Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)*" or "*Revised Bacteria TMDLs Project I.*"

For Revised Bacteria TMDLs Project I, TMDLs were developed to address 20 waterbodies in the San Diego Region that have been listed as impaired by bacteria on the 2002 303(d) List, including 9 segments of Pacific Ocean shoreline, 5 creek/lagoon mouths, and 6 creeks. The presence of bacteria, especially fecal bacteria, in surface water is often used as an indicator for human pathogens. Pathogens can cause illness in recreational water users, but are usually difficult and/or very expensive to measure. Historically, fecal bacteria have been used as indicators of human pathogens because they are easier and less costly to measure than the pathogens themselves. This TMDL project has been developed to specifically address indicator bacteria as a pollutant causing impairment of the beneficial uses in 20 beaches and creeks in the San Diego Region.

This project involved developing TMDLs for beaches and creeks located in 13 watersheds in the San Diego Region. These watersheds drain to the Pacific Ocean (with the exception of Tecolote Creek, which flows to Mission Bay, and Chollas Creek, which flows to San Diego Bay) and include both urbanized and non-urbanized land areas. The waterbodies for which TMDLs were developed include 48 impaired beach segments (including creek/lagoon mouths and coastal shoreline segments) and 5 creeks in the San Diego Region. These locations compose 20 distinct locations identified on the 2002 303(d) List (multiple beach segments are included in each listing). This project is confined to creeks, coastal shorelines, and creeks discharging to shorelines. The waterbodies addressed in this project were added to the List of Water Quality Limited Segments on, or before, the 2002 listing cycle.

A TMDL is intended to fulfill two purposes: 1) calculation of the assimilative loading capacity for an impaired waterbody, and 2) development of a strategy to restore an impaired waterbody so the water quality can once again meet the water quality standards. Under federal regulations, a TMDL is defined as the "sum of the individual waste load allocations (WLAs) for point sources

[5] Resolution No. R9-2008-0028, *Implementation Provisions for Indicator Bacteria Water Quality Objectives to Account for Loading from Natural Uncontrollable Sources Within the Context of a TMDL,* adopted by the San Diego Water Board on May 14, 2008, approved by the State Water Board on March 17, 2009, approved by OAL on June 25, 2009, and approved by USEPA on September 16, 2009

and load allocations (LAs) for non-point sources and natural background"[6] such that the capacity of the waterbody to assimilate the loading of a specific pollutant (the loading capacity) is not exceeded. The WLA or LA is the maximum allowable amount of a specific pollutant can be discharged by a point or nonpoint source, respectively. When all the sources meet their respective WLAs or LAs, the water quality standards should be restored and attained.

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

The write-up of the above components is generally referred to as the technical TMDL analysis. The scientific basis of this technical TMDL analysis has undergone external peer review pursuant to Health and Safety Code section 57-004 during the development of Bacteria TMDLs Project I. The scientific basis for this technical TMDL analysis has not been changed for Revised Bacteria TMDLs Project I, thus a second external peer review was not required. The California Regional Water Quality Control Board, San Diego Region (San Diego Water Board) has considered and responded to all comments submitted by the peer review panel. The peer reviewer's comments and the San Diego Water Board's responses to comments are contained in Appendix A.

The results of the technical TMDL analysis were used to develop an **Implementation Plan**. The Implementation Plan describes the actions that must be taken by the San Diego Water Board and/or other entities to further regulate various dischargers to meet the WLAs and LAs. The dischargers will be responsible for meeting their assigned WLAs or LAs and for monitoring to assess the effectiveness of the implementation measures at achieving the TMDLs in the receiving waters. A time schedule for meeting the WLAs and LAs is also included in the Implementation Plan.

Once established, the regulatory provisions of the TMDLs are incorporated into the *Water Quality Control Plan for the San Diego Basin (9)* or "Basin Plan" (San Diego Water Board, 1994).[7] Typically, the San Diego Water Board, following a public comment period and hearing process, adopts a resolution amending the Basin Plan to incorporate the TMDLs, allocations, reductions, and implementation plan with a compliance schedule and minimum monitoring

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[6] Code of Federal Regulations Title 40 section 130.2(i)
[7] Pursuant to Code of Federal Regulations section 130.6(c)(1) and Water Code section 13242

requirements. Pursuant to the California Environmental Quality Act (CEQA), most Basin Plan amendments, including TMDL amendments, must also undergo an evaluation of the environmental impacts of complying with the amendment, and an evaluation of the costs of complying with the amendment.

As with any Basin Plan amendment involving surface waters, a TMDL amendment will not take effect until it has undergone subsequent agency approvals by the State Water Resources Control Board (State Water Board) and the Office of Administrative Law (OAL). The United States Environmental Protection Agency (USEPA) must also approve any amendment involving surface water. For purposes of state law, however, the effective date of the TMDL Basin Plan amendment will begin upon approval by OAL.

Following these approvals, the San Diego Water Board is required to incorporate the regulatory provisions of the TMDL into all applicable orders prescribing waste discharge requirements (WDRs), or other regulatory mechanisms. For point sources, the San Diego Water Board will issue, reissue amend, and/or enforce existing WDRs that implement National Pollutant Discharge Elimination System (NPDES) requirements and/or Basin Plan waste discharge prohibitions. For nonpoint sources, the San Diego Water Board will issue, reissue, amend, or enforce WDRs, waivers of WDRs, or Basin Plan waste discharge prohibitions. Water quality based effluent limitations (WQBELs) for the impairing pollutant in the subject watersheds are incorporated in the appropriate WDRs to implement and make the TMDLs enforceable. WQBELs may be expressed as numeric effluent limitations, when feasible, and/or as a best management (BMP) program of expanded or better-tailored BMPs.[8]

The final and most important step in the process is the implementation of the TMDLs by the dischargers. Per the governing implementing order (or other regulatory mechanism), each discharger must reduce its current loading of the pollutant to its assigned allocation in accordance with the time schedule specified in the Implementation Plan in this Technical Report and the Basin Plan amendment. When each discharger has achieved its required load reduction, the beneficial uses should be restored in the receiving waters.

Public participation has been a key element in the development of these TMDLs. The San Diego Water Board formed a Stakeholder Advisory Group (SAG), made up of key stakeholders to assist in the development of this Technical Report. The SAG was comprised of representatives from various disciplines and geographic locations. Participants that have been involved in the SAG included representatives for municipal separate storm sewer system (MS4) owners/operators from all coastal watersheds in the San Diego Region included in this project, publicly owned treatment works (POTWs), environmental groups, California Department of Transportation (Caltrans), research and academia, agricultural interests, and business and industry interests.

All public hearings and public meetings have been conducted as stipulated in the regulations [40 CFR 25.5 and 40 CFR 25.6, respectively], for all programs under the CWA. During the development of Bacteria TMDLs Project I, public participation was provided through two public workshops, numerous SAG meetings and communications. In addition, staff contact information

[8] Code of Federal Regulations Title 40 section 122.44(k)(2)&(3)

was provided on the San Diego Water Board's web site, along with periodically updated drafts of TMDL project documents throughout the development process. Public participation also took place through the San Diego Water Board's Basin Plan amendment process, which included an additional public workshop, two hearings, and three formal public comment periods.

For Revised Bacteria TMDLs Project I, additional meetings were held with the SAG to discuss the revisions made. Public participation also took place through the San Diego Water Board's Basin Plan amendment process, which included a formal public comment period and a public hearing.

2.1 Technical Approach

The San Diego Water Board and the USEPA coordinated a watershed assessment and modeling study to support the development of TMDLs. In order to assist the San Diego Water Board in the development of the technical analysis, the USEPA used Clean Water Act section 106 funds to contract the environmental consulting firm, Tetra Tech, Inc. Tetra Tech provided the San Diego Water Board with technical assistance in calculating the mass-load based TMDLs for the impaired waterbodies through the development of region-wide watershed models. Although beaches and creeks are separate systems with different WQOs, the technical approach for assessing both systems were identical.

Because the climate in southern California has two distinct hydrological patterns, two modeling approaches were developed for estimating bacteria loads. One modeling approach specifically quantified loading during wet weather events (storms), which tend to be episodic and short in duration, and characterized by rapid wash-off and transport of very high bacteria loads from all land use types. The wet weather approach is consistent with the methodologies used for bacteria TMDL development for impaired coastal areas of the Los Angeles Region, specifically Santa Monica Bay beaches (Los Angeles Water Board, 2002) and also Malibu Creek (Los Angeles Water Board, 2004). In contrast, the dry weather modeling approach quantified bacteria loading during dry weather conditions. Dry weather loading was much smaller in magnitude, did not occur from all land use types, and exhibited less variability over time. In addition to estimating current loading, both models were used to estimate TMDLs for the two climate conditions for each watershed.

A significant portion of bacteria loads can often be attributed to natural sources. Bacteria loads from these natural sources may cause exceedances of bacteria WQOs even if there are no anthropogenic sources. It is not the intent of these TMDLs to require treatment or diversion of natural waterbodies or to require treatment of natural sources of indicator bacteria. Therefore, the San Diego Water Board adopted an amendment to the Basin Plan to incorporate authorization to implement the indicator bacteria WQOs, within the context of a TMDL, using the "reference system approach."[9]

[9] A Basin Plan amendment to incorporate a reference system approach for implementation of the WQOs for bacteria (Resolution No. R9-2008-0028) was adopted by the San Diego Water Board on May 14, 2008, approved by the State Water Board on March 17, 2009, approved by OAL on June 25, 2009, and approved by USEPA on September 16, 2009.

The reference system approach, which is explained in more detail in section 4, allows exceedances of the numeric WQOs for water contact recreation (REC-1) beneficial uses, expressed as an allowable exceedance frequency. The purpose of the allowable exceedance frequency is to account for the natural, and largely uncontrollable sources of bacteria (e.g. bird and wildlife feces, and re-suspension or re-growth at the beach) in the bacteria loads generated in the watersheds which can, by themselves, cause exceedances of the numeric WQOs. An allowable exceedance frequency of the numeric WQOs was included in the development of the wet weather and dry weather TMDLs.

In these TMDLs, WLAs were calculated for point source discharges and LAs were calculated for nonpoint source discharges. For wet weather, two WLAs were calculated for each watershed; one for Caltrans, and one for municipal MS4 dischargers.[10] LAs for wet weather were calculated for controllable sources consisting of discharges from agricultural and livestock land uses, and uncontrollable sources from open recreation and open space land uses, and water.

[10] The dry and wet weather wasteload allocation for discharges from wastewater treatment facilities, also know as publicly owned treatment works (POTWs), is zero. This means that POTWs are not expected or allowed to discharge a bacteria load as part of these TMDLs. The only exception is Padre Dam whose discharge to the San Diego River is regulated by the San Diego Waterboard and must meet REC-1 permit requirements. Therefore Padre Dam received a separate TMDL wasteload allocation which is based on the effluent limitations of its WDRs, and is included in addition to these TMDLs which are based on surface runoff. Please see section 8.1.5 for further discussion.

3 Problem Statement

Bacteria densities in the waters of the beaches and creeks addressed in this project have exceeded the numeric WQOs for total, fecal, and/or enterococci bacteria. Exceedances of WQOs for indicator bacteria are shown in the monitoring data for beach segments where such data exist. Other beaches were consistently posted with health advisories and/or closed. These exceedances and postings threaten and impair the water contact (REC-1) and non-water contact (REC-2) beneficial uses. REC-1 includes uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible, such as swimming or other water sports. REC-2 includes the uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. Examples include picnicking and sunbathing. All inland surface waters and coastal marine waters in the Region are designated with both REC-1 and REC-2 beneficial uses.

Although WQOs for REC-1 and REC-2 beneficial uses are written in terms of density of indicator bacteria colonies (most probable number of colonies per 100 milliliter of water), the actual risk to human health is caused by the presence of disease-causing pathogens. When the risk to human health from pathogens in the water is so great that beaches are posted with health advisories or closure signs, the quality and beneficial use of the water are impaired. At present, measuring pathogens directly is difficult and expensive, and for this reason high concentrations of bacteria, which originate from the intestinal biota of warm-blooded animals, are used to indicate the presence of pathogens. For a discussion of the use of indicator bacteria to measure water quality and the presence of pathogens, see Appendix C.

Sources of bacteria under all conditions vary widely and include natural sources such as feces from aquatic and terrestrial wildlife, and anthropogenic sources such as sewer line breaks, illegal sewage disposal from boats along the coastline, trash, and pet waste. Once in the environment, bacteria also re-grow and multiply. Bacteria sources and their transport mechanisms to receiving waters are discussed in section 6.

3.1 Project Area Description

The beaches and creeks addressed in this analysis are in southern California, primarily in southern Orange and San Diego Counties. The beaches and creeks are located within or hydraulically downstream of five watersheds in Orange County (with a small portion in Riverside County) (Figure 3-1) and eight watersheds in San Diego County (Figure 3-2). Table 3-1 lists the watersheds that affect the bacteria-impaired waterbodies in the Region. Most of the waterways flow directly to the Pacific Ocean, except Tecolotec Creek, which flows to Mission Bay, and Chollas Creek, which flows to San Diego Bay. The combined watersheds cover roughly 1,740 square miles (4,500 square kilometers).

The climate in the Region is generally mild with annual temperatures averaging around 65°F near the coastal areas. Average annual rainfall ranges from 9 to 11 inches along the coast to more than 30 inches in the eastern mountains. There are three distinct types of weather in the Region. Summer dry weather occurs from late April to mid-October. During this period almost no rain falls. The winter season (mid-October through early April) has two types of weather; 1) winter dry weather when rain has not fallen for the preceding 72 hours, and 2) wet weather consisting of storms of 0.2 inches of rainfall and the 72 hour period after the storm. Eighty five to 90 percent of the annual rainfall occurs during the winter season (County of San Diego, 2000).

The land use of the Region is highly variable. The coastline areas are highly concentrated with urban and residential land uses, and the inland areas primarily consist of open space. Most of the area is open space or recreational land use (64.2 percent), followed by low-density residential (14.1 percent) and agriculture/livestock (12.4 percent) land uses. Other major land uses are commercial/institutional (3.0 percent), high-density residential (2.2 percent), industrial/transportation (1.6 percent), military (1.0 percent), transitional (0.8 percent), and water (0.7 percent).

3.2 Impairment Overview

The waterbodies included in this project have been documented to be impaired by the State Water Board's *2002 Clean Water Act Section 303(d) List of Water Quality Limited Segments Requiring TMDLs* (2002 303(d) List). The waterbodies included in this project were listed as impaired primarily because of non-attainment of the indicator bacteria WQOs associated with contact recreation. The beaches were listed as impaired based on monitoring data for total coliform, fecal coliform, and enterococci bacteria, or because the beaches were consistently posted with health advisories and/or closed.

For this study, a watershed-based approach was developed to calculate bacteria mass loadings for the impaired shoreline and creek segments. Table 3-1 lists the impaired waterbodies addressed in this study. The drainage areas of many of the watersheds that affect shoreline impairments are located above more than one impaired beach segment. Table 3-1 lists the watersheds (shown in Figures 3-1 and 3-2) that affect impaired waterbodies due to bacteria loadings. Appendix D provides a more detailed list of the 20 waterbodies from the 2002 303(d) List addressed by this TMDL project, including waterbody segment names and approximate length of impairment. Appendix E shows higher resolution maps of the impaired watersheds.

Table 3-1. Beach and Creeks Addressed in this TMDL Analysis

Watershed	Type of Listing	Impaired Waterbody Name [a]	Drainage Area (mi^2)[b]	Number of Listings
San Joaquin Hills HSA (901.11)/ Laguna Beach HSA (901.12)	Shoreline	Pacific Ocean Shoreline	13.94	2 [b]
Aliso HSA (901.13)	Creek Estuary Shoreline	Aliso Creek Aliso Creek (mouth) Pacific Ocean Shoreline	35.74	3
Dana Point HSA (901.14)	Shoreline	Pacific Ocean Shoreline	8.89	1
Lower San Juan HSA (901.27)	Creek Estuary Shoreline	San Juan Creek San Juan Creek (mouth) Pacific Ocean Shoreline	177.18	3
San Clemente HA (901.30)	Shoreline	Pacific Ocean Shoreline	18.78	1
San Luis Rey HU (903.00)	Shoreline	Pacific Ocean Shoreline (at San Luis Rey River mouth)	560.42 (354.12)	1
San Marcos HA (904.50)	Shoreline	Pacific Ocean Shoreline	1.43	1
San Dieguito HU (905.00)	Shoreline	Pacific Ocean Shoreline (at San Dieguito Lagoon mouth)	346.22 (292.24)	1
Miramar Reservoir HA (906.10)	Shoreline	Pacific Ocean Shoreline	93.73	1
Scripps HA (906.30)	Shoreline	Pacific Ocean Shoreline	8.75	1
Tecolote HA (906.50)	Creek	Tecolote Creek	10.00	1
Mission San Diego HSA (907.11)/ Santee HSA (907.12)	Creek Creek Shoreline	Forester Creek San Diego River (Lower) Pacific Ocean Shoreline	436.48 (173.95)	3
Chollas HSA (908.22)	Creek	Chollas Creek	26.80	1
TOTAL NUMBER OF LISTINGS				**20**

Note: HSA = hydrologic subarea; HA = hydrologic area; HU = hydrologic unit
[a] Listed as impaired on the 2002 Clean Water Act Section 303(d) List of Water Quality Limited Segments due to exceedances of the water contact recreation (REC-1) water quality objectives (WQOs) for fecal coliform, and/or total coliform, and/or enterococci indicator bacteria.
[b] Two separate segments of the Pacific Ocean Shoreline are included in the listings for the San Juan Hills/Laguna Beach watershed.

On the 2002 303(d) List, the Pacific Ocean shoreline is listed for several hydrologic subareas (HSAs), hydrologic areas (HAs), and hydrologic units (HUs). The listing of Pacific Ocean shorelines on the 2002 303(d) List are assumed to be applicable to all the beaches located on the shorelines of the HSAs, HAs, and HUs listed above.

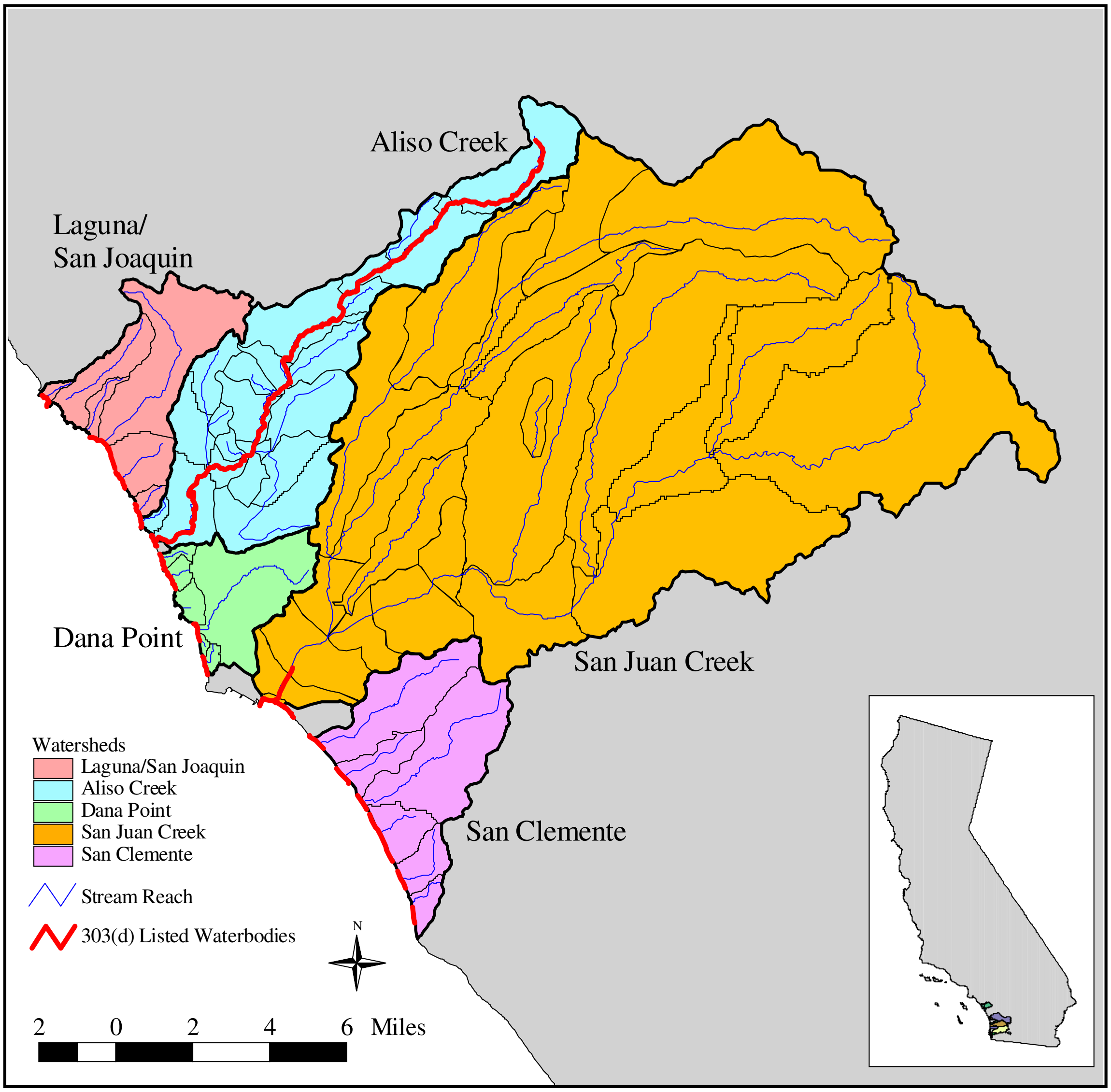

Figure 3-1. Watersheds of interest in Orange County.

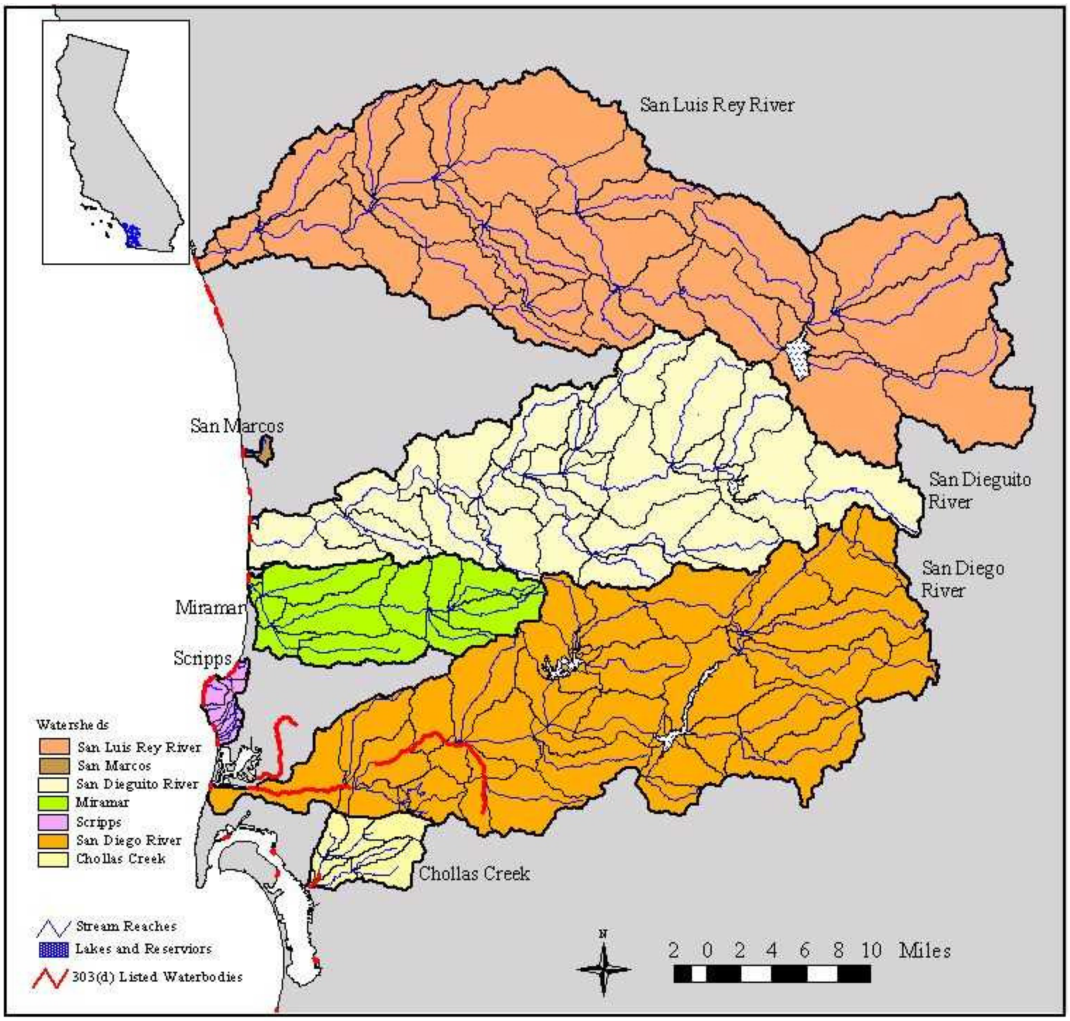

Figure 3-2. Watersheds of interest in San Diego County.

3.3 Applicable Water Quality Standards

Water quality standards consist of WQOs, beneficial uses, and the antidegradation policy. WQOs are defined under Water Code section 13050(h) as "limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water." Under section 304(a)(1) of the CWA, the USEPA is required to publish water quality criteria that incorporate ecological and human health assessments based on current scientific information. WQOs must be based on scientifically sound water quality criteria, and be at least as stringent as those criteria.

The Basin Plan and *Water Quality Control Plan for Ocean Waters of California* (Ocean Plan) identify beneficial uses and WQOs for the impaired waterbodies. The beneficial use designations are as follows:

- Municipal and domestic supply (MUN)
- Agricultural supply (AGR)
- Industrial process supply (PROC)
- Industrial water supply (IND)
- Ground water recharge (GWR)
- Freshwater replenishment (FRSH)
- Navigation (NAV)
- Hydropower generation (POW)
- Water contact recreation (REC-1)
- Non-contact recreation (REC-2)
- Commercial and sport fishing (COMM)
- Aquaculture (AQUA)
- Warm freshwater habitat (WARM)
- Cold freshwater habitat (COLD)
- Inland saline water habitat (SAL)
- Estuarine habitat (EST)
- Marine habitat (MAR)
- Wildlife habitat (WILD)
- Preservation and enhancement of "Areas of Special Biological Significance" (BIOL)
- Rare and endangered species (RARE)
- Migration of aquatic organisms (MIGR)
- Spawning, reproduction, and/or early development (SPWN)
- Shellfish harvesting (SHELL)

Table 3-2 lists the beneficial uses for each of the impaired inland segments and the Pacific Ocean shoreline.

Table 3-2. Beneficial Uses of the Impaired Waters

Waterbody Type	Waterbody	Designated Beneficial Uses
Creek	Aliso Creek	MUN,[a] AGR, REC-1,[b] REC-2, WARM, WILD
Creek	San Juan Creek	MUN,[a] AGR, IND, REC-1, REC-2, WARM, COLD, WILD
Creek	Forrester Creek	MUN,[b] IND, REC-1, REC-2, WARM, WILD
Creek	Tecolote Creek	REC-1,[b] REC-2, WARM, WILD
Creek	San Diego River, Lower	MUN,[a] AGR, IND, REC-1, REC-2, WARM, WILD, RARE
Creek	Chollas Creek	MUN,[a] REC-1,[b] REC-2, WARM, WILD
Coastal water	Pacific Ocean Shoreline	IND, NAV, REC-1, REC-2, COMM, BIOL, WILD, RARE, MAR, AQUA, MIGR, SPWN, SHELL

[a] The waterbody is exempted by the San Diego Water Board under terms and conditions of State Water Board Resolution No. 88-63, *Sources of Drinking Water Policy*.
[b] This use is listed as a potential beneficial use.
Source: San Diego Water Board, 1994.

The REC-1 WQOs for indicator bacteria that are applicable to the Pacific Ocean shoreline are contained in the Ocean Plan (State Water Board, 2005). Those applicable to inland surface waters are contained in the Basin Plan. The objectives contained in both Plans are derived from water quality criteria promulgated by the USEPA in 1976, 1986, and 2004. Both the Ocean Plan and Basin Plan contain REC-1 objectives for total coliform, fecal coliform, and enterococci.[11] In addition, the Basin Plan contains REC-1 objectives for *Escherichia coli* (*E. coli)* for inland surface waters.

[11] The Basin Plan and Ocean Plan also contains SHELL objectives for total coliform. SHELL TMDLs for total coliform are being developed in a separate TMDL or standards action.

For each type of bacteria, WQOs are expressed as the most probable number (MPN) of bacteria colonies per 100 mL of water sample. For a complete discussion of WQOs for each beneficial use and each type of waterbody, see Appendix F.

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4 Numeric Target Selection

When performing a technical TMDL analysis, one or more quantitative numeric targets are required to calculate a TMDL. Numeric targets are selected based on the water quality standards (i.e., beneficial uses and the water quality objectives) that are applicable to the waterbody. The selected numeric target(s) must be able to implement existing water quality standards. In other words, when the numeric targets are met, the water quality standards should be restored.

The beneficial uses of the beaches and creeks addressed by this technical TMDL analysis are set forth in the Basin Plan, and discussed and summarized in section 3.3 and Table 3-2. This TMDL analysis specifically addresses the water contact recreation (REC-1) and non-water contact recreation (REC-2) beneficial uses. The water quality objectives (WQOs) are set forth in the *Water Quality Control Plan for the San Diego Basin (9)* (Basin Plan) and in the *Water Quality Control Plan for Ocean Waters of California* (Ocean Plan). Because the REC-1 bacteria WQOs are more stringent than the REC-2 stringent WQOs, waters that can meet the REC-1 bacteria WQOs will also meet the REC-2 WQOs. The REC-1 bacteria WQOs are based on four bacterial indicators and include both geometric mean limits and single sample maximum limits. The Ocean Plan and Basin Plan's objectives for bacteria are as follows:

REC-1
Ocean Waters (from Ocean Plan[12])

30-day Geometic Mean – The following standards are based on the geometric mean of the five most recent samples from each site:

i. **Total coliform** density shall not exceed 1,000 MPN per 100 ml;
ii. **Fecal coliform** density shall not exceed 200 MPN per 100 ml; and
iii. **Enterococci** density shall not exceed 35 MPN per 100 ml.

Single Sample Maximum:

i. **Total coliform** density shall not exceed 10,000 MPN per 100 ml;
ii. **Fecal coliform** density shall not exceed 400 MPN per 100 ml;
iii. **Enterococci** density shall not exceed 104 MPN per 100 ml; and
iv. **Total coliform** density shall not exceed 1,000 MPN per 100 ml when the fecal coliform/total coliform ratio exceeds 0.1.

[12] As adopted by the State Water Board on January 20, 2005 and April 21, 2005, approved by OAL on October 12, 2005, and approved by USEPA on February 14, 2006

REC-1
Inland Surface Waters, Enclosed Bays and Estuaries and Coastal Lagoons (from Basin Plan[13])

Fecal Coliform Water Quality Objective for Contact Recreation:

The fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200 organisms per 100 ml.

In addition, the fecal coliform concentration shall not exceed 400 organisms per 100 ml for more than 10 percent of the total samples during any 30-day period.

Enterococci and **E. Coli** Water Quality Objectives for Contact Recreation:

The USEPA published E. coli and enterococci bacteriological criteria applicable to waters designated for contact recreation (REC-1) in the Federal Register, Vol. 51, No. 45, Friday, March 7, 1986, 8012-8016.

USEPA BACTERIOLOGICAL CRITERIA FOR WATER CONTACT RECREATION
(in colonies per 100 ml)

	Freshwater		Saltwater
	Enterococci	E. coli	Enterococci
Steady State			
(all areas)	33	126	33
Maximum			
(designated beach)	61	235	61
(moderately or lightly used area)	108	406	108
(infrequently used area)	151	576	151

Total Coliform Water Quality Objective for Contact Recreation for Bays and Estuaries:

In bays and estuaries, the most probable number of total coliform organisms in the upper 60 feet of the water column shall be less than 1,000 organisms per 100 ml (10 organisms per ml); provided that not more than 20 percent of the samples at any sampling station, in any 30-day period, may exceed 1,000 organisms per 100 ml (10 per ml); and provided further that no single sample as described below is exceeded.

The most probable number of total coliform organisms in the upper 60 feet of the water column in no single sample when verified by a repeat sample taken within 48 hours shall exceed 10,000 organisms per 100 ml (100 organisms per ml).

[13] As amended in the Basin Plan as part of Resolution No. R9-2008-0028, *Implementation Provisions for Indicator Bacteria Water Quality Objectives to Account for Loading from Natural Uncontrollable Sources Within the Context of a TMDL,* adopted by the San Diego Water Board on May 14, 2008, approved by the State Water Board on March 17, 2009, approved by OAL on June 25, 2009, and approved by USEPA on September 16, 2009

These objectives are generally based on an acceptable health risk for recreational waters of 19 illnesses per 1,000 exposed individuals as set forth by the USEPA (US EPA, 1986). The bacteria WQOs apply throughout the year.

Because the bacteria WQOs are expressed in numeric terms, the numeric targets used in the technical TMDL analysis were based on the numeric WQOs for bacteria for the REC-1 beneficial use. Different dry weather and wet weather numeric targets were used for mass load calculations because the bacteria transport mechanisms to receiving waters are different under wet and dry weather conditions. Because wet weather conditions, or storm flow, are episodic and short in duration, and characterized by rapid wash-off and transport of high bacteria loads, with short residence times, from all land use types to receiving waters, the single sample maximum WQOs were appropriate for use as wet weather numeric targets. For dry weather conditions, because dry weather runoff is not generated from storm flows, is not uniformly linked to every land use, and is more uniform than stormflow, with lower flows, lower loads, and slower transport, making die-off and/or amplification processes more important, the geometric mean WQOs were appropriate for use as dry weather numeric targets.

For impaired beaches, the numeric targets for the calculations in the technical TMDL analysis are based on the total coliform, fecal coliform and enterococci WQOs for REC-1. Wet weather numeric targets are based on the single sample maximum REC-1 WQOs, while dry weather numeric targets are based on the geometric mean REC-1 WQOs.

The numeric targets used to calculate the mass-load based TMDLs for beaches were also used to calculate TMDLs for impaired creeks. Numeric targets for load calculations for beaches and creeks are summarized in sections 4.1 and 4.2.

Even though beaches and creeks are separate waterbodies with slightly different numeric WQOs, all creeks included in this project eventually discharge to beaches, and therefore WQOs applicable to beaches must be protected at creek mouths. In other words, although the total coliform objective is not an applicable WQO in freshwater creeks and rivers, the total coliform density in these waters where they discharge to the Pacific Ocean must meet the Ocean Plan total coliform WQO at the shorelines. Thus, the WQO for total coliform is the appropriate numeric target for the TMDLs for creeks and rivers even though they do not need to meet this objective. Although REC-1 WQOs for fecal coliform and enterococci apply throughout the watersheds, the total coliform TMDLs must be met only at the bottom of the watershed where creeks and rivers discharge to the Pacific Ocean. Numeric targets for load calculations for beaches and creeks are summarized in sections 4.1 and 4.2.

4.1 Wet Weather Numeric Targets

Another difference between the wet weather and dry weather mass-load based TMDL calculations, besides the use of single sample maximum WQOs versus geometric mean WQOs, is the allowable exceedance frequency that is applied. The wet weather numeric targets are implemented in the TMDL by allowing the single sample WQOs for REC-1 to be exceeded due to bacteria loads that are attributed to natural, uncontrollable sources of bacteria. The allowable exceedances of the single sample maximum bacteria WQOs is authorized by a Basin Plan amendment that was recently adopted by the San Diego Water Board.

4.1.1 Authorization to Allow Exceedances of Bacteria Water Quality Objectives

A Basin Plan amendment was recently adopted by the San Diego Water Board authorizing the development of indicator bacteria TMDLs that account for exceedances of bacteria WQOs due to bacteria loads from natural uncontrollable sources.[14] Allowing exceedances of bacteria WQOs may be incorporated into the bacteria TMDLs using a reference system approach or natural sources exclusion approach.

The reference system approach incorporates an allowable exceedance frequency into the calculation of the TMDLs. The purpose of the exceedance frequency is to account for the natural, and largely uncontrollable sources of bacteria (e.g., bird and wildlife feces) in the wet weather loads generated in the watersheds and at the beaches which can, by themselves, cause exceedances of WQOs.

The allowable exceedance frequency is determined by identifying an appropriate reference system. An appropriate reference system is a beach and upstream watershed that are minimally impacted by anthropogenic activities. The frequency of exceedances of the indicator bacteria single sample maximum WQOs at a reference system can be used to determine an allowable exceedance frequency for the target watershed. The reference system approach also incorporates antidegradation principles in that, if water quality in the target waterbody is better than that of the reference system in a particular location, no degradation of existing bacteriological water quality is permitted. The reference system approach was first developed by the California Regional Water Quality Control Board, Los Angeles Region (Los Angeles Water Board), and is included in its Basin Plan as an implementation policy for single sample bacteria WQOs in the context of a TMDL.[15]

The Basin Plan amendment also authorizes the implementation of indicator bacteria single sample maxmum WQOs (REC-1 & REC-2) using a natural sources exclusion approach in the context of a TMDL. This approach authorizes the development or re-calculation of a bacteria TMDL that allows exceedances of WQOs after all sources of indicator bacteria associated with human and domesticated animal wastes are controlled. Under the natural sources exclusion approach, after all such anthropogenic sources of indicator bacteria have been controlled, a certain frequency of exceedance of WQOs can be authorized for developing TMDLs based on the residual exceedance frequency of the WQO in the specific waterbody. The residual exceedance frequency can be used to calculate the allowable exceedance load due to natural sources.

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[14] Resolution No. R9-2008-0028, *Implementation Provisions for Indicator Bacteria Water Quality Objectives to Account for Loading from Natural Uncontrollable Sources Within the Context of a TMDL,* was adopted by the San Diego Water Board on May 14, 2008, approved by the State Water Board on March 17, 2009, approved by OAL on June 25, 2009, and approved by USEPA on September 16, 2009, 2009.

[15] The Los Angeles Water Board used the Arroyo Sequit Watershed as the reference system watershed for development of TMDLs for the Santa Monica Bay beaches and Malibu Creek (Los Angeles Water Board, 2002 and 2003). This watershed, consisting primarily of unimpacted land use (98 percent open space), discharges to Leo Carillo Beach, where 22 percent of wet weather fecal coliform data (10 out of 46 samples) were observed to exceed the WQOs).

The reference system approach may be used to account for exceedances of bacteria WQOs during the initial development and calculation of bacteria TMDLs. The natural sources exclusion approach can only be used to account for exceedances of bacteria WQOs after the responsible dischargers demonstrate that all controllable anthropogenic sources have been eliminated, typically after a bacteria TMDL has already been adopted and implemented.

Implementation of indicator bacteria WQOs using a reference system approach requires control of indicator bacteria from anthropogenic sources so that the bacteriological water quality that is achieved is consistent with that of a reference system. In contrast, implementation of indicator bacteria water quality objectives using the natural sources exclusion approach also requires control of indicator bacteria from anthropogenic sources, but rather than requiring achievement of reference system bacteria levels, it requires evidence that remaining indicator bacteria densities do not indicate a human health risk. For these TMDLs, the reference system approach appears to be an appropriate method for accounting for exceedances of bacteria WQOs in the calculation of the wet weather TMDLs, as discussed below.

4.1.2 Applicability of the Reference System Approach

Determining whether the use of the reference system approach in the calculation of wet weather indicator bacteria TMDLs in the San Diego Region is appropriate was evaluated by analyzing data collected from the mouth of San Mateo Creek and from San Onofre State Beach, both located in northern San Diego County (Figure 4-1). These data were only evaluated in this TMDL technical analysis to show that using the reference system approach is appropriate for these TMDLs. The data were not used to determine region specific or watershed specific exceedance frequencies for the watersheds addressed by these TMDLs.

Most of the San Mateo Creek watershed is open space (85 percent); minor areas are associated with agriculture (2 percent) and low-density residential (1 percent). The remaining land uses, which contribute less that two percent of the total area, include high-density residential, commercial/institutional, industrial/transportation, parks/recreation, open recreation, horse ranches, and transitional (construction activities). The watershed that drains to San Onofre State Beach is likewise mostly open space. Because of the high percentage of open space and land uses with low anthropogenic activities, the San Mateo Creek watershed appears to be a potential reference system in the San Diego Region. A recent study of potential reference systems in southern California conducted by the Southern California Coastal Water Research Project (SCCWRP) also included the San Mateo Creek watershed in the study (Schiff, et al., 2006).

The data evaluated in this TMDL technical analysis were collected by the San Diego County Department of Environmental Health (DEH) during routine monitoring as part of a wider beach-monitoring program. The DEH collected bacteria data at two stations located near the mouth of San Mateo Creek from 1999 through 2002 (Appendix G, No. 16).

The monitoring data were separated based on their association with wet or dry conditions to better understand bacteria concentration variability during wet weather runoff verses dry weather runoff. To separate the data into two distinct groups, the wet period was defined to be consistent with the DEH's General Advisory to avoid contact with ocean and bay water within 300 feet on either side of any storm drain, river, or lagoon outlet. A wet period is specifically defined as periods of rainfall of 0.2 inch or more and the following 72 hours. For each monitoring station, sampling dates were compared to rainfall data collected at the closest rainfall gage (ALERT21) to determine whether bacteria samples had been collected during wet or dry periods (Appendix G, No. 23). Once the data for all stations were designated as wet or dry samples, the wet weather samples were compared to single sample maximum WQOs for fecal coliform, total coliform, and enterococci at each station (Tables 4-1).

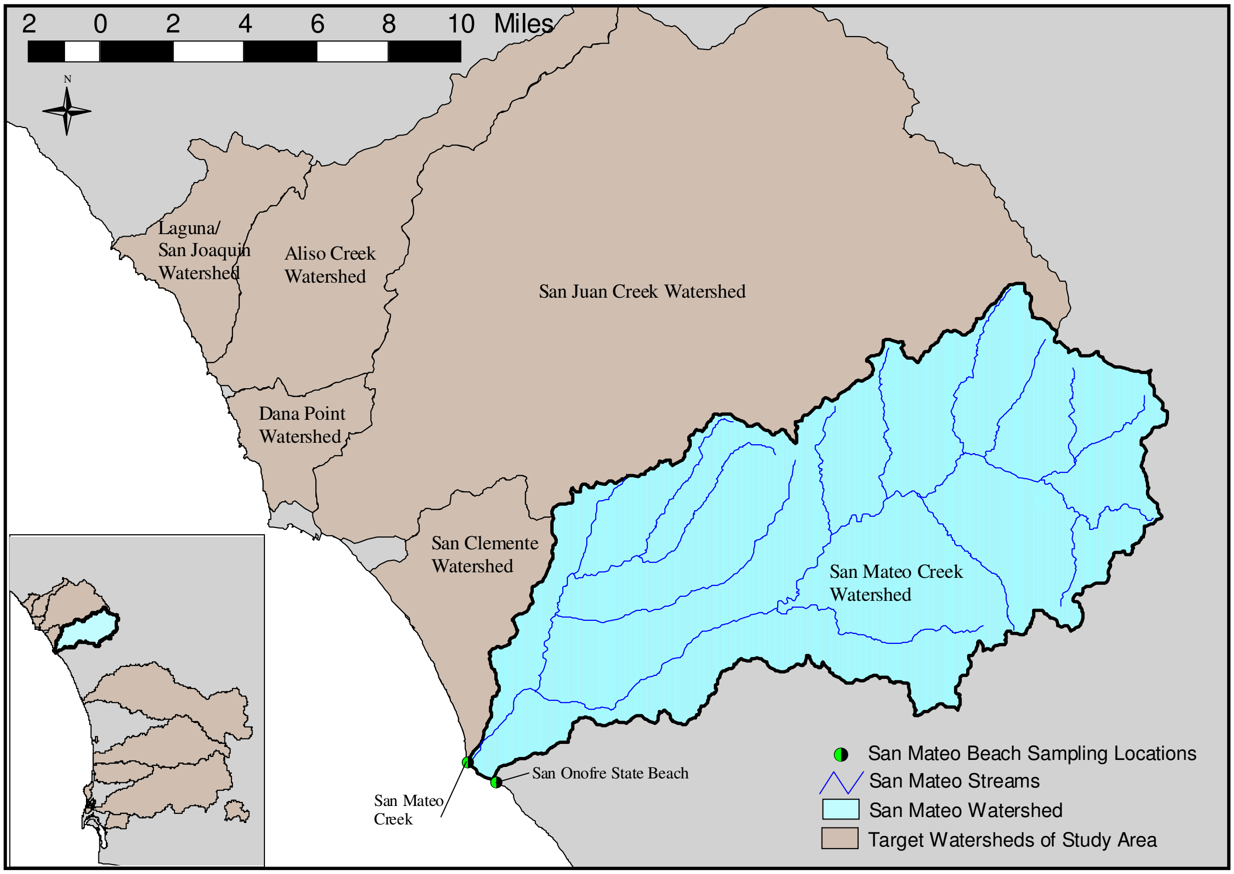

Figure 4-1. San Mateo watershed and San Onofre State Beach.

Table 4-1. Wet Weather Exceedances in Potential Reference Systems

Site ID	Location	Number of wet weather samples	Number of wet weather exceedances	Wet weather exceedance probability
Fecal Coliform				
EH-520	San Mateo Creek	6	2	33%
EH-510	San Onofre State Beach	5	2	40%
Total Coliform				
EH-520	San Mateo Creek	6	1	17%
EH-510	San Onofre State Beach	5	1	20%
Enterococci				
EH-520	San Mateo Creek	6	3	50%
EH-510	San Onofre State Beach	5	2	40%

An analysis of the wet weather water quality data provided by DEH (Table 4-1) from San Mateo Creek and San Onofre State Beach show that single sample maximum WQOs for fecal coliform, total coliform, or enterococci are exceeded in 17 to 50 percent of the wet weather samples depending on the indicator. Although this data set is limited in size, the high percentage of exceedances suggests that during wet weather events, a reference system approach is appropriate for use in calculating the wet weather indicator bacteria TMDLs for the San Diego Region.

4.1.3 Allowable Exceedance Frequency for the Reference System Approach

In the calculation of the wet weather mass-load based TMDLs, the San Diego Water Board chose to apply the 22 percent allowable exceedance frequency as determined for Leo Carillo Beach in Los Angeles County. At the time the wet weather watershed model was developed, the 22 percent exceedance frequency from Los Angeles County was the only reference beach exceedance frequency available. Since then, additional data were collected and analyzed for five other reference beaches by SCCWRP (Schiff, et al., 2006).

The study conducted by SCCWRP occurred over only two wet seasons (2004-2005 and 2005-2006). The data collected and analyzed by SCCWRP indicate that the flux of indicator bacteria from undeveloped watersheds and the resulting frequency of water quality threshold exceedences at reference beaches during wet weather can be correlated to watershed size, storm size, and early versus late season storms. Exceedance frequencies ranged from zero percent to 30 percent for an exceedance of any bacteria indicator.

Two of the reference beaches included in the study were from the San Diego Region (San Onofre State Beach at the mouth of San Onofre Creek and San Mateo State Beach at the mouth of San Mateo Creek). Both reference beaches had the highest exceedance frequencies during wet weather, but were also the largest watersheds in the study. The exceedance frequencies for these two San Diego Region watersheds may not be appropriate for every watershed addressed by these TMDLs. Additional data will be required to determine appropriate watershed specific exceedance frequencies for indicator bacteria TMDLs in the San Diego Region. If watershed specific exceedance frequencies are determined for any of the watersheds addressed in this TMDL, the wet weather TMDLs can be re-calculated based on these watershed specific exceedance frequencies.

At this time, however, the 22 percent exceedance frequency used to calculate the wet weather TMDLs is justified because the San Diego Region watersheds' exceedance frequencies will likely be close to the value calculated for Leo Carillo Beach, and is consistent with the exceedance frequency that was applied by the Los Angeles Water Board. If this exceedance frequency does indeed turn out to be appropriate for all the watersheds addressed in this TMDL, or if an appropriate exceedance frequency is determined to be greater for one or more watersheds, then the resulting wet weather TMDLs will be the same as, or less stringent than, the wet weather TMDLs that have been developed. If so, the wet weather TMDLs may be revised if requested. If, however, the appropriate exceedance frequency is determined to be lower for one or more watersheds, then the resulting wet weather TMDLs may be more stringent, and the San Diego Water Board may determine that the wet wet weather TMDLs need to be revised to restore and protect the beneficial uses of the waterbodies in these watersheds.

4.1.4 Summary of Wet Weather Numeric Targets for Mass-Load Based Calculations

The numeric targets used in the wet weather mass-load based TMDL calculations are based on the REC-1 single sample maximum WQOs. The numeric targets used in the calculations of the wet weather TMDLs include a 22 percent allowable exceedance frequency of the REC-1 single sample maximum WQOs. The allowable mass load (i.e., TMDL) that is calculated based on these numeric targets consists of the sum of two parts: 1) the bacteria load that is calculated with the REC-1 WQOs and, 2) the bacteria load that is associated with the allowable exceedance frequency.

For all beaches (except those that are downstream of San Juan Creek, Aliso Creek and the San Diego River), the wet weather numeric targets based on REC-1 WQOs are as follows: fecal coliform 400 most probable number of colonies (MPN)/100 milliliters (mL); total coliform 10,000 MPN/100 mL; and enterococci 104 MPN/100 mL. These single sample maximum values may be exceeded 22 percent of the time in the calculation of the wet weather mass-load based TMDLs.

For San Juan Creek and downstream beach, Aliso Creek and downstream beach, Tecolote Creek, Forrester Creek and the (lower) San Diego River and downstream beach, and Chollas Creek, the wet weather numeric targets are as follows: fecal coliform 400 MPN/100 mL; total coliform 10,000 MPN/100 mL; and enterococci 61 MPN/100 mL. These single sample maximum values may be exceeded 22 percent of the time in the calculation of the wet weather mass-load based TMDLs.

Different enterococci REC-1 WQOs were used to calculate TMDLs in watersheds modeled with the inland freshwater creeks (i.e., San Juan Creek, Aliso Creek, Tecolote Creek, Forrester Creek, (lower) San Diego River, and Chollas Creek) and watersheds modeled only with coastal saltwater beaches. The WQOs applicable to ocean waters are provided in the Ocean Plan. The Ocean Plan is applicable only to ocean waters and does not apply to marine bays, estuaries and lagoons. The WQOs applicable to all other surface waters in the San Diego Region (e.g., marine bays, estuaries and lagoons, and freshwater inland surface waters) are contained in the Basin Plan.

There are different enterococci REC-1 WQOs in the Ocean Plan compared to the Basin Plan. Specifically, the Ocean Plan contains REC-1 single sample maximum and 30-day geometric mean WQOs for ocean waters that do not vary. In the Basin Plan, however, the REC-1 single sample maximum WQOs for enterococci are dependent upon the type (e.g., freshwater or saltwater) and usage frequency (e.g., designated beach, moderately or lightly used area, or infrequently used area) of the waterbody, and the REC-1 geometric mean WQOs are dependent of the type (e.g., freshwater or saltwater) of waterbody. The enterococci saltwater REC-1 WQOs in the Basin Plan, for waters designated with “designated beach” usage frequency, are the same as the enterococci REC-1 WQOs in the Ocean Plan.

For the application of the Basin Plan’s enterococci REC-1 WQOs, unless otherwise specified in the Basin Plan, all waterbodies in the San Diego Region designated with REC-1 beneficial use are assumed to have a “designated beach” usage frequency. The “designated beach” usage frequency has the most conservative and protective enterococci REC-1 WQOs in the Basin Plan. The enterococci REC-1 single sample maximum WQOs in the Basin Plan are more stringent for freshwater (61 MPN/100mL) than for saltwater (104 MPN/100mL) waterbodies. The enterococci REC-1 geometric mean WQOs in the Basin Plan are also more stringent for freshwater (33 MPN/100mL) than for saltwater (35 MPN/100mL) waterbodies. Since coastal saltwater beaches are downstream of inland freshwater creeks, TMDLs for coastal saltwater beaches are calculated using the more conservative enterococci REC-1 WQOs applicable to freshwater creeks (i.e., 61 MPN/100mL and 33 MPN/100mL). The numeric targets used in the calculation of the TMDLs for Tecolote Creek and Chollas Creek are also based on the enterococci REC-1 WQOs applicable to freshwater creeks.

However, the dischargers commented that the “designated beach” category may be over-protective of water quality because of the infrequent recreational use in the impaired creeks. The recreational usage frequency in these creeks may correspond to the “moderately to lightly used area” category in the Basin Plan, which has an enterococci WQO of 108 MPN/100mL. . In such cases, the “designated beach” enterococci saltwater REC-1 single sample maximum WQO (104 MPN/100mL) would also be protective of the “moderately to lightly used area” freshwater creek

Before the less stringent enterococci single sample maximum saltwater REC-1 WQO may be applied to a freshwater creek, the Basin Plan must be amended to designate a lower usage frequency (i.e., “moderately to lightly used area”) for each freshwater creek. If information and evidence are provided to justify the “moderately to lightly used area” usage frequency for a freshwater creek, and the designated usage frequency of the freshwater creek is amended to “moderately to lightly used area” in the Basin Plan, the wet weather TMDLs that were calculated in a watershed that was modeled with a freshwater creek using the enterococci saltwater REC-1 WQOs can be implemented instead.

Table 4-2. Wet Weather Numeric Targets

Indicator Bacteria	Numeric Target (MPN/100mL)	Allowable Exceedance Frequency [a]
Fecal coliform	400 [b]	22%
Total coliform	10,000 [c]	22%
Enterococci	104 [d] / 61 [e]	22%

a. Percent of wet days (i.e., rainfall events of 0.2 inches or greater and the following 72 hours) allowed to exceed the wet weather numeric targets. Exceedance frequency based on reference system in the Los Angeles Region.
b. Fecal coliform single sample maximum WQO for REC-1 use in creeks and at beaches.
c. Total coliform single sample maximum WQO for REC-1 use at beaches and the point in creeks that discharges to beaches.
d. Enterococci single sample maximum WQO for REC-1 use in creeks established and designated as "moderately or lightly used" in the Basin Plan and at beaches downstream of those creeks, as well as all other beaches.
e. Enterococci single sample maximum WQO for REC-1 use in creeks not established and designated as "moderately or lightly used" in the Basin Plan and at beaches downstream of those creeks ("designated beach" frequency of use; applicable to San Juan Creek and downstream beach, Aliso Creek and downstream beach, Tecolote Creek, Forrester Creek, San Diego River and downstream beach, and Chollas Creek).

4.2 Dry Weather Numeric Targets

4.2.1 Allowable Exceedance Frequency for Dry Weather

Little data are available regarding exceedances of WQOs in a reference system (i.e., a beach and upstream watershed that are minimally impacted by anthropogenic activities) during dry weather. Water quality data from the mouth of San Mateo Creek and San Onofre State Beach (Table 4-3) indicate that exceedances of the single sample WQOs during dry weather conditions are uncommon in the relatively undeveloped San Mateo watershed. Furthermore, if the exceedance of the single sample maximum WQOs is unlikely, exceedances of the geometric mean are even more unlikely. However, if adequate data are collected to characterize dry weather flows and bacteria densities using a statistical approach, the reference system approach may be an option that would allow an exceedance frequency to be included with the dry weather numeric targets in the dry weather TMDLs.

The low percentage of exceedances of the single sample maximum WQOs during dry weather conditions could be caused by the existence of berms that prohibit creeks from flowing all the way to the ocean. When the berms are in place, there may be substantial levels of bacteria in the creeks. Data from the creeks are needed to verify this hypothesis. If berms were in place when the beach data were collected, the exceedances measured at the beaches were most likely caused by local sources on the beach that exist downstream of the mixing zone such as birds, marine mammals, resuspension from sediment, or re-growth in the wrack line.

More data could be collected to better characterize a reference watershed during dry weather flows. Therefore, WQOs, without any allowable exceedances, are sufficient for use as dry weather TMDL targets. Although the dry weather allowable mass loads were calculated based on the geometric mean WQOs, the single sample maximum WQOs must also be met pursuant to the Ocean Plan and Basin Plan.

Table 4-3. Single Sample Maximum Dry Weather Exceedances in Potential Reference Systems

Site ID	Location	Number of dry weather samples	Number of dry weather exceedances	Dry weather exceedance probability
Fecal Coliform				
EH-520	San Mateo Creek	101	0	0%
EH-510	San Onofre State Beach	72	0	0%
Total Coliform				
EH-520	San Mateo Creek	100	0	0%
EH-510	San Onofre State Beach	72	0	0%
Enterococci				
EH-520	San Mateo Creek	101	3	3%
EH-510	San Onofre State Beach	72	1	1%

4.2.2 Summary of Dry Weather Targets for Load Calculations

The numeric targets used in the dry weather mass-load based TMDL calculations are based on the REC-1 geometric mean WQOs. The numeric targets used in the calculations of the dry weather TMDLs include a 0 percent allowable exceedance frequency of the REC-1 geometric mean WQOs.

For all beaches (except those that are downstream of San Juan Creek, Aliso Creek and the San Diego River), the dry weather numeric targets based on REC-1 WQOs are as follows: fecal coliform 200 MPN/100 mL; total coliform 1,000 MPN/100 mL; and enterococci 35 MPN/100 mL (30-day geometric mean in all instances). These geometric mean values may be exceeded 0 percent of the time in the calculation of the dry weather mass-load based TMDLs.

For San Juan Creek and downstream beach, Aliso Creek and downstream beach, Tecolote Creek, Forrester Creek and the (lower) San Diego River and downstream beach, and Chollas Creek, the numeric targets are as follows: fecal coliform 200 MPN/100 mL; total coliform 1,000 MPN/100 mL; and, enterococci 33 MPN/100 mL (30-day geometric mean in all instances). These geometric mean values may be exceeded 0 percent of the time in the calculation of the dry weather mass-load based TMDLs.

Table 4-4. Dry Weather Numeric Targets

Indicator Bacteria	Numeric Target (MPN/100mL)	Allowable Exceedance Frequency [a]
Fecal coliform	200 [b]	0%
Total coliform	1,000 [c]	0%
Enterococci	35 [d] / 33 [e]	0%

a. Percent of dry days (i.e., days with less than 0.2 inch of rainfall observed on each of the previous 3 days) allowed to exceed the dry weather numeric targets.
b. Fecal coliform 30-day geometric mean WQO for REC-1 use in creeks and at beaches.
c. Total coliform 30-day geometric mean WQO for REC-1 at beaches and the point in creeks that discharges to beaches.
d. Enterococci 30-day geometric mean WQO for REC-1 at beaches.
e. Enterococci 30-day geometric mean WQO for REC-1 use in impaired creeks and beaches downstream of those creeks (applicable to San Juan Creek and downstream beach, Aliso Creek and downstream beach, Tecolote Creek, Forrester Creek, San Diego River and downstream beach, and Chollas Creek).

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5 Data Inventory and Analysis

Data from numerous sources were used to characterize the watersheds and water quality conditions, identify land uses associated with bacteria sources, and support the calculation of TMDLs for the watersheds. No new data were collected as part of this effort. The data analysis provided an understanding of the conditions that result in impairments.

5.1 Data Inventory

The categories of data used in developing these TMDLs include physiographic data that describe the physical conditions of the watershed and environmental monitoring data that identify past and current conditions and support the identification of potential pollutant sources. Table 5-1 presents the various data types and data sources used in the development of these TMDLs. The following sections describe the key data sets used for TMDL development.

5.1.1 Water Quality Data

Monitoring data for the impaired beaches were received from a number of agencies in San Diego and Orange Counties. Data were received for 52 locations monitored along impaired shorelines, in addition to 7 unimpaired shoreline locations (Figures 5-1 and 5-2; Appendix G, No. 15-20). Bacteria data (including fecal coliform, total coliform, and enterococci data) were collected at various times from 1999 through 2002, and the amount of data varied among monitored locations. Most locations had fecal coliform, total coliform, and enterococci data for assessment of existing conditions.

Special studies were conducted for Aliso Creek and San Juan Creek (San Diego Water Board, 2002b) by the Orange County Public Facilities and Resources Department and the Orange County Public Health Laboratory, respectively (Figure 5-3; Appendix G, No. 4 and 6). The City of San Diego conducted studies of Rose Creek and Tecolote Creek (data included in Figure 5-4 were collected in 2001 and 2002; Appendix G, No. 5). For each of the studies, multiple bacteria samples were collected throughout the year at stations throughout the watersheds and along several tributaries.

In addition, monitoring data were obtained for the following five rivers or creeks from various agencies in the Region: San Diego River (Padre Dam Municipal Water District), San Mateo Creek (Southwest Division Naval Facilities Engineering Command), Santa Margarita River (Southwest Division Naval Facilities Engineering Command), and San Luis Rey River (City of Oceanside). Data sources are described in Appendix G.

Water quality data from six major inland discharges—five at Camp Pendleton and one on Murrieta Creek (Santa Rosa Water Reclamation Facility)—were obtained. All these sources are in the Santa Margarita River watershed. Discharge data for inland outfalls to streams are limited to the period prior to 2002, after which these major inland discharges were either discontinued or diverted to ocean outfalls.

Table 5-1. Inventory of Data and Information Used for the Source Assessment of Bacteria

Data Set	Type of Information	Data Source(s)
Watershed physiographic data	Location of dams	USEPA BASINS
	Stream network	USEPA BASINS (Reach File, Versions 1 and 3); USGS National Hydrography Dataset (NHD) reach file; special studies of Aliso Creek, Tecolote Creek, and Rose Creek.
	Land use	USGS MRLC (1993); San Diego Regional Planning Agency – 2000 land use coverage for San Diego County (SANDAG); Southern California Association of Governments (SCAG) land use coverage of Orange and portions of Riverside Counties (1993)
	Counties	USEPA BASINS
	Cities/populated places	USEPA BASINS, U.S. Census Bureau's Tiger Data
	Soils	USEPA BASINS (USDA-NRCS STATSGO)
	Watershed boundaries	USEPA BASINS (8-digit hydrologic cataloging unit); CALWTR 2.2 (1995)
	Topographic and digital elevation models (DEMs)	USEPA BASINS; USGS
Environmental monitoring data	Water quality monitoring data	USEPA's STORET; California Department of Environmental Health; County of San Diego Department of Environmental Health; Orange County Pubic Facilities and Resources Department; City of San Diego; City of Oceanside; Orange County Public Health Laboratory, San Diego Water Board; Padre Dam Municipal Water District; Southwest Division Naval Facilities Engineering Command
	Streamflow data	USGS; Orange County Public Facilities and Resources Department; City of San Diego
	Meteorological station locations	BASINS; National Oceanic and Atmospheric Administration - National Climatic Data Center (NOAA-NCDC); California Irrigation Management Information System (CIMIS); California Department of Water Resources, Division of Flood Management; ALERT (Automatic Local Evaluation in Real-Time) Flood Warning System

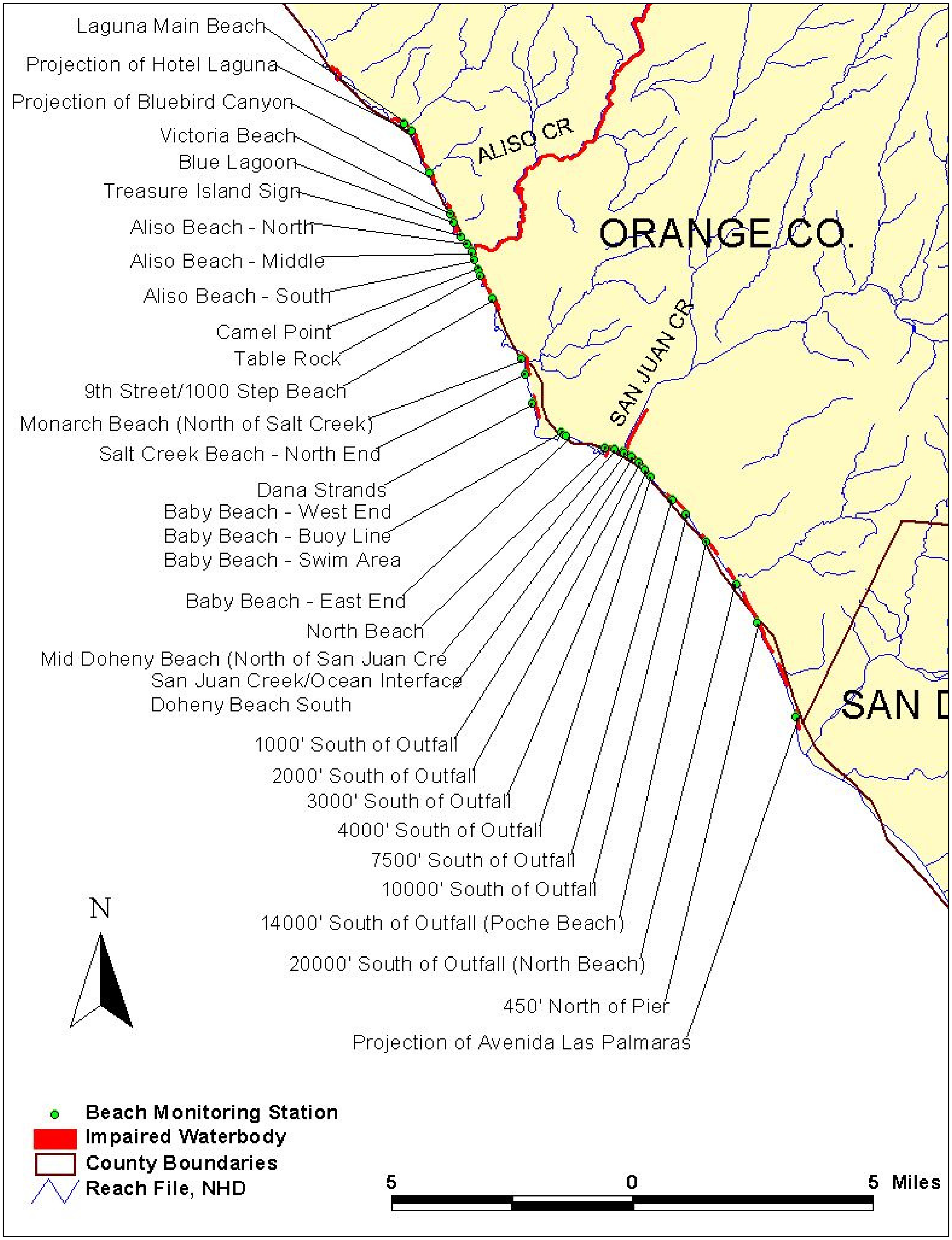


Figure 5-1. Beach monitoring station locations in Orange County.

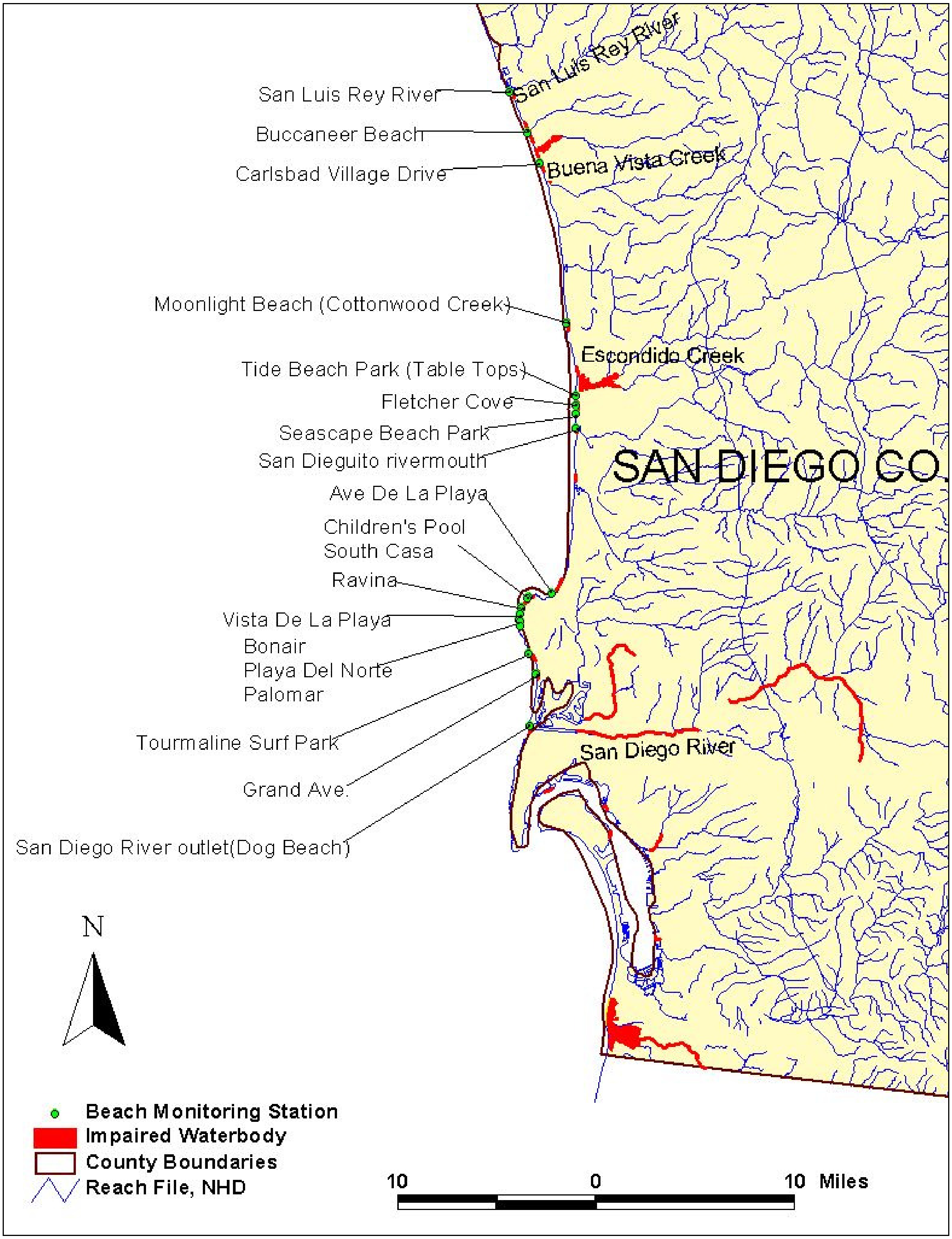


Figure 5-2. Beach monitoring station locations in San Diego County.

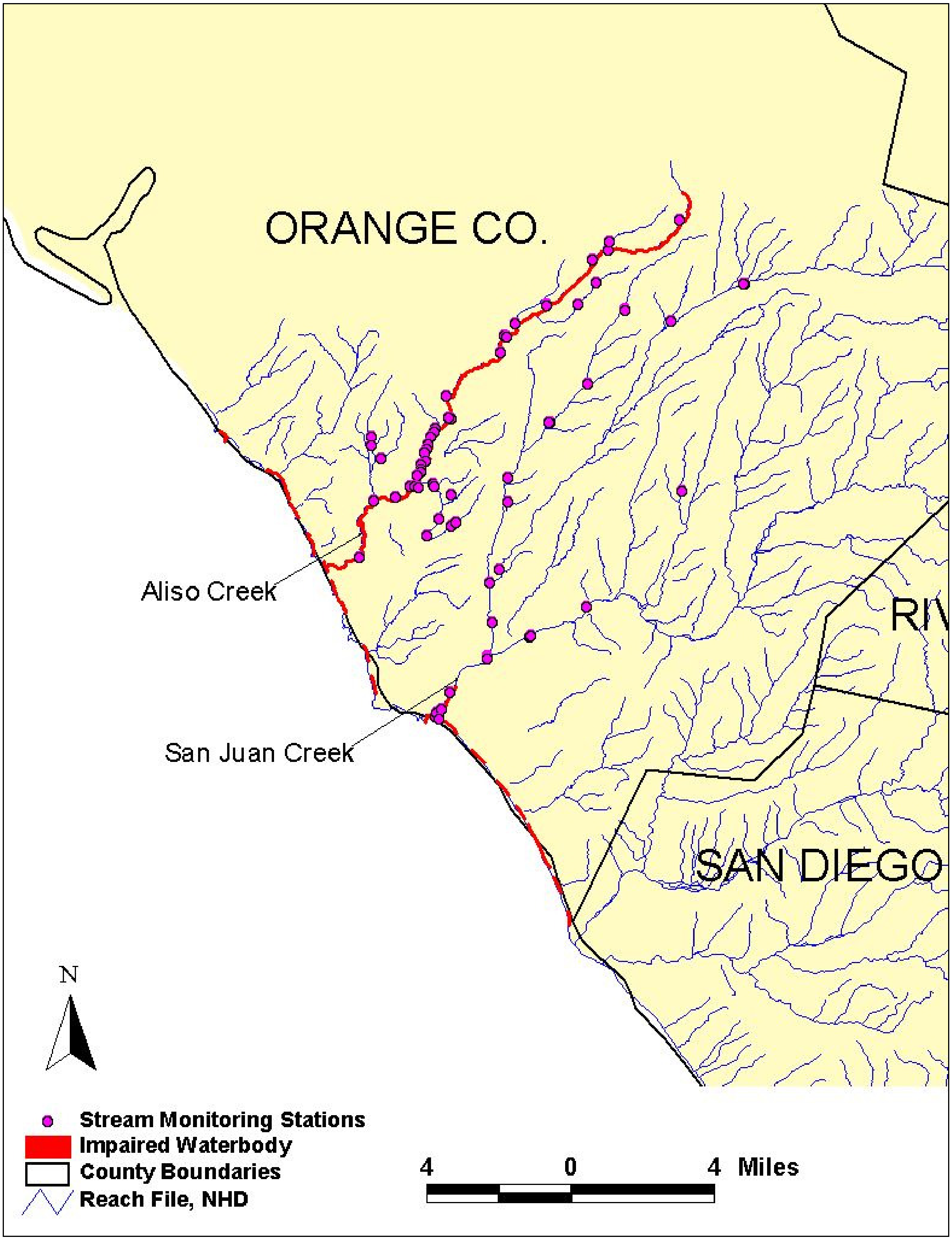


Figure 5-3. Bacteria monitoring stations on Aliso Creek and San Juan Creek.

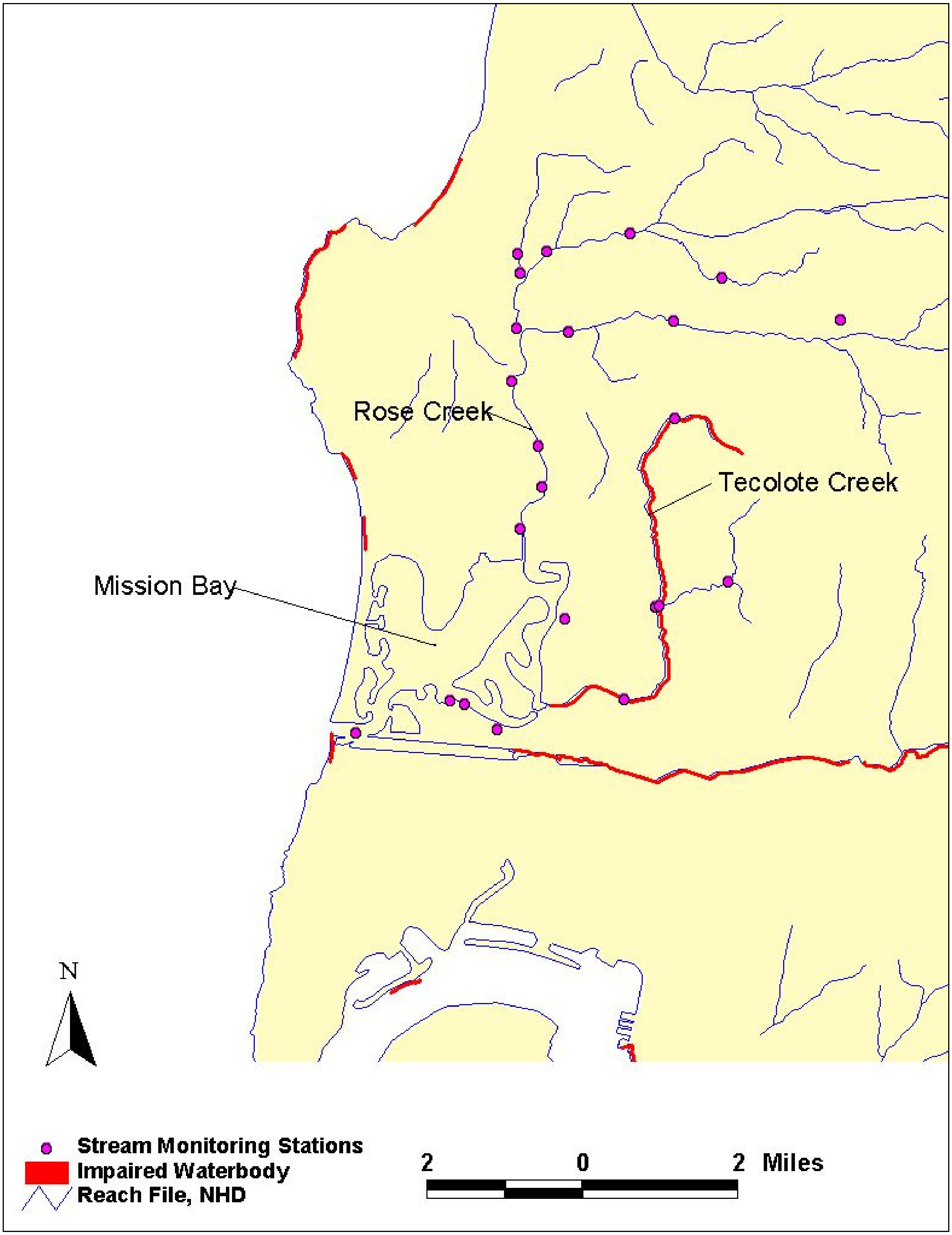


Figure 5-4. Bacteria monitoring stations on Rose Creek and Tecolote Creek.

5.1.2 Waterbody Characteristics

The assessment of waterbody characteristics involved analyzing streamflow data and assessing physical information. This information was used to determine the volume and hydraulic features of waterbodies for determining assimilative capacity and physical processes that affect bacteria transport for TMDL analysis.

A limited amount of streamflow data for the listed segments was available. The Aliso Creek, Rose Creek, and Tecolote Creek watersheds had streamflow information associated with special studies performed for the assessment of bacteria loading characteristics (see section 5.1.1). In addition, U.S. Geological Survey (USGS) gages with recent streamflow records were identified in the study area (Table 5-2). Historical streamflow data and data for stream channel geometry (width and depth) for these gages were obtained from USGS (Appendix G, No. 3).

Table 5-2. USGS Streamflow Gages in the San Diego Region with Recent Data

Station Number	Station Name	Historical Record
11022480	San Diego River at Mast Road near Santee, CA	5/1/1912–9/30/2002
11023000	San Diego River at Fashion Valley at San Diego, CA	1/18/1982–9/30/2002
11023340	Los Penasquitos Creek near Poway, CA	10/1/1964–9/30/2002
11025500	Santa Ysabel Creek near Ramona, CA	2/1/1912–9/30/2002
11028500	Santa Maria Creek near Ramona, CA	12/1/1912–9/30/2002
11042000	San Luis Rey River at Oceanside, CA	10/1/1912–11/10/1997; 4/29/1998–9/30/2002
11042400	Temecula Creek near Aguanga, CA	8/1/1957–9/30/2002
11044300	Santa Margarita River at FPUD Sump near Fallbrook, CA	10/1/1989–9/30/2002
11046000	Santa Margarita River at Ysidora, CA	3/1/1923–2/25/1999; 10/1/2001–9/30/2002
11046530	San Juan Creek at La Novia Street Bridge near San Juan Capistrano, CA	10/1/1985–9/30/2002
11047300	Arroyo Trabuco near San Juan Capistrano, CA	10/1/1970–9/30/1989; 10/1/1995–9/30/2002
11022350	Forrester Creek near El Cajon, CA	10/1/1993–9/30/2002
11039800	San Luis Rey River at Couser Canyon Bridge near Pala, CA	10/1/1986–1/4/1993

5.1.3 Meteorological Data

Hourly rainfall data were obtained from the National Climatic Data Center (NCDC) of the National Oceanic and Atmospheric Administration (NOAA). To augment the NCDC data, hourly rainfall data were also obtained from the California Irrigation Management Information System (CIMIS); California Department of Water Resources, Division of Flood Management;

and the Automatic Local Evaluation in Real-Time (ALERT) Flood Warning System. In addition, hourly evapotranspiration data were obtained from CIMIS (Appendix G, No. 21-23).

5.1.4 Land Characteristic Data

Available land use data to support this study included the 1993 USGS Multi-Resolution Land Characteristic (MRLC) data, which were available for the entire study area. The San Diego Regional Planning Agency (SANDAG) had a more detailed and recent 2000 land use data set that covers San Diego County. For Orange County and portions of Riverside County, land use data were obtained from the Southern California Association of Governments (SCAG). A combination of MRLC, SANDAG, and SCAG data was used to provide the most complete and up-to-date land use representation of the Region (Appendix G, No. 25).

In addition, soil data were obtained from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) State Soil Geographic (STATSGO) database and topographic information was obtained from the USEPA's Better Assessment Science Integrating Point and Nonpoint Sources (BASINS) system (Appendix G, No. 26).

5.2 Review of Impaired Segments

Bacteria data collected from beach and creek segments were analyzed to provide guidance for the source assessment. Results of these analyses are reported in the following sections.

5.2.1 Beach Impairments

Bacteria monitoring data for beach stations (Appendix G, No. 15-20) were analyzed to provide insight into the spatial extent of impairment and the timing of any exceedances of WQOs. Results of this analysis were also used in the source assessment to identify the proximity of impaired coastal segments to tributaries, outfalls, and other potential sources (see Section 6). Monitoring data were reviewed based on their association with wet or dry conditions to better understand variability during periods when methods of transport differ (wet weather runoff versus dry weather runoff). The wet period was defined to be consistent with the DEH General Advisory to avoid contact with ocean and bay water within 300 feet on either side of any storm drain, river, or lagoon outlet for 72 hours after 0.2 inch or more of rain. For each monitoring station, sampling dates were compared to rainfall data collected at the closest rainfall gage to determine whether bacteria samples had been collected during wet or dry periods. Once the data for all stations were identified as wet or dry, the number of exceedances of single sample WQOs was quantified for fecal coliform, total coliform, and enterococci at each station. Wet weather data cannot be analyzed for exceedance of 30-day geometric mean WQOs because wet weather periods do not come close to approaching 30 days in length.

To assess the spatial variability of bacteria levels during both wet and dry conditions, the exceedance frequency of the REC-1 (fecal coliform, enterococci and total coliform) single sample WQOs for each station were plotted in Figures H-1 through H-6 of Appendix H. These plots show that at some locations, bacteria concentrations frequently exceed the WQOs for indicator bacteria. The frequency of exceedances varies for each indicator bacteria, location, and for wet or dry weather conditions. Also, higher exceedance frequencies are observed in the vicinity of creeks or lagoons and major stormwater outfalls, especially at the mouths of those creeks and lagoons that are impaired due to high bacteria levels.

5.2.2 Creek Impairments

The analysis of beach monitoring data confirms that the highest number of exceedances of WQOs was in the vicinity of rivers, major stormwater outfalls, and known local sources (e.g., waterfowl at creek outlets; Appendix G, No. 15-20). This analysis is important in review of creek impairments because high numbers of exceedances were observed at the mouths of Aliso Creek, San Juan Creek, Tecolote Creek, and the San Diego River. Tables 5-3 through 5-5 list the number of monitoring stations and observed data, ranges of indicator bacteria levels observed, and exceedance frequencies of marine WQOs in the watershed of each impaired creek addressed in this TMDL where data were available (Appendix G, No. 4, 5, 6, 10, 11, 12, 13, and 14), and respective indicator bacteria were identified as the pollutant/stressor. For each impaired watershed, exceedances of marine WQOs were observed. Although the data are from inland surface waters (creeks), the marine WQOs were used to tally the number of exceedances likely to occur at a beach at the outlet of the watershed. This is because high bacteria counts in the watershed generally lead to high bacteria counts downstream, at the shoreline.

Table 5-3. Summary of Fecal Coliform Data for Impaired Creeks

Stream	Number of Monitoring Stations	Total Number of Samples	Fecal Coliform (MPN/100mL)			Frequency of Exceedance of WQOs for Marine Waters
			Minimum	Mean	Maximum	
Aliso Creek	108	8,816	2	10,739	684,600	77%
Tecolote Creek	5	208	5	16,429	1,732,870	40%
San Diego River	6	36	2	1,557	24,000	36%
San Juan Creek	31	357	10	5,680	350,000	58%

Table 5-4. Summary of Total Coliform Data for Impaired Creeks

Stream	Number of Monitoring Stations	Total Number of Samples	Total Coliform (MPN/100 mL)			Frequency of Exceedance of WQOs for Marine Waters
			Minimum	Mean	Maximum	
Aliso Creek	108	8,815	2	40,750	878,400	55%
Tecolote Creek	5	208	959	171,746	2,419,200	63%
San Diego River	6	34	300	14,885	300,000	15%
San Juan Creek	31	357	10	130,683	14,900,000	45%

Table 5-5. Summary of Enterococci Data for Impaired Creeks

Stream	Number of Monitoring Stations	Total Number of Samples	Enterococci (MPN/100 mL)			Frequency of Exceedance of WQOs for marine waters
			Minimum	Mean	Maximum	
Aliso Creek	108	8,817	1	6,018	492,800	98%
Tecolote Creek	5	208	5	15,099	2,419,200	95%
San Juan Creek	31	357	5	4,834	280,000	89%

5.3 Analyses of Beach Water Quality Versus Magnitude of Streamflow

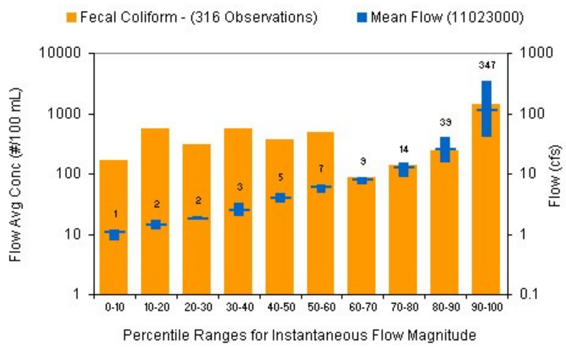
A statistical comparison of flow versus bacteria density was also performed to evaluate historical effects of high- and low-flow conditions near the mouths of the creeks. Two USGS gage stations in close proximity to the monitoring locations had flow data for the same time period as the bacteria monitoring data: San Diego River–Dog Beach (USGS 11023000 and FM-010) and San Luis Rey River (USGS 11042000 and OC-100; Appendix G, No. 3, 18-19). Figures 5-5 and 5-6 show the flow versus fecal coliform density comparisons. In general, high fecal coliform levels were observed under a range of flow levels. For both locations, high fecal coliform densities were observed under low-flow and high-flow conditions. This indicates the need to assess bacteria sources separately during both wet weather events and dry weather conditions.

Location: Dog Beach
Pollutant: Fecal Coliform
Data from: 1/4/1999 to 9/27/2001 (316 Observations)

Flow Range	# Obs	Flow (cfs)			Concentration (#/100 mL)		
Percentile	*Count*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*
0-10	32	1.059	0.790	1.200	170.73	6.00	1400.00
10-20	32	1.422	1.200	1.700	552.58	2.00	16000.00
20-30	32	1.809	1.700	2.000	299.54	2.00	3200.00
30-40	31	2.529	2.100	3.200	552.92	2.00	6800.00
40-50	31	3.961	3.200	4.700	360.19	2.00	7600.00
50-60	32	5.934	4.800	6.700	494.83	2.00	3600.00
60-70	31	7.968	6.800	8.800	86.50	20.00	800.00
70-80	31	12.581	9.000	14.000	135.76	16.00	800.00
80-90	32	25.094	15.000	39.000	245.75	2.00	2300.00
90-100	32	114.094	42.000	347.000	1438.09	20.00	12000.00

Location: Dog Beach
Pollutant: Fecal Coliform
Data from: 1/4/1999 to 9/27/2001 (316 Observations)

Time Period	# Obs	Flow (cfs)			Concentration (#/100 mL)		
Month	*Count*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*
January	15	19.013	4.900	153.000	614.71	2.00	2400.00
February	38	54.066	5.500	347.000	2179.54	2.00	12000.00
March	25	56.960	11.000	182.000	199.64	2.00	2300.00
April	26	26.262	6.500	248.000	687.87	2.00	1800.00
May	42	7.421	3.600	11.000	282.45	2.00	3600.00
June	41	3.566	1.500	5.600	370.64	2.00	7600.00
July	52	1.830	0.980	2.600	680.52	2.00	16000.00
August	23	1.346	0.790	2.100	61.05	4.00	300.00
September	19	1.284	0.930	1.900	198.19	6.00	1600.00
October	13	34.908	1.000	146.000	260.46	2.00	1500.00
November	13	4.815	1.500	15.000	150.41	20.00	3200.00
December	9	5.344	2.400	14.000	72.16	2.00	500.00



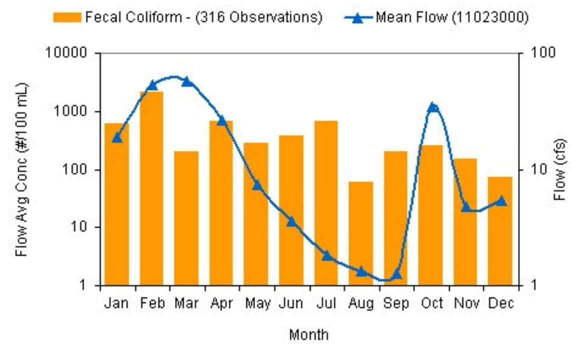


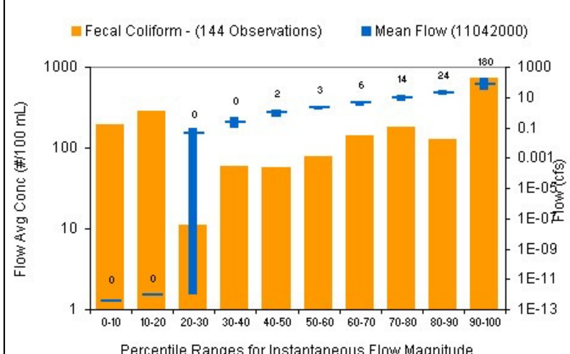
Figure 5-5. Flow versus fecal coliform concentration near San Diego River outlet (Dog Beach).

Location: San Luis Rey River
Pollutant: Fecal Coliform
Data from: 1/11/1999 to 9/25/2001 (144 Observations)

Flow Range	# Obs	Flow (cfs)			Concentration (#/100 mL)		
Percentile	*Count*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*
0-10	15	0.000	0.000	0.000	195.85	2.00	2400.00
10-20	14	0.000	0.000	0.000	285.52	2.00	1600.00
20-30	14	0.041	0.000	0.060	11.19	2.00	240.00
30-40	15	0.239	0.090	0.460	59.52	4.00	500.00
40-50	14	1.098	0.570	1.600	57.09	2.00	240.00
50-60	14	2.057	1.600	2.600	78.52	2.00	240.00
60-70	15	4.260	2.900	5.700	144.03	11.00	500.00
70-80	15	10.173	6.200	14.000	177.98	17.00	700.00
80-90	13	20.385	15.000	24.000	128.66	2.00	300.00
90-100	15	71.533	28.000	180.000	741.48	5.00	3000.00

Location: San Luis Rey River
Pollutant: Fecal Coliform
Data from: 1/11/1999 to 9/25/2001 (144 Observations)

Time Period	# Obs	Flow (cfs)			Concentration (#/100 mL)		
Month	*Count*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*
January	7	31.570	0.060	180.000	2449.41	2.00	3000.00
February	5	53.140	5.700	124.000	440.47	11.00	700.00
March	8	50.875	22.000	137.000	135.83	13.00	300.00
April	12	35.750	13.000	95.000	271.09	5.00	900.00
May	17	9.700	4.500	19.000	169.62	17.00	700.00
June	10	5.200	1.600	12.000	74.53	17.00	130.00
July	15	1.799	0.420	5.100	61.14	2.00	240.00
August	15	0.579	0.000	2.100	86.87	7.00	130.00
September	17	1.231	0.000	3.700	134.64	2.00	500.00
October	17	0.241	0.000	4.100	500.00	2.00	2400.00
November	13	0.178	0.000	0.990	168.30	2.00	500.00
December	8	0.029	0.000	0.060	15.39	2.00	240.00



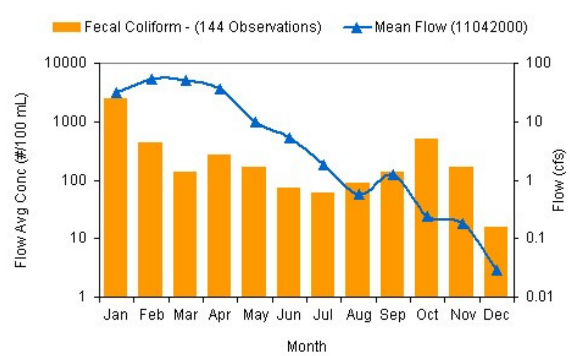


Figure 5-6. Flow versus fecal coliform concentration near San Luis Rey River

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6 Source Analysis

The purpose of the source analysis is to identify and quantify the sources of bacteria causing or contributing to the impairment of the beaches and creeks. Both in-stream and watershed data were used to identify potential sources and characterize the relationship between point and nonpoint source loadings and in-stream response, under both wet weather and dry weather conditions. Point sources typically discharge at a specific location from pipes, outfalls, and conveyance channels from, for example, municipal wastewater treatment plants or municipal separate storm sewer systems (MS4s). These discharges are regulated through waste discharge requirements (WDRs) that implement federal NPDES (National Pollutant Discharge Elimination System) requirements issued by the State Water Board or the San Diego Water Board through various orders.[16] Nonpoint sources are diffuse sources that have multiple routes of entry into surface waters. Some nonpoint sources, such as agriculture, livestock, and horse ranch facilities (hereafter referred to collectively as agriculture land uses) may be regulated through WDRs, or may be eligible for conditional waivers of WDRs.

During both wet weather and dry weather periods, multiple point and nonpoint sources of bacteria may contribute to overall loads to the impaired waterbodies. Bacteria are deposited both directly to the waterways and also onto land surfaces. Sources can include storm drain discharges, sewer line breaks, leaking septic systems, agricultural activities, deposit of waste from aquatic and terrestrial wildlife and pets, decaying matter, soil, and deposit of waste from encampments of homeless persons. Discharges directly to marine shorelines include illegal sewage disposal from boats along the coastline, direct input to waterbodies from waterfowl, bacteria re-growth in the wrack line, and even swimmers themselves.

Sources of bacteria are the same under both wet weather and dry weather conditions. However, the method of transport for the two conditions is very different. Wet weather loading is dominated by episodic storm flows that wash off bacteria that build up on the surface of all land use types in a watershed during dry periods. Dry weather loading is dominated by nuisance flows from urban land use activities such as car washing, sidewalk washing, and lawn over-irrigation, which pick up bacteria and deposit it into receiving waters. These types of nuisance flows are generally referred to as urban runoff. Because the relative loads from bacteria sources vary significantly between wet weather events and dry weather conditions, load assessment required separate wet and dry weather analyses. For this reason, two distinct modeling platforms were used to assess bacteria loading and TMDLs. These models are described in the Linkage Analysis in section 7.

6.1 Land Use / Bacteria Source Correlation

In this technical TMDL analysis, bacteria sources were quantified by land-use type since bacteria loading can be highly correlated with land-use practices. Some land use types, such as low and high density residential, produce high concentration of bacteria while other land use types such as military produce relatively smaller concentrations of bacteria.

[16] A discussion of the State Water Board and San Diego Water Board Orders regulating point source discharges of bacteria is presented in the Implementation Plan, section 11.

Since several land-use types share hydrologic or pollutant loading characteristics, many were grouped into similar classifications, resulting in a subset of 13 categories for modeling. Selection of these land-use categories was based on the availability of monitoring data and literature values that could be used to characterize individual land use contributions and critical bacteria-contributing practices associated with different land uses. For example, multiple urban categories were represented independently (e.g., high density residential, low density residential and commercial/institutional), whereas forest and other natural categories were grouped.

6.1.1 Wet Weather Transport

During wet weather events, wash-off of bacteria from various land uses is considered the primary mechanism for transport of bacteria. This is due to the relatively large bacteria levels observed at the mouths and/or within the watersheds of impaired creeks. After bacteria build up on the land surface as the result of various land sources and associated management practices (e.g., management of livestock in agricultural areas, pet waste in residential areas), many of the bacteria are washed off the surface during rainfall events. The amount of runoff and associated bacteria concentrations are therefore highly dependent on land use. This methodology of correlating land use to bacteria sources produced successful modeling results, despite the fact that some sources are distributed across several different land uses (i.e. wildlife inhabiting open space land use and also urbanized land uses such as high and low density residential).

Pie charts were developed that show relative bacteria loads by land use type for each watershed (Appendix I). Land use classifications were provided by SANDAG and SCAG and were grouped in some instances (Appendix J). Land uses were further classified into either point source dominated discharge or nonpoint source dominated discharge (Appendix I).

6.1.2 Dry Weather Transport

From analysis of spatial distributions of bacteria concentrations along the Pacific Ocean shoreline, high bacteria levels were observed at the mouths of major stormwater outfalls and creeks under dry conditions. This observance was validated through an analysis of streamflow versus bacteria concentration that indicated a significant dry weather bacteria source to streams. During dry conditions, most impaired streams exhibit a sustained baseflow even if no rainfall has occurred for a significant period to provide runoff. These flows result from various urban land use practices that generate urban runoff, which enters storm drains and creeks. As these flows travel across lawns and urban surfaces, bacteria are carried from these areas to receiving waters.

Analysis of flow and bacteria data from Aliso Creek, San Juan Creek, Tecolote Creek, and Rose Creek showed that dry weather urban runoff and associated bacteria levels could be estimated from land use information in a given watershed. This analysis is discussed in detail in Appendix K.

6.2 Point Sources

Bacteria loads attributable to point sources are discharged in urban runoff from the following land use types:

- Low Density Residential;

- High Density Residential;
- Commercial/Institutional;
- Industrial/Transportation (excluding areas owned by Caltrans)
- Caltrans;
- Military;
- Parks/Recreation; and
- Transitional (construction activities).

These land use types were classified as generating point source loads because, although the bacteria sources on these land use types may be diffuse in origin, the pollutant loading is transported and discharged to receiving waters through MS4s. The principal MS4s contributing bacteria to receiving waters are owned or operated by either municipalities located throughout the watersheds or Caltrans.[17]

6.3 Nonpoint Sources

Bacteria loads attributable to nonpoint sources are discharged in stormwater runoff from the following land use types:

- Agriculture;
- Dairy/Intensive Livestock;
- Horse Ranches;
- Open Recreation;
- Open Space;
- Water.

These land use types were classified as generating nonpoint source loads because the loads are discharged in overland stormwater runoff that is diffuse in origin, and are largely located in areas without constructed (man-made) MS4s or in areas upstream of MS4 networks. One exception is that several dairies in these watersheds are regulated as point source discharges pursuant to NPDES requirements.

6.4 Wastewater Treatment Facilities and Collection Systems

Wastewater treatment facilities and collection systems are located in the watersheds addressed by these TMDLs. However, most of the effluent from these facilities is discharged to the Pacific Ocean through offshore ocean outfalls. Therefore, these loads were not included in the TMDL calculations. The only exception is the Padre Dam Municipal Water District Water Reclamation Plant (Padre Dam), which discharges effluent to the San Diego River via a series of ponds that feed the Santee Lakes. However, Padre Dam's bacterial discharges do not contribute to the San Diego River's bacterial impairment because Padre Dam's effluent meets the REC-1 water quality standard.

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[17] A complete discussion regarding the dischargers identified for meeting allocations is available in section 10, Legal Authority for TMDL Implementation Plan.

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7 Linkage Analysis

The technical TMDL analysis of pollutant loading from watersheds, and the waterbody response to this loading is referred to as the linkage analysis. The purpose of the linkage analysis is to quantify the "existing" bacteria loads that are currently generated by the pollutant sources in the watershed under critical conditions, and quantify the maximum allowable bacteria loading to each impaired waterbody that will result in in attainment of the numeric targets under the same critical conditions. This maximum allowable bacteria loading is, in other words, the TMDL. Existing loads and TMDLs were calculated for each watershed. The load reduction from the total existing load in a watershed needed in order to attain the TMDLs in the receiving waters was also calculated for each watershed.

For these TMDLs, a distinction is made between wet weather events and dry weather conditions because bacteria loads differ between the two scenarios and implementation measures will be specific to wet and dry conditions. The linkage analysis utilized two district modeling approaches for calculating bacteria loads. One modeling approach specifically quantified loading during wet weather events. The other modeling approach quantified loading during dry weather conditions. Both current loading and TMDLs were calculated for each watershed under both wet weather events and dry weather conditions. This information is available in Tables 9-1 through 9-4.

7.1 Consideration Factors for Model Selection

In selecting an appropriate linkage analysis modeling approach for TMDL calculation, technical and regulatory criteria were considered. Technical criteria include the physical system in question, including watershed or stream characteristics and processes, and the constituent of interest, in this case, bacteria. Regulatory criteria include water quality standards or procedural protocol. The following discussion details the considerations in each of these categories. Based on these considerations, appropriate models were chosen to simulate both wet weather events and dry weather conditions. The same technical approaches were used for both beaches and creeks.

7.1.1 Technical Criteria

Technical criteria are divided into four main topics. Consideration of each topic was critical in selecting the most appropriate modeling approach to address the types of sources and the numeric targets associated with the impaired waters.

7.1.1.a Physical Domain

Representation of the physical domain is perhaps the most important consideration in model selection. The physical domain is the focus of the modeling effort—typically described by either the receiving water itself or a combination of the contributing watershed and the receiving water. Selection of the appropriate modeling domain depends on the constituents and the conditions under which the stream exhibits impairment. For a stream dominated by point source inputs (e.g., wastewater treatment plant discharge; urban runoff discharged from stormwater outfalls) that exhibits impairments under only low-flow conditions, a steady-state approach is typically used. This type of modeling approach focuses on only in-stream (receiving water) processes during a user-specified condition. For streams affected additionally or solely by nonpoint sources or primarily rainfall-driven flow and pollutant contributions during wet weather, a dynamic approach is recommended. Dynamic watershed models consider time-variable nonpoint source contributions from a watershed surface or subsurface. Some models consider monthly or seasonal variability, while others enable assessment of conditions immediately before, during, and after individual rainfall events. Dynamic models require a substantial amount of information regarding input parameters and data for calibration purposes.

For this project, two conditions were recognized that require specific model development to address key physical and environmental conditions. For wet weather, it was assumed that the San Diego Region is dominated by nonpoint sources that are generally constant on an hourly time step and deposit directly to drains. For dry weather, streams in the Region are characterized by much smaller flows than wet conditions, with flows less dynamic than wet periods and assumed steady-state for model development. Although during both conditions the sources are nonpoint in nature, their behavior in the streams is represented in the models more like that of a point source, since specific discharge points of watershed inflows are assumed.

7.1.1.b Source Contributions

Primary sources of pollution to a waterbody must be considered in the model selection process. Accurately representing contributions from nonpoint sources and regulated point sources is critical in properly representing the system and ultimately evaluating potential load reduction scenarios.

Water quality monitoring data were not sufficient to fully characterize all sources of bacteria in the watersheds draining to impaired waterbodies. However, analyses of the available data indicate that the main controllable sources are dry and wet weather urban runoff. Thus, models were selected to develop bacteria TMDLs for beaches and creeks to address the major source categories during wet weather events and dry weather conditions considered controllable for TMDL implementation purposes.

7.1.1.c Critical Conditions

The goal of a TMDL analysis is to determine the assimilative capacity of a waterbody and to identify potential allocation scenarios that will enable the waterbodies to achieve the numeric targets, and thus the TMDLs, in the receiving waters. The critical condition is the set of environmental conditions for which controls designed to protect water quality will ensure attainment of objectives for all other conditions. The critical conditions typically include the location and the period of time in which the waterbody exhibits the most vulnerability. Critical conditions are accounted for in this project by way of using separate modeling approaches for wet weather events and dry weather conditions. In addition, to ensure that numeric targets are met in impaired waterbodies, a critical period associated with extreme rainfall conditions was selected for watershed modeling analysis. The dry weather critical condition was based on predictions of flow from the steady-state model (described in Appendix K).

7.1.1.d Constituents

Another important consideration in model selection and application is the constituent(s) to be assessed. Choice of state variables is a critical part of model application. The more state variables included, the more difficult the model is to apply and calibrate. However, if key state variables are omitted from the simulation, the model might not simulate all necessary aspects of the system and might produce unrealistic results. A delicate balance must be met between minimal constituent simulation and maximum applicability.

The focus of development of these TMDLs is on fecal coliform, total coliform, and enterococci bacteria. Factors affecting the survival of bacteria include soil moisture content, pH, solar radiation, and available nutrients. In-stream bacteria dynamics can be extremely complex, and accurate estimation of bacteria concentrations relies on a host of interrelated environmental factors. Bacteria concentrations in the water column are influenced by die-off, re-growth, partitioning of bacteria between water and sediment during transport, settling, and re-suspension of bottom materials. First-order die-off is likely the most important dynamic process to simulate in the San Diego Region, despite observations that bacteria re-grow in low flow conditions. The limited data available provide few insights into which of the other factors listed above might be most influential on bacterial behavior for the models. A description of assumptions regarding these factors is described in Appendix L.

7.1.2 Regulatory Criteria

A properly designed and applied model provides the source-response linkage component for each waterbody and enables accurate assessment of assimilative capacities. A stream's assimilative capacity is determined by assuming adherence to water quality standards (i.e., the beneficial uses and the WQOs that support those uses). The Basin Plan establishes, for all waters in the San Diego Region, the beneficial uses for each waterbody to be protected, the WQOs that support and protect those uses, and an implementation plan that accomplishes those objectives. The modeling platform must enable direct comparison of model results to in-stream concentrations and allow for the analysis of the duration of those concentrations. For the watershed loading analysis and implementation of measures to reduce sources, that the modeling platform enable examination of gross land use loading as well as in-stream concentration is also important.

7.2 Wet Weather Modeling Analysis

During wet weather events, sources of bacteria are associated with wash-off of bacteria accumulated, or built up, on the land surface. Bacteria are delivered to receiving waters through creeks and stormwater collection systems. In this analysis, bacteria sources were linked to specific land use types with higher relative bacteria accumulation rates because they are more likely to deliver bacteria to waterbodies through stormwater collection systems. To assess the link between sources of bacteria and the impaired waters, a modeling system that simulates the build-up and wash-off of bacteria and the hydrologic and hydraulic processes that affect delivery was used. The wet weather modeling approach assumes the following:

- All sources can be represented through build-up/wash-off of bacteria from specific land use types.
- The discharge of sewage is zero. Sewage spill information was reserved for use during the calibration process to account for observed spikes in bacteria indicators, as applicable; however, the calibration process did not necessitate removal of any wet

weather data considered to be affected by sewage spill information. In other words, data from wet weather events used for calibration were not indicative of sewage spills.

- For numeric target assessment, the critical points were assumed to be the point upstream of where the creek/watershed or storm drain initially mixes with ocean water at the surf zone.

The wet weather modeling approach chosen for use in this project is based on the application of the USEPA's Loading Simulation Program in C++ (LSPC) model to estimate bacteria loading from streams and assimilation within the waterbodies. LSPC is a recoded C++ version of the USEPA's Hydrological Simulation Program–FORTRAN (HSPF) that relies on fundamental (and USEPA-approved) algorithms. LSPC has been successfully applied and calibrated in the Los Angeles, San Gabriel, and San Jacinto Rivers in Southern California. A complete discussion of LSPC configuration, calibration, and application is provided in Appendix J. Additional assumptions for wet weather modeling can be found in Appendix L.

Although the name implies that a "daily load" is calculated, wet weather mass-load based TMDLs for each watershed are expressed as "annual loads" in terms of number of bacteria colonies per year (billion MPN/yr). Wet weather mass-load based TMDLs are expressed in terms of annual loads because wet weather events (i.e., storm events) do not occur on a regular basis in any given year, and expressing the TMDL on a daily basis would be extremely difficult.

7.3 Dry Weather Modeling Analysis

The density of bacteria in receiving water during dry weather is extremely variable in nature. This necessitated an approach that relied on detailed analysis of available data to better identify and characterize sources. Data collected from dry weather samples were used to develop empirical relationships that represent water quantity and water quality associated with dry weather runoff from various land uses. For each monitoring station, a watershed was delineated and the land use was related to flow and bacteria densities. A statistical relationship was established between streamflow, bacteria densities, and areas of each land use.

To represent the linkage between source contributions and in-stream response, a steady-state mass balance model was developed to simulate transport of bacteria in the impaired creeks and the creeks flowing to impaired shorelines. This predictive model represents the streams as a series of plug-flow reactors, with each reactor having a constant, steady-state flow and bacteria load. A complete discussion of the development of the empirical framework for estimating watershed loads, and a description of the configuration and calibration of the stream-modeling network is provided in Appendix K.

The model was created to estimate bacteria densities in the San Diego Region, to develop necessary load allocations for TMDL development, and to allow for incorporation of any new data. Bacteria densities in each segment were calculated using available water quality data, and assuming values for a first-order die-off rate, stream infiltration, basic channel geometry, and flow. Assumptions made for dry weather modeling can be found in Appendix L.

Dry weather mass-load based TMDLs for each watershed are expressed as "monthly loads" in terms of number of bacteria colonies per month (billion MPN/mo). Dry weather mass-load based TMDLs are expressing in terms of monthly loads because the dry weather numeric targets are based on 30-day geometric means, and expressing the TMDL on a daily basis would not be strictly comparable to the numeric targets.

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8 Allocation and Reduction Calculations

The calibrated models were used to simulate flow and bacteria densities for use in estimating existing bacteria mass loads to the impaired waterbodies under the critical conditions. The simulated flow from the models and the numeric targets were used in estimating the allowable bacteria mass loads (i.e., mass-load based TMDLs) that could be assimilated by the impaired waterbodies. The estimated existing mass loads were compared to the calculated mass-load based TMDLs, and the difference between the two were quantified as the mass load reductions needed to meet the numeric targets in the receiving waters, which are based on the numeric indicator bacteria WQOs and allowable exceedance frequency.

Although allocations are distributed to the dischargers of bacteria identified in the technical TMDL analysis, this does not imply that other potential sources do not exist. Any potential sources in the watersheds not receiving an explicit allocation (i.e., WLA = 0 or LA = 0) described in the technical TMDL analysis is not expected or allowed to discharge bacteria to the impaired beaches and creeks.

This section describes briefly the methodology used to calculate and allocate the mass-load based TMDLs. An in-depth discussion of this topic is the subject of Appendix I.

8.1 Wet Weather Mass Loading Analysis

The LSPC model (see Appendix J) was used to estimate existing bacteria mass loads at critical conditions for comparison to allowable bacteria mass loads calculated based on the numeric targets, and determination of required reductions for each watershed. The hydrology calibration and validation results for the LSPC model are shown in Appendix M. A comparison of the modeling results to observed bacteria densities are shown in Appendix N.

8.1.1 Identification of the Critical Wet Weather Condition

To ensure that numeric targets are met in impaired waterbodies during wet weather events, a critical period associated with extreme wet conditions was selected for the wet weather mass-load based TMDL calculations. The year 1993 was selected as the critical wet period for assessment of extreme wet weather loading conditions because this year was the wettest year of the 12 years of record (1990 through 2002) evaluated in the TMDL analysis. This corresponds to the 92nd percentile of annual rainfalls for those 12 years measured at multiple rainfall gages in the San Diego Region (Appendix G, No.21-23). Selection of this year was consistent with studies performed by the Southern California Coastal Water Research Project (SCCWRP). An analysis of rainfall data for the Los Angeles Airport (LAX) from 1947 to 2000 shows that 1993 was the 90th percentile year, meaning 90 percent of the years between 1947 and 2000 had less annual rainfall than 1993 (Los Angeles Water Board, 2002).

8.1.2 Wet Weather Mass Load Estimation

Estimation of “existing” mass loading and “allowable” mass loading (i.e., mass-load based TMDL) to the impaired waterbodies required use of the model to predict flows and bacteria densities under critical conditions. The dynamic model-simulated watershed processes, based on observed rainfall data as model input, provided temporally variable load estimates for the critical period. These load estimates were simulated using calibrated, land use-specific processes associated with hydrology and build-up and wash-off of bacteria from the land surface. Transport processes of bacteria loads from the source to the impaired waterbodies were also simulated in the model with a first-order loss rate based on literature values.

For estimation of bacteria loading during wet weather events, simulations were performed using local rainfall data. The total number of wet days for each watershed is listed in Table 8-1. For larger watersheds that extend into the mountains (e.g., San Luis Rey River, San Dieguito River, San Diego River), more rainfall was observed. Although the Miramar watershed is near the coast and does not extend into the mountains as do the larger watersheds, localized rainfall patterns for 1993 suggested that there were a large number of wet days relative to neighboring watersheds.

Table 8-1. Wet Days of the Critical Period (1993) Identified for Watersheds Affecting Impaired Waterbodies

Watershed	Number of Wet Days in 1993
San Joaquin Hills HSA/Laguna Beach HSA	69
Aliso HSA	69
Dana Point HSA	69
Lower San Juan HSA	76
San Clemente HA	73
San Luis Rey HU	90
San Marcos HA	49
San Dieguito HU	98
Miramar Reservoir HA	94
Scripps HA	57
Tecolote HA	57
Mission San Diego HSA/Santee HSA	86
Chollas HSA	65

Only the model-predicted flows and bacteria densities for wet days were considered in estimating existing mass loads and mass-load based TMDLs. A separate modeling approach was used for assessment of dry weather mass loads (see section 8.2).

8.1.3 Identification of Allowable Wet Weather Exceedance Days

The numeric targets used to calculate the wet weather mass-load based TMDLs is discussed in section 4.1.4. For the calculation of the wet weather mass-load based TMDLs, these numeric targets include a 22 percent allowable exceedance frequency. This exceedance frequency is used to identify the number of allowable exceedance days during the critical period. The allowable exceedance days, or the total number of days that numeric targets may be exceeded based on reference conditions, was calculated for each of the watersheds addressed by these TMDLs. Calculations of the allowable exceedance days for each watershed were performed by multiplying the allowable exceedance frequency (22 percent or 0.22) by the number of wet days for the critical period, as presented in Table 8-1. For example, the number of allowable exceedance days for the Aliso HSA watershed is 22 percent of 69 wet days during the critical period, which is equal to 15 allowable exceedance days during the critical period. The resulting number of allowable exceedance days for each watershed is listed in Table 8-2.

Table 8-2. Allowable Wet Weather Exceedance Days in the Critical Period (1993) for Watersheds Affecting Impaired Waterbodies

Watershed	Number of Allowable Wet Exceedance Days
San Joaquin Hills HSA/Laguna Beach HSA	15
Aliso HSA	15
Dana Point HSA	15
Lower San Juan HSA	17
San Clemente HA	16
San Luis Rey HU	20
San Marcos HA	11
San Dieguito HU	22
Miramar Reservoir HA	21
Scripps HA	13
Tecolote HA	13
Mission San Diego HSA/Santee HSA	19
Chollas HSA	14

8.1.4 Critical Points for Wet Weather Mass-Load Based TMDL Calculation

The existing mass loads and mass-load based TMDLs were calculated for each watershed at a node in the model representing the culmination point at the bottom of the watershed, before intertidal mixing and dilution takes place (or at the downstream end of the impaired creek segment, in the case of Forrester Creek). Since the approach for the wet weather mass load calculation was identical for both impaired beaches and impaired creeks, one critical point was identified for each watershed. The critical point in the wet weather model represents the lowest point in the watershed where creeks and storm drains discharge, and before mixing with the surf zone and dilution takes place. This critical point is considered to be a conservative location for assessment of water quality conditions, and is therefore selected based on high bacteria loads predicted at that location. Although this critical point for water quality assessment is utilized to calculate the bacteria mass loads discharged from the watersheds, compliance with TMDLs in the receiving waters must be assessed and maintained for all segments of a waterbody to ensure that impairments of beneficial uses do not occur. Beneficial uses apply throughout all segments of a waterbody.

8.1.5 Calculation of Wet Weather Mass-Load Based TMDLs

For each modeled subwatershed discharging to an impaired waterbody (subwatersheds and proximity to impaired waterbodies are shown in Appendix E), existing wet weather mass loads were compared to mass-load based TMDLs through the use of load-duration curves. Load-duration curves are bar graphs that rank the modeled flows into percentiles, or groups arranged in increasing orders of magnitude. This allows current estimated bacteria mass loads to be compared to the numeric targets. Load-duration curves for each modeled watershed are provided in Appendix O.

On each load-duration curve, much of the lower range of flow has no associated bacteria mass loads. This is due to model predicted flows or bacterial densities close to zero. Although days were categorized as wet periods based on a criterion associated with rainfall (0.2 inches or more of rainfall and the following 72 hours), some of these days were actually dry in terms of streamflow (some streams may return to baseflow conditions within 72 hours following a rainfall event), leading to poor modeling results. For this reason, bacteria loading during dry weather (low flow) was analyzed with a separate computer model.

For each watershed, load-duration curves were produced for each indicator bacteria showing the daily loads ranked by the percentile of their associated flow magnitude. These plots formed the basis for the existing mass load and mass-load based TMDL calculations as described below.

1. Calculation of allowable mass-load based on REC-1 single sample maximum WQO – daily flows were multiplied by the representative REC-1 single sample maximum WQO to create a "numeric target line" across the load-duration curves;
2. Calculation of daily existing mass loads – daily existing loads (colored bars) for the wet weather days in the critical period (1993) were ranked based on their associated flow percentile; daily loads above the numeric target line are in exceedance of the REC-1 single sample maximum WQO, while loads below the numeric target line do not cause the REC-1 single sample maximum WQO to be exceeded;
3. Calculation of the allowable exceedance mass loads using reference system approach - sum of the highest daily exceedance loads (loads above the numeric target line) corresponding to the number of allowable exceedance days (shown as the blue bar segments above the numeric target line in the load-duration curves). The number of allowable exceedance days was equal to 22 percent of the wet days during the critical period of 1993 for each watershed (see Table 8-2);
4. Calculation of non-allowable exceedance mass loads - sum of the daily loads exceeding the numeric targets minus allowable exceedance loads from Step 3 (shown as the patterned bar segments above the numeric target line); and
5. Calculation of the required annual load reduction - total calculated existing mass load (sum of all the colored bar segments above and below the numeric target line) minus allowable mass loads (sum of bar segments below numeric target line and blue bar segments above numeric target line), equal to the non-allowable exceedance mass loads from Step 4.

The use of load-duration curves to calculate wet weather mass-load based TMDLs is further described in Appendix I.

For the San Diego River wet weather mass-load based TMDLs, the wasteload from the Padre Dam waste water discharge was added to the load calculated from the flow duration curves. The Padre Dam facility discharges effluent pursuant to San Diego Water Board Order No. R9-2003-0179, Waste Discharge Requirements for the discharge of effluent to the San Diego River. These requirements allow the Padre Dam facility to discharge 2.0 million gallons per day of tertiary treated municipal wastewater to the San Diego River. These discharges have bacteria MPN limits for fecal coliform.

According to Order No. R9-2003-0179, the "fecal coliform concentration based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200/100 ml, nor shall more than 10 percent of total samples during any 30-day period exceed 400/100 ml." This is consistent with the REC-1 water quality standard for fecal coliform in the Basin Plan.

At a rate of 2.0 million gallons per day, the associated average permitted yearly discharge of fecal coliform is 5,526 billion MNP per year. Accordingly, the waste load allocation for the Padre Dam facility is 5,526 billion MNP per year. Padre Dam's bacterial discharges do not contribute to the San Diego River bacterial impairment because Padre Dam's effluent is required to meet the REC-1 water quality standard.

In order to distribute this yearly wasteload into the appropriate wet and dry weather allocations, the wet and dry weather days for the 1993 critical period were utilized to apportion the load. In 1993, there were 86 wet days and 279 dry days in the San Diego River Watershed. Therefore, the wet weather WLA is (5,526 billion MNP per year) x (86/365) = 1,302 billion MNP per year. The dry weather WLA is (5,526 billion MNP per year) x (279/365) = 4,224 billion MNP per year, or 461 billion MNP per month.

8.1.6 Allocation of Wet Weather Bacteria Mass Loads to Point and Nonpoint Sources

The mass-load based TMDLs were allocated to point sources and nonpoint sources as follows. Loads generated by urban land uses were classified as point sources because of the likelihood that urban lands are drained by MS4s. Loads generated by rural land uses were classified as nonpoint sources based on the likelihood that MS4s are absent in these areas. Loads generated on undeveloped lands were classified as uncontrollable nonpoint sources based on the likelihood that loads from these lands are from natural and wildlife sources. For each watershed, wasteload allocations (WLAs) were developed for municipal discharges and Caltrans discharges from urban lands.[18] Load allocations (LAs) were developed for controllable nonpoint source discharges that include agricultural land uses (i.e., agriculture, horse ranches, dairies/intensive livestock). Finally, LAs were developed for uncontrollable nonpoint sources from undeveloped lands.

Municipalities and Caltrans own and/or operate the MS4s within the watersheds and are regulated under different NPDES requirements. Therefore, separate WLAs were developed for the municipalities and Caltrans for each watershed. The wet weather WLAs for Caltrans were set equal to existing loads, since discharges from Caltrans were found to account for less than 1 percent of the wet weather load. The rationale and methodology for distributing the WLAs are described in Appendix I.

Nonpoint sources were separated into controllable and uncontrollable categories. Controllable nonpoint sources were identified by land use types and coverages. Controllable sources include those found in the following land-use types: agriculture, dairy/intensive livestock, and horse ranches. These are considered controllable because the activities that generate bacteria pollutant

[18] The dry and wet weather wasteload allocation for discharges from wastewater treatment facilities, also know as publicly owned treatment works (POTWs), is zero. The only exception is Padre Dam whose discharge to the San Diego River is regulated by the San Diego Waterboard and must meet REC-1 permit requirements. Therefore Padre Dam received a wasteload allocation which is based on the effluent limitations of its WDRs, and is included in addition to these TMDLs which are based on urban runoff. Please see section 8.1.5 for further discussion.

loads on these land uses are anthropogenic in nature, and load reductions can be reasonably expected with the implementation of suitable management measures. For implementation purposes, controllable nonpoint source discharges were associated with loads from agriculture, livestock, and horse ranch facilities. Because these loads are controllable, these nonpoint source discharges were given LAs and in watersheds where these loads were greater than 5 percent of the total load, were required to reduce their bacteria loads (see section 10).

In the watersheds addressed by these TMDLs, there are four concentrated animal feeding operations (CAFOs) that are regulated as point source discharges under NPDES requirements.[19] Although technically point sources of bacteria, these facilities are included in the controllable nonpoint source load allocations because the precision of the modeling results, and loading parameters associated with the dairy/intensive livestock land use category is not sufficient to calculate individual WLAs for these facilities. The same is true for other agriculture, livestock, and horse ranch facilities in the watersheds regulated under non-NPDES waste discharge requirements.

Uncontrollable nonpoint sources include loads from open recreation, open space, and water land uses. Loads from these areas are considered uncontrollable because they come from mostly natural sources (e.g. bird and wildlife feces) and the areas are located in parts of the watershed not likely to be drained by MS4 systems. Loads from these sources were quantified and accounted for in the wet weather mass-load based TMDL calculations using the reference system approach. The methodology for calculating the WLAs assigned to point sources and LAs assigned to and nonpoint sources is presented in Appendix I.

8.1.7 Margin of Safety

TMDLs must include a margin of safety (MOS). There are two ways to incorporate the MOS: (1) implicitly incorporate the MOS using conservative model assumptions to develop TMDLs and (2) explicitly specify a portion of the total TMDL as the MOS and use the remainder for allocations (USEPA, 1991). For the wet weather TMDLs, some general assumptions were made regarding overall conditions facilitating bacteria subsistence and growth, and conditions affecting bacteria die-off. These assumptions are conservative in that they are expected to be protective of beneficial uses during extreme conditions. Because of the conservative assumptions that were included in the development of the TMDLs, there was no explicit margin of safety included. Instead, the TMDLs include an implicit margin of safety. The following examples describe the conservative assumptions that constitute the implicit MOS for the wet weather TMDLs.

- *Critical Point for Loading Assessments* - For existing mass load and mass-load based TMDL calculations, the water quality is assessed at a *critical point* or location in each impaired waterbody. For beaches, the critical points for evaluating numeric targets are at

[19] Order No. 2000-163 NPDES No. CA0109053 *Waste Discharge Requirements for Frank J. Konyn, Frank J. Konyn Dairy, San Diego County*, Order No. 2000-18 NPDES No. CA0109011 *Waste Discharge Requirements for Jack and Mark Stiefel Dairy, Riverside County*, Order No. 2000-0206, NPDES No. CA 0109321, *Waste Discharge Requirements for Diamond Valley Dairy, Riverside County*, Order No. 2002-0067 NPDES No.CA0109371 *Waste Discharge Requirements for S&S Farms, Swine Raising Facility, San Diego County*.

the mouths of the watersheds, upstream of any surf zone mixing and dilution. High bacteria loads are predicted at this area. This critical point is therefore a conservative location for assessment of water quality conditions. Because beneficial uses of the beach are to be maintained at all locations, including the discharge point of creeks, the conservative approach was to evaluate numeric targets at those discharge points where bacterial densities are assumed to be greatest. For development of TMDLs for impaired creeks, critical points were also selected at the mouths of the impaired creek segments. This approach provides an implicit margin of safety to ensure protection of the beneficial uses of the beaches and creeks under critical conditions.

- *Wet Weather TMDL Numeric Targets* –Because bacteria in wet weather runoff and streamflows have a quick travel time, and therefore, a short residence time in the waterbodies, the REC-1 single-sample maximum WQOs were determined to be most appropriate for the wet weather TMDLs. The numeric targets used for the wet weather mass-load based and concentration based TMDLs are assumed to be conservative by utilizing the most stringent REC-1 single sample maxmimum WQOs contained in the Ocean Plan and/or Basin Plan.
- *Wet Weather Critical Wet Weather Condition* – The critical wet weather condition was selected based on identification of the wettest year of the 12 years of record (1990 through 2002) included in this technical TMDL analysis. This corresponds to the 92nd percentile of annual rainfalls for those 12 years measured at multiple rainfall gages in the San Diego region. This resulted in selection of 1993 as the critical wet year for assessment of wet weather mass loading conditions. This condition was consistent with studies performed by Southern California Coastal Water Research Project (SCCWRP), where a 90th percentile year was selected based on rainfall data for LAX from 1947 to 2000, also resulting in selection of 1993 as the critical year (Los Angeles Water Board, 2002). Because of the large amount of rainfall, bacteria loads are assumed higher in 1993 than another year with less rainfall.

8.1.8 Seasonality

Through simulation of an entire critical wet year, daily existing wet weather mass loads were estimated for all seasons of that year and compared to mass-load based TMDLs to determine necessary load reductions. Model simulation of a full year accounted for seasonal variations in rainfall, evaporation, and associated impacts on runoff and transport of bacteria loads to receiving waters. Although large storms in the wet season of the critical wet year were associated with large volumes of runoff that transported large bacteria loads, smaller storms during the dry season (April-October) also provided large bacteria loads resulting from wash-off of bacteria that had accumulated on the surface during the preceding extended dry period. For estimating bacteria loads during dry weather conditions, a separate dry weather modeling approach was used.

8.2 Dry Weather Loading Analysis

A low-flow, steady state modeling apporach was used to estimate bacteria mass loads during dry weather conditions. The steady-state aspect of the model resulted in estimation of a constant bacteria mass load from each watershed. This mass load is representative of the average flow and bacteria loading conditions resulting from various urban land use practices (e.g., runoff from lawn irrigation or sidewalk washing). A complete discussion of the dry weather model development, calibration, and validation is provided in Appendix K.

Because dry weather loading was estimated as a function of steady-state flows derived from an analysis of average dry weather flows, there was no critical dry period identified. Dry weather days were selected based on the criterion that less than 0.2 inch of rainfall was observed on each of the previous 3 days. Based on analysis of dry weather flow, critical flows were predicted for each impaired watershed.

8.2.1 Dry WeatherMass Load Estimation

For each watershed, the dry weather model was used to estimate the flows and bacteria densities resulting from dry weather urban runoff. Estimation of source loadings was based on empirical relationships established between both flow and bacteria densities and land use distribution in the watershed. Transport of bacteria loads was simulated using standard plug-flow equations to describe steady-state losses resulting from first-order die-off and stream infiltration. Steady-state estimates of bacteria mass loads were assumed constant for all dry days.

For consistency with the wet weather modeling approach, dry days were assessed for the critical wet year, identified as 1993. The dry days in 1993 (365 days minus the wet days in Table 8-1) for each watershed are listed in Table 8-3.

Table 8-3. Dry Days of the Critical Period (1993) Identified for Watersheds Affecting Impaired Waterbodies

Watershed	Number of Dry Days in 1993
San Joaquin Hills HSA/Laguna Beach HSA	296
Aliso HSA	296
Dana Point HSA	296
LowerSan Juan HSA	289
San Clemente HA	292
San Luis Rey HU	275
San Marcos HA	316
San Dieguito HU	267
Miramar Reservoir HA	271
Scripps HA	308
Tecolote HA	308
Mission San Diego HSA/Santee HSA	279
Chollas HSA	300

8.2.2 Dry Weather Numeric Targets

Dry weather numeric targets consist of the REC-1 30-day geometric mean WQOs and a zero percent allowable exceedance frequency. Since the REC-1 30-day geometric mean WQO is an average bacteria density of 5 samples over 30 days, using the 30-day geometric mean in the numeric target is appropriate for the dry weather analysis because the dry weather model simulates average flows. The dry weather numeric targets are discussed further in section 4.2.

8.2.3 Critical Points for Dry Weather Mass-Load Based TMDL Calculation

Consistent with the approach used for wet weather analysis, the dry weather existing mass loads and mass-load based TMDLs were calculated based on modeled flow and bacteria density at a node in the model, called the *critical point*, which represents the watershed mouth. Since the approach for TMDL calculation was identical for both beaches and creeks, one critical point was identified for each watershed model draining to an impaired waterbody. The critical point in the model represents the lowest point in the watershed where creeks and storm drains discharge, and before mixing with the surf zone and dilution takes place. This critical point is considered to be a conservative location for assessment of water quality conditions, and is therefore selected based on high bacteria loads predicted at that location. Although this critical point for water quality assessment is utilized to calculate the bacteria mass loads discharged from the watersheds, compliance with the TMDLs in the receiving waters must be assessed and maintained for all segments of a waterbody to ensure that impairments of beneficial uses do not occur. Beneficial uses apply throughout all segments of a waterbody.

8.2.4 Calculation of Dry Weather Mass-Load Based TMDLs

For each modeled watershed discharging to an impaired waterbody (see Figures 3-1 and 3-2), calculation of allocations and required load reductions were performed using the following steps:

1. Calculation of the existing mass loads based on model-predicted flows multiplied by applicable model-predicted bacteria densities;
2. Calculation of the mass-load based TMDLs based on model-predicted flows multiplied by applicable numeric targets; and
3. Calculation of required load reductions based on the difference between existing bacteria mass loads from Step 1 and mass-load based TMDLs from Step 2.

For the San Diego River dry weather mass-load based TMDLs, the wasteload from the Padre Dam discharge was added to the model predicted load. The Padre Dam facility discharges effluent pursuant to San Diego Water Board Order No. R9-2003-179, Waste Discharge Requirements for the discharge of effluent to the San Diego River. These requirements allow the Padre Dam facility to discharge 2.0 million gallons per day of tertiary treated municipal wastewater to the San Diego River. These discharges have bacteria MPN limits for fecal coliform.

According to Order No. R9-2003-179, the “fecal coliform concentration based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200/100 ml, nor shall more than 10 percent of total samples during any 30-day period exceed 400/100 ml.” This is consistent with the REC-1 water quality standard for fecal coliform in the San Diego Basin Plan.

At a rate of 2.0 million gallons per day, the associated average permitted yearly discharge of fecal coliform is 5,526 Billion MNP per year. Accordingly, the waste load allocation for the Padre Dam facility is 5,526 Billion MNP per year. Padre Dam’s bacterial discharges do not contribute to the San Diego River bacterial impairment because Padre Dam’s effluent meets the REC-1 water quality standard.

In order to distribute this yearly load into the appropriate dry and wet weather allocations, the dry and wet weather days for the 1993 critical period were utilized in order to determine the ration. In 1993, there were 279 dry days and 86 wet days. Therefore, the dry weather WLA is (5,526 Billion MNP per year) x (279/365) = 4,224 Billion MNP per year. The wet weather WLA is (5,526 Billion MNP per year) x (86/365) = 1,302 Billion MNP per year.

8.2.5 Allocation of Wet Weather Bacteria Mass Loads to Point and Nonpoint Sources

Unlike the wet weather approach, for the dry weather approach, the allocation of the dry weather mass-load based TMDLs assumes that no surface runoff discharge to receiving waters occurs from Caltrans, agricultural, or undeveloped land use categories (i.e., $WLA_{Caltrans} = 0$, $LA_{Agriculture} = 0$, and $LA_{OpenSpace} = 0$), meaning the entire dry weather mass-load based TMDL (i.e., allowable mass load) is allocated to Municipal MS4 land use categories (i.e., $WLA_{MS4} = TMDL$). See Appendix I for methodology used for assigning dry weather WLAs.

8.2.6 Margin of Safety

As with the wet weather TMDLs, conservative assumptions were made during the development of the dry weather TMDLs. These assumptions are conservative in that they are expected to be protective of beneficial uses during extreme condition. Because of the conservative assumptions that were included in the development of the TMDLs, there was no explicit margin of safety included. Instead, the TMDLs include an implicit margin of safety. The following examples describe the conservative assumptions that constitute the implicit MOS for the dry weather TMDLs.

- *Critical Point for Loading Assessments* - For existing mass load and mass-load based TMDL calculations, the water quality is assessed at a *critical point* or location in each impaired waterbody. For beaches, the critical points for evaluating numeric targets are at the mouths of the watersheds, upstream of any surf zone mixing and dilution. High bacteria loads are predicted at this area. This critical point is therefore a conservative location for assessment of water quality conditions. Because beneficial uses of the beach are to be maintained at all locations, including the discharge point of creeks, the conservative approach was to evaluate numeric targets at those discharge points where bacterial densities are assumed to be greatest. For development of TMDLs for impaired creeks, critical points were also selected at the mouths of the impaired creek segments. This approach provides an implicit margin of safety to ensure protection of the beneficial uses of the beaches and creeks under critical conditions.
- *Dry Weather TMDL Numeric Targets* - Because dry weather conditions have flows and bacteria loads much smaller in magnitude than wet weather conditions, do not occur from all land use types, and are more uniform than stormflow, the REC-1 30-day geometric mean WQOs were determined to be most appropriate for the dry weather TMDLs. The numeric targets used for the dry weather mass-load based and concentration based TMDLs are assumed to be conservative by utilizing the most stringent REC-1 30-day geometric mean WQOs contained in the Ocean Plan and/or Basin Plan.

8.2.7 Seasonality

The dry weather approach uses a unique modeling system designed to assess average bacteria loading and TMDLs during dry weather conditions. This approach is distinct from the wet weather approach described in section 8.1.

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9 Total Maximum Daily Loads and Allocations

The TMDL (i.e., loading capacity or allowable load) for a specific pollutant and waterbody combination is the total amount of the pollutant of concern that can be assimilated by the receiving waterbody while still achieving water quality standards under all conditions. In California, water quality standards primarily consist of beneficial uses and the water quality objectives (WQOs) that support those uses.[20]

Quantitative numeric targets were selected for development of the TMDLs (see section 4). Numeric targets are selected to implement existing water quality standards. For these TMDLs, the numeric targets were set equal to the numeric WQOs that support the REC-1 and REC-2 beneficial uses with an allowable exceedance frequency. In other words, when the numeric targets are met, the REC-1 and REC-2 beneficial uses should be restored. Of particular note, however, is that while the TMDLs use numeric targets to interpret water quality standards, *TMDLs are not water quality standards*.

The TMDL is set equal to the sum of individual wasteload allocations (WLAs) for point sources, and load allocations (LAs) for both nonpoint sources and natural background levels. In addition, the TMDL must include a margin of safety (MOS), either implicitly or explicitly, to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. Conceptually, this definition is represented by the equation:

$$\text{TMDL} = \sum \text{WLAs} + \sum \text{LAs} + \text{MOS}$$

In TMDL development, allowable loadings from pollutant sources that cumulatively amount to no more than the TMDL must be established; this provides the basis to establish water quality-based controls. The San Diego Water Board is responsible for incorporating the WLAs and LAs into the enforceable regulatory mechanisms that are available to compel controllable sources to reduce their pollutant loads. Controllable sources are responsible for taking actions to reduce their pollutant loads to meet their assigned WLAs or LAs. When all the regulated controllable sources meet their assigned WLAs and LAs, and the numeric targets (i.e., numeric WQOs and allowable exceedance frequencies) are also met in the receiving waters, compliance with the TMDLs will be achieved.

TMDLs can be expressed as mass per time (i.e., mass-loading basis), or other appropriate measure (e.g., as a concentration).[21] For these TMDLs, the wet weather and dry weather TMDLs are expressed both in terms of concentration and on a mass loading basis. The concentration based TMDLs will be used to determine compliance with the TMDLs in the receiving waters. Mass-load based TMDLs were calculated for the impaired waterbodies in each watershed. The mass-load based TMDLs were allocated to the identified point and nonpoint sources and used to identify the controllable sources that need to reduce their bacteria loads in order for the concentration based TMDLs to be met in the receiving waters. The concentration based TMDLs, mass-load based TMDLs, and allocations are discussed below.

[20] Water quality standards in California also include an anti-degradation policy.
[21] Code of Federal Regulations Title 40 section 130.2(1) [40CFR130.2(1)]

9.1 Concentration Based TMDLs

The wet weather and dry weather concentration based TMDLs are based on meeting the numeric targets (i.e., numeric WQOs and allowable exceedance frequencies) in the receiving waters. The numeric WQOs for REC-1 beneficial uses are the basis of the numeric targets used to calculate the TMDLs, expressed as number of bacteria colonies per volume. An allowable exceedance frequency is included as part of the numeric target to allow for exceedances that may be caused by natural sources, based on a reference system. Tables 9-1 and 9-3 summarize the concentration based TMDLs, which are expressed as numeric objectives and allowable exceedance frequencies in the receiving waters for each watershed, for wet weather and dry weather, respectively. Meeting the concentration based TMDLs in the receiving waters will be used to determine compliance with the TMDLs.

9.2 Mass-Load Based TMDLs

The numeric targets were used to calculate the TMDLs on a mass loading basis under a set of critical conditions. The TMDLs that were calculated in terms of mass loading were used to identify the bacteria loads from controllable sources that need to be reduced in order for the numeric targets to be met in the receiving waters.

On a mass loading basis, TMDLs are defined as the maximum mass of a pollutant the waterbody can receive and still protect the designated beneficial uses. Separate mass-load based TMDLs were calculated for wet weather and dry weather conditions to account for seasonal variations, and because the transport mechanism, flow, and bacteria loads are different between dry and wet weather conditions.

On a mass-loading basis, the TMDLs are expressed as number of bacteria colonies per unit time. In order for bacteria loading to be calculated, both flow rates and bacteria densities must be measured at a point in time and location. When multiplied together, these two parameters result in bacteria mass loading, or the number of bacteria colonies measured per unit time.

$$Bacteria\ Loading = flow\ rate\,(volume / time) \times bacteria\ density(number\ of\ colonies / volume)$$

The wet weather mass-load based TMDLs are expressed as “annual loads” in terms of number of bacteria colonies per year (billion MPN/yr). The dry weather mass-load based TMDLs are expressed as “monthly loads” in terms of number of bacteria colonies per month (billion MPN/mth).

9.3 Summary of Technical Approach for Mass-Load Based TMDL Calculations

Calibrated models were used to simulate flow and bacteria densities. This information was used to calculate the “existing” bacteria mass loads to, and allowable mass loads (i.e., mass-load based TMDLs) for, each impaired segment. The existing mass loads that were calculated represent the worst case flows and bacteria densities that are expected from the watershed during the critical wet year. The mass-load based TMDLs were calculated based on the flows expected during the critical wet year and the numeric targets. Existing mass loads were compared to the mass-load based TMDLs. The difference between the existing mass loads and the mass-load based TMDLs is the load reduction required to meet the numeric targets in the receiving waters.

For each watershed containing an impaired waterbody, existing mass loads and mass-load based TMDLs were calculated at a critical point for both wet weather events and dry weather conditions during a critical wet year. The calculations and technical approaches were different for the two conditions.

9.3.1 Summary of Wet Weather Mass-Load Based TMDL Calculations

For wet weather, TMDLs were calculated, and allocations were divided among point source dischargers and nonpoint source dischargers. The mass-load based TMDLs for wet weather were calculated by applying the reference system approach, which takes into consideration loading of bacteria from natural sources within the watersheds. The numeric targets used to calculate the wet weather mass-load based TMDLs utilized the single sample maximum component of the REC-1 WQOs and a 22 percent allowable exceedance frequency.

Federal regulations require TMDLs to include individual WLAs for each point source.[22] The only wet weather point sources identified to affect impaired waterbodies addressed in this study were MS4s (municipal and Caltrans), although other point sources of bacteria exist (such as concentrated animal feeding operations (CAFOs) or publicly owned treatment works (POTWs)). USEPA's permitting regulations require municipalities to obtain NPDES requirements for all stormwater discharges from MS4s. The existing mass loads estimated from the wet weather modeling approach were solely the result of watershed runoff, not other types of point sources. WLAs were assigned to municipalities and Caltrans. The exception to this is the San Diego River wet weather mass-load based TMDLs where a WLA was assigned to the Padre Dam facility as previously described.

TMDLs must also include LAs for each nonpoint source. LAs were divided into controllable and uncontrollable categories. Controllable sources include discharges from agriculture land uses and were quantified by the agriculture, dairy/intensive livestock, and horse ranches land use categories. Uncontrollable sources include loads from natural sources and, although LAs are presented, no reductions are required.

In general, controllable point and nonpoint sources generating less than 5 percent of the total loads (e.g., Caltrans and/or Agriculture) were assigned wet weather WLAs and LAs equal to their existing loads, resulting in no load reduction requirements. While they are not required to reduce their existing loads, this means, however, that these sources are not allowed to increase their loads over time, and cannot cause exceedances of the numeric WQOs in the receiving waters.

For the wet weather mass-load based TMDLs, the Caltrans WLAs (which generates less than 5 percent of the total load in all watersheds) and Open Space LAs (which are uncontrollable) were set equal to the existing wet weather mass loads, thus load reductions are not required. The

[22] Code of Federal Regulations Title 40 section 130.7 [40 CFR 130.7]

remaining portions of the wet weather mass-load based TMDLs were assigned to Municipal MS4 WLAs and Agriculture LAs. In watersheds where the bacteria load from Agriculture land uses were less than 5 percent of the total existing wet weather load, the wet weather Agriculture LAs were set equal to the existing wet weather load, and no load reductions were required. Required load reductions were calculated for Municipal MS4s to achieve the wet weather Municipal MS4 WLAs, and for Agriculture land uses, in watersheds where the existing wet weather loads for all indicator bacteria were more than 5 percent of total existing wet weather load, to achieve the wet weather Agriculture LAs.

Because the wet weather modeling approach used to calculate the mass-load based TMDLs, WLAs, LAs, and existing wasteloads and loads were based on critical conditions (i.e., worst case loading scenario), the mass loading numbers (i.e., existing mass loads, and mass-load based TMDLs, WLAs, and LAs expressed in terms of billion MPN/year) presented in Tables 9-1 and 9-2a through 9-2c represent conservative mass-load estimates expected to be protective of the beneficial uses under extreme conditions. The mass loading numbers also provide a tool for identifying bacteria sources that need to be controlled and existing bacteria loads that need to be reduced to meet the TMDLs in the receiving waters.

Ultimately, controllable point and nonpoint sources must reduce their anthropogenic loads so the wet weather concentration based TMDLs, which are based on the numeric REC-1 WQOs in the Basin Plan and allowable exceedance frequencies, can be met during wet weather conditions during each year. Meeting the wet weather numeric targets in the discharge and/or receiving water will indicate the wet weather TMDLs, WLAs, and/or LAs have been met.

9.3.2 Summary of Dry Weather Mass-Load Based TMDL Calculations

For dry weather, TMDLs were calculated, and allocations were assigned solely to point source dischargers. Available data show that exceedances of REC-1 WQOs in local reference systems during dry weather conditions are uncommon (see section 4.2). Further, reference systems do not generate significant dry weather bacteria loads because flows are minimal. During dry weather, flow, and hence bacteria loads, are generated by urban runoff, which is not a product of a reference system. The numeric targets used to calculate the dry weather TMDLs utilized the REC-1 geometric mean WQOs and a 0 percent allowable exceedance frequency.

The only dry weather point sources identified to affect impaired waterbodies addressed in this study were MS4s (municipal), although other point sources of bacteria exist (such as CAFOs or POTWs). In the San Diego River watershed, the Padre Dam facility, which has its own NPDES requirements, was also identified as a dry weather point source. USEPA's permitting regulations require municipalities to obtain NPDES requirements for all urban runoff discharges from MS4s. The existing mass loads estimated from the wet weather modeling approach were solely the result of watershed runoff, not other types of point sources. WLAs were assigned to municipalities located in the affected watersheds. Unlike the wet weather approach, dry weather WLAs were not assigned to Caltrans. This is because Caltrans-owned freeway surfaces are not likely to discharge bacteria to receiving waters during dry weather conditions.

Although TMDLs must also include LAs for each nonpoint source, LAs were not developed for controllable sources for dry weather conditions. This is because land uses associated with nonpoint sources are not expected to discharge bacteria to receiving waters during dry weather conditions. Because Caltrans is not assigned a WLA and controllable nonpoint sources are not assigned LAs, discharge of pollutants is not expected, nor allowed, under the dry weather TMDLs.

Because the dry weather modeling approach used to calculate the mass-load based TMDLs, WLAs, LAs, and existing wasteloads and loads were based on critical conditions (i.e., worst case loading scenario), the mass loading numbers (i.e., existing loads, TMDLs, WLAs and LAs expressed in terms of billion MPN/month) presented in Tables 9-3 and 9-4a through 9- represent conservative mass-load estimates expected to be protective of the beneficial uses under extreme conditions. The mass loading numbers also provide a tool for identifying bacteria sources that need to be controlled and existing bacteria loads that need to be reduced to meet the TMDLs in the receiving waters.

Ultimately, controllable point and nonpoint sources must reduce their anthropogenic loads so the dry weather concentration based TMDLs, which are based on the numeric REC-1 WQOs in the Basin Plan and allowable exceedance frequencies, can be met during dry weather conditions during each year. Meeting the dry weather numeric targets in the discharge and/or receiving water will indicate the dry weather TMDLs, WLAs, and/or LAs have been met.

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Table 9-1. Summary of Wet Weather Numeric Targets and Existing and Allowable Indicator Bacteria Loads

Watershed - Impaired Waterbody	**Indicator Bacteria**	**Existing Bacteria Load (Billion MPN/year)**	**Single Sample Maximum Objective** (MPN/100mL)	**Allowable Numeric Objective Load (Billion MPN/year)**	**Total Wet Days in Critical Year**	**Allowable Exceedance Frequency**	**Allowable Wet Exceedance Days in Critical Year**	**Allowable Exceedance Load (Billion MPN/year)**	**TotalAllowable Load [=TMDL] (Billion MPN/year)**
San Joaquin Hills HSA (901.11)	Fecal Coliform	705,015	**400**	16,043				648,591	664,634
and Laguna Hills HSA (901.12)	Total Coliform	8,221,901	**10,000**	401,049	69	**22%**	15	7,044,601	7,445,649
- Pacific Ocean Shoreline	Enterococcus	852,649	**104**	4,175				778,624	782,799
Aliso HSA (901.13)	Fecal Coliform	1,752,096	**400**	84,562				1,494,512	1,579,073
- Pacific Ocean Shoreline - Aliso Creek	Total Coliform	23,210,774	**10,000**	2,109,600	69	**22%**	15	18,081,198	20,190,798
- Aliso Creek mouth	Enterococcus	2,230,206	**104***	22,682				1,929,834	1,952,517
		2,230,206	**61**	13,644				1,937,321	1,950,964
Dana Point HSA (901.14)	Fecal Coliform	403,911	**400**	14,894				362,419	377,313
- Pacific Ocean Shoreline	Total Coliform	6,546,962	**10,000**	372,328	69	**22%**	15	5,659,144	6,031,472
	Enterococcus	501,526	**104**	3,875				458,431	462,306
Lower San Juan HSA (901.27)	Fecal Coliform	15,304,790	**400**	358,410				14,356,423	14,714,833
- Pacific Ocean Shoreline - San Juan Creek	Total Coliform	130,258,863	**10,000**	8,947,114	76	**22%**	17	113,932,076	122,879,189
- San Juan Creek mouth	Enterococcus	12,980,098	**104***	95,357				12,063,781	12,159,138
		12,980,098	**61**	56,119				12,096,327	12,152,446
San Clemente HA (901.30)	Fecal Coliform	1,441,723	**400**	36,481				1,342,450	1,378,931
- Pacific Ocean Shoreline	Total Coliform	16,236,606	**10,000**	911,994	73	**22%**	16	14,235,609	15,147,603
	Enterococcus	1,663,100	**104**	9,491				1,553,696	1,563,187
San Luis Rey HU (903.00)	Fecal Coliform	33,120,012	**400**	640,595				31,803,647	32,444,242
- Pacific Ocean Shoreline	Total Coliform	231,598,677	**10,000**	15,993,384	90	**22%**	20	208,157,151	224,150,535
	Enterococcus	18,439,920	**104**	167,152				17,296,466	17,463,618
San Marcos HA (904.50)	Fecal Coliform	20,886	**400**	1,559				15,665	17,224
- Pacific Ocean Shoreline	Total Coliform	515,278	**10,000**	38,984	49	**22%**	11	386,099	425,083
	Enterococcus	40,558	**104**	406				32,559	32,966
San Dieguito HU (905.00)	Fecal Coliform	21,286,910	**400**	425,968				20,675,680	21,101,649
- Pacific Ocean Shoreline	Total Coliform	163,541,133	**10,000**	10,637,225	98	**22%**	22	149,176,959	159,814,184
	Enterococcus	14,796,210	**104**	113,253				14,193,834	14,307,087
Miramar Reservoir HA (906.10)	Fecal Coliform	10,392	**400**	312				9,943	10,256
- Pacific Ocean Shoreline	Total Coliform	212,986	**10,000**	7,809	94	**22%**	21	202,371	210,180
	Enterococcus	11,564	**104**	81				11,323	11,405

Table 9-1. Summary of Wet Weather Numeric Targets and Existing and Allowable Indicator Bacteria Loads (Cont'd)

Watershed - Impaired Waterbody	**Indicator Bacteria**	**Existing Bacteria Load (Billion MPN/year)**	**Single Sample Maximum Objective** (MPN/100mL)	**Allowable Numeric Objective Load (Billion MPN/year)**	**Total Wet Days in Critical Year**	**Allowable Exceedance Frequency**	**Allowable Wet Exceedance Days in Critical Year**	**Allowable Exceedance Load (Billion MPN/year)**	**TotalAllowable Load [=TMDL] (Billion MPN/year)**
Scripps HA (906.30)	Fecal Coliform	204,057	**400**	10,329	57	**22%**	13	166,578	176,907
- Pacific Ocean Shoreline	Total Coliform	5,029,519	**10,000**	258,228				4,098,745	4,356,973
	Enterococcus	377,839	**104**	2,686				321,347	324,032
Tecolote HA (906.50)	Fecal Coliform	261,966	**400**	25,080	57	**22%**	13	204,241	229,322
- Tecolote Creek	Total Coliform	7,395,789	**10,000**	626,414				5,753,355	6,379,770
	Enterococcus	708,256	**104***	6,522				597,659	604,180
		708,256	**61**	3,825				599,936	603,761
Mission San Diego HSA (907.11) and **Santee HSA** (907.12)	Fecal Coliform	4,932,380	**400**	310,820	86	**22%**	19	4,370,018	4,680,838
- Forrester Creek - San Diego River (lower) - Pacific Ocean Shoreline	Total Coliform	72,757,569	**10,000**	7,752,284				58,352,938	66,105,222
	Enterococcus	7,255,759	**104***	80,899				6,514,309	6,595,208
		7,255,759	**61**	47,479				6,543,487	6,590,966
Chollas HSA (908.22)	Fecal Coliform	603,863	**400**	55,516	65	**22%**	14	464,924	520,440
- Chollas Creek	Total Coliform	15,390,608	**10,000**	1,386,037				11,861,589	13,247,626
	Enterococcus	1,371,972	**104***	15,008				1,138,590	1,153,599
		1,371,972	**61**	9,073				1,143,572	1,152,645

* Total Maximum Daily Load calculated using a Enterococcus numeric target of 61 MPN/mL that is conservatively protective of the REC-1 "designated beach" usage frequency for freshwater creeks and downstream beaches. If the usage frequency of the freshwater creeks can be established as "moderately to lightly used" in the Basin Plan, alternative Total Maximum Daily Loads calculated using an Enterococcus numeric target of 104 MPN/ml may be used.

Existing Bacteria Load = Predicted existing bacteria load discharged from the watershed calculated by the Loading Simulation Program in C++ (LSPC) model using modeled flows and bacteria densities for all wet days during the critical year 1993

Single Sample Maximum Objective = Target bacteria densities based on numeric single sample maximum water quality objectives that are protective of REC-1 beneficial uses
Allowable Numeric Objective Load = Allowable load from the watershed calculated by the LSPC model using modeled flows and the numeric single sample maximum water quality objective bacteria densities for all wet days during the critical year 1993

Total Wet Days in Critical Year = Number of wet days (i.e., rainfall events of 0.2 inches or greater and the following 72 hours) in the critical year 1993 (i.e., wettest year between 1990 and 2002)
Allowable Exceedance Frequency = Assumed to be 22 percent exceedance frequency. In the calculation of the wet weather TMDLs, the San Diego Regional Board chose to apply the 22 percent allowable exceedance frequency as determined for Leo Carillo Beach in Los Angeles County. At the time the wet weather watershed model was developed, the 22 percent exceedance frequency from Los Angeles County was the only reference beach exceedance frequency available. The 22 percent allowable exceedance frequency used to calculate the wet weather TMDLs is justified because the San Diego Region watersheds' exceedance frequencies will likely be close to the value calculated for Leo Carillo Beach, and is consistent with the exceedance frequency that was applied by the Los Angeles Regional Board.
Allowable Wet Exceedance Days = (Total Wet days in Critical Year) X (Allowable Exceedance Frequency)
Allowable Exceedance Load = Sum of exceedance loads from the allowable exceedance days with the highest exceedance loads calculated by the LSPC model using modeled flows and bacteria densities for all wet days during the critical year 1993

Total Allowable Load [i.e. TMDL] = (Allowable Numeric Objective Load) + (Allowable Exceedance Load)

Table 9-2a. Wet Weather Fecal Coliform Bacteria Existing Loads, TMDLs, WLA, LAs Expressed as Annual Loads (Billion MPN/year)

	Total Watershed		Point Sources						Nonpoint Sources					
			Municipal MS4			Caltrans			Agriculture			Open		
Watershed	Existing Load	TMDL*	Existing Load	WLA*	Reduction Required	Existing Load	WLA*	Reduction Required	Existing Load	LA*	Reduction Required	Existing Load	LA*	Reduction Required
San Joaquin Hills/ Laguna Hills HSAs (901.11 and 901.12)	705,015	664,634	77,548	37,167	52.07%	179	179	0.00%	7,346	7,346	0.00%	619,942	619,942	0.00%
Aliso HSA (901.13)	1,752,096	1,579,073	650,092	477,069	26.62%	260	260	0.00%	26,508	26,508	0.00%	1,075,237	1,075,237	0.00%
Dana Point HSA (901.14)	403,911	377,313	179,043	152,446	14.86%	13	13	0.00%	0	0	0.00%	224,854	224,854	0.00%
Lower San Juan HSA (901.27)	15,304,790	14,714,833	1,326,469	1,156,419	12.82%	1,713	1,713	0.00%	3,275,477	2,855,570	12.82%	10,701,131	10,701,131	0.00%
San Clemente HA (901.30)	1,441,723	1,378,931	255,445	192,653	24.58%	335	335	0.00%	366	366	0.00%	1,185,577	1,185,577	0.00%
San Luis Rey HU (903.00)	33,120,012	32,444,242	943,501	914,026	3.12%	1,537	1,537	0.00%	20,687,954	20,041,659	3.12%	11,487,019	11,487,019	0.00%
San Marcos HA (904.50_	20,886	17,224	8,095	6,558	18.98%	8	8	0.00%	11,199	9,073	18.98%	1,585	1,585	0.00%
San Dieguito HU (905.00)	21,286,910	21,101,649	810,008	798,175	1.46%	1,310	1,310	0.00%	11,872,240	11,698,811	1.46%	8,603,352	8,603,352	0.00%
Miramar Reservoir HA (906.10)	10,392	10,256	6,839	6,703	1.99%	0	0	0.00%	0	0	0.00%	3,552	3,552	0.00%
Scripps HA (906.30)	204,057	176,907	128,403	101,253	21.14%	0	0	0.00%	0	0	0.00%	75,654	75,654	0.00%
Tecolote HA (906.5)	261,966	229,322	159,449	126,806	20.47%	553	553	0.00%	0	0	0.00%	101,963	101,963	0.00%
Mission San Diego/ Santee HSAs (907.11 and 907.12)	4,932,380 +1,302**	4,680,838 +1,302*	472,660	221,117	53.22%	1,009	1,009	0.00%	414,721	414,721	0.00%	4,043,991	4,043,991	0.00%
Chollas HSA (908.22)	603,863	520,440	335,901	252,479	24.84%	892	892	0.00%	0	0	0.00%	267,070	267,070	0.00%

* TMDLs, WLAs, and LAs calculated based on numeric targets consisting of the single sample maximum WQO for fecal coliform (400 MPN/100mL) and a 22 percent allowable exceedance frequency. Meeting the numeric targets in the discharge and/or receiving water indicate the TMDLs, WLAs, and/or LAs have been met.

** Permitted existing fecal coliform bacteria load from Padre Dam Municipal Water District Water Reclamation Plant (Padre Dam), assigned as a separate point source wasteload allocation for discharges from Padre Dam equal to the permitted existing load

Watershed Existing Load = Predicted existing fecal coliform bacteria loads discharged from all land use categories in the watershed calculated by the Loading Simulation Program in C++ (LSPC) model using modeled flows and bacteria densities for all wet days during the critical year 1993

Watershed TMDL = Total Maximum Daily Load (TMDL) or total allowable load (Allowable Numeric Objective Load + Allowable Exceedance Load) that can be discharged from all land uses in the watershed on an annual basis

MS4 Existing Load = Predicted exiting fecal coliform bacteria loads discharged from Municipal Separate Storm Sewer System (MS4) land use categories in the watershed (i.e., commercial/institutional, high density residential, low density residential, parks/recreation, military, transitional, and industrial/transportation, not including Caltrans transportation) calculated by the LSPC model

MS4 WLA = Point source wasteload allocation (WLA) for discharges from Municipal MS4 land uses

MS4 Reduction Required = Percent of the MS4 Existing Load that must be reduced to meet the MS4 WLA = (MS4 Existing Load – MS4 WLA)/(MS4 Existing Load)

Caltrans Existing Load = Predicted exiting fecal coliform bacteria loads discharged from Caltrans land use areas in the watershed calculated as a fraction of the discharge from industrial/transportation land use category area

Caltrans WLA = Point source wasteload allocation (WLA) for discharges from Caltrans land uses, assumed to be equal to Caltrans Existing Load

Caltrans Reduction Required = Percent of the Caltrans Existing Load that must be reduced to meet the Caltrans WLA = (Caltrans Existing Load – Caltrans WLA)/(Caltrans Existing Load)

Agriculture Existing Load = Predicted exiting fecal coliform bacteria loads discharged from Agriculture land use categories in the watershed (i.e., agriculture, dairy/livestock, horse ranch) calculated by the LSPC model

Agriculture LA = Non-point source load allocation (LA) for discharges from Agriculture land uses, assumed to be equal to Agriculture Existing Load in watersheds with existing bacteria load contributions for all three indicator bacteria of less than 5 percent; calculated as a relative load percent of the TMDL minus Caltrans WLA and Open Space LA, based on existing load contributions from MS4 and Agriculture land use categories in watersheds with existing bacteria load contributions for all three indicator bacteria of greater than 5 percent

Agriculture Reduction Required = Percent of the Agriculture Existing Load that must be reduced to meet the Agriculture LA = (Agriculture Existing Load – Agriculture LA)/(Agriculture Existing Load)

Open Existing Load = Predicted exiting fecal coliform bacteria loads discharged from Open Space land use categories in the watershed (i.e., open space, open recreation, water) calculated by the LSPC model

Open LA = Non-point source load allocation (LA) for discharges from Open Space land uses, assumed to be equal to the Open Space Existing Load

Open Reduction Required = Percent of the Open Space Existing Load that must be reduced to meet the Open Space LA = (Open Space Existing Load – Open Space LA)/(Open Space Existing Load)

Table 9-2b. Wet Weather Total Coliform Bacteria Existing Loads, TMDLs, WLA, LAs Expressed as Annual Loads (Billion MPN/year)

	Total Watershed		Point Sources						Nonpoint Sources					
			Municipal MS4			Caltrans			Agriculture			Open		
Watershed	**Existing Load**	**TMDL***	**Existing Load**	**WLA***	**Reduction Required**	**Existing Load**	**WLA***	**Reduction Required**	**Existing Load**	**LA***	**Reduction Required**	**Existing Load**	**LA***	**Reduction Required**
San Joaquin Hills/ Laguna Hills HSAs (901.11 and 901.12)	8,221,901	7,445,649	1,656,904	880,652	46.85%	7,722	7,722	0.00%	50,774	50,774	0.00%	6,506,501	6,506,501	0.00%
Aliso HSA (901.13)	23,210,774	20,190,798	11,943,241	8,923,264	25.29%	11,003	11,003	0.00%	179,828	179,828	0.00%	11,076,702	11,076,702	0.00%
Dana Point HSA (901.14)	6,546,962	6,031,472	3,919,497	3,404,008	13.15%	634	634	0.00%	0	0	0.00%	2,626,830	2,626,830	0.00%
Lower San Juan HSA (901.27)	130,258,863	122,879,189	19,919,322	16,093,160	19.21%	60,480	60,480	0.00%	18,499,884	14,946,372	19.21%	91,779,178	91,779,178	0.00%
San Clemente HA (901.30)	16,236,606	15,147,603	4,566,742	3,477,739	23.85%	13,534	13,534	0.00%	2,370	2,370	0.00%	11,653,960	11,653,960	0.00%
San Luis Rey HU (903.00)	231,598,677	224,150,535	15,229,456	14,373,954	5.62%	54,508	54,508	0.00%	117,360,800	110,768,160	5.62%	98,953,913	98,953,913	0.00%
San Marcos HA (904.50_	515,278	425,083	366,021	298,430	18.47%	533	533	0.00%	122,414	99,809	18.47%	26,311	26,311	0.00%
San Dieguito HU (905.00)	163,541,133	159,814,184	17,406,569	16,660,538	4.29%	47,969	47,969	0.00%	69,551,416	66,570,499	4.29%	76,535,178	76,535,178	0.00%
Miramar Reservoir HA (906.10)	212,986	210,180	174,243	171,436	1.61%	9	9	0.00%	0	0	0.00%	38,734	38,734	0.00%
Scripps HA (906.30)	5,029,519	4,356,973	4,120,310	3,447,764	16.32%	0	0	0.00%	0	0	0.00%	909,209	909,209	0.00%
Tecolote HA (906.5)	7,395,789	6,379,770	6,152,484	5,136,598	16.51%	27,095	27,095	0.00%	0	0	0.00%	1,216,077	1,216,077	0.00%
Mission San Diego/ Santee HSAs (907.11 and 907.12)	72,757,569	66,105,222	17,442,867	10,790,520	38.14%	53,141	53,141	0.00%	3,495,960	3,495,960	0.00%	51,765,601	51,765,601	0.00%
Chollas HSA (908.22)	15,390,608	13,247,626	12,023,766	9,880,784	17.82%	45,652	45,652	0.00%	0	0	0.00%	3,321,191	3,321,191	0.00%

* TMDLs, WLAs, and LAs calculated based on numeric targets consisting of the single sample maximum WQO for total coliform (10,000 MPN/100mL) and a 22 percent allowable exceedance frequency. Meeting the numeric targets in the discharge and/or receiving water indicate the TMDLs, WLAs, and/or LAs have been met.

Watershed Existing Load = Predicted existing total coliform bacteria loads discharged from all land use categories in the watershed calculated by the Loading Simulation Program in C++ (LSPC) model using modeled flows and bacteria densities for all wet days during the critical year 1993
Watershed TMDL = Total Maximum Daily Load (TMDL) or total allowable load (Allowable Numeric Objective Load + Allowable Exceedance Load) that can be discharged from all land uses in the watershed on an annual basis

MS4 Existing Load = Predicted exiting total coliform bacteria loads discharged from Municipal Separate Storm Sewer System (MS4) land use categories in the watershed (i.e., commercial/institutional, high density residential, low density residential, parks/recreation, military, transitional, and industrial/transportation, not including Caltrans transportation) calculated by the LSPC model
MS4 WLA = Point source wasteload allocation (WLA) for discharges from Municipal MS4 land uses
MS4 Reduction Required = Percent of the MS4 Existing Load that must be reduced to meet the MS4 WLA = (MS4 Existing Load – MS4 WLA)/(MS4 Existing Load)

Caltrans Existing Load = Predicted exiting total coliform bacteria loads discharged from Caltrans land use areas in the watershed calculated as a fraction of the discharge from industrial/transportation land use category area
Caltrans WLA = Point source wasteload allocation (WLA) for discharges from Caltrans land uses, assumed to be equal to Caltrans Existing Load
Caltrans Reduction Required = Percent of the Caltrans Existing Load that must be reduced to meet the Caltrans WLA = (Caltrans Existing Load – Caltrans WLA)/(Caltrans Existing Load)

Agriculture Existing Load = Predicted exiting total coliform bacteria loads discharged from Agriculture land use categories in the watershed (i.e., agriculture, dairy/livestock, horse ranch) calculated by the LSPC model
Agriculture LA = Non-point source load allocation (LA) for discharges from Agriculture land uses, assumed to be equal to Agriculture Existing Load in watersheds with existing bacteria load contributions for all three indicator bacteria of less than 5 percent; calculated as a relative load percent of the TMDL minus Caltrans WLA and Open Space LA, based on existing load contributions from MS4 and Agriculture land use categories in watersheds with existing bacteria load contributions for all three indicator bacteria of greater than 5 percent
Agriculture Reduction Required = Percent of the Agriculture Existing Load that must be reduced to meet the Agriculture LA = (Agriculture Existing Load – Agriculture LA)/(Agriculture Existing Load)

Open Existing Load = Predicted exiting total coliform bacteria loads discharged from Open Space land use categories in the watershed (i.e., open space, open recreation, water) calculated by the LSPC model
Open LA = Non-point source load allocation (LA) for discharges from Open Space land uses, assumed to be equal to the Open Space Existing Load
Open Reduction Required = Percent of the Open Space Existing Load that must be reduced to meet the Open Space LA = (Open Space Existing Load – Open Space LA)/(Open Space Existing Load)

Table 9-2c. Wet Weather Enterococci Bacteria Existing Loads, TMDLs, WLA, LAs Expressed as Annual Loads (Billion MPN/year)

	Total Watershed		Point Sources						Nonpoint Sources					
			Municipal MS4			Caltrans			Agriculture			Open		
Watershed	Existing Load	TMDL*	Existing Load	WLA*	Reduction Required	Existing Load	WLA*	Reduction Required	Existing Load	LA*	Reduction Required	Existing Load	LA*	Reduction Required
San Joaquin Hills/ Laguna Hills HSAs (901.11 and 901.12)	852,649	782,799	136,267	66,417	51.26%	365	365	0.00%	3,201	3,201	0.00%	712,816	712,816	0.00%
Aliso HSA (901.13)	2,230,206	1,950,964**	1,014,732	735,490	27.52%	516	516	0.00%	11,245	11,245	0.00%	1,203,713	1,203,713	0.00%
Dana Point HSA (901.14)	501,526	462,306	258,747	219,528	15.16%	25	25	0.00%	0	0	0.00%	242,753	242,753	0.00%
Lower San Juan HSA (901.27)	12,980,098	12,152,446**	1,900,520	1,385,094	27.12%	2,823	2,823	0.00%	1,151,266	839,040	27.12%	9,925,490	9,925,490	0.00%
San Clemente HA (901.30)	1,663,100	1,563,187	395,581	295,668	25.26%	635	635	0.00%	148	148	0.00%	1,266,736	1,266,736	0.00%
San Luis Rey HU (903.00)	18,439,920	17,463,618	1,472,296	1,300,235	11.69%	2,397	2,397	0.00%	6,881,755	6,077,514	11.69%	10,083,473	10,083,473	0.00%
San Marcos HA (904.50_	40,558	32,966	29,784	23,771	20.19%	26	26	0.00%	7,825	6,246	20.19%	2,923	2,923	0.00%
San Dieguito HU (905.00)	14,796,210	14,307,087	1,911,170	1,763,603	7.72%	2,288	2,288	0.00%	4,423,566	4,082,010	7.72%	8,459,187	8,459,187	0.00%
Miramar Reservoir HA (906.10)	11,564	11,405	8,269	8,109	1.93%	0	0	0.00%	0	0	0.00%	3,295	3,295	0.00%
Scripps HA (906.30)	377,839	324,032	285,842	232,035	18.82%	0	0	0.00%	0	0	0.00%	91,997	91,997	0.00%
Tecolote HA (906.5)	708,256	603,761**	575,708	471,211	18.15%	1,266	1,266	0.00%	0	0	0.00%	131,284	131,284	0.00%
Mission San Diego/ Santee HSAs (907.11 and 907.12)	7,255,759	6,590,966*	1,555,411	890,617	42.74%	2,430	2,430	0.00%	213,149	213,149	0.00%	5,484,770	5,484,770	0.00%
Chollas HSA (908.22)	1,371,972	1,152,645**	1,022,245	802,918	21.46%	2,062	2,062	0.00%	0	0	0.00%	347,665	347,665	0.00%

* TMDLs, WLAs, and LAs calculated based on numeric targets consisting of the single sample maximum WQO for enterococcus (104 MPN/100mL or 61 MPN/100mL) and a 22 percent allowable exceedance frequency. Meeting the numeric targets in the discharge and/or receiving water indicate the TMDLs, WLAs, and/or LAs have been met.
** Total Maximum Daily Load calculated using a Enterococcus numeric target of 61 MPN/mL that is conservatively protective of the REC-1 "designated beach" usage frequency for freshwater creeks and downstream beaches. If the usage frequency of the ffreshwater creeks can be established as "moderately to lightly used," alternative Total Maximum Daily Loads calculated using an Enterococcus numeric target of 104 MPN/ml presented in Table 9-5 may be used.
Watershed Existing Load = Predicted existing Enterococcus bacteria loads discharged from all land use categories in the watershed calculated by the Loading Simulation Program in C++ (LSPC) model using modeled flows and bacteria densities for all wet days during the critical year 1993
Watershed TMDL = Total Maximum Daily Load (TMDL) or total allowable load (Allowable Numeric Objective Load + Allowable Exceedance Load) that can be discharged from all lan uses in the watershed on an annual basis
MS4 Existing Load = Predicted exiting Enterococcus bacteria loads discharged from Municipal Separate Storm Sewer System (MS4) land use categories in the watershed (i.e., commercial/institutional, high density residential, low density residential, parks/recreation, military, transitional, and industrial/transportation, not including Caltrans transportation) calculated by the LSPC model
MS4 WLA = Point source wasteload allocation (WLA) for discharges from Municipal MS4 land uses
MS4 Reduction Required = Percent of the MS4 Existing Load that must be reduced to meet the MS4 WLA = (MS4 Existing Load – MS4 WLA)/(MS4 Existing Load)
Caltrans Existing Load = Predicted exiting Enterococcus bacteria loads discharged from Caltrans land use areas in the watershed calculated as a fraction of the discharge from industrial/transportation land use category area
Caltrans WLA = Point source wasteload allocation (WLA) for discharges from Caltrans land uses, assumed to be equal to Caltrans Existing Load
Caltrans Reduction Required = Percent of the Caltrans Existing Load that must be reduced to meet the Caltrans WLA = (Caltrans Existing Load – Caltrans WLA)/(Caltrans Existing Load)
Agriculture Existing Load = Predicted exiting Enterococcus bacteria loads discharged from Agriculture land use categories in the watershed (i.e., agriculture, dairy/livestock, horse ranch) calculated by the LSPC model
Agriculture LA = Non-point source load allocation (LA) for discharges from Agriculture land uses, assumed to be equal to Agriculture Existing Load in watersheds with existing bacteria load contributions for all three indicator bacteria of less than 5 percent; calculated as a relative load percent of the TMDL minus Caltrans WLA and Open Space LA, based on existing load contributions from MS4 and Agriculture land use categories in watersheds with existing bacteria load contributions for all three indicator bacteria of greater than 5 percent
Agriculture Reduction Required = Percent of the Agriculture Existing Load that must be reduced to meet the Agriculture LA = (Agriculture Existing Load – Agriculture LA)/(Agriculture Existing Load)
Open Existing Load = Predicted exiting Enterococcus bacteria loads discharged from Open Space land use categories in the watershed (i.e., open space, open recreation, water) calculated by the LSPC model
Open LA = Non-point source load allocation (LA) for discharges from Open Space land uses, assumed to be equal to the Open Space Existing Load
Open Reduction Required = Percent of the Open Space Existing Load that must be reduced to meet the Open Space LA = (Open Space Existing Load – Open Space LA)/(Open Space Existing Load))

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Table 9-3. Summary of Dry Weather Numeric Targets and Existing and Allowable Indicator Bacteria Loads

Watershed - Impaired Waterbody	**Indicator Bacteria**	**Existing Bacteria Load (Billion MPN/mth)**	**30-Day Geometric Mean Objective** (MPN/100mL)	**Allowable Numeric Objective Load (Billion MPN/year)**	**Total Dry Days in Critical Year**	**Allowable Exceedance Frequency**	**Allowable Dry Exceedance Days in Critical Year**	**Allowable Exceedance Load (Billion MPN/mth)**	**TotalAllowable Load [=TMDL] (Billion MPN/mth)**
San Joaquin Hills HSA (901.11)	Fecal Coliform	2,741	**200**	227				0	227
and Laguna Hills HSA (901.12)	Total Coliform	13,791	**1,000**	1,134	296	**0%**	0	0	1,134
- Pacific Ocean Shoreline	Enterococcus	2,321	**35**	40				0	40
Aliso HSA (901.13)	Fecal Coliform	5,470	**200**	242				0	242
- Pacific Ocean Shoreline - Aliso Creek	Total Coliform	26,639	**1,000**	1,208	296	**0%**	0	0	1,208
- Aliso Creek mouth	Enterococcus	4,614	**33***	40				0	40
Dana Point HSA (901.14)	Fecal Coliform	1,851	**200**	92				0	92
- Pacific Ocean Shoreline	Total Coliform	9,315	**1,000**	462	296	**0%**	0	0	462
	Enterococcus	1,567	**35**	16				0	16
Lower San Juan HSA (901.27)	Fecal Coliform	6,455	**200**	1,665				0	1,665
- Pacific Ocean Shoreline - San Juan Creek	Total Coliform	30,846	**1,000**	8,342	289	**0%**	0	0	8,342
- San Juan Creek mouth	Enterococcus	5,433	**33***	275				0	275
San Clemente HA (901.30)	Fecal Coliform	3,327	**200**	192				0	192
- Pacific Ocean Shoreline	Total Coliform	16,743	**1,000**	958	292	**0%**	0	0	958
	Enterococcus	2,817	**35**	33				0	33
San Luis Rey HU (903.00)	Fecal Coliform	1,737	**200**	1,058				0	1,058
- Pacific Ocean Shoreline	Total Coliform	8,549	**1,000**	5,289	275	**0%**	0	0	5,289
	Enterococcus	1,466	**35**	185				0	185
San Marcos HA (904.50)	Fecal Coliform	149	**200**	26				0	26
- Pacific Ocean Shoreline	Total Coliform	751	**1,000**	129	316	**0%**	0	0	129
	Enterococcus	126	**35**	5				0	5
San Dieguito HU (905.00)	Fecal Coliform	1,631	**200**	1,293				0	1,293
- Pacific Ocean Shoreline	Total Coliform	7,555	**1,000**	6,468	267	**0%**	0	0	6,468
	Enterococcus	1,368	**35**	226				0	226
Miramar Reservoir HA (906.10)	Fecal Coliform	205	**200**	7				0	7
- Pacific Ocean Shoreline	Total Coliform	1,030	**1,000**	36	271	**0%**	0	0	36
	Enterococcus	173	**35**	1				0	1

Table 9-3. Summary of Dry Weather Numeric Targets and Existing and Allowable Indicator Bacteria Loads (Cont'd)

Watershed - Impaired Waterbody	**Indicator Bacteria**	**Existing Bacteria Load (Billion MPN/mth)**	**30-Day Geometric Mean Objective** (MPN/100mL)	**Allowable Numeric Objective Load (Billion MPN/year)**	**Total Dry Days in Critical Year**	**Allowable Exceedance Frequency**	**Allowable Dry Exceedance Days in Critical Year**	**Allowable Exceedance Load (Billion MPN/mth)**	**TotalAllowable Load [=TMDL] (Billion MPN/mth)**
Scripps HA (906.30)	Fecal Coliform	3,320	**200**	119				0	119
- Pacific Ocean Shoreline	Total Coliform	16,707	**1,000**	594	308	**0%**	0	0	594
	Enterococcus	2,811	**35**	21				0	21
Tecolote HA (906.50)	Fecal Coliform	4,329	**200**	234				0	234
- Tecolote Creek	Total Coliform	21,349	**1,000**	1,171	308	**0%**	0	0	1,171
	Enterococcus	3,657	**33***	39				0	39
Mission San Diego HSA (907.11)	Fecal Coliform	4,928	**200**	1,506				0	1,506
and Santee HSA (907.12)	Total Coliform	28,988	**1,000**	7,529	279	**0%**	0	0	7,529
- Forrester Creek (lower 1 mile) - San Diego River (lower 6 miles) - Pacific Ocean Shoreline	Enterococcus	4,106	**33***	248				0	248
Chollas HSA (908.22)	Fecal Coliform	5,068	**200**	398				0	398
- Chollas Creek	Total Coliform	25,080	**1,000**	1,991	300	**0%**	0	0	1,991
	Enterococcus	4,283	**33***	66				0	66

* Total Allowable Load [=TMDL] calculated using a Enterococcus numeric target of 33 MPN/mL that is conservatively protective of the REC-1 "designated beach" usage frequency for watersheds with impaired freshwater creeks.

Existing Bacteria Load = Predicted existing bacteria load discharged from the watershed calculated by the plug-flow reactor model using estimated flows and bacteria densities for 30 dry days during the critical year 1993

30-Day Geometric Mean Objective = Target bacteria densities based on numeric 30-day geometric mean water quality objectives that are protective of REC-1 beneficial uses
Allowable Numeric Objective Load = Allowable load from the watershed calculated by the plug-flow reactor model using estimated flows and the numeric 30-day geometric mean water quality objective bacteria densities for 30 dry days during the critical year 1993

Total Dry Days in Critical Year = Number of dry days (i.e., day not including rainfall events of 0.2 inches or greater and the following 72 hours) in the critical year 1993 (i.e., wettest year between 1990 and 2002)
Allowable Exceedance Frequency = Assumed to be zero; data collected from reference systems generally do not show exceedances of REC-1 water quality objectives
Allowable Wet Exceedance Days = (Total Dry Days in Critical Year) X (Allowable Exceedance Frequency)
Allowable Exceedance Load = Sum of exceedance loads from the allowable exceedance days for all dry days during the critical year 1993

Total Allowable Load [i.e. TMDL] = (Allowable Numeric Objective Load) + (Allowable Exceedance Load) for a 30-day period

Table 9-4a. Dry Weather Fecal Coliform Bacteria Existing Loads, TMDLs, WLA, LAs Expressed as Monthly Loads (Billion MPN/month)

Watershed	Total Watershed		Point Sources						Nonpoint Sources					
			Municipal MS4			Caltrans			Agriculture			Open		
	Existing Load	TMDL*	Existing Load	WLA*	Reduction Required	Existing Load	WLA*	Reduction Required	Existing Load	LA*	Reduction Required	Existing Load	LA*	Reduction Required
San Joaquin Hills/ Laguna Hills HSAs (901.11 and 901.12)	2,741	227	2,741	227	91.72%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Aliso HSA (901.13)	5,470	242	5,470	242	95.58%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Dana Point HSA (901.14)	1,851	92	1,851	92	95.03%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Lower San Juan HSA (901.27)	6,455	1,665	6,455	1,665	74.21%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Clemente HA (901.30)	3,327	192	3,327	192	94.23%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Luis Rey HU (903.00)	1,737	1,058	1,737	1,058	39.09%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Marcos HA (904.50_	149	26	149	26	82.55%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Dieguito HU (905.00)	1,631	1,293	1,631	1,293	20.72%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Miramar Reservoir HA (906.10)	205	7	205	7	96.59%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Scripps HA (906.30)	3,320	119	3,320	119	96.42%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Tecolote HA (906.5)	4,329	234	4,329	234	94.59%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Mission San Diego/ Santee HSAs (907.11 and 907.12)	4,928 +461**	1,506 +461*	4,928	1,506	69.44%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Chollas HSA (908.22)	5,068	398	5,068	398	92.15%	0	0	0.00%	0	0	0.00%	0	0	0.00%

* TMDLs, WLAs, and LAs calculated based on numeric targets consisting of the 30-day geometric mean WQO for fecal coliform (200 MPN/100mL) and a 0 percent allowable exceedance frequency. Meeting the numeric targets in the discharge and/or receiving water indicate the TMDLs, WLAs, and/or LAs have been met.

** Permitted existing fecal coliform bacteria load from Padre Dam Municipal Water District Water Reclamation Plant (Padre Dam), assigned as a separate point source wasteload allocation for discharges from Padre Dam equal to the permitted existing load

Watershed Existing Load = Predicted existing fecal coliform bacteria loads discharged from all land use categories in the watershed calculated by a plug-flow reactor model using estimated flows and bacteria densities for 30 dry days during the critical year 1993
Watershed TMDL = Total Maximum Daily Load (TMDL) or total allowable load (Allowable Numeric Objective Load + Allowable Exceedance Load) that can be discharged from all land uses in the watershed for a 30-day period

MS4 Existing Load = Predicted exiting fecal coliform bacteria loads discharged from Municipal Separate Storm Sewer System (MS4) land use categories in the watershed (i.e., commercial/institutional, high density residential, low density residential, parks/recreation, military, transitional, and industrial/transportation, not including Caltrans transportation) calculated by the plug-flow reactor model
MS4 WLA = Point source wasteload allocation (WLA) for discharges from Municipal MS4 land uses
MS4 Reduction Required = Percent of the MS4 Existing Load that must be reduced to meet the MS4 WLA = (MS4 Existing Load – MS4 WLA)/(MS4 Existing Load)

Caltrans Existing Load = Fecal coliform bacteria loads discharged from Caltrans land use areas in the watershed assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Caltrans WLA = Point source wasteload allocation (WLA) for discharges from Caltrans land uses, assumed to be equal to the Caltrans Existing Load
Caltrans Reduction Required = Percent of the Caltrans Existing Load that must be reduced to meet the Caltrans WLA = (Caltrans Existing Load – Caltrans WLA)/(Caltrans Existing Load)

Agriculture Existing Load = Fecal coliform bacteria loads discharged from Agriculture land use categories in the watershed (i.e., agriculture, dairy/livestock, horse ranch) assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Agriculture LA = Non-point source load allocation (LA) for discharges from Agriculture land uses, assumed to be equal to the Open Space Existing Load
Agriculture Reduction Required = Percent of the Agriculture Existing Load that must be reduced to meet the Agriculture LA = (Agriculture Existing Load – Agriculture LA)/(Agriculture Existing Load)

Open Existing Load = Fecal coliform bacteria loads discharged from Open Space land use categories in the watershed (i.e., open space, open recreation, water) assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Open LA = Non-point source load allocation (LA) for discharges from Open Space land uses, assumed to be equal to the Open Space Existing Load
Open Reduction Required = Percent of the Open Space Existing Load that must be reduced to meet the Open Space LA = (Open Space Existing Load – Open Space LA)/(Open Space Existing Load)

Table 9-4b. Dry Weather Total Coliform Bacteria Existing Loads, TMDLs, WLA, LAs Expressed as Monthly Loads (Billion MPN/month)

	Total Watershed		Point Sources						Nonpoint Sources					
			Municipal MS4			Caltrans			Agriculture			Open		
Watershed	Existing Load	TMDL*	Existing Load	WLA*	Reduction Required	Existing Load	WLA*	Reduction Required	Existing Load	LA*	Reduction Required	Existing Load	LA*	Reduction Required
San Joaquin Hills/ Laguna Hills HSAs (901.11 and 901.12)	13,791	1,134	13,791	1,134	91.78%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Aliso HSA (901.13)	26,639	1,208	26,639	1,208	95.47%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Dana Point HSA (901.14)	9,315	462	9,315	462	95.04%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Lower San Juan HSA (901.27)	30,846	8,342	30,846	8,342	72.96%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Clemente HA (901.30)	16,743	958	16,743	958	94.28%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Luis Rey HU (903.00)	8,549	5,289	8,549	5,289	38.13%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Marcos HA (904.50_	751	129	751	129	82.82%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Dieguito HU (905.00)	7,555	6,468	7,555	6,468	14.39%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Miramar Reservoir HA (906.10)	1,030	36	1,030	36	96.50%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Scripps HA (906.30)	16,707	594	16,707	594	96.44%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Tecolote HA (906.5)	21,349	1,171	21,349	1,171	94.51%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Mission San Diego/ Santee HSAs (907.11 and 907.12)	28,988	7,529	28,988	7,529	74.03%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Chollas HSA (908.22)	25,080	1,991	25,080	1,991	92.06%	0	0	0.00%	0	0	0.00%	0	0	0.00%

* TMDLs, WLAs, and LAs calculated based on numeric targets consisting of the 30-day geometric mean WQO for total coliform (1,000 MPN/100mL) and a 0 percent allowable exceedance frequency. Meeting the numeric targets in the discharge and/or receiving water indicate the TMDLs, WLAs, and/or LAs have been met.

Watershed Existing Load = Predicted existing total coliform bacteria loads discharged from all land use categories in the watershed calculated by a plug-flow reactor model using estimated flows and bacteria densities for 30 dry days during the critical year 1993
Watershed TMDL = Total Maximum Daily Load (TMDL) or total allowable load (Allowable Numeric Objective Load + Allowable Exceedance Load) that can be discharged from all land uses in the watershed for a 30-day period

MS4 Existing Load = Predicted exiting total coliform bacteria loads discharged from Municipal Separate Storm Sewer System (MS4) land use categories in the watershed (i.e., commercial/institutional, high density residential, low density residential, parks/recreation, military, transitional, and industrial/transportation, not including Caltrans transportation) calculated by the plug-flow reactor model
MS4 WLA = Point source wasteload allocation (WLA) for discharges from Municipal MS4 land uses
MS4 Reduction Required = Percent of the MS4 Existing Load that must be reduced to meet the MS4 WLA = (MS4 Existing Load – MS4 WLA)/(MS4 Existing Load)

Caltrans Existing Load = Total coliform bacteria loads discharged from Caltrans land use areas in the watershed assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Caltrans WLA = Point source wasteload allocation (WLA) for discharges from Caltrans land uses, assumed to be equal to the Caltrans Existing Load
Caltrans Reduction Required = Percent of the Caltrans Existing Load that must be reduced to meet the Caltrans WLA = (Caltrans Existing Load – Caltrans WLA)/(Caltrans Existing Load)

Agriculture Existing Load = Total coliform bacteria loads discharged from Agriculture land use categories in the watershed (i.e., agriculture, dairy/livestock, horse ranch) assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Agriculture LA = Non-point source load allocation (LA) for discharges from Agriculture land uses, assumed to be equal to the Open Space Existing Load
Agriculture Reduction Required = Percent of the Agriculture Existing Load that must be reduced to meet the Agriculture LA = (Agriculture Existing Load – Agriculture LA)/(Agriculture Existing Load)

Open Existing Load = Total coliform bacteria loads discharged from Open Space land use categories in the watershed (i.e., open space, open recreation, water) assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Open LA = Non-point source load allocation (LA) for discharges from Open Space land uses, assumed to be equal to the Open Space Existing Load
Open Reduction Required = Percent of the Open Space Existing Load that must be reduced to meet the Open Space LA = (Open Space Existing Load – Open Space LA)/(Open Space Existing Load)

Table 9-4c. Dry Weather Enterococci Bacteria Existing Loads, TMDLs, WLA, LAs Expressed as Monthly Loads (Billion MPN/month)

Watershed	Total Watershed		Point Sources						Nonpoint Sources					
			Municipal MS4			Caltrans			Agriculture			Open		
	Existing Load	TMDL*	Existing Load	WLA*	Reduction Required	Existing Load	WLA*	Reduction Required	Existing Load	LA*	Reduction Required	Existing Load	LA*	Reduction Required
San Joaquin Hills/ Laguna Hills HSAs (901.11 and 901.12)	2,321	40	2,321	40	98.28%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Aliso HSA (901.13)	4,614	40**	4,614	40	99.13%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Dana Point HSA (901.14)	1,567	16	1,567	16	98.98%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Lower San Juan HSA (901.27)	5,433	275**	5,433	275	94.94%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Clemente HA (901.30)	2,817	33	2,817	33	98.83%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Luis Rey HU (903.00)	1,466	185	1,466	185	87.38%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Marcos HA (904.50_	126	5	126	5	96.03%	0	0	0.00%	0	0	0.00%	0	0	0.00%
San Dieguito HU (905.00)	1,368	226	1,368	226	83.48%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Miramar Reservoir HA (906.10)	173	1	173	1	99.42%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Scripps HA (906.30)	2,811	21	2,811	21	99.25%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Tecolote HA (906.5)	3,657	39**	3,657	39	98.94%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Mission San Diego/ Santee HSAs (907.11 and 907.12)	4,106	248**	4,106	248	93.96%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Chollas HSA (908.22)	4,283	66**	4,283	66	98.46%	0	0	0.00%	0	0	0.00%	0	0	0.00%

* TMDLs, WLAs, and LAs calculated based on numeric targets consisting of the 30-day geometric mean WQO for enterococcus (35 MPN/100mL or 33 MPN/100mL) and a 0 percent allowable exceedance frequency. Meeting the numeric targets in the discharge and/or receiving water indicate the TMDLs, WLAs, and/or LAs have been met.

** Total Maximum Daily Load calculated using a Enterococcus numeric target of 33 MPN/mL that is conservatively protective of the REC-1 "designated beach" usage frequency for freshwater creeks and downstream beaches.

Watershed Existing Load = Predicted existing Enterococcus bacteria loads discharged from all land use categories in the watershed calculated by a plug-flow reactor model using estimated flows and bacteria densities for 30 dry days during the critical year 1993
Watershed TMDL = Total Maximum Daily Load (TMDL) or total allowable load (Allowable Numeric Objective Load + Allowable Exceedance Load) that can be discharged from all land uses in the watershed for a 30-day period

MS4 Existing Load = Predicted exiting Enterococcus bacteria loads discharged from Municipal Separate Storm Sewer System (MS4) land use categories in the watershed (i.e., commercial/institutional, high density residential, low density residential, parks/recreation, military, transitional, and industrial/transportation, not including Caltrans transportation) calculated by the plug-flow reactor model
MS4 WLA = Point source wasteload allocation (WLA) for discharges from MS4 land uses
MS4 Reduction Required = Percent of the MS4 Existing Load that must be reduced to meet the MS4 WLA = (MS4 Existing Load – MS4 WLA)/(MS4 Existing Load)

Caltrans Existing Load = Enterococcus bacteria loads discharged from Caltrans land use areas in the watershed assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Caltrans WLA = Point source wasteload allocation (WLA) for discharges from Caltrans land uses, assumed to be equal to the Caltrans Existing Load
Caltrans Reduction Required = Percent of the Caltrans Existing Load that must be reduced to meet the Caltrans WLA = (Caltrans Existing Load – Caltrans WLA)/(Caltrans Existing Load)

Agriculture Existing Load = Enterococcus bacteria loads discharged from Agriculture land use categories in the watershed (i.e., agriculture, dairy/livestock, horse ranch) assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Agriculture LA = Non-point source load allocation (LA) for discharges from Agriculture land uses, assumed to be equal to the Open Space Existing Load
Agriculture Reduction Required = Percent of the Agriculture Existing Load that must be reduced to meet the Agriculture LA = (Agriculture Existing Load – Agriculture LA)/(Agriculture Existing Load)

Open Existing Load = Enterococcus bacteria loads discharged from Open Space land use categories in the watershed (i.e., open space, open recreation, water) assumed to be unlikely during dry weather conditions, or zero bacteria load during dry weather
Open LA = Non-point source load allocation (LA) for discharges from Open Space land uses, assumed to be equal to the Open Space Existing Load
Open Reduction Required = Percent of the Open Space Existing Load that must be reduced to meet the Open Space LA = (Open Space Existing Load – Open Space LA)/(Open Space Existing Load)

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9.3.3 Alternative Enterococci Wet Weather TMDLs for Impaired Creeks and Downstream Beaches

As mentioned in section 4, there are different enterococci REC-1 WQOs in the Ocean Plan compared to the Basin Plan. Specifically, the Ocean Plan contains REC-1 single sample maximum and 30-day geometric mean WQOs that apply only to ocean waters. In the Basin Plan, the REC-1 WQOs for enterococci are dependent upon the type (e.g., freshwater or saltwater) and usage frequency (e.g., designated beach, moderately or lightly used area, or infrequently used area) of the waterbody. The enterococci REC-1 WQOs in the Basin Plan only apply to inland surface waters, enclosed bays and estuaries, and coastal lagoons. The enterococci saltwater REC-1 WQOs in the Basin Plan, for waters designated with "designated beach" usage frequency, are the same as the enterococci REC-1 WQOs in the Ocean Plan.

Of the saltwater and various freshwater enterococci REC-1 WQOs in the Basin Plan, the most stringent is the freshwater REC-1 WQO for the "designated beach" frequency of use (61 MPN/100mL). Therefore, as a conservative approach, the freshwater designated beach REC-1 WQO was used as basis for the numeric targets for the enterococci wet weather TMDLs for six impaired creeks (San Juan Creek, Aliso Creek, Tecolote Creek, Forrester Creek and the (lower) San Diego River, and Chollas Creek) and their associated downstream beaches (see Tables 4-2 and 4-3), as applicable.

In comments, the municipal dischargers pointed out that, for the impaired creeks, the "designated beach" usage frequency REC-1 WQO for enterococci may be over-protective of water quality because of the infrequent recreational use in the impaired creeks. They claim that the recreational usage frequency in these creeks more likely corresponds to the "moderately to lightly used area" category in the Basin Plan, which has an enterococci REC-1 WQO of 108 MPN/100mL. In these cases, using a less stringent numeric target, based on the saltwater enterococci REC-1 WQO of 104 MPN/100 mL ("designated beaches" usage frequency) would result in wet weather TMDLs protective of REC-1 uses in the inland freshwater creeks and at the downstream coastal saltwater beaches.[23] Therefore, if the "moderately to lightly used area" usage frequency is appropriate for the six impaired creeks, and the enterococci saltwater REC-1 single sample maximum WQO of 104 MPN/100 mL could be used as the basis of the numeric target for the enterococci wet weather TMDLs.

The six creeks included in these TMDLs, however, have not been designated in the Basin Plan as "moderately to lightly used area" waterbodies as of the adoption of these TMDLs. If the Basin Plan does not specify the usage frequency of a waterbody, the most stringent and conservative WQOs are appropriate and applicable. For enterococci, the most stringent and conservative WQOs for the freshwater creeks are associated with the "designated beach" usage frequency and freshwater waterbody type. Thus, the enterococci WQOs associated with the freshwater

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[23] The enterococci WQOs in the Basin Plan are structured to reflect the frequency of recreational use. The enterococci freshwater WQO for a "designated beach" area is 61 MPN/100 mL. For a "moderately or lightly used area," the WQO is 108 MPN/100 mL. The saltwater WQO for "designated beach" area is 104 MPN/100 mL. Where the "moderately or lightly used area" designation is appropriate for creeks, the saltwater WQO of 104 MPN/100 mL could be used as the numeric target because it is also protective of both the freshwater creek and the downstream marine beach.

"designated beach" usage frequency are applicable until sufficient evidence is provided to warrant an amendment to the Basin Plan that designates a lower usage frequency to one or more of the six creeks addressed by these TMDLs (San Juan Creek, Aliso Creek, Tecolote Creek, Forrester Creek, San Diego River, and Chollas Creek).

According to the federal regulations,[24] usage frequencies are defined as follows:

- Designated Beach Area: those recreation waters that, during the recreation season, are heavily used (based upon a comparison of use within the state) and may have a lifeguard, bathhouse facilities, or public parking for beach access. States may include any other waters in this category even if the waters do not meet these criteria.

- Moderate Full Body Contact Recreation: those recreation waters that are not designated bathing beach waters but typically, during the recreation season, are used by at least half of the number of people as at typical designated bathing beach waters within the state. States may also include light use or infrequent use coastal recreation waters in this category.

- Lightly Used Full Body Contact Recreation: those recreation waters that are not designated bathing beach waters but typically, during the recreation season, are used by less than half of the number of people as at typical designated bathing beach waters within the state, but are more than infrequently used. States may also include infrequent use coastal recreation waters in this category.

- Infrequently Used Full Body Contact: those recreation waters that are rarely or occasionally used.

If sufficient evidence can be provided to the San Diego Water Board that can demonstrate the usage frequency for one or more of the six impaired creeks falls under the "Lightly Used Full Body Contact Recreation" or "Infrequently Used Full Body Contact" usage frequency, the Basin Plan may be amended to designate one or more of the creeks with the "moderately to lightly used area" usage frequency.

If one or more of the six creeks (San Juan Creek, Aliso Creek, Tecolote Creek, Forrester Creek, San Diego River, and/or Chollas Creek) are designated in the Basin Plan with the "moderately to lightly used area" usage frequency, the enterococci wet weather TMDLs, WLAs, and LAs based on the 104 MPN/100mL (see Table 9-1 and Table 9-5) will be implemented. Otherwise, the more stringent enterococci wet weather TMDLs, WLAs, and LAs based on the freshwater "designated beach" usage frequency WQO of 61 MPN/100mL (see Table 9-1 and Table 9-2c) will be implemented.

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[24] Code of Federal Regulations Title 40 section 131.41 [40CFR131.41]

Table 9-5. Alternative Wet Weather Enterococci Bacteria Existing Loads, TMDLs, WLA, LAs Expressed as Annual Loads (Billion MPN/year)

Watershed	Total Watershed		Point Sources						Nonpoint Sources					
			Municipal MS4			Caltrans			Agriculture			Open		
	Existing Load	TMDL*	Existing Load	WLA*	Reduction Required	Existing Load	WLA*	Reduction Required	Existing Load	LA*	Reduction Required	Existing Load	LA*	Reduction Required
Aliso HSA (901.13)	2,230,206	1,952,517**	1,014,732	737,042	27.37%	516	516	0.00%	11,245	11,245	0.00%	1,203,713	1,203,713	0.00%
Lower San Juan HSA (901.27)	12,980,098	12,159,138**	1,900,520	1,389,261	26.90%	2,823	2,823	0.00%	1,151,266	841,564	26.90%	9,925,490	9,925,490	0.00%
Tecolote HA (906.50)	708,256	604,180**	575,708	471,630	18.08%	1,266	1,266	0.00%	0	0	0.00%	131,284	131,284	0.00%
Mission San Diego/ Santee HSAs (907.11 and 907.12)	7,255,759	6,595,208**	1,555,411	894,859	42.47%	2,430	2,430	0.00%	213,149	213,149	0.00%	5,484,770	5,484,770	0.00%
Chollas HSA (908.22)	1,371,972	1,153,599**	1,022,245	803,871	21.36%	2,062	2,062	0.00%	0	0	0.00%	347,665	347,665	0.00%

* TMDLs, WLAs, and LAs calculated based on numeric targets consisting of the single sample maximum WQO for enterococcus (104 MPN/100mL) and a 22 percent allowable exceedance frequency. Meeting the numeric targets in the discharge and/or receiving water indicate the TMDLs, WLAs, and/or LAs have been met.

** Total Maximum Daily Load calculated using a Enterococcus numeric target of 104 MPN/ml protective of the REC-1 "moderately to lightly used area" usage frequency that is protective freshwater creeks and downstream beaches. Acceptable evidence that impaired freshwater creeks can be considered "moderately to lightly used areas" must be provided before these alternative wet weather TMDLs, WLAs, and LAs can be implemented in these watersheds.

Watershed Existing Load Predicted existing Enterococcus bacteria loads discharged from all land use categories in the watershed calculated by the Loading Simulation Program in C++ (LSPC) model using modeled flows and bacteria densities for all wet days during the critical year 1993
Watershed TMDL = Total Maximum Daily Load (TMDL) or total allowable load (Allowable Numeric Objective Load + Allowable Exceedance Load) that can be discharged from all land uses in the watershed on an annual basis

MS4 Existing Load = Predicted exiting Enterococcus bacteria loads discharged from Municipal Separate Storm Sewer System (MS4) land use categories in the watershed (i.e., commercial/institutional, high density residential, low density residential, parks/recreation, military, transitional, and industrial/transportation, not including Caltrans transportation) calculated by the LSPC model
MS4 WLA = Point source wasteload allocation (WLA) for discharges from Municipal MS4 land uses
MS4 Reduction Required = Percent of the MS4 Existing Load that must be reduced to meet the MS4 WLA = (MS4 Existing Load – MS4 WLA)/(MS4 Existing Load)

Caltrans Existing Load = = Predicted exiting Enterococcus bacteria loads discharged from Caltrans land use areas in the watershed calculated as a fraction of the discharge from industrial/transportation land use category area
Caltrans WLA = Point source wasteload allocation (WLA) for discharges from Caltrans land uses, assumed to be equal to Caltrans Existing Load
Caltrans Reduction Required = Percent of the Caltrans Existing Load that must be reduced to meet the Caltrans WLA = (Caltrans Existing Load – Caltrans WLA)/(Caltrans Existing Load)

Agriculture Existing Load = Predicted exiting Enterococcus bacteria loads discharged from Agriculture land use categories in the watershed (i.e., agriculture, dairy/livestock, horse ranch) calculated by the LSPC model
Agriculture LA = Non-point source load allocation (LA) for discharges from Agriculture land uses, assumed to be equal to Agriculture Existing Load in watersheds with existing bacteria load contributions for all three indicator bacteria of less than 5 percent; calculated as a relative load percent of the TMDL minus Caltrans WLA and Open Space LA, based on existing load contributions from MS4 and Agriculture land use categories in watersheds with existing bacteria load contributions for all three indicator bacteria of greater than 5 percent
Agriculture Reduction Required = Percent of the Agriculture Existing Load that must be reduced to meet the Agriculture LA = (Agriculture Existing Load – Agriculture LA)/(Agriculture Existing Load)

Open Existing Load = Predicted exiting Enterococcus bacteria loads discharged from Open Space land use categories in the watershed (i.e., open space, open recreation, water) calculated by the LSPC model
Open LA = Non-point source load allocation (LA) for discharges from Open Space land uses, assumed to be equal to the Open Space Existing Load
Open Reduction Required = Percent of the Open Space Existing Load that must be reduced to meet the Open Space LA = (Open Space Existing Load – Open Space LA)/(Open Space Existing Load)

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10 LEGAL AUTHORITY FOR TMDL IMPLEMENTATION PLAN

This section presents the legal authority and regulatory framework used as a basis for assigning responsibilities to dischargers to implement and monitor compliance with the requirements set forth in these TMDLs. The laws and policies governing point source[25] and nonpoint source discharges are described below. A large portion of the bacteria loads generated in the watersheds and discharged to beaches and creeks comes from natural, nonanthropogenic sources. These nonpoint sources are considered largely uncontrollable and therefore cannot be regulated.

Discharger accountability for attaining bacteria allocations is established in this section. The legal authority and regulatory framework is described in terms of the following:

- Controllable water quality factors;
- Regulatory framework;
- Persons accountable for point source discharges; and
- Persons accountable for controllable nonpoint source discharges.

10.1 Controllable Water Quality Factors

The source analysis (section 6) found that the vast majority of bacteria are transported to impaired beaches and creeks through wet and dry weather runoff generated from human habitation and land use practices. Much of these bacteria discharges result from controllable water quality factors which are defined as those actions, conditions, or circumstances resulting from man's activities that may influence the quality of the waters of the state and that may be reasonably controlled. These TMDLs establish wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources for these controllable discharges.

10.2 Regulatory Framework

The regulatory framework for point sources of pollution differs from the regulatory framework for nonpoint sources. The different regulatory frameworks are described in the subsections below.

10.2.1 Point Sources

Clean Water Act section 402 establishes the National Pollutant Discharge Elimination System (NPDES) program to regulate the ''discharge of a pollutant,'' other than dredged or fill materials, from a ''point source'' into ''waters of the U.S." Under section 402, discharges of pollutants to waters of the U.S. are authorized by obtaining and complying with NPDES permits.

In California, state Waste Discharge Requirements (WDRs) for discharges of pollutants from point sources to navigable waters of the United States that implement federal NPDES regulations and CWA requirements serve in lieu of federal NPDES permits. These are referred to as NPDES

[25] The term ''point source'' is defined in CWA section 502(6) to mean any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture.

requirements. Such requirements are issued by the State pursuant to independent state authority described in California's Porter Cologne Water Quality Control Act[26] (not authority delegated by the USEPA or derived from the CWA).

Because point sources identified as discharing bacteria were largely determined to be from storm water and non-storm water runoff discharged from MS4s (Municipal and Caltrans), the primary mechanism for TMDL attainment will be regulation of these discharges with WDRs that implement NPDES requirements. Mechanisms to impose regulations on these discharges are discussed in the Implementation Plan, section 11.

10.2.2 Nonpoint Sources

While laws mandating control of point source discharges are contained in the federal CWA's NPDES regulations, direct control of nonpoint source pollution is left to state programs developed under state law. LAs for nonpoint sources sources are not directly enforceable under the Clean Water Act and are only enforceable to the extent they are made so by state laws and regulations. The Porter-Cologne Water Quality Control Act applies to both point and nonpoint sources of pollution and serves as the principle legal authority in California for the regulation of discharges from controllable nonpoint sources.

Although the majority of bacteria reductions in these TMDLs will take place by regulation of point source discharges, in some watersheds controllable wet weather nonpoint sources have been identified as potentially significant sources of bacteria. Controllable nonpoint sources that warrant regulation include, for example, runoff from agricultural facilities, nurseries, dairy/intensive livestock operations, horse ranches, and manure composting and soil amendment operations not regulated under NPDES requirements, and septic systems. Land uses associated with these practices comprise a significant area in the Lower San Juan HSA, San Luis Rey HU, San Marcos HA, and San Dieguito HA watersheds. Wet weather bacteria loads generated from these land uses in these watersheds comprise more than 5 percent of the total wet weather bacteria load. Nonpoint source discharges from natural sources (bacteria deposition from aquatic and terrestrial wildlife, and bacteria bound in soil, humic material, etc.) are considered largely uncontrollable, and therefore cannot be regulated. The State policy pertaining to regulation of nonpoint sources of pollution in California is provided in the *Plan for California's Nonpoint Source Pollution Control Plan* (NPS Program Plan; State Water Board, 2000) and the *Policy for the Implementation and Enforcement of the Nonpoint Source Pollution Control Program* (NPS Implementation and Enforcement Policy; State Water Board, 2004).

The primary objective of the NPS Program Plan is to reduce and prevent nonpoint source pollution so that the waters of California support a diversity of biological, educational, recreational, and other beneficial uses. Towards this end, the NPS Program Plan focuses on implementation of 61 management measures[27] (MMs) and related management practices[28] (MPs)

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[26] Division 7 of the Water Code, commencing with section 13000

[27] MMs serve as general goals for the control and prevention of nonpoint source polluted runoff.

[28] MPs are the implementation actions taken by nonpoint source dischargers to achieve the management measure goals. The USEPA and the SWRCB have dropped the word 'best' when describing the implementation actions taken by nonpoint source dischargers to control NPS pollution because "best" is considered too subjective. The

in six land use categories by the year 2013.[29]

The success of the NPS Program Plan depends upon individual discharger implementation of MPs. Pollutants can be effectively reduced in nonpoint source discharges by the application of a combination of pollution prevention,[30] source control, and treatment control MPs. Source control MPs (both structural and non-structural) minimize the contact between pollutants and flows (e.g., rerouting run-off around pollutant sources or keeping pollutants on-site and out of receiving waters). Treatment control (or structural) MPs remove pollutants from NPS discharges. MPs can be applied before, during, and after pollution producing activities to reduce or eliminate the introduction of pollutants into receiving waters.

- The NPS Implementation and Enforcement Policy provides guidance on the statutory and regulatory authorities of the State Water Board and the San Diego Water Board to prevent and control nonpoint source pollution.

10.3 Persons Responsible for Point Source Discharges

Persons identified as responsible for point source discharges of bacteria include the following:

- municipal Phase I urban runoff dischargers (Phase I MS4s),
- municipal Phase II urban runoff dischargers (Phase II MS4s),
- Caltrans,
- publicly owned treatment works (POTWs) and waste water collection systems, and
- concentrated animal feeding operations (CAFOs) of a certain size that subject them to regulation underNPDES requirements.

Caltrans and the Municipal MS4s have been assigned WLAs, as shown in Tables 9-2a through 9-2c and 9-4a through 9-4c. These point sources are regulated under WDRs that implement NPDES requirements. The Padre Dam POTW, which is regulated under WDRs that implement NPDES requirement, has been assigned a fecal coliform TMDL based on its NPDES requirements (see Tables 9-2a and 9-4a). CAFOs that are regulated under NPDES requirements have not been assigned a WLA. Any point source that has not been assigned a WLA or has a WLA of zero is not allowed to discharge a pollutant load as part of the TMDL.

10.4 Persons Responsible for Controllable Nonpoint Source Discharges

Controllable nonpoint source discharges are present in most watersheds, however, in only four watersheds do these dischargers account for more than 5 percent of the total wet weather load for

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"best" management practice in one area or situation might be entirely inappropriate in another area or situation. In this document the term "best management practices (BMPs)" is used exclusively in reference to schedules of activities, prohibitions of practices, maintenance procedures, and other management practices taken by NPDES dischargers.

[29] MMs are identified in Volume II of the *Plan for California's Nonpoint Source Pollution Control Program* (NPS Program Plan) 1999 Program Plan: *California's Management Measures for Polluted Runoff* (CAMMPR) (http://www.waterboards.ca.gov/nps/cammpr.html).

[30] Pollution prevention, the initial reduction/elimination of pollutant generation at its source should be used in conjunction with source control and treatment control MPs. Pollutants that are never generated do not have to be controlled or treated.

all three indicator bacteria. These watersheds are the Lower San Juan HSA, San Luis Rey HU, San Marcos HA, and San Dieguito HA watersheds.

The persons identified as responsible for controllable nonpoint source bacteria discharges in these watershed include the owners and operators of the following:

- agriculture facilities (including nurseries),
- dairy/intensive livestock facilities,
- horse ranches,
- manure composting and soil amendment operations not regulated by NPDES requirements, and
- individual septic systems.

Agriculture land uses (i.e., agriculture facilities, dairy/intensive livestock facilities, and horse ranches) are controllable nonpoint sources that have been assigned LAs, as shown in Tables 9-2a through 9-2c and 9-4a through 9-4c. Controllable nonpoint sources will be regulated via individual or general WDRs, conditional waivers of WDRs, or Basin Plan discharge prohibitions as mandated by California's NPS Implementation and Enforcement Policy. Any controllable nonpoint source that has not been assigned a LA or has a LA of zero is not allowed to discharge a pollutant load as part of the TMDL.

11 IMPLEMENTATION PLAN

The ultimate goal of the Implementation Plan is to restore the impaired beneficial uses of the waterbodies addressed by these TMDLs. Restoring the impaired beneficial uses will be accomplished by achieving the TMDLs in the receiving waters, and the wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources. This section describes the actions necessary to implement the TMDLs to restore the recreational beneficial uses in the bacteria impaired beaches and creeks.

TMDLs are not self-implementing or directly enforceable for sources in the watershed. Instead, TMDLs must be implemented through the programs or authorities of the San Diego Water Board and/or other entities to compel dischargers responsible for controllable sources to achieve the pollutant load reductions identified by a TMDL analysis to restore and protect the designated beneficial uses of a waterbody. Federal regulations require TMDLs to be incorporated into the Basin Plan.[31] Because TMDLs must be incorporated into the Basin Plan, and are developed to implement previously established water quality standards (i.e., beneficial uses and WQOs), state statute requires the Basin Plan amendment to include a program of implementation (or Implementation Plan) for achieving water quality objectives.[32]

11.1 Regulatory Authority for Implementation Plans

TMDL implementation plans are not currently required under federal law; however, federal policy is that TMDLs should include implementation plans. The USEPA is authorized to require implementation plans for TMDLs.[33] USEPA regulations implementing Clean Water Act section 303 do not currently require states to include implementation plans for TMDLs but are likely to be revised in the future. USEPA regulations require states to incorporate TMDLs in the State Water Quality Management Plans (Basin Plans) along with adequate implementation measures to implement all aspects of the plan.[34] USEPA policy is that states must include implementation plans as an element of TMDL Basin Plan amendments submitted to USEPA for approval.[35]

TMDL implementation plans are required under State law. Basin plans must have a program of implementation to achieve WQOs.[36] The implementation plan must include a description of actions that are necessary to achieve the objectives, a time schedule for these actions, and a description of surveillance to determine compliance with the WQOs.[37] State law requires that a TMDL include an implementation plan since a TMDL supplements, interprets, and/or refines existing water quality objectives. The TMDLs, LAs, and WLAs must be incorporated into the Basin Plan.[38]

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[31] Code of Federal Regulations Title 40 section 130.6(c)(1)
[32] Water Code section 13242
[33] Code of Federal Regulations Title 40 section 130 [40CFR130]
[34] Code of Federal Regulations Title 40 section 130.6 [40CFR130.6]
[35] See *Guidance for Developing TMDLs in California,* USEPA Region 9, (January 7, 2000).
[36] See Water Code section 13050(j). A “Water Quality Control Plan” or “Basin Plan” consists of a designation or establishment for the waters within a specified area of all of the following: (1) Beneficial uses to be protected, (2) Water quality objectives and (3) A program of implementation needed for achieving water quality objectives.
[37] See Water Code section 13242.
[38] See Clean Water Act section 303(e).

11.2 San Diego Water Board Actions

This section describes the actions that the San Diego Water Board will take to implement the TMDLs. The San Diego Water Board uses its authorities and programs to regulate discharges from the controllable sources in the Region. The controllable sources that are subject to regulation are, in turn, responsible for complying with the requirements issued by the San Diego Water Board. Ultimately, the dischargers subject to regulation are responsible for reducing their pollutant loads in order for the TMDLs, WLAs, and LAs to be achieved. When all discharges from controllable sources meet their assigned WLAs and LAs, and the numeric targets are met in the receiving waters, the beneficial uses should be restored and compliance with the TMDLs will be achieved.

The authorities that are available to the San Diego Water Board to regulate dischargers are given under the Porter-Cologne Water Quality Control Act (Division 7 of the Water Code). The available regulatory authorities include incorporating discharge prohibitions in to the Basin Plan,[39] issuing individual or general WDRs,[40] or issuing individual or general conditional waivers of WDRs.[41] The San Diego Water Board has the authority to enforce Basin Plan prohibitions, WDRs, or conditional waivers of WDRs through the issuance of enforcements actions (e.g., time schedule orders, cleanup and abatement orders, cease and desist orders, administrative civil liabilities).[42] The San Diego Water Board also has the authority to require monitoring and/or technical reports from dischargers,[43] which may be used to support the development, refinement, and/or implementation of TMDLs, WLAs, and/or LAs.

The actions taken by the San Diego Water Board depends on the regulatory authority and the source. The regulatory authorities and actions that the San Diego Water Board will use to implement these TMDLs are as follows.

11.2.1 Basin Plan Waste Discharge Prohibitions

The San Diego Water Board may specify certain conditions or areas where the discharge of waste, or certain types of waste is not permitted, known as "waste discharge prohibitions," in the Basin Plan.[44] Waste discharge prohibitions can apply to any controllable sources, including point sources and nonpoint sources discharged to ground or surface waters. The waste discharge prohibitions for the San Diego Region are listed in Chapter 4 (Implementation) of the Basin Plan, under the heading "Waste Discharge Prohibitions." Basin Plan waste discharge prohibitions that are applicable to the implementation of these TMDLs include the following:

- The discharge of waste to waters of the state in a manner causing, or threatening to cause a condition of pollution, contamination or nuisance as defined in Water Code section 13050, is prohibited.

[39] Pursuant to Water Code section 13243
[40] Pursuant to Water Code section 13263 and 13264
[41] Pursuant to Water Code section 13269
[42] Pursuant to Water Code sections 13301-13304, 13308, 13350, 13385 and/or 13399
[43] Pursuant to Water Code sections 13225, 13267, and/or 13383
[44] Authorized pursuant to Water Code section 13243

- The discharge of waste to inland surface waters, except in cases where the quality of the discharge complies with applicable receiving water quality objectives, is prohibited. Allowances for dilution may be made at the discretion of the Regional Board. Consideration would include streamflow data, the degree of treatment provided and safety measures to ensure reliability of facility performance. As an example, discharge of secondary effluent would probably be permitted if streamflow provided 100:1 dilution capability.

- The dumping, deposition, or discharge of waste directly into waters of the state, or adjacent to such waters in any manner which may permit its being transported into the waters, is prohibited unless authorized by the Regional Board.

- Any discharge to a storm water conveyance system that is not composed entirely of "storm water" is prohibited unless authorized by the Regional Board. [The federal regulations, 40 CFR 122.26(b)(13), define storm water as storm water runoff, snow melt runoff, and surface runoff and drainage. 40 CFR 122.26(b)(2) defines an illicit discharge as any discharge to a storm water conveyance system that is not composed entirely of storm water except discharges pursuant to a NPDES permit and discharges resulting from fire fighting activities.] [Section 122.26 amended at 56 FR 56553, November 5, 1991; 57 FR 11412, April 2, 1992].

- The unauthorized discharge of treated or untreated sewage to waters of the state or to a storm water conveyance system is prohibited.

Existing discharges are violating one or more of these of these Basin Plan prohibitions. The existing Basin Plan prohibitions are consistent with the TMDLs, WLAs, and LAs. If necessary, the San Diego Water Board may amend the Basin Plan to revise current waste discharge prohibitions or include new waste discharge prohibitions. The controllable sources must comply with the Basin Plan waste discharge prohibitions.

11.2.2 Waste Discharge Requirements

The primary regulatory authority used by the San Diego Water Board to protect water resources and water quality in the San Diego Region is the issuance of WDRs.[45] The San Diego Water Board can issue WDRs to any controllable point source or nonpoint source discharging waste to ground or surface waters of the state. The WDRs impose conditions which protect water quality, implement the provisions of the Basin Plan, and when the discharge is to waters of the United States, meet the requirements of the Clean Water Act.

The San Diego Water Board will issue, or revise and re-issue WDRs to point sources and/or nonpoint sources in the San Diego Region to be consistent with the TMDLs, WLAs, and LAs. Specific San Diego Water Board actions with regard to WDRs for point sources and nonpoint sources are discussed in the following subsections.

[45] Authorized pursuant to Water Code sections 13263 and 13264

11.2.2.1 Point Sources

The USEPA has delegated responsibility to the State and Regional Boards for implementation of the federal National Pollutant Discharge Elimination System (NPDES) program, which specifically regulates discharges of "pollutants" from point sources to "waters of the United States." The San Diego Water Board regulates discharges from point sources to surface waters with WDRs that implement federal NPDES regulations (NPDES requirements).

The NPDES requirements may include numerical effluent limitations, when feasible, on the amounts of specified pollutants that may be discharged and / or specified best management practices (BMPs) designed to minimize water quality impacts.[46] These numerical effluent limitations and BMPs or other non-numerical effluent limitations must implement both technology-based and water quality-based requirements of the Clean Water Act. Technology-based effluent limitations (TBELs) represent the degree of control that can be achieved by point sources using various levels of pollution control technology.

If necessary to achieve compliance with applicable water quality standards, NPDES requirements must contain water quality-based effluent limitations (WQBELs), derived from the applicable receiving water quality standards, more stringent than the applicable technology-based standards. In the context of a TMDL, the WQBELs must be consistent with the assumptions and requirements of the WLAs of any applicable TMDL.[47]

Although NPDES requirements must contain WQBELs that are consistent with the assumptions and requirements of the TMDL WLAs, the federal regulations do not specifically require the WQBELs to be identical to the WLAs. The regulations leave open the possibility that the San Diego Water Board could determine that fact-specific circumstances render something other than literal incorporation of the WLA to be consistent with the TMDL assumptions and requirements. For example, the WLAs in Tables 9-2a through 9-2c and 9-4a through 9-4c are expressed as billion MPN per year or per month; however, the WQBELs prescribed in response to the WLAs may or may not be written using the same metric. WQBELs may be expressed as numeric effluent limitations using a different metric and/or as BMP development, implementation, and revision requirements.

When developing WQBELs to be incorporated in to NPDES requirements, the following summarizes the requirements and assumptions included in the calculation of the TMDLs, WLAs, and LAs that should be considered:

<u>Numeric Targets</u>

- The numeric targets consist of the numeric WQOs from the Basin Plan and/or Ocean Plan and an allowable exceedance frequency.
- The numeric targets for the wet weather TMDLs consist of the REC-1 single sample maximum WQOs and a 22 percent allowable exceedance frequency.
- The numeric targets for dry weather TMDLs consist of the REC-1 30-day geometric metric mean WQOs and a 0 percent allowable exceedance frequency.

[46] Code of Federal Regulations Title 40 section 122.44(k)(2)&(3)
[47] Code of Federal Regulations Title 40 section 122.44(d)(1)(vii)(B)

- The TMDL calculations are based on either the single sample maximum WQO (for wet weather) or 30-day geometric mean WQOs (for dry weather), but both the single sample maximum and 30-day geometric mean numeric WQOs must be met in the receiving waters.
- The TMDLs, and in turn the WLAs for point sources and LAs for nonpoint sources, are assumed to be met when the numeric targets for all three indicator bacteria (fecal coliform, total coliform, and *Enterococcus*) are met in the receiving waters.

Critical Conditions

- The mass-load based TMDLs were calculated under critical conditions consisting of flows generated during a critical wet year and estimation of existing and allowable loads at a critical location.
- The flow from the critical wet year is a "worst case" annual wet weather flow and loading scenario. Actual annual wet weather flow and loading will vary from year to year.
- The mass-load based TMDLs calculated at the critical location are dependent on the flow, which can vary from year to year, but the numeric targets will not vary. When the numeric targets are met in the receiving water, the TMDLs are assumed to be met.
- The mass-load based TMDLs, WLAs, and LAs are calculated for the critical location, but the appropriate numeric targets (based on freshwater and/or saltwater REC-1 WQOs and allowable exceedance frequencies) must be met throughout the waterbodies addressed by these TMDLs.

Linkage Analysis

- The linkage analysis was performed by utilizing calibrated and validated models to predict flow from surface runoff and predict bacteria densities under the critical conditions (i.e., during the critical wet year at the critical location). Existing mass loads and allowable mass loads (i.e., TMDLs) were calculated for each watershed. The existing mass loads were calculated based on model-predicted flow and model-predicted bacteria densities. The allowable mass loads (i.e., TMDLs) were calculated based on model-predicted flow and the numeric targets (i.e., numeric WQOs and allowable exceedance frequencies).
- The wet weather existing mass loads and allowable mass loads (i.e., wet weather mass-load based TMDLs) are calculated assuming surface runoff is generated by rainfall from storm events and discharged from all land use categories to receiving waters.
- The dry weather existing mass loads and allowable mass loads (i.e., dry weather mass-load based TMDLs) are calculated assuming surface runoff is generated only by anthropogenic activities and discharged from specific land use categories to receiving waters.

Allocations

- Each mass-load based TMDL is allocated to known point sources and nonpoint sources. Wasteload allocations (WLAs) are assigned to point sources, and load allocations (LAs) are assigned to nonpoint sources. WLAs and LAs are the maximum load a source can discharge and still achieve the TMDL in the receiving water.
- The TMDLs, and in turn the WLAs for point sources and LAs for nonpoint sources, are assumed to be met when the numeric targets are met in the receiving waters.

- The sources were identified based on land use and grouped in to Municipal MS4, Caltrans MS4 (Caltrans), Agriculture, and Open Space categories. The Municipal MS4 and Caltrans land use categories are point sources, and the Agriculture and Open Space land use categories are nonpoint sources.
- Sources that are not identified are assumed to be assigned a zero allowable load as part of the mass-load based TMDL (i.e., WLA = 0 or LA = 0). In other words, discharges of pollutant loads from these sources are not expected or allowed as part of the TMDLs.
- Sources that are assigned an allowable load equal to the existing mass load as part of the mass-load based TMDL (i.e., WLA or LA = existing mass load) are not expected or allowed to increase their mass load in the future. In other words, discharges of pollutant loads (i.e., flows and bacteria densities) from these sources are not allowed to increase.
- The allocation of the dry weather mass-load based TMDLs assumes that no surface runoff discharge to receiving waters occurs from Caltrans, Agriculture, or Open Space land use categories (i.e., $WLA_{Caltrans} = 0$, $LA_{Agriculture} = 0$, and $LA_{OpenSpace} = 0$), meaning the entire dry weather mass-load based TMDL (i.e., allowable mass load) is allocated to Municipal MS4 land use categories (i.e., $WLA_{MS4} = TMDL$) (see Tables 9-4a through 9-4c).
- The allocation of the wet weather mass-load based TMDLs assumes surface runoff discharge occurs from all land use categories, and allocated according to the following steps (see Tables 9-2a through 9-2c):
  1) Sources are separated in to controllable and uncontrollable sources. Discharges from Municipal MS4, Caltrans, and Agriculture land use categories are assumed to be controllable (i.e., subject to regulation), and discharges from Open Space land use categories are assumed to be uncontrollable (i.e., not subject to regulation).
  2) Because discharges from Open Space land use categories are uncontrollable (i.e., not subject to regulation), the LAs for Open Space land use categories are set equal to the existing mass loads calculated under the critical conditions.
  3) For discharges from controllable land use categories that do not contribute more than 5 percent of the total existing mass load for all three indicator bacteria, the WLA or LA is set equal to the existing mass loads from those land uses calculated under the critical conditions.
  4) After the WLAs and LAs are assigned based on steps 2 and 3, the remaining portion of the mass-load based TMDL is assigned to discharges from controllable land use categories that contribute more than 5 percent of the total existing mass load for all three indicator bacteria. The allowable mass load for each source (WLA or LA) is calculated based on the ratio of the existing mass loads from those sources relative to each other.

<u>Load Reductions</u>

- The load reductions required to meet the mass-load based TMDLs, WLAs, and LAs are based on reducing the loads compared to pollutant loads from 2001 to 2002.
- Load reductions for each source are calculated based on the difference between the existing mass load and the mass-load based WLA or LA for each source (see Tables 9-2a through 9-2c and 9-4a through 9-4c).
- WLAs and LAs that are set equal to the existing mass loads do not require load reductions to be calculated, but this also means that existing mass loads from those sources cannot

increase over time (i.e., pollutant loads should be less than or equal to pollutant loads relative to 2001 to 2002).

- The load reductions needed to meet the WLAs for point sources and LAs for nonpoint sources are assumed to be achieved when the numeric targets are met in the receiving waters.

The persons identified as responsible for point source discharges causing or contributing to bacteria impairments at the beaches and creeks addressed in these TMDLs include:

- Phase I MS4s,
- Phase II MS4s,
- Caltrans,
- POTWs and wastewater collection systems, and
- CAFOs.

According to Tables 9-1 through 9-4, Municipal (Phase I and Phase II) MS4s and Caltrans are the only point sources that have been assigned WLAs. POTWs,[48] CAFOs, and any other unidentified point sources were not assigned WLAs, which is equivalent to being assigned a WLA of zero. All these identified point sources are subject to NPDES regulations.

In order for the WDRs, NPDES requirements, and discharges from these point sources to be consistent with the TMDLs and WLAs, the San Diego Water Board will issue or revise and re-issue the WDRs for these point sources as follows:

Phase I MS4s

According to Tables 9-1 through 9-4, Municipal MS4s were identified as requiring load reductions to achieve and meet its WLAs. The linkage analysis identified urban land uses, primarily associated with Phase I MS4s, as the most significant controllable point source causing or contributing to the bacteria impairments during wet and dry weather conditions in all the watersheds addressed in these TMDLs.

The TMDLs and Municipal MS4 WLAs, with respect to discharges from Phase I MS4s, will be implemented primarily by revising and re-issuing the existing NPDES requirements that have been issued for Phase I MS4 discharges.

The Phase I MS4s subject to these TMDLs are regulated under San Diego Water Board WDRs that implement NPDES requirements.49 The NPDES requirements regulating the Phase I MS4s include discharge prohibitions and receiving water limitations that are applicable to the implementation of these TMDLs, as summarized below:

- Discharges from MS4s are subject to all Basin Plan prohibitions.

[48] Not including Padre Dam, which has been allocated a fecal coliform TMDL based on the effluent limitations in the WDRs for Padre Dam

[49] Phase I MS4s in Orange County are regulated under San Diego Water Board Order No. R9-2002-0001 or subsequent orders; Phase I MS4s in San Diego County are regulated under San Diego Water Board Order No. R9-2007-0001 or subsequent orders.

- Discharges from MS4s that cause or contribute to the violation of water quality standards (designated beneficial uses and water quality objectives developed to protect beneficial uses) are prohibited.

- Discharges into and from MS4s in a manner causing, or threatening to cause, a condition of pollution, contamination, or nuisance, in waters of the state are prohibited.

- Effectively prohibit all types of non-storm water discharges into the MS4 unless such discharges are either authorized by separate NPDES requirements, or not prohibited (i.e., exempted) by the NPDES requirements regulating the MS4. Exempted non-storm water discharges into the MS4 are not prohibited unless the discharge category is identified as a significant source of pollutants to waters of the United States.

The available data reported by the Phase I MS4s and the results of the technical TMDL analysis indicate that discharges into and from MS4s are likely in violation of the discharge prohibitions and receiving water limitations above. Enforcement of the current discharge prohibitions and receiving water limitations is an action that the San Diego Water Board can immediately implement to compel the MS4s to reduce discharge of bacteria to the receiving waters.

In addition to the discharge prohibitions and receiving water limitations, WQBELs consistent with the assumptions and requirements of the WLAs of any applicable TMDL must also be incorporated into the NPDES requirements. The San Diego Water Board will revise and re-issue the WDRs and NPDES requirements for Phase I MS4s to incorporate the following:

- WQBELs consistent with the requirements and assumptions of the Municipal MS4 WLAs described in Tables 9-1 through 9-4. WQBELs may be expressed as numeric effluent limitations, when feasible, and/or as a BMP program of expanded or better-tailored BMPs.[50]

- If the WQBELs include a BMP program, periodic reporting requirements on BMP planning, implementation, and effectiveness in improving water quality at impaired beaches and creeks (i.e., progress reports). Progress reports will also be required to include water quality monitoring results. Progress reports will be required as long as necessary to ensure that the beneficial uses of the impaired waterbodies have been restored and maintained.

- Compliance schedule for Phase I MS4s to attain the Municipal MS4 WLAs and TMDLs in the receiving waters.

The WQBELs will likely consist of receiving water limitations (based on the numeric targets) and require the implementation of a BMP program to achieve the TMDLs in the receiving waters. The Phase I MS4s will be required to submit Bacteria Load Reduction Plans (BLRPs) or Comprehensive Load Reduction Plans (CLRPs) to the San Diego Water Board within 18 months

[50] Code of Federal Regulations Title 40 section 122.44(k)(2)&(3)

after the effective date of these TMDLs.[51] Ideally, the Phase I MS4s and Caltrans will develop and submit their BLRPs or CLRPs together. The San Diego Water Board will require the BLRPs or CLRPs to be developed on a watershed or region wide scale. The BLRPs or CLRPs should be developed and incorporated as part of the Watershed Runoff Management Programs required under the Phase I MS4 NPDES requirements. Ideally, the Phase I MS4s and Caltrans will develop and coordinate the elements of their BLRPs or CLRPs together.

If the receiving water limitations (based on the numeric targets) are met in the receiving waters, the assumption will be that the Phase I MS4s have met their WLAs. If, however, the receiving water limitations are not being met in the receiving waters, the Phase I MS4s will be responsible for reducing their bacteria loads and/or demonstrating that discharges from the Phase I MS4s are not causing the exceedances.

Phase II MS4s
According to Tables 9-1 through 9-4, Municipal MS4s were identified as requiring load reductions to achieve and meet its WLAs. The linkage analysis identified urban land uses, primarily associated with Phase I MS4s, as the most significant controllable point source causing or contributing to the bacteria impairments during wet and dry weather conditions in all the watersheds addressed in these TMDLs. Some urban land uses are associated with non-traditional, small MS4s, which are governmental facilities such as military bases, public campuses, and prison and hospital complexes (hereafter refer to as Phase II MS4s).

The TMDLs and Municipal MS4 WLAs, with respect to discharges from Phase II MS4s, will be implemented primarily by requiring compliance with the existing general WDRs and NPDES requirements that have been issued for Phase II MS4 discharges. Phase II MS4s are subject to regulation under State Water Board general WDRs implementing NPDES requirements.[52]

Under these general WDRs and NPDES requirements, Phase II MS4s are required to develop and implement a Stormwater Management Plan/Program (SWMP) with the goal of reducing the discharge of pollutants to the maximum extent practicable (MEP). MEP is the performance standard specified in Clean Water Act section 402(p). The SWMPs specify what BMPs will be used to address certain program areas. The program areas include public education and outreach; illicit discharge detection and elimination; construction and post-construction; and good housekeeping for municipal operations.

The State Water Board general WDRs for Phase II MS4s identifies the facilities in the San Diego Region subject to regulation under the NPDES requirements. Currently, none of these facilities are enrolled under the Phase II MS4 general WDRs. Appendix Q contains the current list of the Phase II MS4 facilities in the watersheds addressed by these TMDLs.

Owners and operators of Phase II MS4s in the watersheds subject to these TMDLs, identified by the San Diego Water Board as significant sources of bacteria discharging to the receiving waters

[51] The effective date is the date the Office of Administrative Law approves this Basin Plan amendment.
[52] Phase II MS4s in the San Diego Region are subject to regulation under State Water Board Order No. 2003-0005-DWQ, or subsequent orders.

and/or Phase I MS4s, will be required to submit a Notice of Intent[53] to comply with the NPDES requirements in the State Water Board general WDRs as soon as possible after the effective date of these TMDLs.[54] Once enrolled under the general WDRs, Phase II MS4 owners and operators are required to comply with the provisions of the State Water Board general WDRs and NPDES requirements to reduce the discharge of bacteria to the MEP as specified in their SWMPs.

For any individual Phase II MS4s that are identified as a significant source of pollutants, the San Diego Water Board may also issue individual WDRs requiring the implementation of WQBELs that are consistent with the requirements and assumptions of the Municipal MS4 WLAs described in Tables 9-1 through 9-4. Upon issuance of such individual WDRs by the San Diego Water Board, the State Water Board general WDRs for Phase II MS4s shall no longer regulate the affected individual Phase II MS4s.[55]

Similarly, for any category of Phase II MS4s that are identified as a significant source of pollutants, the San Diego Water Board may issue general WDRs requiring the implementation of WQBELs that are consistent with the requirements and assumptions of the Municipal MS4 WLAs described in Tables 9-1 through 9-4. Upon issuance of such general WDRs by the San Diego Water Board, the State Water Board general WDRs for Phase II MS4s shall no longer regulate the affected category of Phase II MS4s.[56]

In the event that the San Diego Water Board issues individual or general WDRs for Phase II MS4s in the San Diego Region, the WQBELs will likely consist of receiving water limitations (based on the numeric targets) and require the implementation of a BMP program to achieve the TMDLs in the receiving waters. The Phase II MS4s will likely be required to submit Bacteria Load Reduction Plans (BLRPs) or Comprehensive Load Reduction Plans (CLRPs) outlining a proposed BMP program that will be capable of achieving the necessary load reductions required to attain the TMDLs in the receiving water, acceptable to the San Diego Water Board. When and where possible, the San Diego Water Board will require the BLRPs or CLRPs to be developed on a watershed or region wide scale and have the Phase II MS4 BMP programs coordinate with the BMPs programs for Phase I MS4s and Caltrans.

If the receiving water limitations (based on the numeric targets) are met in the receiving waters, the assumption will be that the Phase II MS4s have met their WLAs. If, however, the receiving water limitations are not being met in the receiving waters and one or more Phase II MS4 dischargers are identified as sources of bacteria causing exceedances, the specific Phase II MS4s will be responsible for reducing their bacteria loads and/or demonstrating that discharges from those specific Phase II MS4s are not causing the exceedances.

Caltrans
According to Tables 9-1 through 9-4, the WLAs for Caltrans are equal to the existing load estimated from Caltrans discharges. Caltrans has been assigned an allowable load (i.e., WLA) during wet weather conditions, and no allowable load (i.e., WLA = 0) during dry weather

[53] The Notice of Intent, or NOI, is attachment 7 to Order No. 2003-0005-DWQ.
[54] The effective date is the date the Office of Administrative Law approves this Basin Plan amendment.
[55] As authorized under State Water Board Order No. 2003-0005-DWQ, section G.
[56] Ibid.

conditions. Although Caltrans is not required to reduce discharges of bacteria from existing loading, WLAs are established so that Caltrans shall not increase its wet weather loads above current levels. The TMDLs and Caltrans WLAs will be implemented primarily by revising and re-issuing the existing NPDES requirements that have been issued for Caltrans discharges.

Caltrans is regulated under State Water Board general WDRs that implement NPDES requirements.[57] The San Diego Water Board will request the State Water Board to revise and re-issue the WDRs and NPDES requirements to incorporate the following for Caltrans discharges in the San Diego Region:

- WQBELs consistent with the requirements and assumptions of the Caltrans WLAs described in Tables 9-1 through 9-4. WQBELs may be expressed as numeric effluent limitations, when feasible, and/or as a BMP program of expanded or better-tailored BMPs.[58]

- If the WQBELs include a BMP program, periodic reporting requirements on BMP planning, implementation, and effectiveness in improving water quality at impaired beaches and creeks (i.e., progress reports). Progress reports will also be required to include water quality monitoring results. Progress reports will be required as long as necessary to ensure that the beneficial uses of the impaired waterbodies have been restored and maintained.

- Compliance schedule for Caltrans to attain the Caltrans WLAs and TMDLs in the receiving waters.

The WQBELs will likely consist of receiving water limitations (based on the numeric targets) and require the implementation of a BMP program to achieve TMDLs in the receiving waters. Caltrans will be required to submit Bacteria Load Reduction Plans (BLRPs) or Comprehensive Load Reduction Plans (CLRPs) outlining a proposed BMP program that will be capable of attaining the TMDLs in the receiving waters, acceptable to the San Diego Water Board, within 18 months after the effective date of these TMDLs.[59] The San Diego Water Board will require the BLRPs or CLRPs to be developed on a watershed or region wide scale. Ideally, Caltrans and the Phase I MS4s will develop and coordinate the elements of their BLRPs or CLRPs together.

If the receiving water limitations (based on the numeric targets) are met in the receiving waters, the assumption will be that Caltrans has met its WLAs. If, however, the receiving water limitations are not being met in the receiving waters, and Caltrans MS4s are identified as a source of bacteria causing exceedances, Caltrans will be responsible for reducing its bacteria loads and/or demonstrating that discharges from the Caltrans MS4s are not causing the exceedances.

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[57] Caltrans is subject to regulation under State Water Board Order No. 99-06-DWQ, and subsequent orders.
[58] Code of Federal Regulations Title 40 section 122.44(k)(2)&(3)
[59] The effective date is the date the Office of Administrative Law approves this Basin Plan amendment.

Publicly Owned Treatment Works and Wastewater Collection Systems
Tables 9-1 through 9-4 do not include WLAs for POTWs and wastewater collection systems (i.e., WLA = 0).[60] In other words, discharges of bacteria from POTWs and wastewater collection systems to the impaired waters addressed by these TMDLs are not expected or allowed.

The TMDLs, with respect to discharges from POTWs and wastewater collection systems, will be implemented primarily by requiring compliance with any existing individual and/or general WDRs and NPDES requirements that have been issued. POTWs are subject to regulation under individual WDRs that implement NPDES requirements. Wastewater collection systems are subject to regulation under general WDRs issued by the State Water Board and San Diego Water Board.[61]

If necessary, individual WDRs for POTWs and/or the San Diego Water Board WDRs for wastewater collection systems can be revised to require more aggressive monitoring, maintenance, and repair schedules to ensure discharges of bacteria wasteloads to surface waters are minimized and/or eliminated.

Concentrated Animal Feeding Operations
Tables 9-1 through 9-4 do not include WLAs for CAFOs (i.e., WLA = 0). In other words, discharges of bacteria from CAFOs to the impaired waters addressed by these TMDLs are not expected or allowed.

The TMDLs, with respect to discharges from CAFOs, will be implemented primarily by requiring compliance with any existing individual and/or general WDRs and NPDES requirements that have been issued. CAFOs that discharge to surface waters are subject to regulation under general WDRs that implement NPDES requirements.

If necessary, the general WDRs and NPDES requirements for CAFOs can be revised to require more aggressive monitoring, maintenance, and repair schedules to ensure discharges of bacteria wasteloads to surface waters are minimized and/or eliminated.

Other Unidentified Point Sources
Tables 9-1 through 9-4 do not include WLAs for any other unidentified point sources (i.e., WLA = 0). In other words, discharges of bacteria from any other unidentified point sources to the impaired waters addressed by these TMDLs are not expected or allowed.

The TMDLs, with respect to discharges from unidentified point sources to surface waters, will be implemented primarily by issuing WDRs implementing NPDES requirements, or requiring the point sources to cease their discharges.

[60] Except for the permitted existing wet weather and dry weather fecal coliform bacteria loads from the Padre Dam Municipal Water District Water Reclamation Plant (Padre Dam), assigned as a separate point source wasteload allocation for discharges from Padre Dam that was set equal to the permitted existing load.
[61] State Water Board Order No. 2006-0003-DWQ and San Diego Water Board Order No. R9-2007-0005

11.2.2.2 Nonpoint Sources

Unlike discharges from point sources to surface waters, discharges from nonpoint sources to surface waters are not subject to regulation under the federal Clean Water Act. Discharges from nonpoint sources, however, are subject to regulation under the California state Porter-Cologne Water Quality Control Act. The San Diego Water Board can regulate discharges from controllable nonpoint sources to surface waters with individual or general WDRs.

The persons identified as responsible for controllable nonpoint source bacteria discharges causing or contributing to bacteria impairments at the beaches and creeks in these watersheds include the owners and operators of the following:

- agricultural facilities,
- nurseries,
- dairy/intensive livestock facilities,
- horse ranches,
- manure composting and soil amendment operations not regulated by NPDES requirements, and
- individual septic systems.

The California's Nonpoint Source Implementation and Enforcement Policy requires that controllable nonpoint sources be regulated via individual or general WDRs, conditional waivers of WDRs, or Basin Plan waste discharge prohibitions. Agriculture (including nurseries), dairy/livestock, and horse ranch land uses (collectively called "agriculture" land uses) are controllable nonpoint sources that have been assigned Agriculture LAs, as shown in Tables 9-1 through 9-4. Manure composting operations, soil amendment operations, and individual septic systems that are not part of agriculture land uses, and any other unidentified controllable nonpoint sources were not assigned LAs, which is equivalent to being assigned a LA of zero. Any controllable nonpoint source that has not been assigned a LA or has a LA of zero is not allowed to discharge a pollutant load as part of the TMDL.

Controllable nonpoint source discharges are present in most watersheds, however, in only four watersheds do these discharges require load reductions to meet the Agriculture LAs. These watersheds are the Lower San Juan HSA, San Luis Rey HU, San Marcos HA, and San Dieguito HU watersheds (see Tables 9-1 through 9-4).

In general, discharges from controllable nonpoint sources in the San Diego Region are not regulated under WDRs. The San Diego Water Board prefers to utilize conditional waivers of WDRs for discharges from controllable nonpoint sources. If necessary, however, the San Diego Water Board will issue individual WDRs to a specific nonpoint source operation that is identified as a significant source causing or contributing to an impairment in the waterbodies addressed in these TMDLs. Likewise, the San Diego Water Board may issue general WDRs for a type or category of controllable nonpoint source discharges that is identified as a significant source causing or contributing to an impairment in the watersheds and/or waterbodies addressed in these TMDLs.

If individual or general WDRs are developed and issued to controllable nonpoint sources, the WDRs should incorporate one or more the following:

- Effluent limitations that are consistent with the requirements and assumptions of the nonpoint source LAs described in Tables 9-1 through 9-4. Effluent limitations should be expressed as numeric effluent limitations, if feasible, and/or as a BMP program.

- Periodic reporting requirements on BMP planning, implementation, and effectiveness in improving the water quality of discharges from the nonpoint source (i.e., progress reports). Progress reports will also be required to include water quality monitoring results. Progress reports will be required as long as necessary to ensure that the beneficial uses of the impaired waterbodies have been restored and maintained.

- Compliance schedule and/or implementation milestones.

The San Diego Water Board will work with the nonpoint source dischargers and/or stakeholders when developing the WDRs. When and where possible, the San Diego Water Board will have the nonpoint source BMP programs coordinate with the BMPs programs for Phase I MS4s and Caltrans.

If the receiving water limitations (based on the numeric targets) are met in the receiving waters, the assumption will be that controllable nonpoint sources have met their LAs. If, however, the receiving water limitations are not being met in the receiving waters, and one or more controllable nonpoint source dischargers are identified as sources of bacteria causing exceedances, the San Diego Water Board may regulate those identified nonpoint sources, as needed, with WDRs or other enforcement actions, and those nonpoint sources will be responsible for reducing their bacteria loads and/or demonstrating that discharges from those nonpoint sources are not causing the exceedances.

11.2.3 Conditional Waivers of Waste Discharge Requirements

There are several types of point source, as well as nonpoint source discharges that may not have an adverse affect on the quality of the waters of the state, and/or are not readily amenable to regulation under WDRs. For these types of discharge, the San Diego Water Board has the authority to issue conditional waivers of WDRs.[62] The types of discharge which may be eligible for a waiver only include discharges to land and groundwater, and discharges to surface waters that are not otherwise subject to National Pollutant Discharge Elimination System (NPDES) regulations.[63] NPDES regulations are federal regulations. There are no federal or state regulations that allow NPDES regulations to be waived.

The point sources that were identified as causing or contributing to the bacteria impairments in the waterbodies addressed in these TMDLs are subject to regulation under WDRs that implement NPDES requirements. Thus, discharges from these point sources would not be eligible for conditional waivers of WDRs.

[62] Authorized pursuant to Water Code section 13269
[63] Defined in Code of Federal Regulations Title 40 section 122.3 [40 CFR 122.3]

There are, however, controllable nonpoint source land uses (agriculture, horse ranches, and dairies/intensive livestock) that were identified in 8 watersheds that are contributing to the bacteria impairments. Four of the 8 watersheds were identified as requiring load reductions (Lower San Juan HSA, San Luis Rey HU, San Marcos HA, and San Dieguito HU) to meet the assigned wet weather Agriculture LAs.

In general, the San Diego Water Board utilizes conditional waivers of WDRs to address the discharges from controllable nonpoint sources. Development and enforcement of waiver conditions that are protective of water quality will likely be sufficient to implement the Agriculture LAs. The controllable nonpoint sources eligible for conditional waivers must comply with the conditions of the waiver to be consistent with the TMDLs and Agriculture LAs. Controllable nonpoint sources that do not comply with the waiver conditions are no longer eligible for the waiver and must either come into compliance with the waiver conditions, become regulated under WDRs, or cease any discharge of wastes to waters of the state.

Currently, discharges from these controllable nonpoint sources may be eligible for one of the general conditional waivers of WDRs, which are provided in the Basin Plan.[64] Conditional waivers of WDRs may not exceed 5 years in duration, but may be revised and renewed, or may be terminated at any time.[65] The San Diego Water Board will implement the conditional waivers of WDRs applicable to the Agriculture land uses to be consistent with the TMDLs and Agriculture LAs.

Because the conditional waivers of WDRs that may be utilized to implement the Agriculture LAs are contained in the Basin Plan, any revision f the conditions will require a Basin Plan amendment. If needed, the San Diego Water Board may amend the Basin Plan to remove these conditional waivers of WDRs from the Basin Plan and re-issue the conditional waivers of WDRs as a general order to reduce the administrative requirements for revising waiver conditions.

As required, the effectiveness of the conditional waivers of WDRs must be evaluated at least once every 5 years. If the conditions in the waivers of WDRs are not sufficient to implement the TMDLs and Agriculture LAs, the San Diego Water Board will amend the waiver conditions to include more stringent conditions, including, but not limited to, additional BMP implementation, monitoring, and/or reporting.

If a conditional waiver of WDRs no longer appears to be effective in protecting water quality from discharges from specific nonpoint source facilities or category of nonpoint source facilities, the waiver may be terminated. For nonpoint source facilities that are no longer eligible for a conditional waiver of WDRs, they will need to be regulated under WDRs, or cease any discharges of waste to waters of the state.

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[64] The current general conditional waivers in the Basin Plan were adopted under San Diego Water Board Resolution No. R9-2007-0104. These waivers will expire December 31, 2012. Conditional Waiver No. 3 (Animal Operations) and Conditional Waiver No. 4 (Agriculture and Nursery Operations) may be utilized to implement the Agriculture LAs.

[65] Pursuant to Water Code section 13269(a)(2)

11.2.4 Enforcement Actions

The regulatory actions described above generally consist of requirements that a discharge from a controllable source must comply with in order for the discharge to legally occur. If a discharge does not comply with those requirements, a violation has occurred. Violations are subject to enforcement action by the San Diego Water Board.

An enforcement action is any formal or informal action taken to address an incidence of actual or threatened noncompliance with existing regulations or provisions designed to protect water quality. Potential enforcement actions including notices of violation (NOVs), notices to comply (NTCs), imposition of time schedule (TSO), issuance of cease and desist orders (CDOs) and cleanup and abatement orders (CAOs), administrative civil liability (ACL), and referral to the attorney general (AG) or district attorney (DA). The San Diego Water Board generally implements enforcement through an escalating series of actions to: (1) assist cooperative dischargers in achieving compliance; (2) compel compliance for repeat violations and recalcitrant violators; and (3) provide a disincentive for noncompliance.

For the controllable sources that have been identified (i.e., Municipal MS4s, Caltrans, and Agriculture land uses), the requirements in existing Basin Plan waste discharge prohibitions, WDRs and NPDES requirements, and conditional waivers of WDRs can be immediately enforced to compel dischargers to implement measures to improve water quality in the receiving waters.

For example, the general WDRs and NPDES requirements for Phase I MS4s and Caltrans require additional BMPs be implemented to reduce bacteria discharges in impaired watersheds to the maximum extent practicable and *to restore compliance with the bacteria WQOs*. This obligation is triggered when either the discharger or the State Water Board or San Diego Water Board determines that Phase I MS4 and Caltrans discharges are *causing or contributing to an exceedance* of an applicable water quality objective, in this case indicator bacteria REC-1 WQOs. Designation of beaches and/or creeks as water quality limited segments under 303(d) List provided sufficient evidence that that Phase I MS4 and Caltrans discharges are causing or contributing to the violation of water quality standards. Thus, Phase I MS4s and Caltrans should be implementing these provisions of the WDRs and NPDES requirements with respect to bacteria discharges into water quality limited segments. The San Diego Water Board could immediately issue enforcement actions to direct the Phase I MS4s and Caltrans to implement measures to restore compliance with the bacteria WQOs.

The San Diego Water Board shall consider enforcement actions, as necessary, against any discharger failing to comply with applicable waiver conditions, WDRs, and/or Basin Plan waste discharge prohibitions.[66] Enforcement actions can also be taken, as necessary, to control the discharge of bacteria to impaired beaches and creeks, to attain compliance with the assumptions and requirements of the TMDLs, WLAs, and LAs.

In order for implementation of the TMDLs to begin as soon as possible, the San Diego Water Board may issue enforcement actions, in lieu of or before revising and re-issuing general WDRs

[66] Authorized pursuant to Water Code sections 13300-13304, 13308, 13350, 13385, and/or 13399

and NPDES requirements, for Phase I MS4s and Caltrans, directing them to begin implementing additional measures to restore compliance with the bacteria WQOs. Enforcement actions may also be issued to require the submission of Bacteria Load Reduction Plans (BLRPs) or Comprehensive Load Reduction Plans (CLRPs) to the San Diego Water Board within 18 months after the effective date of these TMDLs,[67] or sooner. The San Diego Water Board will require the BLRPs or CLRPs to be developed on a watershed or region wide scale.

The San Diego Water Board will also issue enforcement actions, as necessary, to any other discharger that is identified by the San Diego Water Board or other parties as a significant source causing or contributing to the bacteria impairments in the water bodies addressed in these TMDLs.

11.2.5 Investigative Orders

The San Diego Water Board has the authority to require any state or local agency to investigate and report on any technical factors involved in water quality control or to obtain and submit analyses of water.[68] The San Diego Water Board has the authority to require technical or monitoring program reports from persons who have discharged or are discharging waste that could affect the quality of the waters in the San Diego Region.[69] The San Diego Water Board also has the authority to establish monitoring and recordkeeping requirements for discharges regulated under NPDES requirements.[70]

The San Diego Water Board may issue investigative orders requiring the submission of Bacteria Load Reduction Plans (BLRPs) or Comprehensive Load Reduction Plans (CLRPs) to the San Diego Water Board within 18 months after the effective date of these TMDLs.[71] The San Diego Water Board will require the BLRPs or CLRPs to be developed on a watershed or region wide scale. The San Diego Water Board may require the Phase I MS4s and Caltrans to develop and submit their BLRPs or CLRPs together.

The BLRPs or CLRPs will allow the Phase I MS4s and Caltrans to propose methods for assessing compliance and a compliance schedule for WQBELs that implement the TMDLs. The compliance schedule for the Phase I MS4s and Caltrans to attain the their respective WLAs will be based on the BMP program proposed in the BLRPs or CLRPs, as discussed in section 11.5. Components that are recommended for incorporation in the BLRPs or CLRPs are presented in Appendix P. The San Diego Water Board may issue subsequent investigative orders to confirm items in the BLRPs or CLRPs.

The San Diego Water Board will also issue investigative orders requiring BLRPs or CLRPs, or other technical or monitoring program reports, as necessary, to any other discharger that is identified by the San Diego Water Board or other parties as causing or contributing to the bacteria impairments in the waterbodies addressed in these TMDLs.

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[67] The effective date is the date the Office of Administrative Law approves this Basin Plan amendment.
[68] Authorized pursuant to Water Code section 13225
[69] Authorized pursuant to Water Code section 13267
[70] Authorized pursuant to Water Code section 13383
[71] The effective date is the date the Office of Administrative Law approves this Basin Plan amendment.

11.2.6 Basin Plan Amendments

As the implementation of these TMDLs progress, the San Diego Water Board recognizes that revisions to the TMDLs, WLAs, LAs, Implementation Plan, and potentially to beneficial uses and water quality objectives for specific waterbodies may be necessary in the future. Any future revisions to the Basin Plan necessary to implement these TMDLs will require a Basin Plan amendment.

Revisions to the Basin Plan typically require substantial evidence and supporting documentation to initiate the Basin Plan amendment process. Given the severely limited resources available to the San Diego Water Board for developing Basin Plan amendment projects, developing the evidence and documentation to initiate a Basin Plan amendment will be the responsibility of the dischargers and/or other parties interested in amending the requirements or provisions implementing these TMDLs.

The San Diego Water Board will initiate a Basin Plan amendment project to revise the requirements and/or provisions for implementing these TMDLs (including, but not limited to, the TMDLs, WLAs, LAs, Implementation Plan, numeric targets, watershed specific allowable exceedance frequencies, specific waterbody usage frequencies) if all the following conditions are met:

- Sufficient data are collected to provide the basis for the Basin Plan amendment.
- A report is submitted to the San Diego Water Board documenting the findings from the collected data.
- A request is submitted to the San Diego Water Board with specific revisions proposed to the Basin Plan, and the documentation supporting such revisions.

The San Diego Water Board will work with the project proponents to ensure that the data and documentation will be adequate for the initiation of the Basin Plan amendment. If the data and documentation are adequate, the San Diego Water Board will be responsible for taking the Basin Plan amendment project through the administrative and regulatory processes for adoption by the San Diego Water Board, and approval by the State Water Board, OAL, and USEPA.

11.2.7 Other Actions

In addition to the regulatory authorities and actions that the San Diego Water Board can use to implement these TMDLs, the San Diego Water Board may take other actions to help the regulated community implement measures to comply with the regulatory actions above.

For these TMDLs, the San Diego Water Board shall recommend that the State Water Board assign a high priority to awarding grant funding[72] for projects to implement the bacteria TMDLs.

[72] The State Water Board administers the awarding of grants funded from Proposition 13, Proposition 50, Clean Water Act section 319(h) and other federal appropriations to projects that can result in measurable improvements in water quality, watershed condition, and/or capacity for effective watershed management. Many of these grant fund programs have specific set-asides for expenditures in the areas of watershed management and TMDL project implementation for non-point source pollution.

Special emphasis will be given to projects that can achieve quantifiable bacteria load reductions consistent with the specific bacteria TMDLs, WLAs, and LAs.

Implementation of these TMDLs by the San Diego Water Board should not require any special studies to be conducted by the dischargers or other entities. The San Diego Water Board, however, will encourage and support any special studies proposed and undertaken by the dischargers or other entities that will provide information to refine and improve the implementation of these TMDLs. The San Diego Water Board may develop agreements (e.g., a Memorandum of Understanding) with one or more entities to support and use the findings from any special studies that may be conducted. Proposing a special study project and initiating an agreement with the San Diego Water Board to use the results of the study to modify this TMDL Implementation Plan is the responsibility of the project proponent(s). A few topics that may require additional investigation with a special study are discussed in section 11.4.

11.3 Monitoring for TMDL Compliance and Compliance Assessment

An essential component of implementation is water quality monitoring. Monitoring is needed to evaluate the progress toward attainment of the TMDLs and restoring the beneficial uses in the receiving waters. When all discharges from controllable sources meet their assigned WLAs and LAs, and the numeric targets (i.e., numeric WQOs and allowable exceedance frequencies) are also met in the receiving waters, compliance with the TMDLs will be achieved. Additionally, sufficient water quality data are necessary to support the removal of a waterbody from the 303(d) List. Water quality data can also be used identify additional regulatory actions that may need to be implemented by the San Diego Water Board to restore and protect beneficial uses.

The minimum components for any monitoring program that will be used to evaluate progress toward attainment of the TMDLs should include the following:

- For beaches addressed by these TMDLs, monitoring locations should consist of, at a minimum, the same locations used to collect data required under MS4 NPDES monitoring requirements and beach monitoring for Health and Safety Code section 115880.[73] If exceedances of the receiving water limitations are observed in the monitoring data, additional monitoring locations must be added to identify the sources causing the exceedances. An adequate number of additional monitoring locations and frequency of monitoring must be added to identify the sources causing the exceedances in the receiving waters. The additional monitoring locations must also be used to demonstrate that the bacteria loads from the sources have been addressed and no longer causing exceedances in the receiving waters.

- For creeks addressed by these TMDLs, monitoring locations should consist of, at a minimum, a location at or near the mouth of the creek (e.g., Mass Loading Station or Mass Emission Station) and one or more locations upstream of the mouth (e.g., Watershed Assessment Stations). If exceedances of the receiving water limitations are observed in the monitoring data, additional monitoring locations must be added to identify the sources causing the exceedances. An adequate number of additional

[73] Commonly referred to as AB 411 monitoring

monitoring locations and frequency of monitoring must be added to identify the sources causing the exceedances in the receiving waters. The additional monitoring locations must also be used to demonstrate that the bacteria loads from the sources have been addressed and no longer causing exceedances in the receiving waters.

- Because there are dry weather and wet weather TMDLs, monitoring under both conditions is needed. Wet weather[74] monitoring should occur at least once within 24 hours of the end of a storm event[75] that occurs during the rainy season (i.e., October 1 through April 30). Dry weather[76] monitoring should occur at least on a monthly basis, and may be required more often during the summer months (e.g., weekly) when the REC-1 and REC-2 beneficial uses occur most frequently in the creeks and at the beaches.

Compliance with the TMDLs, WLAs, and LAs will be assessed primarily by comparing receiving water indicator bacteria results from the monitoring locations outlined above with receiving water limitations expressed in terms of the appropriate numeric REC-1 WQOs and allowable exceedance frequencies of the appropriate numeric REC-1 WQOs. The appropriate numeric WQOs and allowable exceedance frequencies are dependent upon the type of receiving water (i.e., beach or creek) and weather conditions (i.e., dry weather or wet weather), as shown in Tables 11-1 and 11-2.

[74] Defined as days with a storm with at least 0.2 inches of rainfall and the 72 hour period after the storm event
[75] The end of a storm event is when there is no more precipitation
[76] Defined as days with less than 0.2 inches of rainfall on each of the previous three days

Table 11-1. Receiving Water Limitations for Beaches

	Wet Weather Days [a]		Dry Weather Days [b]	
Indicator Bacteria	**Wet Weather Numeric Objective [c] (MPN/100mL)**	**Wet Weather Allowable Exceedance [d] Frequency**	**Dry Weather Numeric Objective [e] (MPN/100mL)**	**Dry Weather Allowable Exceedance Frequency**
Fecal Coliform	400	22%	200	0%
Total Coliform	10,000	22%	1,000	0%
Enterococcus	104	22%	35	0%

a. Wet weather days defined as days with rainfall events of 0.2 inches or greater and the following 72 hours.
b. Dry weather days defined as days with less than 0.2 inch of rainfall observed on each of the previous 3 days.
c. Wet weather numeric objectives based on the single sample maximum water quality objectives in the California Ocean Plan (2005). Compliance with the wet weather TMDLs in the receiving water is based on the frequency that the wet weather days in any given year exceed the wet weather numeric objective, but 30-day geometric mean must also be met.
d. The wet weather allowable exceedance frequency is set at 22%. In the calculation of the wet weather TMDLs, the San Diego Regional Board chose to apply the 22 percent allowable exceedance frequency as determined for Leo Carillo Beach in Los Angeles County. At the time the wet weather watershed model was developed, the 22 percent exceedance frequency from Los Angeles County was the only reference beach exceedance frequency available. The 22 percent allowable exceedance frequency used to calculate the wet weather TMDLs is justified because the San Diego Region watersheds' exceedance frequencies will likely be close to the value calculated for Leo Carillo Beach, and is consistent with the exceedance frequency that was applied by the Los Angeles Regional Board.
e Dry weather numeric objectives based on the 30-day geometric mean water quality objectives in the California Ocean Plan (2005). Compliance with the dry weather TMDLs in the receiving water is based on the frequency that the dry weather days in any given year exceed the dry weather numeric objective.

Table 11-2. Receiving Water Limitations for Creeks

	Wet Weather Days [a]		Dry Weather Days [b]	
Indicator Bacteria	**Wet Weather Numeric Objective [c] (MPN/100mL)**	**Wet Weather Allowable Exceedance [d] Frequency**	**Dry Weather Numeric Objective [e] (MPN/100mL)**	**Dry Weather Allowable Exceedance Frequency**
Fecal Coliform	400	22%	200	0%
Total Coliform [f]	10,000	22%	1,000	0%
Enterococcus	61 (104) [g]	22%	33	0%

a. Wet weather days defined as days with rainfall events of 0.2 inches or greater and the following 72 hours.
b. Dry weather days defined as days with less than 0.2 inch of rainfall observed on each of the previous 3 days.
c. Wet weather numeric objectives based on the single sample maximum (or equivalent) water quality objectives in the Water Quality Control Plan for the San Diego Basin (1994). Compliance with the wet weather TMDLs in the receiving water is based on the frequency that the wet weather days in any given year exceed the wet weather numeric objective, but 30-day geometric mean must also be met.
d. The wet weather allowable exceedance frequency is set at 22%. In the calculation of the wet weather TMDLs, the San Diego Regional Board chose to apply the 22 percent allowable exceedance frequency as determined for Leo Carillo Beach in Los Angeles County. At the time the wet weather watershed model was developed, the 22 percent exceedance frequency from Los Angeles County was the only reference beach exceedance frequency available. The 22 percent allowable exceedance frequency used to calculate the wet weather TMDLs is justified because the San Diego Region watersheds' exceedance frequencies will likely be close to the value calculated for Leo Carillo Beach, and is consistent with the exceedance frequency that was applied by the Los Angeles Regional Board.
e. Dry weather numeric objectives based on the 30-day geometric mean (or equivalent) water quality objectives in Water Quality Control Plan for the San Diego Basin (1994). Compliance with the dry weather TMDLs in the receiving water is based on the frequency that the dry weather days in any given year exceed the dry weather numeric objective.
f. Wet and dry weather numeric objectives for total coliform apply at the point in a creek that discharges to a beach, bay, or estuary.
g. A wet weather numeric objective for Enterococcus of 104 MPN/100mL may be applied as a receiving water limitation for creeks, instead of 61 MPN/100mL, if one or more of the creeks addressed by these TMDLs (San Juan Creek, Aliso Creek, Tecolote Creek, Forrester Creek, San Diego River, and/or Chollas Creek) is designated with a "moderately to lightly used area" or less frequent usage frequency in the Basin Plan. Otherwise, the wet weather numeric objective of 61 MPN/100mL for Enterococcus will be used to assess compliance with the wet weather allowable exceedance frequency.

At the end of the TMDL Compliance Schedules, which are discussed in section 11.5, the receiving waters must meet the receiving water limitations above to be considered in compliance with these TMDLs, WLAs, and LAs. Determination of compliance with the TMDLs will be assessed differently for dry weather and wet weather as follows:

1. *Compliance with Dry Weather TMDLs*: At the end of the dry weather TMDL compliance schedule, the bacteria densities in the receiving waters for all dry weather days[77] must be less than or equal to the 30-day geometric mean REC-1 WQOs 100 percent of the time (i.e., dry weather days in a 30-day period shall not exceed the 30-day geometric mean REC-1 WQOs more than 0 percent of the time). In addition, the bacteria densities must be consistent with the single sample maximum REC-1 WQOs in the Ocean Plan for beaches, and the Basin Plan for creeks.

   The method and number of samples needed for calculating the 30-day geometric mean should be consistent with the number of samples required by the Ocean Plan for beaches, and the Basin Plan for creeks. Analysis of the monitoring results should also be consistent with the methods given in the Water Quality Control Policy For Developing California's Clean Water Act Section 303(d) List.

   Because the dry weather TMDLs are assigned entirely to the Municipal MS4s as WLAs, the Municipal MS4s are assumed to be the only source of bacteria during dry weather (i.e., dry weather TMDL = MS4 WLA). Discharges from other sources (i.e., Caltrans, Agriculture, and Open Spaces) during dry weather are not expected and/or not allowed (i.e., WLA = 0 or LA = 0). If at the end of the dry weather TMDL compliance schedule the receiving waters exceed the 30-day geometric mean REC-1 WQOs more than 0 percent of the time, the municipal Phase I MS4s are responsible for demonstrating their discharges into the receiving waters are not causing the exceedances, or they will be considered out of compliance.

   The Phase I MS4s may demonstrate that their discharges are not causing the exceedances in the receiving waters by providing data from their discharge points to the receiving waters, by providing data collected at jurisdictional boundaries, and/or by using other methods accepted by the San Diego Water Board. Otherwise, at the end of the dry weather TMDL compliance schedule, the municipal Phase I MS4s will be held responsible and considered out of compliance unless other information or evidence indicates another controllable or uncontrollable source is responsible for the exceedances in the receiving waters. If controllable sources other than discharges from the municipal Phase I MS4s are identified before or after the end of the dry weather TMDL Compliance Schedule as causing the exceedances, those controllable sources will be responsible for reducing their bacteria loads and/or demonstrating that discharges from those sources are not causing the exceedances. The San Diego Water Board shall implement additional actions (e.g., issue enforcement actions, amend existing NPDES requirements or conditional waivers), as needed, to bring all controllable sources into compliance with the dry weather TMDLs.

[77] Defined as days with less than 0.2 inches of rainfall on each of the previous three days

2. *Compliance with Wet Weather TMDLs*: At the end of the wet weather TMDL compliance schedule, the bacteria densities in the receiving waters for all wet weather days[78] cannot exceed the single sample maximum REC-1 WQOs more than the allowable exceedance frequency. In addition, the bacteria densities must be less than or equal to the 30-day geometric mean REC-1 WQOs 100 percent of the time (i.e., both dry and wet weather days in a 30-day period shall not exceed the 30-day geometric mean REC-1 WQOs more than 0 percent of the time).

As described in the minimum monitoring components above, at least one sample should be collected within 24 hours of the end of a storm event that occurs during the rainy season (i.e., October 1 through April 30). If only one sample is collected for a storm event, the bacteria density for every wet weather day associated with that storm event shall be equal to the results from that one sample. If more than one sample is collected for a storm event, but not on a daily basis, the bacteria density for all the wet weather days not sampled shall be equal to the highest bacteria density result reported from samples collected. The exceedance frequency shall be calculated by dividing the number of wet weather days that exceed the single sample maximum REC-1 WQOs by the total number of wet weather days during the rainy season. If at the end of the wet weather TMDL Compliance Schedule the receiving waters exceed the single sample maximum REC-1 WQOs more than the allowable exceedance frequency, all controllable sources are responsible for demonstrating their discharges into the receiving waters are not causing the exceedances, or they will be considered out of compliance.

The data collected for compliance with the dry weather TMDLs, described above, shall be used in addition to the data collected for wet weather with the wet weather TMDLs to calculate the wet weather 30-day geometric mean. If at the end of the wet weather TMDL Compliance Schedule the receiving waters exceed the 30-day geometric mean REC-1 WQOs at any time, all controllable sources are responsible for demonstrating their discharges into the receiving waters are not causing the exceedances, or they will be considered out of compliance.

Because the Phase I MS4s are located at the base of the watersheds and have been identified as the most significant controllable source of bacteria, the municipal Phase I MS4s will have the primary responsible for monitoring the receiving waters. The municipal Phase I MS4s are responsible for reducing their bacteria loads and/or demonstrating their discharges into the receiving waters are not causing the exceedances.

The municipal MS4s may demonstrate that their discharges are not causing the exceedances in the receiving waters by providing data from their discharge points to the receiving waters, by providing data collected at jurisdictional boundaries, and/or by using other methods accepted by the San Diego Water Board. Otherwise, at the end of the wet weather TMDL compliance schedule, the municipal Phase I MS4s will be held responsible and considered out of compliance unless other information or evidence indicates another controllable or uncontrollable source is responsible for the exceedances in the receiving waters. If controllable sources other than discharges from the municipal Phase I MS4s are

[78] Defined as days with a storm with at least 0.2 inches of rainfall and the 72 hour period after the storm event

identified before or after the end of the wet weather TMDL Compliance Schedules as causing the exceedances, those controllable sources will be responsible for reducing their bacteria loads and/or demonstrating that discharges from those sources are not causing the exceedances. The San Diego Water Board shall implement additional actions (e.g., issue enforcement actions, amend existing NPDES requirements or conditional waivers), as needed, to bring all those controllable sources into compliance with the wet weather TMDLs.

Between the effective date of these TMDLs and the end of the TMDL Compliance Schedules, monitoring is also required to demonstrate progress toward achieving and complying with the TMDLs, WLAs, and LAs. Progress can be demonstrated with reductions in exceedance frequencies in the receiving waters until the allowable exceedance frequencies ultimately are achieved at the end of the TMDL Compliance Schedules. Demonstrating progress toward attaining the TMDLs in the receiving waters will be assessed differently for dry weather and wet weather as follows:

1. *Measuring Progress Toward Attaining Dry Weather TMDLs*: For the dry weather TMDLs, available historical monitoring data from the year 2002 to the effective date of these TMDLs should be used to calculate the "existing" dry weather exceedance frequency of the 30-day geometric mean REC-1 WQOs for each watershed. "Existing" dry weather exceedance frequencies may be calculated separately for each impaired waterbody listed, or an "existing" dry weather exceedance frequency may be calculated that is applicable to the entire watershed.

   The "existing" dry weather exceedance frequencies should be reduced until the final allowable dry weather exceedance frequency is achieved by the end of the dry weather TMDL Compliance Schedule. If the TMDL Compliance Schedules include interim milestones that must be achieved to demonstrate progress toward attaining the dry weather TMDLs, reductions in the exceedance frequencies in the receiving water may be used. For example, if the "existing" dry weather exceedance frequency is 60 percent, the final dry weather exceedance frequency is 0 percent, and an interim milestone requires a 50 percent reduction, the exceedance frequency in the receiving water should be 30 percent or less by the interim milestone date. By the end of the dry weather TMDL Compliance Schedule, the final allowable dry weather exceedance frequency of the 30-day geometric mean REC-1 WQOs is 0 percent in the receiving waters for both beaches and creeks.

2. *Measuring Progress Toward Attaining Wet Weather TMDLs*: For the wet weather TMDLs, the number of wet days and number of wet exceedance days during the critical wet year from the wet weather model were used to calculate the "existing" wet weather exceedance frequency that needs to be reduced to the allowable wet weather exceedance frequency. For example, if a watershed had 69 wet weather days during the critical wet year, and the wet weather model predicted that all the subwatersheds had an average of 41 wet weather exceedance days during the critical wet year, the "existing" wet weather exceedance frequency is 41/69=59%. For the watershed addressed by these TMDLs, the number of wet weather exceedance days for each indicator bacteria predicted by the wet weather model for the critical wet year are summarized below in Table11-3:

Table 11-3. "Existing" Wet Weather Exceedance Frequencies by Watershed

Watershed	Number of Wet Days in Critical Wet Year	"Existing" Wet Weather Exceedance Frequency of Single Sample Maximum REC-1 WQO [a]		
		Fecal Coliform	Total Coliform	Enterococcus
San Joaquin Hills HSA/ Laguna Beach HSA	69	52%	54%	55%
Aliso HSA	69	59%	59%	62% (62%) [b]
Dana Point HSA	69	50%	50%	50%
Lower San Juan HSA	76	66%	66%	74% (72%) [b]
San Clemente HA	73	47%	47%	50%
San Luis Rey HU	90	68%	66%	76%
San Marcos HA	49	57%	57%	59%
San Dieguito HU	98	43%	44%	49%
Miramar Reservoir HA	94	30%	30%	30%
Scripps HA	57	52%	52%	52%
Tecolote HA	57	75%	75%	81% (79%) [b]
Mission San Diego HSA/ Santee HSA	86	70%	63%	79% (76%) [b]
Chollas HSA	65	60%	60%	63% (63%) [b]

a. Calculated by taking the average number of wet days that are predicted by the wet weather model to exceed the single sample maximum REC-1 water quality objective (400 MPN/100mL for fecal coliform, 10,000 MPN/100mL for total coliform, and 61 or 104 MPN/100mL) divided by the total number of wet days in the critical wet year (1993).
b. Allowable exceedance frequency calculated based on an *Enterococcus* single sample maximum REC-1 water quality objective of 61 MPN/100mL. Allowable exceedance frequency in parenthesis calculated based on an Enterococcus single sample maximum REC-1 water quality objective of 104 MPN/100mL, which may be applicable if the usage frequency of the creeks in these watersheds are designated as "moderately to lightly used area" or less frequent usage frequency in the Basin Plan.

The "existing" wet weather exceedance frequencies should be reduced until the final allowable wet weather exceedance frequency is achieved by the end of the wet weather TMDL Compliance Schedule. If the TMDL Compliance Schedules include interim milestones that must be achieved to demonstrate progress toward attaining the wet weather TMDLs, reductions in the exceedance frequencies in the receiving water may be used. For example, if the "existing" wet weather exceedance frequency is 59 percent, the final wet weather exceedance frequency is 22 percent, and an interim milestone requires a 50 percent reduction, the exceedance frequency in the receiving water should be 41 percent or less by the interim milestone date. By the end of the wet weather TMDL Compliance Schedule, the allowable wet weather exceedance frequency is 22 percent in the receiving waters for both beaches and creeks.

The specific receiving waters (i.e., specific beaches and creek segments) identified on the 2002 303(d) List are shown in section 11.5. Because the REC-1 WQOs must be met throughout the 20 waterbodies addressed by these bacteria TMDLs, monitoring data from these locations and any other beach segments and/or creek monitoring points in the watersheds addressed by these TMDLs may be used to determine compliance.

Because the municipal MS4s are the most significant controllable sources of bacteria and the Phase I MS4s often discharge directly to the receiving waters addressed by these TMDLs, the municipal Phase I MS4s will be primarily responsible for conducting the monitoring. Additional monitoring locations and frequency may be required to identify sources that need additional controls to reduce bacteria loads. While this TMDL Implementation Plan recommends monitoring at one or two locations for each waterbody, monitoring only one or two locations in the receiving waters may not provide the data to differentiate between and locate sources of bacteria in the watershed. Therefore, the municipal Phase I MS4s may wish to establish additional monitoring locations at key jurisdictional boundaries as part of their monitoring programs, especially in watersheds where Caltrans and Agriculture have been identified as sources contributing bacteria loads to the receiving waters.

Investigative orders, enforcement actions, WDRs, or conditional waiver of WDRs issued by the San Diego Water Board should require monitoring program plans that include, as applicable, the minimum monitoring locations and frequencies outlined above, but also provide the dischargers an opportunity to propose additional or alternative monitoring locations and frequency of monitoring events. The San Diego Water Board may also issue investigative orders, enforcement actions, WDRs, or conditional waiver of WDRs that specify additional or alternative monitoring, monitoring locations, and/or frequency of monitoring events.

The San Diego Water Board will coordinate, to the extent possible, the monitoring that is required by the dischargers, to minimize the monitoring resources required and maximize the temporal and spatial coverage of the data collection.

11.4 Topics for Additional Investigation

The San Diego Water Board recognizes that there ares several topics or areas of study that may require additional investigation by the regulated community and/or other interested persons which could result in improved TMDL implementation, or modification of the requirements and/or provisions for implementing these TMDLs. The topics discussed in this section are not a comprehensive list, but data needs that have been identified by the San Diego Water Board and others that could be useful in the TMDL implementation.

11.4.1 Investigate Landfills as a Potential Bacteria Source

At this time, whether or not landfills are a significant source of bacteria to surface waters is not known. The San Diego Region has 47 regulated landfills (Class III and Class I) and approximately 80 unregulated land discharge sites (e.g., historical burn-ash, waste piles, and other past discharges of waste to land). All 7 of the active Class III (municipal solid waste or MSW) landfills include engineered liner systems with annual leachate monitoring, regular groundwater monitoring and stormwater monitoring under the statewide Industrial Stormwater WDRs (Order No. 97-03-DWQ). Under the applicable solid waste regulations (CCR Title 27 and CFR Title 40 Part 258), the existing monitoring systems do not include bacteria monitoring. The remaining regulated landfills perform groundwater monitoring and some form of stormwater monitoring but do not test for bacteria.

MSW landfills contain waste-metabolizing bacteria in their waste management units as evidenced by the continued off-gassing of methane in landfill gas, although the extent of underground migration of landfill gas (LFG) is generally limited to favorable bacteriological habitat and food source, and the effectiveness of LFG extraction systems.

Sewage wastes are categorically prohibited from being discharged into MSW landfills by the applicable regulations (cited above), however under certain specific conditions active MSW landfills can accept some types of treated sewage sludge for disposal, or use such materials as a component to an alternative daily cover (as allowed under CCR Title 27). Landfills may contain waste-metabolizing bacteria that are actively degrading wastes within the waste management unit.

Active landfills may contribute discharges of stormwater containing waste-metabolizing bacteria to the beaches and creeks because their waste management operations are not fully capped and therefore may result in stormwater discharges. Closed and inactive landfills (not closed under CCR Title 27 or CFR Title 40) in the San Diego Region are generally covered by an engineered soil cap. These caps vary in thickness from 2 feet to approximately 8 feet of earthen cover to protect against pollutant migration from the wastes buried in the waste management unit.

All 47 MSW landfills are regulated by WDRs (general or site specific) issued by the San Diego Water Board and via the statewide Industrial Stormwater NPDES requirements for landfills. Both are interrelated in that a change to the statewide WDRs are always reflected in the Regional WDRs, which are renewed in 5 or 10 year cycles depending on the perceived threat to water quality and complexity ranking of the facility (pursuant to CCR Title 23, section 2200).

From the information available to the San Diego Water Board, active MSW landfills could be a potential source for indicator bacteria discharges to surface waters. If studies provided to the San Diego Water Board indicate that discharges from MSW landfills are a significant source of bacteria, an investigative order (under authority of Water Code section 13267) can be issued to the owners and operators of all active MSW landfills to determine if the active MSW landfills are contributing bacteria via pathways that affect beaches and creeks.

11.4.2 Collect Data Useful for Model Improvement

As described in Appendices J and K, calibration and verification of the models used for TMDL analysis was based on limited data (water quality, flow) and assumed values for input parameters such as rates for bacteria die-off and re-growth. Studies designed to collect additional data that can be used for model improvement will result in more accurate TMDL results. Also, data from each watershed can be collected and used to calibrate and verify the models for that watershed instead of relying on the regional calibration used in this project. Models that are specifically developed for a watershed can help to target the areas or specific sources are that the most likely cause of impairments.

11.4.3 Improve Understanding Between Bacteria Levels and Health Effects

The San Diego Water Board recognizes that there are potential problems associated with using bacteriological WQOs to indicate the presence of human pathogens in receiving waters free of sewage discharges. The indicator bacteria WQOs were developed, in part, based on epidemiological studies in waters with sewage inputs. The risk of contracting a water-born illness from contact with urban runoff devoid of sewage, or human-source bacteria is not known. Some pathogens, such as *giardia* and *cryptosporidium* can be contracted from animal hosts. Likewise, domestic animals can pass on human pathogens through their feces. These and other uncertainties need to be addressed through special studies and, as a result, revisions to the TMDLs established in this project may be appropriate.

Indicator bacteria are used to measure the risk of swimmer illness because they have been shown to indicate the presence of human pathogens, such as viruses, when human bacteria sources are present. Bacterial indicators have been historically used because they are easier and less costly to measure than the pathogens themselves (see Appendix C). In recent years, however, questions have been raised regarding the validity of using indicator bacteria to ascertain risk to swimmers in recreational waters, since they appear to be less correlated to viruses when sources are from urban runoff (Jiang et al, 2001). In fact, most epidemiology studies conducted to measure the risk of swimmer illness in the presence of indicator bacteria have taken place in receiving waters containing known sewage impacts.

To date, only two epidemiology studies have been conducted where the bacteria source was primarily urban runoff.[79] The Santa Monica Bay epidemiology study (Haile et al, 1999) reported that there was a direct correlation between swimming related illnesses and densities of indicator bacteria. The sites included in this study were known to contain human sources of fecal contamination. Most recently, the Mission Bay epidemiological study (Colford et al, 2005) showed that there was no correlation between swimmer illness and concentrations of indicator bacteria. Unlike Santa Monica Bay, bacteria sources in Mission Bay were shown to be primarily of nonhuman origin (City of San Diego and MEC/Weston, 2004). The studies caution against extrapolating the results from the Mission Bay study to other locations, since there have been extensive cleanup activities on this waterbody and subsequently bacteria source analyses have shown that human fecal sources are only a minor contributor. The link between bacteria loads from urban runoff containing mostly nonhuman sources, and risk of illness needs to be better understood.

Recent studies have also shown that bacteria regrowth is a significant phenomenon (City of San Diego and MEC/Weston, 2004; City of Laguna Niguel and Kennedy Jenks, 2003). Such regrowth can cause elevations in bacteria levels that do not correspond to an increase in human pathogens and risk of illness. For example, the Mission Bay Source Identification Study found that bacteria multiply in the wrack line on the beach (eel grass and other debris) during low tide, causing exceedances of the water quality objectives during high tide when the wrack is inundated. This same phenomenon likely occurs inside storm drains, where tidal cycles and freshwater input can cause bacteria to multiply. In both these cases, an increase in bacteria densities does not necessarily correlate to an increase in the presence of human pathogens. The regrowth phenomenon is problematic since dischargers must expend significant resources to reduce the current bacteria loads to receiving waters to meet the required waste load reductions.

As information is gathered, initiating special studies to understand the uncertainties between bacteria levels and bacteria sources within the watersheds may be useful. Specifically, continuing research may be helpful to answer the following questions:

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[79] An epidemiology study looking at the health effects associated with urban runoff is scheduled for 2007 at Doheny Beach, located in the City of Dana Point.

- What is the risk of illness from swimming in water contaminated with urban/stormwater runoff devoid of sewage?
- Do exceedances of the bacteria water quality objectives from animal sources (wildlife and domestic) increase the risk of illness?
- Are there other, more appropriate surrogates for measuring the risk of illness than the indicator bacteria WQOs currently used?

Addressing these uncertainties can be useful in identifying and implementing strategies to reduce the risk of illness, which is currently measured by indicator bacteria densities.

11.4.4 Identification of Method for Direct Pathogen Measurement

Ultimately, the San Diego Water Board supports the idea of measuring pathogens (the agents causing impairment of beneficial uses) rather than indicator bacteria (surrogates for pathogens). However, as stated previously, indicator bacteria have been used to measure water quality historically because measurement of pathogens is both difficult and costly. The San Diego Water Board is supportive of any efforts by the scientific community to perform epidemiological studies and/or investigate the feasibility of measuring pathogens directly.

11.4.5 Identification of Region-wide or Watershed-Specific Allowable Exceedance Frequencies

The San Diego Water Board utilized the reference system approach in the calculation of the wet weather TMDLs to account for the natural, and largely uncontrollable sources of bacteria generated in the watersheds and at the beaches that can, by themselves, cause exceedances of WQOs. The reference system and anti-degradation approach (RSAA) is utilized in the TMDLs by allowing a 22 percent exceedance frequency of the REC-1 single sample maximum WQOs for wet weather, and a 0 percent allowable exceedance frequency of the REC-1 geometric mean WQOs for dry weather. The allowable exceedance frequencies were based on measurements from a reference system in Los Angeles County.

For the wet weather TMDLs, the San Diego Water Board chose to apply the 22 percent exceedance frequency determined for Leo Carillo Beach in Los Angeles County because, at the time of model development, the 22 percent exceedance frequency from Los Angeles County was the only reference beach exceedance frequency available. Since then, additional data were collected and analyzed for five other reference beaches by SCCWRP (Schiff, et al., 2006).

The study conducted by SCCWRP occurred over only two wet seasons (2004-2005 and 2005-2006). The data collected and analyzed by SCCWRP indicate that the flux of indicator bacteria from undeveloped watersheds and the resulting frequency of water quality threshold exceedences at reference beaches during wet weather can be correlated to watershed size, storm size, and early versus late season storms. Exceedance frequencies ranged from zero percent to 30 percent for an exceedance of any bacteria indicator.

Two of the reference beaches included in the study were from the San Diego Region (San Onofre State Beach at the mouth of San Onofre Creek and San Mateo State Beach at the mouth of San Mateo Creek). Both reference beaches had the highest exceedance frequencies during wet weather, but were also the largest watersheds in the study. The exceedance frequencies for these two San Diego Region watersheds may not be appropriate for every watershed addressed by these TMDLs. Additional data are required to determine appropriate watershed specific exceedance frequencies for indicator bacteria TMDLs in the San Diego Region.

11.4.6 Identification of Natural Versus Anthropogenic Sources of Bacteria

Recently, the San Diego Water Board adopted a Basin Plan amendment that authorizes the use of the Natural Sources Exclusion Approach (NSEA) to allow for exceedances of bacteria WQOs due solely to natural sources within the context of a TMDL. Under the NSEA, all anthropogenic sources of indicator bacteria to the waterbodies subject to an indicator bacteria TMDL must be controlled. Dischargers must also demonstrate that all anthropogenic sources of indicator bacteria to the target waterbody are controlled and that residual indicator bacteria densities do not indicate a health risk.

Once control of all anthropogenic sources and demonstration of appropriate health risk levels have been achieved, the residual indicator bacteria loads in the waterbodies attributable to uncontrollable sources can be identified and measured. Likewise, the frequency that uncontrollable sources cause exceedances of indicator bacteria water quality objectives in the waterbody can be identified. The information can be used to establish an allowable indicator bacteria WQO exceedance frequency in the impaired waterbody based upon the residual exceedance frequency observed. This information can then be used to recalculate the TMDLs, WLAs, and LAs.

The use of the NSEA is contingent upon demonstration of control of all anthropogenic sources of indicator bacteria to the waterbodies subject to an indicator bacteria TMDL. Since this task is likely to be formidable, use of the NSEA is not expected to occur immediately. Rather, the NSEA would be used to recalculate TMDLs at some point after their initial adoption, following demonstration of control of all anthropogenic sources.

11.5 TMDL Compliance Schedule and Implementation Milestones

The purpose of these TMDLs is to restore the impaired beneficial uses of the waterbodies addressed through mandated reductions of bacteria from controllable point and nonpoint sources discharging to impaired waters. The requirements of these TMDLs mandate that the San Diego Water Board require dischargers improve water quality conditions in impaired waters by achieving the assigned WLAs and LAs. After the controllable sources achieve their assigned WLAs and LAs, the TMDLs in the receiving waters will be met and beneficial uses restored.

Until the dischargers achieve their assigned WLAs and LAs, the beneficial uses of the waterbodies addressed by this project will likely remain impaired, and the dischargers will continue violating one or more Basin Plan waste discharge prohibitions. The San Diego Water Board recognizes that restoring the beneficial uses of the waterbodies impaired by elevated bacteria levels will require time and multiple approaches to implement. Therefore, the bacteria TMDLs are expected to be implemented in a phased approach with a monitoring component to identify bacteria sources, determine the effectiveness of each phase, and guide the selection of BMPs, as outlined in the BMP programs proposed in the BLRPs or CLRPs that are accepted by the San Diego Water Board.

11.5.1 Prioritization of Waterbodies

"Impaired" waters were prioritized based on several factors, because the waterbodies included in these TMDLs are numerous and diverse in terms of geographic location, swimmer accessibility and use, and degree of contamination.

Dischargers accountable for attaining load reductions in multiple watersheds may have difficulty providing the same level of effort simultaneously in all watersheds. In order to address these concerns a scheme for prioritizing implementation of bacteria reduction strategies in waterbodies within watersheds was developed. The prioritization scheme is largely based on the following criteria:

- Level of beach (marine or freshwater) swimmer usage;
- Frequency of exceedances of WQOs; and
- Existing programs designed to reduce bacteria loading to surface waters.

Dischargers were placed into one of three groups (North, Central, and South), based on geographic location. Group N consists of dischargers located in watersheds within Orange County, the northernmost region watersheds included in these TMDLs. Group C consists of dischargers located in watersheds in northern San Diego County, outside the City of San Diego limits, the central region watersheds included in these TMDLs. Group S consists of dischargers who are located in watersheds within and south of the City of San Diego limits, the southernmost region watersheds included in these TMDLs. Table 11-4 shows the dischargers in each of the three groups.

Table 11-4. Responsible Municipalities and Lead Jurisdictions†

Watershed	Waterbody	Segment or Area**	Responsible Municipalities	Group
San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12)	Pacific Ocean Shoreline	Cameo Cove at Irvine Cove Dr. - Riviera Way	City of Laguna Beach **County of Orange** Orange County Flood Control District Caltrans Owners/operators of small MS4s*	N
		at Heisler Park – North		
	Pacific Ocean Shoreline	at Main Laguna Beach	City of Aliso Viejo **County of Orange** City of Laguna Beach City of Laguna Woods Orange County Flood Control District Caltrans Owners/operators of small MS4s*	
		Laguna Beach at Ocean Avenue		
		Laguna Beach at Laguna Avenue		
		Laguna Beach at Cleo Street		
		Arch Cove at Bluebird Canyon Road		
		Laguna Beach at Dumond Drive		
Aliso HSA (901.13)	Pacific Ocean Shoreline	Laguna Beach at Lagunita Place/Blue Lagoon Place at Aliso Beach	City of Aliso Viejo City of Laguna Beach City of Laguna Hills City of Laguna Niguel City of Laguna Woods City of Lake Forest City of Mission Viejo **County of Orange** Orange County Flood Control District Caltrans Owners/operators of small MS4s*	N
	Aliso Creek	The entire reach (7.2 miles) and associated tributaries Aliso Hills Channel, English Canyon Creek, Dairy Fork Creek, Sulphur Creek, and Wood Canyon Creek		
	Aliso Creek (mouth)	At creek mouth		
Dana Point HSA (901.14)	Pacific Ocean Shoreline	Aliso Beach at West Street	City of Dana Point City of Laguna Beach City of Laguna Niguel **County of Orange** Orange County Flood Control District Caltrans Owners/operators of small MS4s*	N
		Aliso Beach at Table Rock Drive		
		1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave)		
		at Salt Creek (large outlet)		
		Salt Creek Beach at Salt Creek service road		
		Salt Creek Beach at Dana Strand Road		

Table 11-4. Responsible Municipalities and Lead Jurisdictions† (Cont'd)

Watershed	Waterbody	Segment or Area**	Responsible Municipalities	Group
Lower San Juan HSA (901.27)	Pacific Ocean Shoreline	At San Juan Creek	City of San Juan Capistrano City of Mission Viejo City of Laguna Hills City of Laguna Niguel City of Dana Point City of Rancho Santa Margarita **County of Orange** Orange County Flood Control District Caltrans Owners/operators of small MS4s*	N
	San Juan Creek	Lower 1 mile		
	San Juan Creek (mouth)	At creek mouth		
San Clemente HA (901.30)	Pacific Ocean Shoreline	Poche Beach	City of San Clemente **County of Orange** Orange County Flood Control District Dana Point Caltrans Owners/operators of small MS4s*	N
		Ole Hanson Beach Club Beach at Pico Drain		
		San Clemente City Beach at El Portal Street Stairs		
		San Clemente City Beach at Mariposa Street		
		San Clemente City Beach at Linda Lane		
		San Clemente City Beach at South Linda Lane		
		San Clemente City Beach at Lifeguard Headquarters		
		Under San Clemente Municipal Pier		
		San Clemente City Beach at Trafalgar Canyon (Trafalgar Lane)		
		San Clemente State Beach at Riviera Beach		
		San Clemente State Beach at Cypress Shores		
San Luis Rey HU (903.00)	Pacific Ocean Shoreline	at San Luis Rey River Mouth	**City of Oceanside** City of Vista County of San Diego Caltrans Owners/operators of small MS4s* Controllable nonpoint sources	C

Table 11-4. Responsible Municipalities and Lead Jurisdictions[†] *(Cont'd)*

Watershed	Waterbody	Segment or Area**	Responsible Municipalities	Group
San Marcos HA (904.50)	Pacific Ocean Shoreline	at Moonlight State Beach	City of Carlsbad **City of Encinitas** City of Escondido City of Oceanside City of San Marcos City of Solana Beach City of Vista County of San Diego Caltrans Owners/operators of small MS4s* Controllable nonpoint sources	C
San Dieguito HU (905.00)	Pacific Ocean Shoreline	at San Dieguito Lagoon Mouth	City of Del Mar **City of Escondido** City of Poway City of San Diego City of Solana Beach County of San Diego Caltrans Owners/operators of small MS4s* Controllable nonpoint sources	C/S
Miramar Reservoir HA (906.10)	Pacific Ocean Shoreline	Torrey Pines State Beach at Del Mar (Anderson Canyon)	City of Del Mar **City of Poway** City of San Diego County of San Diego Caltrans Owners/operators of small MS4s*	S
Scripps HA (906.30)	Pacific Ocean Shoreline	La Jolla Shores Beach at El Paseo Grande La Jolla Shores Beach at Caminito Del Oro La Jolla Shores Beach at Vallecitos La Jolla Shores Beach at Ave de la Playa at Casa Beach, Children's Pool South Casa Beach at Coast Blvd. Whispering Sands Beach at Ravina Street Windansea Beach at Vista de la Playa Windansea Beach at Bonair Street Windansea Beach at Playa del Norte Windansea Beach at Palomar Ave. at Tourmaline Surf Park Pacific Beach at Grand Ave.	**City of San Diego** Owners/operators of small MS4s*	S

Table 11-4. Responsible Municipalities and Lead Jurisdictions† (Cont'd)

<table>
<tr><th>Watershed</th><th>Waterbody</th><th>Segment or Area**</th><th>Responsible Municipalities</th><th>Group</th></tr>
<tr><td>Tecolote HA (906.50)</td><td>Tecolote Creek</td><td>Tecolote Creek</td><td>City of San Diego
Owners/operators of small MS4s*</td><td>S</td></tr>
<tr><td rowspan="3">Mission San Diego HSA (907.11)
&
Santee HSA (907.12)</td><td>Forrester Creek</td><td>Lower 1 mile</td><td>City of El Cajon
City of La Mesa
City of Santee
County of San Diego
Caltrans
Owners/operators of small MS4s*</td><td>S</td></tr>
<tr><td>San Diego River, Lower</td><td>Lower 6 miles</td><td rowspan="2">City of El Cajon
City of La Mesa
City of San Diego
City of Santee
County of San Diego
Caltrans
Owners/operators of small MS4s*
Padre Dam Water Treatment Facility</td><td rowspan="2">S</td></tr>
<tr><td>Pacific Ocean Shoreline</td><td>At San Diego River Mouth at Dog Beach</td></tr>
<tr><td>Chollas HSA (908.22)</td><td>Chollas Creek</td><td>Lower 1.2 miles</td><td>City of La Mesa
City of Lemon Grove
City of San Diego
County of San Diego
San Diego Unified Port District
Caltrans
Owners/operators of small MS4s*</td><td>S</td></tr>
</table>

† Developed based on the 2002 Clean Water Act Section 303(d) List
*Owners/operators of small MS4s are listed in Appendix Q.
** As listed on the 2002 Clean Water Act Section 303(d) List

The SAG applied the above criteria and proposed a prioritization scheme for implementing bacteria reduction strategies in the impaired waters addressed in these TMDLs. Impaired waters were given a priority number of 1, 2, or 3 with 1 being the highest priority. Priority 1 waters also included waterbodies likely meeting WQOs and likely to be removed from the List of Water Quality Limited Segments. Priority schemes are designated within watersheds. A prioritized list of impaired beaches and creeks included in this project is shown in Table 11-5.

Table 11-5. Prioritized List of Impaired Waters for TMDL Implementation †

Watershed	Waterbody	Segment or Area[a]	Priority
San Joaquin Hills HSA (901.11) & Laguna Beach HSA (901.12)	Pacific Ocean Shoreline	Cameo Cove at Irvine Cove Dr. - Riviera Way	1
		at Heisler Park – North	1
	Pacific Ocean Shoreline	at Main Laguna Beach	1
		Laguna Beach at Ocean Avenue	1
		Laguna Beach at Laguna Avenue	1
		Laguna Beach at Cleo Street	1
		Arch Cove at Bluebird Canyon Road	1
		Laguna Beach at Dumond Drive	1
Aliso HSA (901.13)	Pacific Ocean Shoreline	Laguna Beach at Lagunita Place/Blue Lagoon Place at Aliso Beach	1
	Aliso Creek	The entire reach (7.2 miles) and associated tributaries Aliso Hills Channel, English Canyon Creek, Dairy Fork Creek, Sulphur Creek, and Wood Canyon Creek	3
	Aliso Creek (mouth)	At creek mouth	3
Dana Point HSA (901.14)	Pacific Ocean Shoreline	Aliso Beach at West Street	1
		Aliso Beach at Table Rock Drive	1
		1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave)	1
		at Salt Creek (large outlet)	1
		Salt Creek Beach at Salt Creek service road	2
		Salt Creek Beach at Dana Strand Road	2
Lower San Juan HSA (901.27)	Pacific Ocean Shoreline	At San Juan Creek	1
	San Juan Creek	Lower 1 mile	3
	San Juan Creek (mouth)	At creek mouth	1

Table 11-5. Prioritized List of Impaired Waters for TMDL Implementation † (Cont'd)

Watershed	Waterbody	Segment or Area[a]	Priority
San Clemente HA (901.30)	Pacific Ocean Shoreline	at Poche Beach (large outlet)	1
		Ole Hanson Beach Club Beach at Pico Drain	1
		San Clemente City Beach at Linda Lane	1
		San Clemente State Beach at Riviera Beach	1
		San Clemente City Beach at Mariposa Street	2
		San Clemente State Beach at Cypress Shores	2
		San Clemente City Beach at Lifeguard Headquarters	2
		Under San Clemente Municipal Pier	2
		San Clemente City Beach at El Portal Street Stairs	2
		San Clemente City Beach at South Linda Lane	3
		San Clemente City Beach at Trafalgar Canyon (Trafalgar Lane)	3
San Luis Rey HU (903.00)	Pacific Ocean Shoreline	at San Luis Rey River Mouth	2
San Marcos HA (904.50)	Pacific Ocean Shoreline	at Moonlight State Beach	1
San Dieguito HU (905.00)	Pacific Ocean Shoreline	at San Dieguito Lagoon Mouth	1
Miramar Reservoir HA (906.10)	Pacific Ocean Shoreline[a]	Torrey Pines State Beach at Del Mar (Anderson Canyon)	1
Scripps HA (906.30)	Pacific Ocean Shoreline	La Jolla Shores Beach at El Paseo Grande	1
		La Jolla Shores Beach at Caminito Del Oro	1
		La Jolla Shores Beach at Vallecitos	1
		La Jolla Shores Beach at Ave de la Playa	1
		at Casa Beach, Children's Pool	1
		South Casa Beach at Coast Blvd.	1
		Whispering Sands Beach at Ravina Street	1
		Windansea Beach at Vista de la Playa	1
		Windansea Beach at Bonair Street	1
		Windansea Beach at Playa del Norte	1
		Windansea Beach at Palomar Ave.	1
		at Tourmaline Surf Park	1
		Pacific Beach at Grand Ave.	1
Tecolote HA (906.10)	Tecolote Creek	The entire reach and associated tributaries	1

Table 11-5. Prioritized List of Impaired Waters for TMDL Implementation † (Cont'd)

Watershed	Waterbody	Segment or Area[a]	Priority
Mission San Diego HSA (907.11) & Santee HSA (907.12)	San Diego River, Lower	Lower 6 miles	3
	Pacific Ocean Shoreline	At San Diego River Mouth at Dog Beach	3
	Forrester Creek	Lower 1 mile	3
Chollas HSA (908.22)	Chollas Creek	Bottom 1.2 miles	3

† Developed based on the 2002 Clean Water Act Section 303(d) List
a As listed on the 2002 Clean Water Act Section 303(d) List

Beginning with the 2008 303(d) List, specific beach segments of the Pacific Ocean shoreline are listed individually, and may not be identified in the same way as those segments listed in the table above. Several of the segments or areas in the list above have been delisted or redefined in the 2008 303(d) List. In addition, other segments or areas have been added to the Pacific Ocean shorelines listed above. The TMDLs that address the Pacific Ocean shorelines identified in the 2002 303(d) List are assumed to be applicable to all the beaches located on the shorelines of the hydrologic subareas (HSAs), hydrologic areas (HAs), and hydrologic units (HUs) listed above, or as listed individually in the 2008 and future 303(d) Lists.

The prioritized list above recognizes that there are segments or areas where bacterial water quality improvements are most likely to occur first (Priority 1), and segments or areas where bacterial water quality improvements are most likely to require more time to achieve (Priority 3). In some cases, receiving water limitations are already being met, resulting in the delisting of those segments or areas from the 2006 and/or 2008 303(d) Lists. The protection of the REC-1 beneficial use of those delisted segments or areas, however, must also be maintained, and those segments or areas must remain off future iterations of the 303(d) List.

The BLRPs or CLRPs that are developed are expected to focus on implementing BMP programs to reduce bacteria loads to those segments or areas where exceedances of the receiving water limitations continue to occur. The BMP programs that are included in the BLRPs or CLRPs should include short-term and long-term implementation strategies. The short-term strategies should be able to result in bacteria load reductions that can result in achieving the TMDLs in the receiving waters of Priority 1 segments or areas. The long-term strategies should be able to result in bacteria load reductions that will result in achieving the TMDLs in the receiving waters of all segments or areas by the end of the TMDL compliance schedules and maintain the protection of the REC-1 beneficial use after the end of the TMDL compliance schedules.

In the segments or areas where the receiving water limitations are being met, the BLRPs or CLRPs also need to include a monitoring component to ensure that protection of the REC-1 beneficial use is maintained. If receiving water limitations are exceeded in the future in those locations, the BLRPs or CLRPs must include the implementation of a BMP program that will ensure that the TMDLs will be achieved by the end of the TMDL compliance schedules.

11.5.2 Compliance Schedule

Full implementation of the TMDLs for indicator bacteria shall be completed as soon as possible, but no later than 10 years[80] from the effective date[81] for both the dry weather and wet weather TMDLs.

The San Diego Water Board will require the Phase I MS4s to submit Bacteria Load Reduction Plan (BLRPs) outlining a proposed BMP program that will be capable of achieving the necessary load reductions required to attain the bacteria TMDLs in the receiving waters, acceptable to the Regional Board within 18 months after the effective date of these TMDLs. The Phase I MS4 BLRPs should be incorporated into their Watershed Runoff Management Programs. Caltrans will also be required to develop and submit BLRPs outlining a proposed BMP program that will be capable of achieving the necessary load reductions required to attain the TMDLs in the receiving waters, acceptable to the Regional Board, within 18 months after the effective date of these TMDLs. To the extent possible, the Phase I MS4s and Caltrans should develop and coordinate the elements of their BLRPs together. The BLRPs will allow the Phase I MS4s and Caltrans to propose a compliance schedule for WQBELs that implement the bacteria TMDLs. The compliance schedule for the Phase I MS4s and Caltrans to attain their respective WLAs and the TMDLs in the receiving waters will be based on the BMP program proposed in the BLRPs.

If the Phase I MS4s and Caltrans choose to submit BLRPs that address only bacteria, the proposed schedule for compliance with the wet weather and dry weather TMDLs cannot extend beyond 10 years from the effective date, and must include at least a milestone for achieving a 50 percent exceedance frequency reduction. Additional milestones for achieving exceedance frequency reductions (e.g., 25 and 75 percent) are encouraged, but may also be required by the Regional Board. If the BLRPs do not include a proposed compliance schedule that is acceptable to the Regional Board, the compliance schedule will be as follows.

The compliance schedule for achieving the dry weather and wet weather bacteria TMDLs (Tables 11-6 and 11-7, respectively) are structured in a phased manner, with 100 percent of dry weather exceedance frequency reductions, and 100 percent of wet weather exceedance frequency reductions within 10 years from the effective date. At the end of the dry weather TMDL compliance schedule, the receiving waters must not exceed the 30-day geometric mean REC-1 WQOs more than 0 percent of the time. At the end of the wet weather TMDL compliance schedule, the receiving waters must not exceed the single sample maximum REC-1 WQOs more than the wet weather allowable exceedance frequency. All of these reductions are aimed at restoring water quality to a level that supports REC-1 beneficial uses in the ocean shoreline and in impaired creeks. These reductions required by the compliance schedule vary on the timeline based on the priority scheme described in Table 11-5. Intermediate milestone reductions in bacteria wasteloads are required sooner in the higher priority waters.

[80] If a Comprehensive Load Reduction Plan (CLRP) is developed to address several pollutants, including bacteria, the implementation of the wet weather bacteria TMDLs shall be completed as soon as possible, but no later than 20 years from the effective date. See Alternative Compliance Schedules under section (j)(3).
[81] The effective date is the date the Office of Administrative Law approves this Basin Plan amendment.

Table 11-6. Dry Weather Compliance Schedule and Milestones for Achieving Exceedance Frequency Reductions

Compliance Year (year after OAL approval)	Required Exceedance Frequency Reduction		
	Priority 1	Priority 2	Priority 3
5	50% (All Dry Weather)		
6		50% (All Dry Weather)	
7			50% (All Dry Weather)
10+	100% (All Dry Weather)	100% (All Dry Weather)	100% (All Dry Weather)

Table 11-7. Wet Weather Compliance Schedule and Milestones for Achieving Exceedance Frequency Reductions

Compliance Year (year after OAL approval)	Required Exceedance Frequency Reduction		
	Priority 1	Priority 2	Priority 3
5	50% (All Wet Weather)		
6		50% (All Wet Weather)	
7			50% (All Wet Weather)
10+	100% (All Wet Weather)	100% (All Wet Weather)	100% (All Wet Weather)

The first four years of the compliance schedules above do not require any exceedance frequency reductions from current conditions. These years will provide the dischargers time to identify sources, develop plans and implement enhanced and expanded BMPs capable of achieving the mandated decreases in exceedance frequencies of the REC-1 WQOs in the impaired beaches and creeks. The Regional Board may also include additional milestones for achieving exceedance frequency reductions (e.g., 25 and 75 percent).

If appropriate and acceptable to the San Diego Water Board, the proposed compliance schedules included in the BLRPs will be incorporated into the various TMDL implementing orders, such as the municipal Phase I MS4 stormwater WDRs and NPDES requirements. Otherwise, the compliance schedules given above will be implemented.

11.5.3 Alternative Compliance Schedules

The dischargers to Chollas Creek in the Chollas HSA watershed will have to address reductions from multiple water quality improvement projects in addition to bacteria, namely TMDLs for copper, lead, zinc, and diazinon,[82] and a trash reduction program. Addressing multiple pollutants (in addition to bacteria) will require the development and submittal of a Comprehensive Load

[82] As described in *Total Maximum Daily Loads for Dissolved Copper, Lead, and Zinc in Chollas Creek, Tributary to San Diego Bay*, adopted under Resolution No. R9-2007-0043, and *Total Maximum Daily Load for Diazinon in Chollas Creek Watershed, San Diego County*, adopted under Resolution No. R9-2002-0123.

Reduction Plan (CLRP) by the Phase I MS4s and Caltrans. The CLRP will allow the Phase I MS4s and Caltrans to propose a compliance schedule to address impairments due to loads from multiple pollutants, including bacteria.

Full implementation of the TMDLs for indicator bacteria included under the CLRP for the Chollas HSA watershed shall be completed as soon as possible, but cannot extend beyond 10 years for the dry weather bacteria TMDLs and 20 years for the wet weather bacteria TMDLs. The proposed compliance schedules for the bacteria TMDLs included under the CLRP must include at least a milestone for achieving a 50 percent exceedance frequency reduction. Additional milestones for achieving exceedance frequency reductions (e.g., 25 and 75 percent) are encouraged. If the CLRP for the Chollas HSA watershed does not include a proposed compliance schedule, specifically for bacteria, the compliance schedule will be as given in Table 11-8.

Table 11-8. *Alternative Compliance Schedule for Chollas Creek*

Compliance Year*	**Exceedance Frequency Reduction Milestone****
7	50% for dry weather
10	100% for dry weather 50% for wet weather
20	100% for wet weather

* Year after effective date for the TMDL that initiated the development of the CLRP.
** The Regional Board may also include additional milestones for achieving exceedance frequency reductions (e.g., 25 and 75 percent).

Likewise, dischargers in other bacteria-impaired watersheds may also find that undertaking concurrent load reduction programs for other pollutant constituents (e.g. metals, pesticides, trash, nutrients, sediment, etc.) together with the bacteria load reduction requirements in these TMDLs, is more cost effective, and has fewer potential environmental impacts from structural BMP construction. In these cases, the dischargers may develop and submit a CLRP for all constituents of concern in lieu of the BLRP, and to propose an appropriately tailored alternative compliance schedule. Proposed alternative compliance schedules tailored under this provision may not extend beyond 10 years for the dry weather bacteria TMDLs and 20 years for the wet weather bacteria TMDLs from the effective date, and must include at least a milestone for achieving a 50 percent exceedance frequency reduction. Additional milestones for achieving exceedance frequency reductions (e.g., 25 and 75 percent) are encouraged, but may also be required by the Regional Board.

If appropriate and acceptable to the Regional Board, the proposed alternative compliance schedules included in the CLRPs will be incorporated into the various TMDL implementing orders. Otherwise, the alternative compliance schedule given above as an example for Chollas Creek will be implemented for a CLRP that is developed for any other watershed.

11.5.4 Implementation Milestones

Accomplishing the goals of the implementation plan will be achieved by cooperative participation from all responsible parties, including the San Diego Water Board. Major milestones are described in Table 11-9.

Table 11-9. *TMDL Implementation Milestones*

Item	Implementation Action	Responsible Parties	Date
1	Obtain approval of Beaches and Creeks Indicator Bacteria TMDLs from the State Water Board, OAL, and USEPA.	San Diego Water Board	Effective date[a]
2	Issue investigative orders to Phase I MS4s and Caltrans requiring the development and submittal of BLRPs or CLRPs acceptable to the Regional Board within 18 months of effective date	San Diego Water Board	As soon as possible (if necessary)
3	Issue, reissue, or revise general WDRs and NPDES requirements for the Phase I MS4s to incorporate the requirements for complying with the TMDLs and MS4 WLAs.	San Diego Water Board	Within 5 years of effective date[b]
4	Issue, reissue, or revise general WDRs and NPDES requirements for Caltrans to incorporate the requirements for complying with the TMDLs and Caltrans WLAs.	San Diego Water Board, State Water Board	Within 5 years of effective date[b]
5	Issue, reissue, or revise the WDRs and NPDES requirements for POTWs and wastewater collection systems to incorporate new requirements for sewer line surveillance and maintenance, consistent with the zero WLA.	San Diego Water Board	Within 5 years of effective date[b]
6	Meet 50% Dry Weather exceedance frequency reductions required to achieve TMDLs in receiving waters in Priority 1 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	5 years after effective date[b]
7	Meet 50% Wet Weather exceedance frequency reductions required to achieve TMDLs in receiving waters in Priority 1 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	5 years after effective date[b]
8	Meet 50% Dry Weather exceedance frequency reductions required to achieve TMDLs in receiving waters in Priority 2 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	6 years after effective date[b]
9	Meet 50% Wet Weather exceedance frequency reductions required to achieve TMDLs in receiving waters in Priority 2 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	6 years after effective date[b]
10	Meet 50% Dry Weather exceedance frequency reductions required to achieve TMDLs in receiving waters in Priority 3 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	7 years after effective date[b]
11	Meet 50% Wet Weather exceedance frequency reductions required to achieve TMDLs in receiving waters in Priority 3 watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	7 years after effective date[b]
12	Meet 100% Dry Weather exceedance frequency reductions required to achieve TMDLs in receiving waters in all watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	10 years after effective date[b,c]

Item	Implementation Action	Responsible Parties	Date
13	Meet 100% Wet Weather exceedance frequency reductions required to achieve TMDLs in receiving waters in all watersheds.	Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	10 to 20 years after effective date[b,c]
14	Amend discharge conditions of appropriate waivers to be consistent with the requirements for complying with the TMDLs and Agriculture LAs.	San Diego Water Board	As needed after effective date
15	Issue individual or general WDRs or Basin Plan prohibitions consistent with the TMDLs and LAs for controllable nonpoint source discharges not eligible conditional waivers.	San Diego Water Board	As needed after effective date
16	Submit BLRP or CLRP Progress Reports to San Diego Water Board	Phase I MS4s, Caltrans	In accordance with BLRPs or CLRPs accepted by the Regional Board
17	Enroll Phase II MS4s identified as significant sources of bacteria to receiving waters under State Water Board general WDRs and NPDES requirements.	San Diego Water Board	As needed after effective date
18	Issue individual or general WDRs and NPDES requirements consistent with the TMDLs and WLAs for specific Phase II MS4s or category of Phase II MS4s.	San Diego Water Board	As needed after effective date
19	Take enforcement actions against controllable point sources and nonpoint sources to attain compliance with the WLAs and LAs.	San Diego Water Board	As needed after effective date
20	Recommend TMDL-related projects as high priority for grant funds.	San Diego Water Board	As needed after effective date
21	Amend the Basin Plan and/or provisions of these TMDLs (e.g., usage frequency or creeks or watershed-specific allowable exceedance frequency) based on evidence provided by dischargers and/or other entities	San Diego Water Board, Municipal Dischargers, Caltrans, Agriculture/Livestock Dischargers	As needed after effective date

[a] Effective date = date of approval by OAL

[b] May defer to alternative compliance schedule proposed in BLRPs or CLRPs that have been incorporated into implementing orders (e.g., WDRs, cleanup and abatement orders)

[c] Compliance schedules for dry weather and wet weather TMDLs proposed in BLRPs cannot extend beyond 10 years from the effective date. Compliance schedules proposed in CLRPs for dry weather TMDLs cannot extend beyond 10 years and for wet weather TMDLs cannot extend beyond 20 years from the effective date.

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12 Environmental Analysis, Environmental Checklist, and Economic Factors

The San Diego Water Board must comply with the California Environmental Quality Act (CEQA) when amending the Basin Plan as proposed in this project to adopt these TMDLs for bacteria in the San Diego Region. Under the CEQA, the San Diego Water Board is the Lead Agency for evaluating the environmental impacts of the reasonably foreseeable methods of compliance with the proposed TMDLs.

The environmental impacts of the reasonably foreseeable methods of compliance with the proposed TMDLs were evaluated as part of Bacteria TMDLs Project I, which was adopted by the San Diego Water Board on December 12, 2007. Because there have been no fundamental changes to the technical approach or reasonably foreseeable methods of compliance with the proposed TMDLs, the environmental analysis, environmental analysis, and economic factors from Bacteria TMDLs Project I also apply to Revised Bacteria TMDLs Project I..

The following section summarizes the environmental analysis conducted to fulfill the CEQA requirements. The complete environmental analysis, including the environmental checklist and discussion of economic factors, are discussed in detail in Appendix R.

12.1 California Environmental Quality Act Requirements

The CEQA authorizes the Secretary of the Resources Agency to certify state regulatory programs, designed to meet the goals of the CEQA, as exempt from its requirements to prepare an Environmental Impact Report (EIR), Negative Declaration, or Initial Study. The State Water Board's and San Diego Water Board's Basin Plan amendment process is a certified regulatory program and is therefore exempt from the CEQA's requirements to prepare such documents.

The State Water Board's CEQA implementation regulations describe the environmental documents required for Basin Plan amendment actions. These documents consist of a written report that includes a description of the proposed activity, alternatives to the proposed activity to lesson or eliminate potentially significant environmental impacts, and identification of mitigation measures to minimize any significant adverse impacts.

The CEQA and CEQA Guidelines limit the scope to an environmental analysis of the reasonably foreseeable methods of compliance with the WLAs and LAs. The State Water Board CEQA Implementation Regulations for Certified Regulatory Programs require the environmental analysis to include at least the following:

1. A brief description of the proposed activity. In this case, the proposed activity is the TMDL Basin Plan amendment.
2. Reasonable alternatives to the proposed activity.
3. Mitigation measures to minimize any significant adverse environmental impacts of the proposed activity.

Additionally, the CEQA and CEQA Guidelines require the following components, some of which are repetitive of the list above:

1. An analysis of the reasonably foreseeable environmental impacts of the methods of compliance.
2. An analysis of the reasonably foreseeable feasible mitigation measures relating to those impacts.
3. An analysis of reasonably foreseeable alternative means of compliance with the rule or regulation, which would avoid or eliminate the identified impacts.

Additionally, the CEQA Guidelines require the environmental analysis take into account a reasonable range of:
1. Environmental factors.
2. Economic factors.
3. Technical factors.
4. Population.
5. Geographic areas.
6. Specific sites.

12.2 Analysis of Reasonably Foreseeable Methods of Compliance

The analysis of potential environmental impacts is based on the numerous alternative means of compliance available for controlling bacteria loading to beaches and creeks in the San Diego Region. The majority of bacteria discharged into the 12 watersheds result from urban and stormwater runoff from a combination of point and nonpoint sources. Attainment of the WLAs will be achieved through discharger implementation of structural and non-structural Best Management Practices (BMPs) for point sources and management measures (MMs) for nonpoint sources. The BMP and MM control strategies should be designed to reduce bacteria loading in urban and stormwater runoff.

The controls evaluated in Appendix R include the following non-structural and structural BMPs and MMs:

- Education and outreach;
- Road and street maintenance;
- Storm drain system cleaning;
- BMP inspection and maintenance;
- Enforcement of local ordinances;
- Manure fertilizer management plan;
- Sizing and location of facilities;
- Buffer strips and vegetated swales;
- Bioretention;
- Infiltration trenches;
- Sand filters;
- Diversion systems;
- Animal exclusion; and
- Waste treatment lagoons.

Structural and non-structural control strategies can be based on specific land uses, sources, or periods of a storm event. In order to comply with these TMDLs, emphasis should be placed on BMPs and MMs that control the sources of pollutants and on the maintenance of BMPs and MMs that remove pollutants from runoff.

12.3 Possible Environmental Impacts

The CEQA and CEQA Guidelines require an analysis of the reasonably foreseeable environmental impacts of the methods of compliance with the TMDL Basin Plan amendment. The environmental checklist identifies the potential environmental impacts associated with these methods with respect to earth, air, water, plant life, animal life, noise, light, land use, natural resources, risk of upset, population, housing, transportation, public services, energy, utilities and services systems, human health, aesthetics, recreation, and archeological/historical concerns.

From the 61 reasonably foreseeable environmental impacts identified in the checklist, none were considered to be "Potentially Significant." Fifty-five were considered either "Less Than Significant with Mitigation" or "Less Than Significant." Ten were considered to have "No Impact" on the environment. See sections 4 and 5 in Appendix R for a complete discussion of the potential environmental impacts.

In addition to the potential impacts mentioned above, mandatory finding of significance regarding short-term, long-term, cumulative, and substantial impacts were evaluated. Based on this review, the San Diego Water Board concluded that the potentially significant cumulative impacts can be mitigated to less than significant levels as discussed in Appendix R.

12.4 Alternative Means of Compliance

The CEQA requires an analysis of reasonably foreseeable alternative means of compliance with the rule or regulation, which would avoid or eliminate the identified impacts. The dischargers can use the structural and non-structural BMPs and MMs described in Appendix R or other structural and non-structural BMPs and MMs, to control and prevent pollution, and meet the TMDLs' required load reductions. The alternative means of compliance with the TMDLs consist of the different combinations of structural and non-structural BMPs and MMs that the dischargers might use. Since most of the adverse environmental effects are associated with the construction and installation of large scale structural BMPs, to avoid or eliminate impacts, compliance alternatives should minimize structural BMPs, maximize non-structural BMPs, and site, size, and design structural BMPs in ways to minimize environmental effects.

12.5 Reasonably Foreseeable Methods of Compliance at Specific Sites

The San Diego Water Board analyzed various reasonably foreseeable methods of compliance at specific sites within the subject watersheds. Because this project is large in scope (encompassing 12 watersheds), the specific sites analysis was focused on reviewing potential compliance methods within various land uses. The land uses analyzed correspond to the land uses that were utilized for watershed model development (discussed section 7).

In the discussion of potential compliance methods in section 6 of Appendix R, the San Diego Water Board assumed that, generally speaking, the BMPs suitable for the control of bacteria generated from a specific land use within a given watershed are also suitable for the control of bacteria generated from the same land use category within a different watershed. For example, a BMP used to control the discharge of bacteria from a residential area in the San Diego River watershed is likely suitable to control the discharge of bacteria from a residential area in the Aliso Creek watershed. However, in addition to land use, BMP selection includes considering site-specific geographical factors such as average rainfall, soil type, and the amount of impervious surfaces, and non-geographical factors such as available funding. Such factors vary between watersheds. The most suitable BMP(s) for a particular site must be determined by the dischargers in a detailed, project-specific environmental analysis.

In order to meet TMDL requirements, dischargers will determine and implement the actual compliance method(s) after a thorough analysis of the specific sites suitable for BMP implementation within each watershed. In most cases, the San Diego Water Board anticipates a potential strategy to be the use of management measures, or other non-structural BMPs as a first step in controlling bacteria discharges, followed by structural BMP installation if necessary.

12.6 Economic Factors

The environmental analysis required by the CEQA must take into account a reasonable range of economic factors. This section contains estimates of the costs of implementing the reasonably foreseeable methods of compliance with the TMDL Basin Plan amendment. Specifically, this analysis estimates the costs of implementing the structural and non-structural BMPs which the dischargers could use to reduce bacteria loading.

As discussed in section 7 in Appendix R, the cost estimates for non-structural BMPs ranged from $0 to $211,000. The cost estimates for treating 10 percent of the watershed with structural BMPs ranged from $50,000 to $973 million, depending on BMP selection, with yearly maintenance costs estimated from $10,000 to $68 million. Implementation of these TMDLs will also entail water quality monitoring which has associated costs. Assuming that a two-person sampling team can collect samples at 5 sites per day, the total cost for one day of sampling would be $2,274.

The specific BMPs and MMs to be implemented will be chosen by the dischargers after adoption of these TMDLs. All costs are preliminary estimates since particular elements of a BMP and MM, such as type, size, and location, would need to be developed to provide a basis for more accurate cost estimations.

12.7 Reasonable Alternatives to the Proposed Activity

The environmental analysis must include an analysis of reasonable alternatives to the proposed activity. The proposed activity is a Basin Plan Amendment to incorporate bacteria TMDLs for the beaches and creeks in the San Diego Region. The purpose of this analysis is to determine if there is an alternative that would feasibly attain the basic objective of the rule or regulation (the proposed activity), but would lessen, avoid, or eliminate any identified impacts. The alternatives analyzed include taking no action and modifying water quality standards. These alternative actions are discussed in section 8 of Appendix R. Because these alternatives are not expected to attain the basic objective of the proposed activity at this point in time, the preferred alternative is the proposed activity itself, which is the Basin Plan amendment incorporating the bacteria TMDLs.

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13 Necessity of Regulatory Provisions

The OAL is responsible for reviewing administrative regulations proposed by State agencies for compliance with standards set forth in California's Administrative Procedure Act, Government Code section 11340 *et seq*., for transmitting these regulations to the Secretary of State and for publishing regulations in the California Code of Regulations. Following State Water Board approval of this Basin Plan amendment establishing TMDLs, any regulatory portions of the amendment must be approved by the OAL per Government Code section 11352. The State Water Board must include in its submittal to the OAL a summary of the necessity[83] for the regulatory provision.

This Basin Plan amendment for Bacteria Impaired Waters meets the "necessity standard" of Government Code section 11353(b). Amendment of the Basin Plan to establish and implement bacteria TMDLs in affected watersheds in the San Diego Region is necessary because the existing water quality does not meet applicable numeric WQOs for indicator bacteria. Applicable state and federal laws require the adoption of this Basin Plan amendment and regulations as provided below.

The State Water Board and Regional Water Boards are delegated the responsibility for implementing California's Porter Cologne Water Quality Control Act and the federal CWA. Pursuant to relevant provisions of both of those acts the State Water Board and San Diego Water Boards establish water quality standards, including designated (beneficial) uses and criteria or objectives to protect those uses.

Section 303(d) of the CWA [33 USC section 1313(d)] requires the states to identify certain waters within their borders that are not attaining WQSs and to establish TMDLs for certain pollutants impairing those waters. USEPA regulations [40 CFR 130.2] provide that a TMDL is a numerical calculation of the amount of a pollutant that a water body can assimilate and still meet standards. A TMDL includes one or more numeric targets that represent attainment of the applicable standards, considering seasonal variations and a MOS, in addition to the allocation of the target or load among the various sources of the pollutant. These include WLAs for point sources, and LAs for nonpoint sources and natural background. TMDLs established for impaired waters must be submitted to the USEPA for approval.

CWA section 303(e) requires that TMDLs, upon USEPA approval, be incorporated into the state's Water Quality Management Plans, along with adequate measures to implement all aspects of the TMDL. In California, these are the basin plans for the nine regions. Water Code sections 13050(j) and 13242 require that basin plans have a program of implementation to achieve WQOs. The implementation program must include a description of actions that are necessary to achieve the objectives, a time schedule for these actions, and a description of surveillance to determine compliance with the objectives. State law requires that a TMDL project include an implementation plan because TMDLs normally are, in essence, interpretations or refinements of existing WQOs. The TMDLs have to be incorporated into the Basin Plan [CWA section 303(e)],

[83] "Necessity" means the record of the rulemaking proceeding demonstrates by substantial evidence the need for a regulation to effectuate the purpose of the statute, court decision, provision of law that the regulation implements, interprets, or makes, taking into account the totality of the record. For purposes of this standard, evidence includes, but is not limited to, facts, studies, and expert opinion. [Government Code section 11349(a)].

and, because the TMDLs supplement, interpret, or refine existing objectives, State law requires a program of implementation.

14 Public Participation

Public participation is an important component of TMDL development. The federal regulations [40 CFR 130.7] require that TMDL projects be subject to public review. All public hearings and public meetings have been conducted as stipulated in the regulations [40 CFR 25.5 and 25.6], for all programs under the CWA. Public participation was provided through two public workshops, and through the formation and participation of the Stakeholder Advisory Group. In addition, staff contact information was provided on the San Diego Water Board's website, along with periodically updated drafts of the TMDL project documents. Public participation also took place through the San Diego Water Board's Basin Plan amendment process, which included an additional public workshop, a hearing, and a formal public comment period. A chronology of public participation and major milestones is provided in Table 14-1.

Table 14-1. Public Participation Milestones

Date	Event
March 27, 2003	Public Workshop and CEQA Scoping Meeting
March 9, 2004	Public Workshop and SAG Meeting
March 26, 2004	SAG Meeting
June 15, 2004	SAG Meeting
August 2, 2004	SAG Meeting
September 20, 2004	SAG Meeting
December 14, 2004	SAG Meeting
January 11, 2005	SAG Meeting
February 16, 2005	SAG Meeting
May 10, 2005	SAG Meeting
May 31, 2005	SAG Meeting
December 9, 2005	Draft Documents released for first public review
January 11, 2006	Public Workshop
February 8, 2006	1st Public Hearing
August 4, 2006	Draft Documents released for second public review
September 12, 2006	SAG Meeting
March 9, 2007	Draft Documents released for third public review
April 25, 2007	2nd Public Hearing
June 25, 2007	Draft Documents released for fourth public review
December 12, 2007	3rd Public Hearing and Adoption.
June 3, 2009	SAG Meeting
Month Day, 2009	SAG Meeting
November 25, 2009	Revised Draft Documents released for public review
February 10, 2010	Public Hearing and Adoption

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