Mission Bay
Watershed Management Area
Water Quality Improvement Plan

Submitted to the San Diego Regional Water Quality Control Board by:

March 2015

DRAFT

Prepared by:

AMEC Environment & Infrastructure, Inc.

With:

TETRA TECH

armand ruby consulting

ACKNOWLEDGMENTS

The following members of the Water Quality Improvement Plan Consultation Committee have collaborated with the Responsible Agencies to make significant contributions to this plan:

Wayne Chiu, San Diego Regional Water Quality Control Board
Deborah Knight, Environmental Representative
Dan Biggs, Development Community Representative
Cindy Lin, At-Large Member
Lance Kyle, At-Large Member
Andrew Wiese, At-Large Member
Martin Schmidt, At-Large Member
Bryn Evans, At-Large Member
Nobu Murakami, At-Large Member
Isabelle Kay, At-Large Member

Executive Summary

The Executive Summary will be provided with the complete Draft Water Quality Improvement Plan in June 2015.

Intentionally Left Blank

Table of Contents

Table of Contents (continued)

Page

Table of Contents (continued)

Table of Contents (continued)

List of Tables

Page

List of Tables (continued)

List of Figures

List of Figures (continued)

Acronyms and Abbreviations

Acronym or Abbreviation	Definition
%	percent
303(d) list	Clean Water Act Section 303(d) list of impaired waters
Ag Waiver	Conditional Waiver of Discharges from Agricultural and Nursery Operations
ASBS	Area of Special Biological Significance
ASBS 29	La Jolla Area of Special Biological Significance
ASBS General Exception	State Water Resources Control Board Resolution No. 2012-0012, *General Exception to the California Ocean Plan for Areas of Special Biological Significance Waste Discharge Prohibition for Storm Water and Nonpoint Source Discharges, with Special Protections*
Bacteria TMDL	San Diego Regional Water Quality Control Board Resolution Number R9-2010-0001, *Revised TMDL for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)*
Basin Plan	*Water Quality Control Plan for the San Diego Basin*
BIOL	Preservation of Biological Habitats of Special Significance (beneficial use)
BMI	benthic macroinvertebrates
BMP	best management practice
BOA	business owners association
CalRecycle	California Department of Resources Recycling and Recovery
Caltrans	California Department of Transportation
CEDEN	California Environmental Data Exchange Network
City	City of San Diego
CLRP	Comprehensive Load Reduction Plan

Acronyms and Abbreviations (continued)

Acronym or Abbreviation	Definition
Consultation Committee	Water Quality Improvement Plan Consultation Committee
Copermittee	Operator of a municipal separate storm sewer system in San Diego County that is party to the MS4 Permit.
CRAM	California Rapid Assessment Method
CWA	Clean Water Act
DDT	dichloro-diphenyl-trichloroethane
DEH	Department of Environmental Health
DPR	California Department of Pesticide Regulation
FIB	fecal indicator bacteria
FY	Fiscal Year
GI	gastrointestinal illness
GIS	geographic information system
HMP	Hydromodification Management Plan
HOA	home owners association
IBI	Index of Biological Integrity
IC/ID	illicit connection/illicit discharge
IDDE	illicit discharge detection and elimination
JRMP	Jurisdictional Runoff Management Program (2013 MS4 Permit)
JURMP	Jurisdictional Urban Runoff Management Program/Plan (2007 MS4 Permit)
LID	low-impact development
LTEA	Long-Term Effectiveness Assessment
MAR	Marine Habitat (beneficial use)

Acronyms and Abbreviations (continued)

Acronym or Abbreviation	Definition
MEP	maximum extent practicable
MLS	mass loading station
MS4	municipal separate storm sewer system
MS4 Permit	San Diego Regional Water Quality Control Board Order Number R9-2013-0001, *National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer System (MS4) Draining the Watersheds Within the San Diego Region*
MST	microbial source tracking
MWD	Metropolitan Water District of Southern California
NA	not applicable
NAL	non-storm water action level
NCTD	North County Transit District
NIH	National Institutes of Health
NLCD	National Land Cover Database
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
OAL	California Office of Administrative Law
PDP	priority development project
PFC	permeable friction course
PGA	pollutant-generating activity
Porter-Cologne	Porter-Cologne Water Quality Control Act
POTW	publicly owned treatment works
psu	practical salinity unit
PUD	Public Utilities Department

Acronyms and Abbreviations (continued)

Acronym or Abbreviation	Definition
QMRA	Quantitative Microbial Risk Assessment Study
REC-1	Contact Water Recreation (beneficial use)
REC-2	Non-Contact Water Recreation (beneficial use)
Regional Board	San Diego Regional Water Quality Control Board
Responsible Agency	Responsible Agencies include parties subject to the Bacteria TMDL and participating in this Water Quality Improvement Plan, specifically City of San Diego and Caltrans.
RHMP	Regional Harbor Monitoring Program
RSAA	Reference System Antidegradation Approach
RWL	Receiving Water Limitation
SAL	storm water action level
SANDAG	San Diego Association of Governments
SCCWRP	Southern California Coastal Water Research Project
SDCWA	San Diego County Water Authority
SHELL	Shellfish Harvesting (beneficial use)
SMARTS	Storm Water Multiple Application and Report Tracking System
SMC	Southern California Stormwater Monitoring Coalition
SOP	standard operating procedure
SQO	Sediment Quality Objective
SSID	stressor/source identification
State	State of California
State Board	State Water Resources Control Board
Strategic Plan	City of San Diego Strategic Plan for Watershed Activity Implementation
SUSMP	Standard Urban Storm Water Mitigation Plan

Acronyms and Abbreviations (continued)

Acronym or Abbreviation	Definition
SUSTAIN	System for Urban Stormwater Treatment and Analysis Integration
SWAMP	Surface Water Ambient Monitoring Program
SWMP	Storm Water Management Plan
T&SW	City of San Diego Transportation and Storm Water Division
TDS	total dissolved solids
TIE	toxicity identification evaluation
TMDL	total maximum daily load
TRE	toxicity reduction evaluation
TSS	total suspended solids
TWAS	temporary watershed assessment station
UC	University of California
USD	University of San Diego
USEPA	United States Environmental Protection Agency
VA	Veterans Administration
WARM	Warm Freshwater Habitat (beneficial use)
WLA	waste load allocation
WMA	Watershed Management Area
WMAA	Watershed Management Area Analysis
WQBEL	water quality based effluent limitation
WQO	water quality objective
WRI	World Resources Institute
WURMP	Watershed Urban Runoff Management Program

Intentionally Left Blank

1 Introduction

Local government agencies work hard to protect water quality throughout the San Diego region. New regulations along with existing environmental protections create the need for new plans and programs that will address concerns about pollution in local rivers, streams, and other waterways leading to the ocean. Local agencies worked to develop Water Quality Improvement Plans that will help protect and improve the quality of waters in each community of San Diego. These plans address protections in what are known as Watershed Management Areas (WMAs). A Watershed Management Area includes the lands, stream systems, and other tributaries draining to a specific ocean or bay shoreline (or other receiving water). This document is the Water Quality Improvement Plan for the Mission Bay WMA.

The Mission Bay WMA is a highly urbanized 64-square-mile portion of central San Diego County. It includes four distinct hydrologic areas draining to Mission Bay and the Pacific Ocean. Two local agencies share jurisdictional authority in this WMA and worked collaboratively to prepare this Water Quality Improvement Plan.

Water Quality Improvement Plans are required for each WMA under regulations adopted by the San Diego Regional Water Quality Control Board (Regional Board). The plans address only water flows and discharges from the storm drain systems maintained by the local agencies sharing authority in each area. Other discharges and sources of pollution are considered in the plan to the extent that they affect conditions in the storm drain system.

Following the passage of the Federal Clean Water Act (CWA) in 1972, surface water

Section 1 Highlights

- This Water Quality Improvement Plan helps to protect and improve waters in the Mission Bay Watershed Management Area.
- The plan specifically addresses conditions within storm water systems and receiving waters of this area.
- Mission Bay WMA = 64 square miles
- Main Subwatersheds:
  - Rose Canyon
  - Tecolote Creek
  - Mission Bay
  - Scripps (includes drainage to Pacific Ocean and Mission Bay)
- Responsible Agencies:
  - City of San Diego
  - Caltrans (participating voluntarily)
- Other Discharge Impacts:
  - Phase II Permittees – University of California at San Diego; Veterans Administration (VA) San Diego Healthcare System; North County Transit District; Marine Corps Air Station Miramar
  - Construction General Permits
  - Industrial General Permits
  - Federal/State Lands
  - Agricultural Lands
- This document will serve as the Bacteria Total Maximum Daily Load Comprehensive Load Reduction Plan for the Scripps and Tecolote Creek subwatersheds.

quality throughout the United States has improved substantially. However, poor water quality still impairs some beneficial uses of surface waters in the Mission Bay WMA. Beneficial uses are "the uses of water necessary for the survival or well-being of man, plants, and wildlife" (Regional Board, 1994).

1.1 Jurisdiction and Responsibilities

The Water Quality Improvement Plan outlines a framework to improve the surface water quality in the Mission Bay WMA by identifying, prioritizing, and addressing impairments related to urban runoff discharges. On May 8, 2013, the San Diego Regional Water Quality Control Board adopted Order Number R9-2013-0001, *National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer System (MS4) Draining the Watersheds Within the San Diego Region* (MS4 Permit), establishing requirements for discharges from MS4s in the San Diego region.

This MS4 Permit affects local agencies, including those with jurisdictional responsibilities in the Mission Bay WMA. As defined in the MS4 Permit, a permittee to an NPDES permit is responsible only for permit conditions relating to the discharges for which it is an operator. In the case of the MS4 Permit, this responsibility includes discharges from Copermittees (jurisdictions party to the MS4 Permit) in the San Diego region. The San Diego County Copermittees are listed in Table 1a of the MS4 Permit and the Copermittee with jurisdictional area within the Mission Bay WMA is as follows:

- City of San Diego

Each Copermittee must comply with the MS4 discharge prohibitions and receiving water limitations outlined in the MS4 Permit through timely implementation of control measures, other actions specified in the MS4 Permit, and adherence to this Water Quality Improvement Plan.

The Mission Bay WMA also includes land area and MS4s that are owned and operated by parties other than the Copermittees or that are regulated by separate NPDES permits.

Discharges from non-municipal sources and activities (e.g., runoff from agriculture and industrial land uses, federal and state facilities, the California Department of Transportation [Caltrans], and Phase II storm water permittees) are regulated separately. For example, facilities designated as Phase II permittees (small MS4s) are regulated under the Phase II General Permit (State Water Resources Control Board [State Board] Order No. 2013-0001-DWQ). Phase II permittees in the Mission Bay WMA include a transit authority, a medical facility, a university, and a military installation. In California, industrial and construction activities are regulated under the General Industrial Permit (State Board Order No. 2014-0057-DWQ) (State Board, 2014a) and General Construction Permit (State Board Order No. 2012-0006-DWQ) (State Board, 2012a). Finally, conditional waivers that remove the need to file a report of waste discharge and that avoid coverage under the NPDES permit program are given to

activities such as agriculture and nursery operations, onsite disposal systems, silvicultural operations, and animal operations. Recently, draft general water discharge requirements for commercial agricultural and nursery operations were released for public review. The tentative draft order may be finalized during the development of this Water Quality Improvement Plan, affecting the ways in which sources from commercial agricultural and nursery operations are managed.

Under this regulatory framework, there are two general areas of storm water management responsibilities: (1) jurisdictional inspection and oversight (such as education, enforcement, and other Illicit Discharge Detection and Elimination (IDDE) activities), as described in the Jurisdictional Runoff Management Programs (JRMPs) in the MS4 Permit, and (2) control of pollutant discharges.

(1) The Mission Bay WMA Copermittees require minimum Best Management Practices (BMPs) and have inspection responsibilities over all lands within their jurisdictional boundaries (including industrial lands and construction sites), except for NPDES Phase II, agricultural, state, federal, Caltrans, and Indian reservation lands. The United States Environmental Protection Agency (USEPA), State Board, and Regional Board are responsible for inspections of Phase II, agricultural, state, federal, and Indian reservation lands. Caltrans is subject to its own State of California (State)-issued MS4 Permit. In addition, the USEPA, State Board, and Regional Board have dual permitting and oversight responsibilities over industrial lands and construction sites.

    Copermittees do have limited regulatory oversight over industrial lands, construction sites, Phase II MS4s, and agricultural, state, federal, and Indian reservation lands. For example, the Copermittees implement IDDE activities to identify, investigate, and enforce discharges to their MS4s, as shown in Table 1-1. Discharges to receiving waters from non-municipal sources and activities (e.g., runoff from agriculture and industrial land uses, federal and state facilities, Caltrans, and Phase II storm water permittees) are not regulated or controlled by the Copermittees because they do not enter a MS4. Accordingly, the scope of the Water Quality Improvement Plan is limited to the regulatory oversight of the Copermittees specified above.

(2) In regard to controlling pollutant discharges, various NPDES permits or conditional waivers regulate storm water and non-storm water discharges within the Mission Bay WMA, as shown in Figure 1-1. The Copermittees are responsible for controlling pollutant discharges from lands within their jurisdictional boundaries, except for agriculture and industrial land uses, federal and state facilities, Caltrans, and Phase II storm water permittees. The Copermittees do not have regulatory authority under the MS4 Permit to require entities regulated by other permits issued by the USEPA, State Board, or Regional Board to implement and/or construct BMPs to treat wet/dry weather pollutant discharges originating from their properties, facilities, and/or activities. However, the MS4 Permit requires the Copermittees to control pollutants

originating from non-MS4 or non-municipal lands if those pollutants ultimately discharge into the MS4. Therefore, the Copermittees recognize the need to collaborate with and improve communication between non-municipal entities within the WMA and the appropriate regulatory agencies to ensure that discharges are appropriately regulated before entering the MS4, and to improve water quality throughout the Mission Bay WMA.

To help identify non-municipal sources, the Copermittees are participating in special source identification studies to determine potential sources (including non-municipal sources) of pollutants entering the MS4; these studies are presented in Section 5. Additionally, the Copermittees are conducting additional watershed modeling to quantify the amount of pollutant loads coming from non-municipal sources and activities, and the results are presented in Section 4.

This document incorporates and replaces the Tecolote and Scripps Comprehensive Load Reduction Plans, which were submitted to the Regional Board in July 2012 to satisfy the requirements of the *Total Maximum Daily Load (TMDL) for Indicator Bacteria*, *Project I—Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek),* Resolution No. R9-2010-0001 (Regional Board, 2010), referred to as the Bacteria TMDL. The Mission Bay WMA Water Quality Improvement Plan represents an update to those plans as it provides more recent programmatic guidance for the implementation of the Bacteria TMDL. A goal of the Water Quality Improvement Plan is to describe the programmatic and adaptive management approach developed by the Responsible Agencies to meet the requirements of the Bacteria TMDL. This includes the implementation strategies needed to achieve the pollutant load reductions identified in the TMDL. Therefore, this document now serves as the compliance plan for the Bacteria TMDL for the Tecolote and Scripps subwatersheds.

Caltrans has partial responsibility for the implementation of the Bacteria TMDL Caltrans and is therefore included as a Responsible Agency, but is not listed in the MS4 Permit as a Copermittee. Caltrans is under a separate storm water permit from the State of California to reduce or eliminate the discharge of pollutants to storm drainage systems and receiving waters (Order No. 2012-0011-DWQ). Caltrans is voluntarily participating in Water Quality Improvement Plan development across the San Diego region.

This plan has been prepared, as required by the MS4 Permit, by the Responsible Agencies in the Mission Bay WMA. The Responsible Agencies that are party to the development of this Water Quality Improvement Plan are:

- Caltrans
- City of San Diego

Table 1-1
City of San Diego Inspection and Oversight Authority Under the MS4 Permit

City of San Diego Can:	Non-municipal Sources and/or Activities					
	Industrial Facilities	Construction Sites	Agricultural Lands	Federal/State/Indian Reservations	Caltrans	Phase IIs
Conduct storm water inspections [MS4 Permit Provisions E.4.d and E.5.c]	✓	✓	–	–	–	–
Require minimum BMPs [MS4 Permit Provisions E.4.c and E.5.b.]	✓	✓	–	–	–	–
Implement Illicit Discharge Detection and Elimination Program[1] [MS4 Permit Provision E.2]	✓	✓	✓	✓	✓	✓
Educate [MS4 Permit Provision E.7]	✓	✓	✓	✓	✓	✓

1. The Illicit Discharge Detection and Elimination Program (IDDE) includes the identification, investigation and confirmation of sources of illicit discharges to the MS4. Investigation can include monitoring and sampling of discharges. After confirmation, follow up activities can include notification, education, notice of violation, and/or monetary fines. Discharges and/or non-filers under the Industrial General Permit can be reported to the Regional Board. The City of San Diego's Storm Water Ordinance provides the legal authority to implement its IDDE Program.

Intentionally Left Blank

Currently, some of the Copermittees are pursuing a subvention of funds from the State to pay for certain activities required by the 2007 MS4 Permit, including activities that require Copermittees to perform activities outside their jurisdictional boundaries and on a regional or watershed basis. Nothing in this Water Quality Improvement Plan should be viewed as a waiver of those claims or as a waiver of the rights of Copermittees to pursue a subvention of funds from the State to pay for certain activities required by the 2013 MS4 Permit, including the preparation and implementation of the Water Quality Improvement Plan. In addition, several Copermittees have filed petitions with the State Board challenging the requirement to prepare Water Quality Improvement Plans that are not voluntary and that are not linked to a receiving water limitations language compliance path. Nothing in this Water Quality Improvement Plan should be viewed as a waiver of those claims. Because the State Board has not issued a stay of the 2013 MS4 Permit, Copermittees must comply with the MS4 Permit's requirements while the State Board process is pending.

Intentionally Left Blank

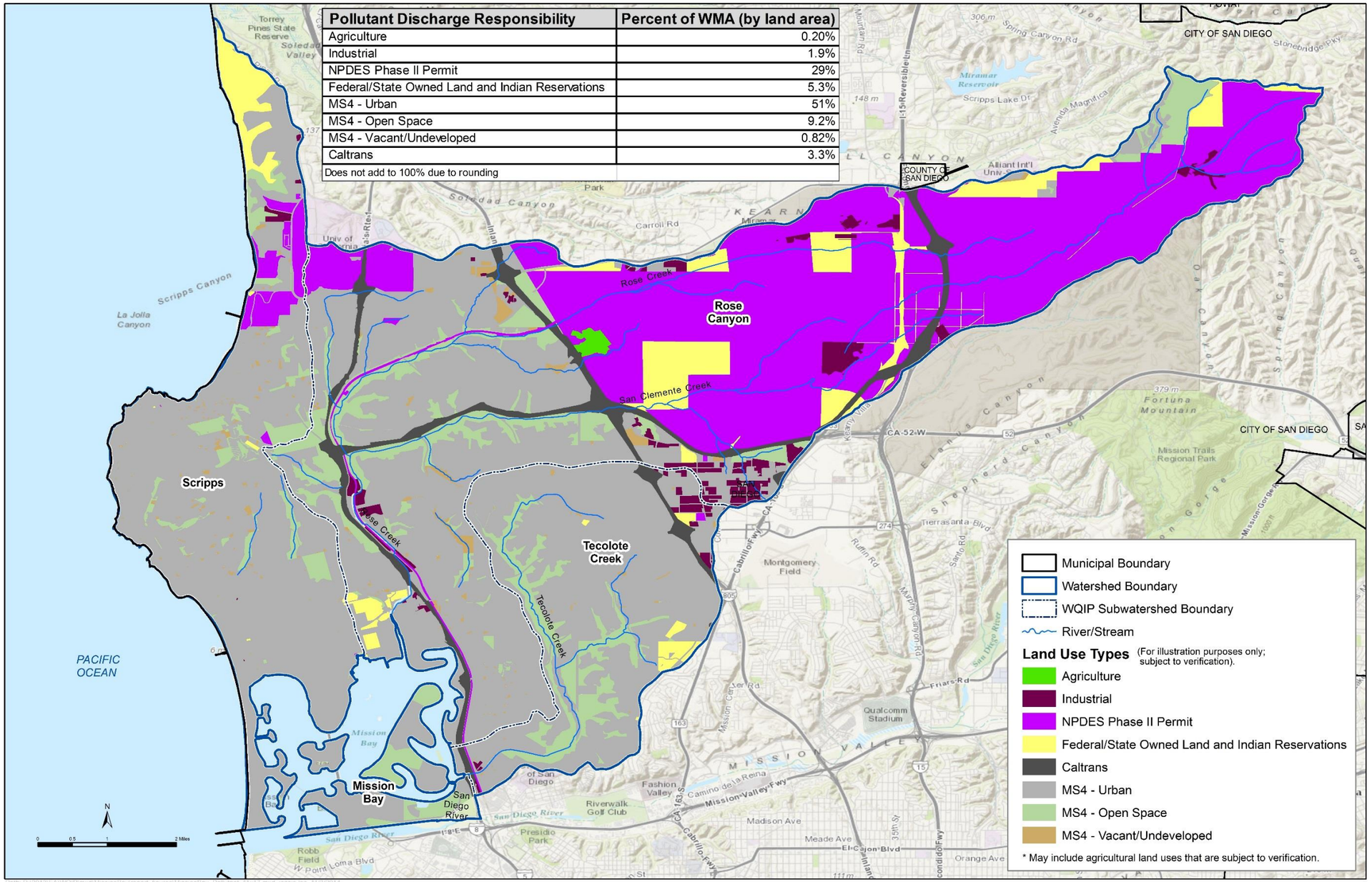


Figure 1-1
Mission Bay WMA Pollutant Discharge Responsibilities

Intentionally Left Blank

1.2 Regulatory Background

In 1972, the CWA amended the Federal Water Pollution Control Act, providing the mechanism for regulating discharges to waters of the United States through the NPDES permit program. The CWA requires appropriate NPDES permits for specific types of discharges (e.g., municipal and industrial storm water) to surface waters of the United States. Individual states may administer the federal law through their own legislation, in addition to regulating other types of discharges (e.g., discharges to land and irrigated agriculture).

California passed the Porter-Cologne Water Quality Control Act (Porter-Cologne) to control water pollution in 1969 (prior to the CWA), and has since amended it to comply with and implement the CWA. Porter-Cologne gave the State Board and nine Regional Water Quality Control Boards the authority to regulate discharges to waters of the state (which include all waters of the United States) and to issue NPDES permits.

The jurisdictions of the nine Regional Water Quality Control Boards correspond to nine large watershed areas across the state, which are referred to as basins. These basins are delineated using topographical maps surveyed by the United States Geological Survey and are further subdivided into (smaller) watersheds and subwatersheds. The water quality standards, including the beneficial uses and water quality objectives, for each basin are detailed in the Basin Plan for each region. For the San Diego region (Region 9), the Water Quality Control Plan for the San Diego Region (Basin Plan) was adopted in 1994 and has been amended several times since. The Mission Bay WMA is one of ten watersheds (otherwise referred to as WMAs) within the San Diego Basin and is regulated by the Regional Board using its authority under Porter-Cologne in conjunction with the water quality standards described in the Basin Plan.

For approximately 20 years after the CWA's passage, NPDES permits were primarily issued to wastewater and industrial facilities (such as publicly owned treatment works [POTWs], paper mills, and power plants) that discharged waste to natural surface waterbodies as part of their operations. These regulations substantially improved surface water quality throughout the country. However, many waterbodies still suffer from suboptimal water quality, and their benefits (termed "beneficial uses" in the CWA) were not always attained.

The pathways by which pollutants can enter waters of the state are not limited to wastewater discharging from a pipe. In the early 1990s, the Regional Water Quality Control Boards began to issue NPDES permits to municipalities and other agencies that discharge water via a storm drain system, identified as an MS4. The MS4s, which are systems of conveyances that may include the storm drains and flood control structures associated with land development, are primarily owned and operated by municipalities. MS4s are distinguished from combined sewers, which direct storm drain flows to a wastewater treatment plant; in contrast, MS4s convey water flowing from streets, buildings, and other land areas into surface waters, both directly and indirectly. MS4s may convey both storm water and authorized non-storm water discharges.

The initial ("Phase I") MS4 Permits, typically issued for a five-year term, focused on actions to be taken by Copermittees. These actions included regulation of residential and commercial activities, new and existing development, and other construction activities; facility inspections; water quality monitoring; and programs to detect and eliminate illegal discharges.

The Phase I MS4 Permits also established the following regulatory mechanisms:

- ***Receiving water limitations*** prohibit discharges from MS4s that cause or contribute to the violation of water quality standards or water quality objectives.
- ***Effluent limitations*** are based either on technology, by requiring pollutants to be reduced to the maximum extent practicable (MEP), or on water quality, by specifying the maximum concentration of pollutants in MS4 storm water discharges.
- ***Discharge prohibitions*** specify what may and may not be legally discharged to a state waterbody in a manner causing, or threatening to cause, a condition of pollution, contamination, or nuisance.

Monitoring programs required by the Phase I MS4 Permits were effective in characterizing the receiving waters in urban areas and the pollutants typically found in MS4 discharges. Furthermore, the permit programs developed and implemented numerous BMPs, ranging from street sweeping to public education and outreach to true source control (e.g., eliminating copper from automotive brake pads through state legislation). However, despite the implementation of program activities meeting the MEP standard, impairments of beneficial uses remain. Because these impairments exist, the Regional Board is required to review existing policies and to develop new policies, such as TMDLs. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards, and an allocation of that load among the various sources of the pollutant.

The Regional Board worked closely with the Copermittees and interested parties during development of the most recent version of the MS4 Permit to institute a new scientifically based approach to water quality management. The new approach is based on water quality outcomes, rather than on fulfillment of prescriptive activities. While maintaining each jurisdiction's authority and accountability, monitoring is conducted to answer specific questions and provide the basis for implementation actions in the Mission Bay WMA.

1.3 Water Quality Improvement Plan Process

During development of the Water Quality Improvement Plan, the Responsible Agencies solicited data, information, and recommendations through a public participation process, as mandated by Provision F.1.a of the MS4 Permit. The public participation process included public workshops (described in Sections 2 and 3 of this document) and the creation of a Water Quality Improvement Consultation Committee (Consultation

Committee), which provided recommendations during the development of the Water Quality Improvement Plan. The Consultation Committee included the following required representatives:

- A representative of the Regional Board
- A representative of the environmental community (i.e., a non-governmental organization) associated with a waterbody within the Mission Bay WMA
- A representative of the development community familiar with the opportunities and constraints for implementing structural BMPs, retrofitting projects, and stream, channel, or habitat rehabilitation projects in the Mission Bay WMA

In addition to the three required Consultation Committee members, the Responsible Agencies chose seven members at large, based on interest forms received after the first public workshop.

The Consultation Committee will review drafts of keys sections of the Water Quality Improvement Plan, and will meet periodically during the two-year development process to discuss the following topics:

- Priorities, potential strategies, and sources of pollutants and stressors (November 2013 [completed])
- Numeric goals, strategies, and schedules (July 2014 [completed] and October 2014 [completed])
- Final Water Quality Improvement Plan (June 2015, 30-day comment period)

1.4 Water Quality Improvement Plan Goal and Approach

As stated in the MS4 Permit, “the goal of the Water Quality Improvement Plans is to further the CWA’s objective to protect, preserve, enhance, and restore the water quality and designated beneficial uses of waters of the state.”

Since the inception of MS4 Permits more than 20 years ago, the Responsible Agencies have directed substantial resources to improve water quality in the Mission Bay WMA through the City’s Watershed Urban Runoff Management Program (WURMP) and Jurisdictional Urban Runoff Management Program (JURMP), and Caltrans’ Storm Water Management Plan. The Water Quality Improvement Plan represents the next phase in watershed management and enhancement following many years of monitoring and program implementation. Additionally, this Water Quality Improvement Plan serves as the comprehensive planning document for the proposed management program that will be implemented within the Mission Bay WMA. As the comprehensive planning document, this Water Quality Improvement Plan incorporates and replaces all previously submitted comprehensive planning documents for this WMA, including the Bacteria TMDL CLRP.

This Water Quality Improvement Plan is intended to be a living document and proposes an iterative and adaptive management process to meet the MS4 Permit goals. The overall process is shown in Figure 1-2 and described in this section.

Figure 1-2
Water Quality Condition Improvement Plan Process

The initial step in developing this Water Quality Improvement Plan was a review of known receiving water impairments and the water quality data that had been collected during prior MS4 Permit cycles, along with other available data and public input. This process identified a set of receiving water conditions within the Mission Bay WMA (Section 2.1).

For each identified receiving water condition, available data from upstream MS4 discharges were reviewed to determine whether there was evidence that the MS4 discharges may be a source of pollutants to the receiving water condition (Section 2.2). When evidence of a potential linkage was found, the receiving water condition became a “priority water quality condition” (Section 2.3). A subset of these priority water quality conditions was selected to represent the highest priority water quality conditions (Section 2.4).

The CWA regulatory process and the MS4 Permit monitoring programs performed to date have generally been successful in identifying the highest priorities in the Mission Bay WMA. Selection of the highest priority water quality conditions is based on the methodology developed by the Responsible Agencies (Appendix A) and these conditions reflect some of the most challenging water quality issues to address in the WMA. The strategies identified in this Water Quality Improvement Plan to address these issues are expected to simultaneously address many of the other priorities in the WMA. The highest priority water quality conditions identified in this plan were subject to review and input from the Regional Board; environmental, business, and development organizations; and the public.

Current water quality issues identified by the Responsible Agencies include a list of impaired waterbodies with designations that have been approved by the USEPA per CWA Section 303(d) (303(d) or 303(d) list or listing). Goals and schedules for addressing these issues have been developed and included in the Basin Plan as TMDLs for certain 303(d) listings or as General Ocean Plan Exceptions for areas of special biological significance (ASBS).

With the highest priority water quality conditions established, the next step was to identify the potential sources of the pollutants and stressors contributing to the highest

priority water quality conditions (Section 3). Concurrently, potential strategies to address the highest priority water quality conditions were identified. The potential strategies ranged from activities such as street sweeping, public outreach, and construction of water quality treatment structures to the development of standards and regulatory initiatives. The potential strategies were selected from existing plans, public feedback, and suggestions from the Consultation Committee.

Given the potential strategies and the final Water Quality Improvement Plan goals, interim numeric goals have been developed using the latest research and currently available technology (Section 4). These interim goals provide a schedule for measuring progress toward final numeric goals. Final numeric goals are intended to protect and restore beneficial uses when achieved. According to the MS4 Permit (Provision B.3), "the water quality improvement goals and strategies must address the highest priority water quality conditions by effectively prohibiting non-storm water discharges to the MS4, reducing pollutants in storm water discharges from the MS4 to the MEP, and protecting the water quality standards of receiving waters." Numeric goals and schedules have been developed to track improvements related to the highest priority water quality conditions detailed in this Water Quality Improvement Plan, while prioritizing strategies that can address multiple pollutants simultaneously.

In coordination with the Regional Board and other interested parties, the Responsible Agencies have developed a list of recommended strategies with implementation schedules and the estimated date for achievement of interim and final numeric goals. The list of recommended strategies was developed by evaluating the potential strategies developed under the previous step for their estimated ability to ultimately achieve the numeric goals, while providing a multi-pollutant benefit. The Responsible Agencies have prioritized the list of recommended strategies by incorporating a comprehensive approach to all pollutants and conditions. The end goal is to optimize the improvement to water quality in relation to the overall costs of implementation and assessment. The Responsible Agencies are committed to contributing to improved water quality in the Mission Bay WMA by reducing the discharge of pollutants from their MS4s through implementation of the recommended strategies identified in this Water Quality Improvement Plan.

To evaluate progress toward improving water quality and meeting scheduled goals, a question-based program to monitor and assess water quality improvement has been developed (Section 5). The program will be implemented on a watershed basis so that the Responsible Agencies can efficiently combine their resources.

This Water Quality Improvement Plan includes an iterative and adaptive management process for Responsible Agencies to re-evaluate conditions and improve strategies and assessments (Section 6). The process will draw from the data collected as part of the Monitoring and Assessment Program and the JRMP to create a water quality improvement program that is dynamic and proactive.

1.5 The Mission Bay WMA

The Mission Bay WMA drains a highly urbanized area of approximately 64 square miles, almost entirely west of Interstate 15 in coastal San Diego County. The WMA is entirely within the jurisdiction of the City of San Diego; however, several major corridors maintained by Caltrans are also in the WMA. The land areas of the jurisdictions are provided in Table 1-2.

Table 1-2
Jurisdictional Land Area Sizes
for the Mission Bay WMA

Responsible Agencies	Land Area (Acres)
City of San Diego	39,650
Caltrans	1,378

To develop the Water Quality Improvement Plan, the Mission Bay WMA was separated into four main subwatersheds to make receiving water the focus when selecting priority water quality conditions and implementing the jurisdictional runoff management program. These subwatersheds, which are delineated by the major hydrologic boundaries in the WMA, are Rose Canyon, Tecolote Creek, Mission Bay, and Scripps. A subwatershed map is provided in Appendix B. These subwatersheds aid organization and help give geographical context to the conditions and strategies. However, the locations of the receiving waters were not a factor in determining the priority water quality conditions.

Rose Creek, Tecolote Creek, and Cudahy Creek are the WMA's main tributaries to Mission Bay. San Clemente Creek and Cudahy Creek are tributaries to Rose Creek, and are considered part of the Rose Canyon subwatershed. It flows to the southwest, parallel to Rose Creek, before joining Rose Creek near the interchange of Interstate 5 and State Route 52.

The Mission Bay subwatershed comprises Vacation Isle and Fiesta Island areas, which are smaller, separate drainage areas within Mission Bay.

The Scripps subwatershed is unique in that it has two separate drainage ways. The "Crown Point" area and the eastern portion of the Mission Beach community drain into Mission Bay. The remaining portion of the Scripps subwatershed drains into the Pacific Ocean and two current ASBS, which encompass a large portion of the La Jolla Shores marine environment.

Many of the natural vegetative communities in the Mission Bay WMA have been altered by land development. However, concentrated native chaparral scrub habitats are found in the headwaters of the Rose Canyon subwatershed (Appendix B).

Land use information was obtained from the land layer of the geographical information system (GIS) of the San Diego Association of Governments (SANDAG, 2009), which contains over 80 different land use classifications. These land use classifications were aggregated into nine general land use classifications. A breakdown of the land uses in the Mission Bay WMA is provided in Table 1-3. While a large portion of the WMA is highly urbanized (Appendix B), open space and recreation is the single largest land use type (31 percent), followed by residential land use (28 percent).

Table 1-3
Mission Bay WMA Land Uses

Land Use	Area (Acres)	Percent of Total (%)
Open Space/Parks	12,582	30.67
Residential	11,463	27.94
Freeway/Road/Transportation	6,610	16.11
Office/Institutional	4,686	11.42
Vacant/Undeveloped	2,794	6.81
Industrial	1,448	3.53
Commercial	1,294	3.15
Agriculture	80	0.19
Water	72	0.18

The map illustrating the impervious areas of the Mission Bay WMA is provided in Appendix B. Impervious cover in this map is any surface in the landscape that cannot effectively absorb or infiltrate rainfall. Impervious areas include driveways, roads, parking lots, rooftops, and sidewalks. The amount of impervious cover reflects the amount of urbanization in a watershed. Increased impervious cover adds to the rainfall runoff potential in the WMA, with implications for water quality and flood control. Soils on this map are depicted as pervious; however, some local soil types may exhibit such low infiltration rates that they may be nearly impermeable.

1.6 Water Quality Improvement Plan Organization

The organization of this Water Quality Improvement Plan follows the requirements of the MS4 Permit. The Water Quality Improvement Plan sections and the corresponding MS4 Permit provisions are organized as follows:

Section 1, Introduction – This section provides the purpose of the Water Quality Improvement Plan and summarizes the spatial context of the WMA encompassed by the Water Quality Improvement Plan.

Section 2, Priority Water Quality Conditions – This section steps through the process of selecting the priority water quality conditions, including assessing

receiving water conditions (Provision B.2.a), assessing the impacts of the MS4 discharges (Provision B.2.b), identifying the priority water quality conditions (Provision B.2.c (1)), and identifying the highest priority water quality conditions (Provision B.2.c (2)).

Section 3, MS4 Sources of Pollutants and/or Stressors – This section describes known and suspected sources of pollutants or other stressors that cause or contribute to the highest priority water quality conditions, describes the prioritization process of the sources or stressors, and summarizes the priority sources or stressors by jurisdiction (Provision B.2.d).

Section 4, Water Quality Goals, Strategies, and Schedules – For the highest priority water quality conditions, this section details the WMA interim and final numeric goals and the schedule for measuring progress toward achieving these goals (Provision B.3.a(1)). These goals are used to develop the jurisdictional specific water quality improvement strategies (Provision B.3.b(1)) and the schedules for jurisdictional specific water quality improvement strategies (Provisions B.3.a(2) and B.3.b(3)).

Section 5, Water Quality Improvement Monitoring and Assessment Program – This section summarizes the integrated Monitoring and Assessment Program (Provision B.4).

Section 6, Iterative Approach and Adaptive Management Process – This section describes the methodology to re-evaluate the priority water quality conditions (Provision B.5.a); adapt the goals, strategies, and schedules (Provision B.5.b); and adapt the Monitoring and Assessment Program (Provision B.5.c). It also describes the processes to modify the Water Quality Improvement Plan (Provision B.6.b) and the JRMP (Provision F.2.a) following re-evaluation.

2 Priority Water Quality Conditions

Local agencies have long worked in partnership to protect and improve water quality throughout the Mission Bay Watershed Management Area. Over the years there have been substantial improvements to water quality in the streams and other tributaries leading to Mission Bay and ultimately the Pacific Ocean. Even so, there are segments of waterbodies in the Mission Bay Watershed Management Area that continue to suffer from impairments to water quality.

Working collaboratively with the Regional Board and the public, the agencies with jurisdictional responsibilities in the Mission Bay WMA identified a total of 16 priority water quality conditions associated with discharges from storm drain systems within this area. This identification effort is the first step required for the new Water Quality Improvement Plan process (illustrated in the graphic above). The plan developed for the Mission Bay WMA employs a scientific process of pollutant source identification and management.

Section 2 Highlights

- Describes the process to determine priority water quality conditions and identify highest priority water quality conditions
- Identifies the priority water quality conditions:
  - Rose Canyon – 10 priority water quality conditions (2 selected on the basis of monitoring data)
  - Tecolote Creek – 4 priority water quality conditions
  - Scripps – 2 priority water quality conditions
- Identifies the highest priority water quality conditions:
  - Tecolote Creek subwatershed
    - Impairment of contact recreation of Tecolote Creek from indicator bacteria during wet and dry weather
  - Scripps subwatershed
    - Impairment of contact recreation of Pacific Shoreline at multiple locations from indicator bacteria during wet and dry weather
    - Impairment of the La Jolla Area of Special Biological Significance (ASBS 29) from sediment during wet weather

The impairment of contact recreation in Tecolote Creek from bacteria was determined to be one of the highest priority water quality conditions in the Tecolote Creek subwatershed during wet and dry weather. Another highest priority water quality condition related to bacteria is the impairment of contact recreation along the Pacific Shoreline at multiple locations in the Scripps subwatershed during wet and dry weather. The final highest priority water quality condition is impairment of the Area of Special Biological Significance just off the coast in La Jolla from sediment transported during wet weather.

Discharges that are not conveyed by the MS4 are regulated separately. However, the Responsible Agencies are responsible for discharges originating from these non-MS4 lands outside of their regulatory control (i.e., industrial, agricultural, Phase II, state, federal, and Indian reservation lands) if those pollutants are ultimately discharged from the MS4 of a Responsible Agency. Non-MS4 discharges also have an impact on water quality in the Mission Bay WMA. Therefore, Responsible Agencies will seek opportunities for collaboration and improved communication with non-municipal sources and the appropriate regulatory agencies to ensure that these discharges are appropriately regulated before they enter the Responsible Agencies' storm drain systems.

A water quality condition may be defined as an impairment of a receiving water beneficial use. Priority water quality conditions are defined in this Water Quality Improvement Plan as receiving water conditions that have evidence of being caused or contributed to by MS4 discharges and may be "pollutants, stressors, and/or receiving water conditions that are the highest threat to receiving water quality or that most adversely affect the quality of receiving waters" (Provision B.2.c).

The priority water quality condition identification process began by assessing the receiving water conditions (Provision B.2.a) and the impacts from MS4 sources (Provision B.2.b). Combining these assessments resulted in a list of priority water quality conditions. During these assessments, data gaps were discovered. Data gaps are defined in this Water Quality Improvement Plan as areas where there is a lack of information needed to assess the receiving water conditions or impacts from MS4 sources. Data gaps are addressed in Sections 5 and 6 of this Water Quality Improvement Plan (Monitoring and Assessment Program and Iterative Approach and Adaptive Management Process).

The highest priority water quality conditions were then selected by the Responsible Agencies from the list of priority water quality conditions using the process detailed below and summarized in Appendix A.

Figure 2-1 summarizes the selection sequence used to identify the priority and highest priority water quality conditions.

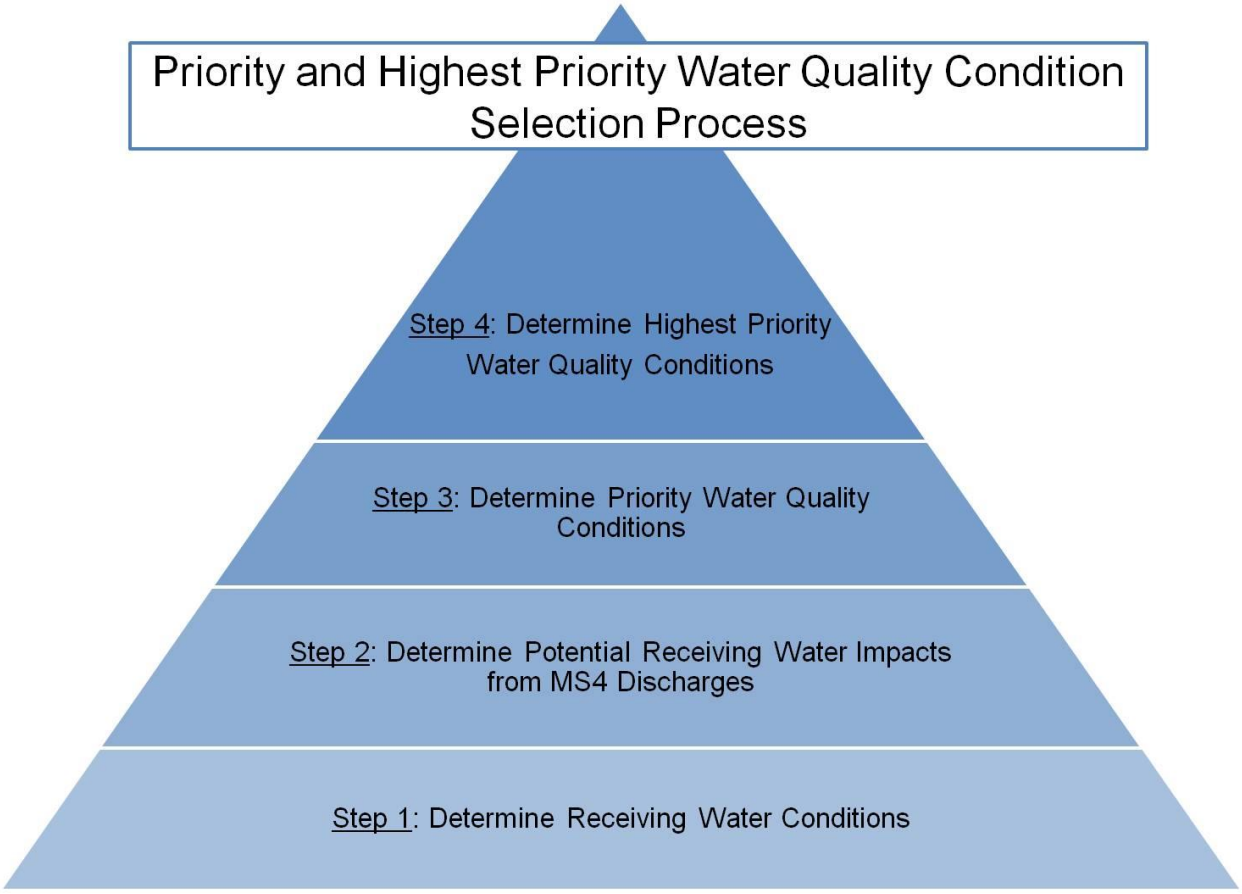


Figure 2-1
Mission Bay WMA Priority and Highest Priority Water Quality Condition Selection Process

2.1 Step 1: Determine Receiving Water Conditions

As defined by the USEPA, a receiving water is any body of water (for example, a creek, river, lake, or estuary) into which surface water, treated waste, or untreated wastewater is discharged (USEPA, 2012a).

Receiving water conditions are identified based on the following considerations listed in Provision B.2.a of the MS4 Permit:

(1) Receiving waters listed as impaired on the 2010 303(d) list of impaired waters

(2) TMDLs adopted and/or under development by the Regional Board

(3) Receiving waters recognized as sensitive or highly valued by the Copermittees, including estuaries designated under the National Estuary Program under CWA Section 320, wetlands defined by the State or U.S. Fish and Wildlife Service's National Wetlands Inventory as wetlands, waters having the beneficial use designation of Preservation of Biological Habitats of Special Significance (BIOL), and receiving waters identified as ASBS

(4) The receiving water limitations of Provision A.2 of the MS4 Permit

(5) Known historical versus current biological, physical, and chemical water quality conditions

(6) Available, relevant, and appropriately collected and analyzed biological, physical, and chemical receiving water monitoring data, including, but not limited to, data describing:

(a) Chemical constituents

(b) Water quality parameters (i.e., pH, temperature, conductivity, etc.)

(c) Toxicity identification evaluations for both receiving water column and sediment

(d) Trash impacts

(e) Bioassessments

(f) Physical habitat

(7) Available evidence of erosional impacts on receiving waters due to accelerated flows (i.e., hydromodification)

(8) Available evidence of adverse impacts on the biological, physical, and chemical integrity of receiving waters

(9) The potential improvements in the overall condition of the WMA that can be achieved

The following subsections detail how Considerations 1 through 9 are incorporated into the assessment.

2.1.1 The 2010 303(d) List and Beneficial Uses (Consideration 1)

2010 303(d) Listings

The 303(d) list is named after the section number of the CWA that established the requirements to create a list of impaired waterbody segments. An impaired waterbody is a waterbody with "chronic or recurring monitored violations" of "applicable numeric and/or narrative water quality criteria" (USEPA, 2012a). Under CWA Section 303(d), states, territories, and authorized tribes are required to develop lists of impaired waters (303(d) list) and submit for USEPA approval every two years. The Regional Board is tasked with developing the 303(d) list in the San Diego region. The 303(d) list was updated in 2010 and identifies these impaired waterbodies by specifying:

- The particular waterbody that is impaired (in the Mission Bay WMA, the specific waterbody can range in scale from an ephemeral stream to portions of the Pacific Ocean Shoreline)
- If known, the pollutant causing the impairment (e.g., bacteria or sediment)
- The beneficial use(s) being impaired
- The potential pollutant source(s)

The Mission Bay WMA has several 2010 303(d)-listed waterbodies, which are mapped in Figure 2-2. The names of the listed waterbodies are provided in Table 2-1.

Intentionally Left Blank

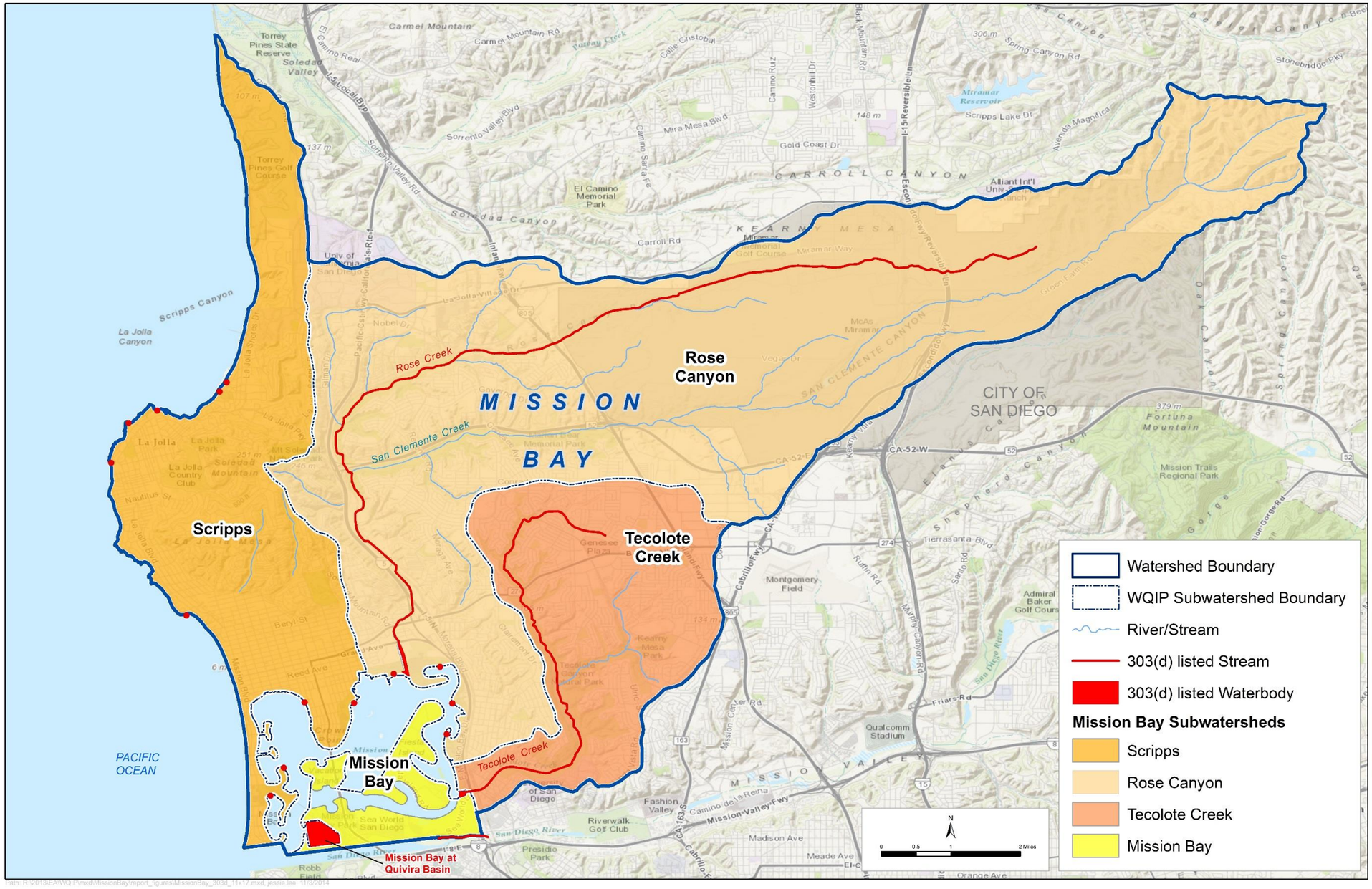


Figure 2-2
Mission Bay WMA
2010 303(d)-Listed Waterbodies

Intentionally Left Blank

Beneficial Uses

The beneficial uses of a waterbody are designated in the Basin Plan and are defined as "the uses of a waterbody necessary for the survival or well-being of man, plants, and wildlife" (Regional Board, 1994). The development and the adoption of the Basin Plan is the responsibility of the Regional Board. The beneficial uses listed as impaired on 303(d) list of impaired waterbodies within the Mission Bay WMA are described and highlighted in Appendix C. A total of 72 percent of beneficial uses in Mission Bay WMA are not impaired or have not been assessed by the Regional Board. Of those waterbodies that are listed in Appendix C as having impairments, most beneficial uses are being attained. For more information on the beneficial uses in the Mission Bay WMA, refer to the Basin Plan (http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/).

Beneficial uses may be impaired by various pollutants and stressors, which may be biological (e.g., indicator bacteria), physical (e.g., sedimentation), or chemical (e.g., metals) in nature. Pollutants that may impair beneficial uses in the Mission Bay WMA include the following:

Bifenthrin and permethrin are pyrethroid pesticides that are highly toxic to aquatic organisms and are currently regulated as restricted-use pesticides (California Department of Pesticide Regulation [DPR], 1999; USEPA, 2006).

Indicator bacteria are surrogates used to measure the potential presence of harmful bacteria, fecal material, and associated fecal pathogens. The common indicator bacteria types include total coliform, fecal coliform, *Escherichia coli*, and *Enterococcus*. Indicator bacteria may include non-fecal bacteria or be non-fecal in origin (Regional Board, 1994; Southern California Coastal Water Research Project [SCCWRP], 2012).

Metals (cadmium, copper, lead, and zinc) can cause adverse effects on biological species at even slightly elevated levels. Metals can adsorb on to particulate matter and dissolved copper can be directly taken up by algae, bacteria, plants, and benthic organisms (Regional Board, 2007). However, some metals are essential micronutrients for human health. Inadequate copper intake has been linked to heightened cholesterol and increased risk of cardiovascular disease (National Institutes of Health [NIH], 2014). Zinc deficiency can lead to growth retardation, appetite loss, and reduced immune function (NIH, 2013a).

Potential eutrophication conditions exist when excessive amounts of nutrients (commonly nitrogen and phosphorus) are present within an aquatic environment. Nutrients can accelerate the growth of algae and phytoplankton, which can reduce dissolved oxygen content and harm aquatic organisms (World Resources Institute [WRI], 2013). These conditions can imbalance the aquatic system, harming fish, wildlife, and human health.

Sedimentation is the excessive buildup of sediment within downstream waterbodies resulting from high flow events.

Selenium occurs naturally in sulfide ores and volcanic deposits, and can be found in receiving waters through the interaction with groundwater. It can also be related to the irrigation of soil, discharges from coal-fired power plants, mining activities, and petroleum refineries (USEPA, 2014). Acute and chronic exposure can lead to adverse health effects on human circulatory and nervous systems (USEPA, 2014). However, selenium is an essential micronutrient for human health and selenium deficiency may play a role in cancer, cardiovascular disease, cognitive decline, and thyroid disease (NIH, 2013b).

The Index of Biological Integrity (IBI) is a comprehensive method to evaluate the health of the benthic macroinvertebrate community on a scale of 0 to 100, with 100 being very good condition and 0 being very poor condition. This information can be used to assess the health of the stream and is commonly used with bioassessment (State Board, 2013a). The IBI score is not a pollutant or stressor itself, but is a measure of the biological condition of a waterbody. It is used as a surrogate for anthropogenic impacts on receiving water health.

Toxicity, as defined by the Basin Plan, is the adverse response of organisms to chemicals or physical agents. Toxic substances or concentrations thereof produce harmful physiological responses in humans, plants, animals, or other aquatic life (Regional Board, 1994). Toxicity is measured in terms of the lethality (acute) or reproductive impacts (chronic) of the sample on live organisms.

Total dissolved solids (TDS) consist of carbonates, bicarbonates, chlorides, sulfates, phosphates, nitrates, magnesium, sodium, iron, manganese, and other substances. TDS can affect water based in the cells of aquatic organisms. High TDS concentrations can change soil permeability, thereby affecting vegetation (Regional Board, 1994).

Turbidity is a measure of the clarity of water, which is attributed to the amount of suspended particles. Increased turbidity can reduce light penetration, which can reduce photosynthesis and adversely affect aquatic life. High levels of turbidity may also impair drinking water uses (Regional Board, 1994).

2.1.2 Applicable TMDLs, Special Biological Habitats, and Receiving Water Limitations (Considerations 2, 3, and 4)

Mission Bay WMA TMDLS

TMDLs identify the total pollutant loading that receiving waters can receive and still meet water quality standards. The Regional Board is required to develop TMDLs or follow an alternative regulatory process to address 303(d)-listed impairments. One TMDL (the Bacteria TMDL) has been adopted in the Mission Bay WMA. The impaired 2010 303(d)-listed waterbodies in the Mission Bay WMA, the assessed length or area of

the impairment in the waterbody, and the pollutant listed as causing the impairment are summarized in Table 2-1. The locations of these waterbodies are mapped in Figure 2-2.

The Bacteria TMDL was developed by the Regional Board for impaired beaches and creeks on the 2002 303(d) list to attain and maintain fecal indicator bacteria (FIB) water quality standards. Figure 2-2 presents the 303(d)-listed impaired segment for FIB in the Mission Bay WMA. Most beaches were listed as impaired for total coliform or indicator bacteria on the 2002 303(d) list. The Bacteria TMDL included three FIB (total coliform, fecal coliform, and *Enterococcus)* in its approach to address the contact recreational water quality standards. Separate dry weather and wet weather TMDLs were calculated for each FIB. The San Diego Regional Board recognized that exceedances of the water quality objectives (WQOs) for the Contact Water Recreation (REC-1) beneficial use may be partially due to natural sources and so developed the wet weather TMDLs to include an allowable exceedance frequency on the basis of a reference system antidegradation approach (RSAA). The reference system antidegradation approach was included to ensure that bacterial water quality is at least as good as that of a natural (i.e., reference) system. The RSAA is based on data collected at Leo Carrillo Beach, a reference watershed in northern Los Angeles County. The Responsible Agencies have been assigned a waste load allocation (WLA) and will be responsible for reducing their bacterial load and demonstrating that their discharges are not causing exceedances of the numeric WQOs and allowable exceedance frequencies in the receiving water.

According to the TMDL, MS4 discharges are “anthropogenic in nature and the most significant controllable source of bacteria” (Regional Board, 2010). Each MS4 was assigned an individual WLA for bacteria. The TMDL applied a conservative approach by selecting the most stringent numeric targets. The MS4 Permit defines interim and final water quality based effluent limitations (WQBELs) as the basis for compliance, as provided in Attachment E.6 of the MS4 Permit, and describes various ways to achieve compliance. The WQBELs include receiving water limits for the listed segment and effluent limitations for MS4 outfalls or discharges. The receiving water limits are a combination of numeric targets for bacteria density and allowable exceedance frequencies.

The Bacteria TMDL includes Tecolote Creek and 13 segments of the Pacific Ocean Shoreline in the Scripps subwatershed, but was based on the 2002 303(d) list (Regional Board, 2010). Nine of the Pacific Ocean Shoreline segments were subsequently delisted in 2010 (see Note 1 in Table 2-1). Furthermore, the 2010 CWA 303(d) list includes two Pacific Ocean Shoreline segments (La Jolla Cove and Pacific Beach at Pacific Beach Point) that were not included in the Bacteria TMDL or the 2002 303(d) list. The Bacteria TMDL includes the 13 Pacific Ocean Shoreline segments from 2002, prior to the delisting of 9 segments, and does not include the 2 additional segments on the 2010 list. All Pacific Ocean Shoreline segments in Scripps subwatershed that are either listed in the Bacteria TMDL or included on the 2010 303(d) list for bacteria impairments are shown on Figure 2-3.

The delisted Pacific Ocean Shoreline segments were originally included in the TMDL, and then delisted in 2006 or 2008. Although these sites are currently meeting water quality standards, monitoring is required to verify that the delisted sites continue to meet water quality standards and they will be incorporated into Water Quality Improvement Plan as part of the iterative approach in case exceedances occur. If exceedances do occur at delisted sites, the monitoring data will be evaluated, sources will be investigated, and the Responsible Agencies will potentially apply source control strategies to address their potential inputs by the end of the compliance period.

Table 2-1
2010 303(d) or TMDL Listed Waterbodies in the Mission Bay WMA

Waterbody Name	Assessed Length/Area	Pollutant or Stressor	TMDL Approved by OAL
Pacific Ocean Shoreline, Casa Beach (Children's Pool)[1]	0.03 mile	*Enterococcus*, total coliform, fecal coliform	April 2011
Pacific Ocean Shoreline, La Jolla Cove[2]	0.03 mile	Total coliform	To be developed
Pacific Ocean Shoreline, La Jolla Shores Beach at Avenida de la Playa[1]	0.03 mile	Total coliform	April 2011
Pacific Ocean Shoreline, La Jolla Shores Beach at Caminito del Oro[3]	NA	*Enterococcus*, total coliform, fecal coliform	April 2011
Pacific Ocean Shoreline, La Jolla Shores Beach at El Paseo Grande[3]	0.03 mile[4]	*Enterococcus*, total coliform, fecal coliform	April 2011
Pacific Ocean Shoreline, Pacific Beach at Grand Avenue[3]	0.03 mile[4]	*Enterococcus*, total coliform, fecal coliform	April 2011
Pacific Ocean Shoreline, Pacific Beach at Pacific Beach Point[2]	0.03 mile	*Enterococcus*, total coliform, fecal coliform	To be developed
Pacific Ocean Shoreline, South Casa Beach at Coast Boulevard[3]	0.03 mile[4]	*Enterococcus*, total coliform, fecal coliform	April 2011
Pacific Ocean Shoreline, Tourmaline Surf Park[3]	0.03 mile[4]	*Enterococcus*, total coliform, fecal coliform	April 2011

Table 2-1 (continued)
2010 303(d) or TMDL Listed Waterbodies in the Mission Bay WMA

Waterbody Name	Assessed Length/Area	Pollutant or Stressor	TMDL Approved by OAL
Pacific Ocean Shoreline, Vallecitos Court[1]	0.03 mile	Total coliform	April 2011
Pacific Ocean Shoreline, Windansea Beach at Bonair Street[3]	0.03 mile[4]	*Enterococcus*, total coliform, fecal coliform	April 2011
Pacific Ocean Shoreline, Windansea Beach at Palomar Avenue[3]	NA	*Enterococcus*, total coliform, fecal coliform	April 2011
Pacific Ocean Shoreline, Windansea Beach at Playa del Norte[3]	0.03 mile[4]	*Enterococcus*, total coliform, fecal coliform	April 2011
Pacific Ocean Shoreline, Windansea Beach at Vista de la Playa[3]	0.03 mile[4]	*Enterococcus*, total coliform, fecal coliform	April 2011
Pacific Ocean Shoreline, Whispering Sands Beach at Ravina Street[1]	0.03 mile	Total coliform	April 2011
Mission Bay Shoreline, Bahia Point	0.14 mile	*Enterococcus*, total coliform, fecal coliform	To be developed
Mission Bay Shoreline, Bonita Cove	0.09 mile	*Enterococcus*, total coliform	To be developed
		Fecal coliform	To be developed
Mission Bay Shoreline, Fanuel Park	0.12 mile	Total coliform	To be developed
		Enterococcus	To be developed
Mission Bay, mouth of Rose Creek	9.2 acres	Eutrophic, lead	To be developed
Mission Bay Shoreline, Campland	0.08 mile	*Enterococcus*, total coliform, fecal coliform	To be developed

Table 2-1 (continued)
2010 303(d) or TMDL Listed Waterbodies in the Mission Bay WMA

Waterbody Name	Assessed Length/Area	Pollutant or Stressor	TMDL Approved by OAL
Mission Bay Shoreline, De Anza Cove	0.06 mile	*Enterococcus*, total coliform, fecal coliform	To be developed
Mission Bay Shoreline, Leisure Lagoon	0.12 mile	*Enterococcus*, total coliform	To be developed
Mission Bay Shoreline, North Crown Point	0.12 mile	*Enterococcus*, total coliform	To be developed
Mission Bay Shoreline, Visitors Center	0.10 mile	*Enterococcus*, total coliform, fecal coliform	To be developed
Rose Creek	13 miles	Selenium, toxicity	To be developed
Mission Bay, mouth of Tecolote Creek	3.1 acres	Eutrophic, lead	To be developed
Tecolote Creek	6.6 miles	Indicator bacteria	April 2011
		Cadmium, copper, lead, phosphorus, toxicity, turbidity, zinc	To be developed
		Nitrogen, selenium	To be developed
Mission Bay, Quivira Basin	65 acres	Copper	To be developed
Mission Bay Shoreline, Tecolote Shores	0.04 mile	*Enterococcus*, total coliform	To be developed

1. Segment is currently listed in 2010 303(d) list and included in the Bacteria TMDL.
2. Segment was added to the 303(d) list in 2010, but is not currently listed in the Bacteria TMDL or the 2002 303(d) list.
3. Segment is not currently listed on the 2010 303(d) List, but is listed in the Bacteria TMDL.
4. Segment length is provided in the 2010 303(d) list.

NA = Segment lengths were not available; OAL = California Office of Administrative Law
See Figure 2-2 for a map of the 303(d)-listed waterbodies.

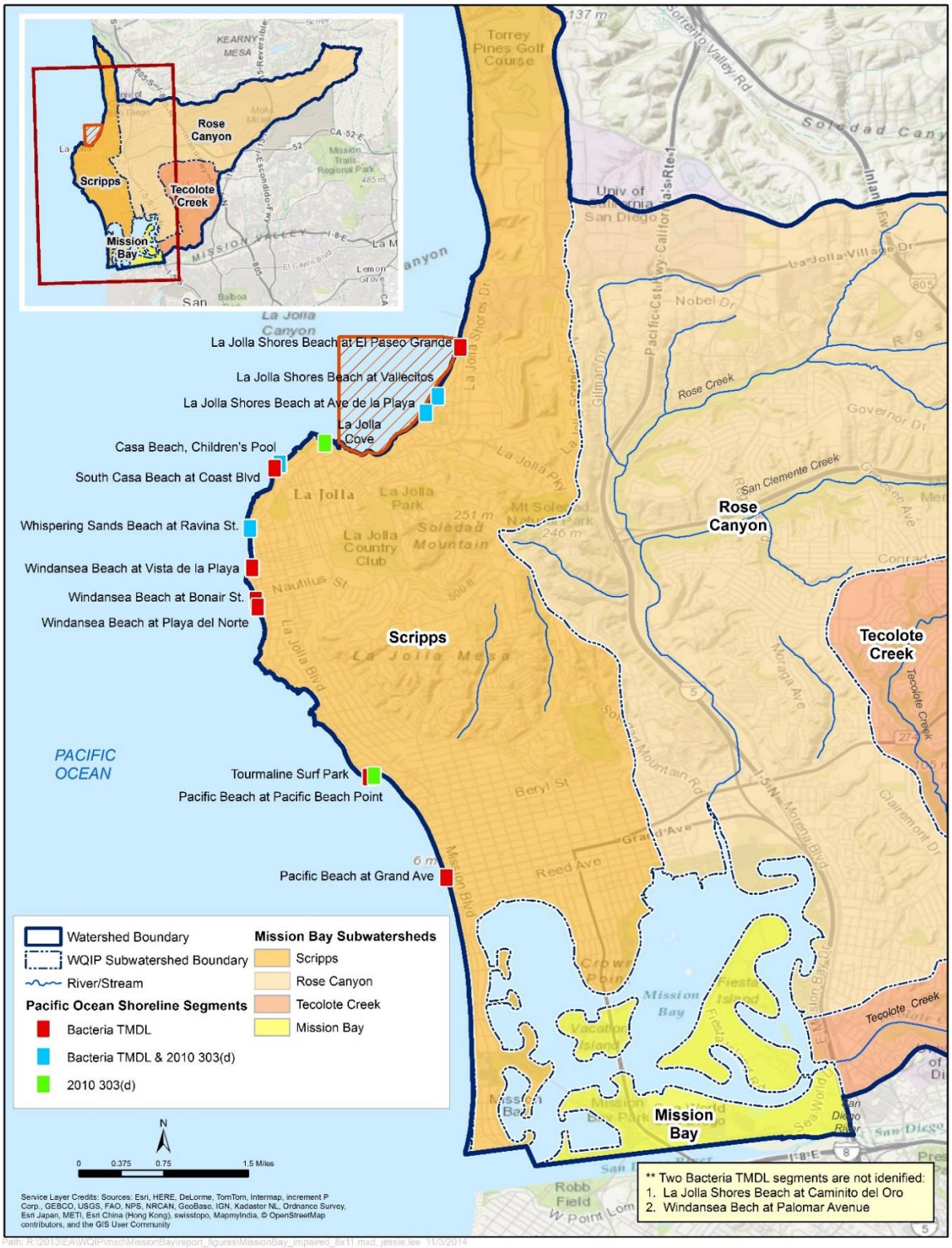


Figure 2-3
Scripps Subwatershed Pacific Shoreline Listed Segments

Special Biological Habitats

Biological Habitats of Special Significance are waterbodies designated with the BIOL beneficial use. In the Mission Bay WMA, the following waterbody is of special significance:

- Pacific Ocean Shoreline at the La Jolla ASBS (ASBS 29)

ASBS 29 is one of 34 ASBS throughout California designated by the State Board. ASBS are areas that are basic building blocks for a sustainable, resilient coastal environment and support an unusual variety of aquatic life (State Board, 2014b). Dischargers to an ASBS are regulated under the Ocean Plan by either a specific NPDES permit or the *General Exception to the California Ocean Plan for Areas of Special Biological Significance Waste Discharge Prohibition for Storm Water and Nonpoint Source Discharges, with Special Protections* (Resolution 2012-0012) (ASBS General Exception). Dischargers are required to monitor receiving waters and outfall discharges to ensure that natural water quality is not being altered.

Figure 2-4 shows the location of ASBS 29. The following shoreline segments are listed in the Bacteria TMDL and are located in the ASBS sub-drainage area:

- Pacific Ocean Shoreline, La Jolla Shores Beach at El Paseo Grande
- Pacific Ocean Shoreline, La Jolla Shores Beach at Caminito del Oro
- Pacific Ocean Shoreline, La Jolla Shores Beach at Avenida de la Playa
- Pacific Ocean Shoreline, La Jolla Shores Beach at Vallecitos

Receiving Water Limitations

Under the receiving water limitations provision of the MS4 Permit (Provision A.2), discharges from MS4s must not cause or contribute to the violation of water quality standards in any receiving waters. Water quality standards are defined in various regulations, including the Basin Plan. Waterbodies that do not meet water quality standards are identified on the 2010 303(d) list (see Table 2-1).

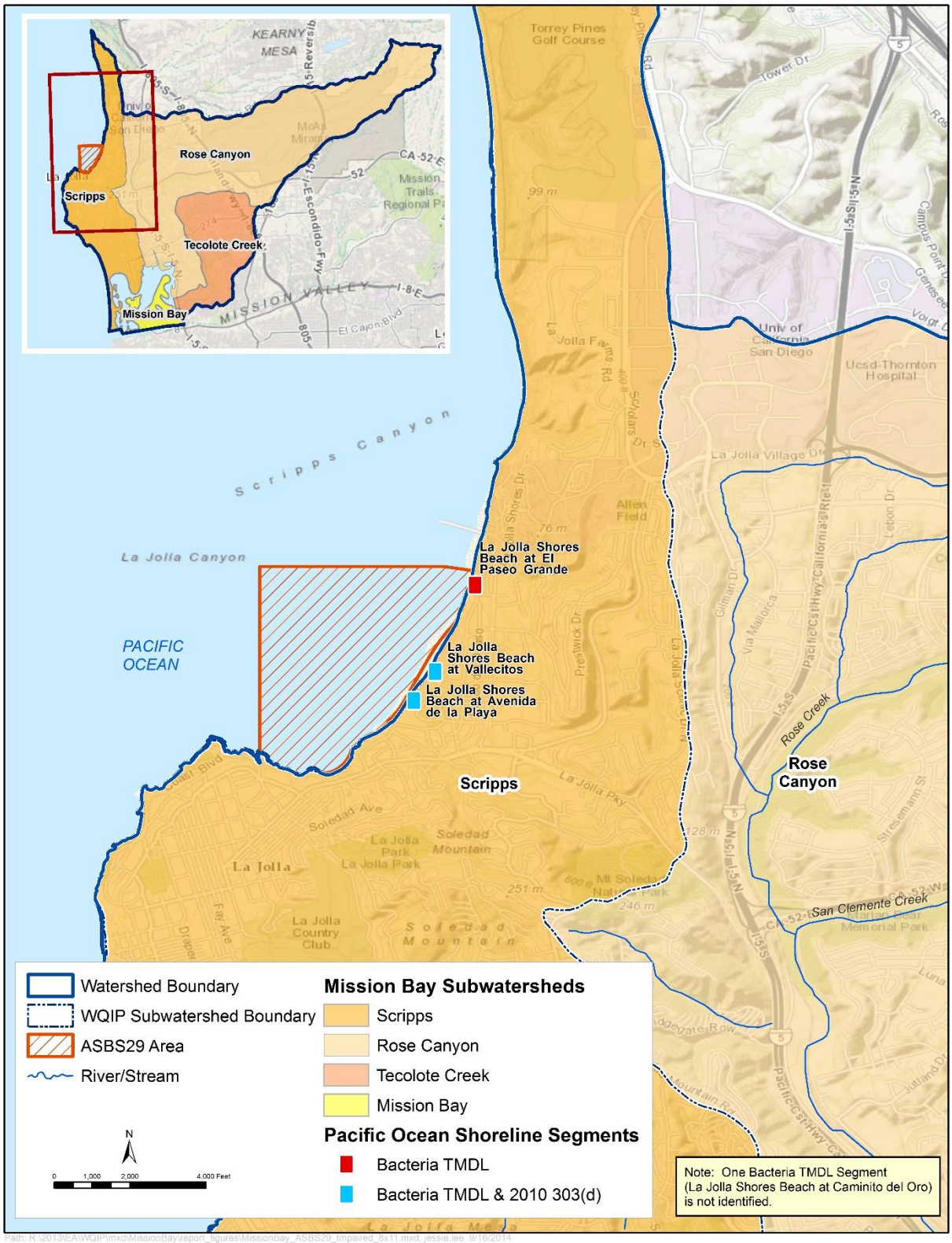


Figure 2-4
ASBS 29 in the Scripps Subwatershed

2.1.3 Data Sources Used To Assess Receiving Water Conditions (Considerations 5 and 6)

The Copermittees participated in the MS4 Permit Regional Monitoring Program under the two previous MS4 Permits. This monitoring program used a triad approach to evaluate receiving water chemistry, toxicity, and benthic community data. It was designed to meet the requirements of previous MS4 Permits. Monitoring plans were submitted to the Regional Board to document sampling and analytical methodology and data quality requirements consistent with USEPA regulations and guidance and with regional standard operating procedures (SOPs), such as the Surface Water Ambient Monitoring Program (SWAMP) and the SCCWRP, as appropriate.

Since 2005, several primary documents containing biological, physical, and chemical monitoring data on receiving water collected under the MS4 Permit monitoring program have been developed. High priority and medium priority pollutants and stressors were identified by following the WMA Assessment Methodology developed by the Copermittees in 2010. Waterbodies for which monitoring data indicate a failure to meet standards or are 303(d) listed have been identified as receiving water conditions. Data generated from these monitoring programs provided the basis for the assessments and conclusions of the Long-Term Effectiveness Assessment (LTEA) and the WURMP Annual Reports. These primary data sources as described below were used to identify or assess receiving water conditions for this Water Quality Improvement Plan.

Primary Source 1: Long-Term Effectiveness Assessment

The comprehensive LTEA was released by the San Diego Copermittees in 2011 as a precursor to the 2012 Report of Waste Discharge (San Diego County Municipal Copermittees, 2011). It presents and summarizes data for each WMA between 2005 and 2010, and considers historical trends. In addition to NPDES and MS4 outfall monitoring program data collected by the Copermittees directly, the LTEA includes third-party data from agencies and non-governmental organizations. Examples of third parties are the Southern California Stormwater Monitoring Coalition (SMC) (for additional dry weather receiving water quality data) and Coastkeeper (for water quality data and observational condition assessments).

Primary Sources 2 and 3: Fiscal Year 2011 and Fiscal Year 2012 Watershed Urban Runoff Management Program Annual Reports

The two most recent Annual Reports (Fiscal Years [FY] 2011 and 2012) produced under the WURMP (City of San Diego, 2013c) were consulted as primary data sources. These Annual Reports include monitoring and inspection data and activities conducted under the WURMP. The reports assess pollutants for the annual receiving water and outfall data collected since the publication of the 2011 LTEA.

Primary Sources 4 and 5: Comprehensive Load Reduction Plans for Tecolote Creek and Scripps Subwatersheds

The Phase I and Phase II CLRPs for the Scripps (City of San Diego, 2012a; 2013a) and Tecolote Creek (City of San Diego, 2012b; 2013b) subwatersheds provide additional primary documents for the Mission Bay WMA. The Bacteria TMDL required the development of CLRPs to provide a blueprint for how the Responsible Agencies would achieve the pollutant load reduction requirements mandated in the Bacteria TMDL, and to incorporate strategies for other pollutants of concern in the subwatersheds. The CLRPs provided objectives and strategies for the other 2010 303(d)-listed pollutants and ASBS priorities. For the La Jolla ASBS, the Scripps CLRP specifically highlighted the priority pollutants that had been identified through years of monitoring and in previous regulatory documents (e.g., the La Jolla Shores Coastal Watershed Management Plan).

Secondary Data Sources

Numerous secondary data sources augment the primary data sources described above and are listed in Appendix D.1. These additional data sources were categorized as observational, plan-based, and quality-assured, as follows:

- Observational data include unplanned visual record(s) of a condition or source, or of evidence of a condition or source from a single sample or measurement.
- Plan-based data include a structured monitoring plan and sampling based on standard clean practices; however, these data may not have associated data quality and control requirements.
- Quality-assured data include quality assurance protocols and described procedures to collect representative samples and certification that quality control has been performed.

An important secondary data source is the City of San Diego Strategic Plan for Watershed Activity Implementation (Strategic Plan) (City of San Diego, 2007). The Strategic Plan identifies priority water quality problems based on an assessment of the 2005 Baseline LTEA, monitoring data from the City's annual storm water monitoring reports, and additional water quality data. The priorities identified in the Strategic Plan are:

- Bacteria
- Heavy metals
- Nutrients
- Sediments
- Benthic alterations
- Toxicity

Since the Strategic Plan was completed in 2007, the updated 2011 LTEA and the 2011 and 2012 WURMP Annual Reports are more recent assessments of the data available for the Mission Bay WMA. The priorities identified by the Strategic Plan are similar to those of the two primary data sources.

The LTEA and WURMP reports provide current and historical monitoring data for three receiving water monitoring stations (shown in Figure 2-5), per the requirements of the previous MS4 Permit monitoring program, with the data reported and evaluated independently for wet weather and dry weather. During the previous two MS4 Permit cycles, the stations were operated and maintained by the Copermittees as part of the monitoring programs. Monitoring included rapid stream bioassessments, toxicity analysis, flow monitoring, trash surveys, and analytical analysis of samples. One of the stations (in the Tecolote Creek subwatershed) has been monitored since 2002; the other two stations (in the Tecolote Creek and Rose Canyon subwatersheds) have been monitored since 2008. Additionally, portions of the Scripps subwatershed have been monitored as part of the Ocean Outfalls Monitoring Program under the previous MS4 Permit. The La Jolla ASBS has been monitored since 2005, including monitoring under the draft and final requirements of the ASBS General Exception. Table 2-2 provides additional details on the NPDES receiving water monitoring stations.

The Mission Bay subwatershed does not have a designated NPDES receiving water monitoring location. This was identified as a data gap in the development of this Water Quality Improvement Plan because Mission Bay lacks a consistent historical monitoring record. Various water quality and bay sediment quality studies have been performed in the bay as follows:

- Sediments were monitored during the 2003–2005 Ambient Bay and Lagoon Monitoring Program (San Diego County Municipal Copermittees, 2007). The results of this study indicate that sediment chemistry, toxicity, and biological indicators improved over the three years of the study.
- In 2004, the Mission Bay Water and Sediment Project was completed, with the goal of developing baseline water quality data for Mission Bay. This study did not designate high priority and medium priority pollutants and stressors, but noted when chemical concentrations in water and sediment were associated with toxicity or were above the appropriate water quality criteria. The project found elevated levels of phosphate, particularly associated with wet weather events in the eastern side of the bay. Toxicity related to copper, lead, zinc, and pesticides (4’4’-DDE and dieldrin, specifically) was also observed (University of San Diego [USD], 2004).

- Mission Bay was part of the Regional Harbor Monitoring Program (RHMP), developed and implemented by the Port of San Diego, the City of San Diego, the City of Oceanside, and the County of Orange. The RHMP is intended to evaluate the general water quality and condition of aquatic life in the four harbors within the Regional Board's jurisdiction. The 2008 RHMP monitoring stations are provided in Figure 2-5. As with the 2004 Mission Bay Water and Sediment Project, the RHMP did not designate high priority and medium priority pollutants and stressors, but noted when chemical concentrations in water and sediment were above the appropriate water quality criteria. Because this RHMP is the most recent study published, the data are being used to represent the receiving water condition in the Mission Bay subwatershed (Port of San Diego et al., 2008, 2010).

Intentionally Left Blank

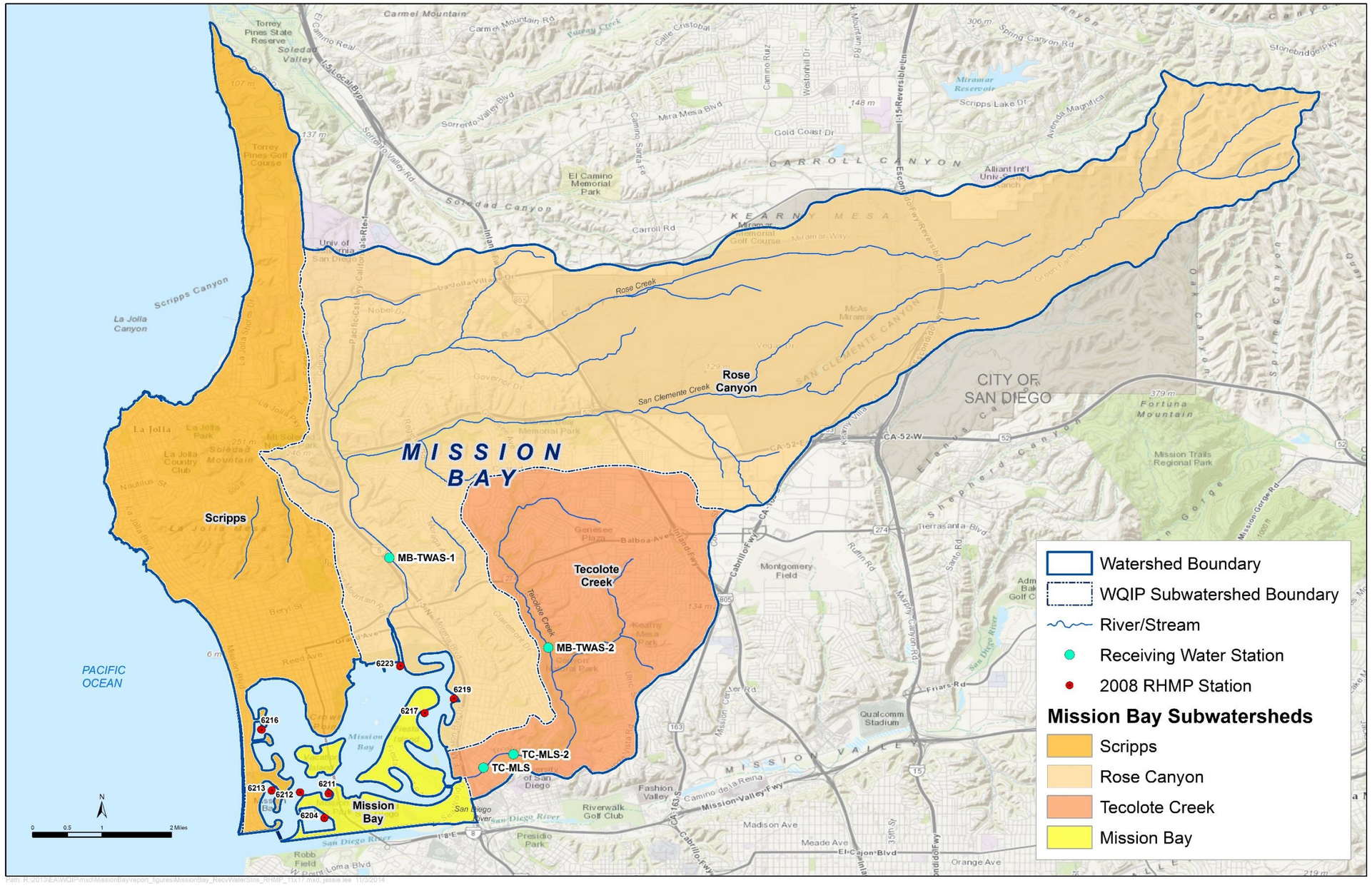


Figure 2-5
NPDES and RHMP Monitoring Stations

Intentionally Left Blank

Table 2-2
NPDES Monitoring Stations in the Mission Bay WMA

Subwatershed	Station Name	Waterbody	Latitude	Longitude
Rose Canyon	MB-TWAS1	Rose Creek	32.81677	-117.22272
Tecolote	MB-TWAS2	Tecolote Creek	32.79799	-117.18956
Tecolote	TC-MLS	Tecolote Creek	32.77294	-117.20308

MLS = mass loading station; TWAS = temporary watershed assessment station

Data from these three NPDES monitoring stations were considered to represent the receiving water quality of the subwatershed in which they were collected. However, water quality monitoring data are typically highly variable, and water quality at any specific point in a subwatershed may vary considerably from that of the samples collected at these stations. Medium priority or high priority pollutants provided in two or more of the regional monitoring reports, including the LTEA, the MS4 Permit Regional Monitoring Program (which includes the SMC program), and recent WURMP Annual Reports, are presented in Table 2-3. This table accounts for historical and current water quality monitoring findings used to inform the determination of the receiving water conditions presented in Section 2.1.7.

Table 2-3
Medium and High Priority Pollutants for Receiving Waters

Subwatershed	Dry Weather Conditions	Wet Weather Conditions
Rose Canyon	Poor Index of Biological Integrity (IBI)[1], total dissolved solids (TDS)[1], toxicity[1]	Bifenthrin[1], fecal coliform[1], permethrin[1], TDS[1], total suspended solids (TSS)[1], turbidity[1]
Tecolote Creek	*Enterococcus*[1], poor IBI[1], total phosphorus[1], toxicity[1]	Bifenthrin[1], fecal coliform[1], TSS[1], turbidity[1]
Mission Bay	Total arsenic[2], total chlordane[2], total and dissolved copper[2], total dichloro-diphenyl-trichloroethane (DDT)[2], total mercury[2], total zinc[2]	No receiving water data are available
Scripps	No receiving water data are available	Copper[3], fecal coliform[3], total coliform[3], sediment[3]

1. As identified in both the LTEA and recent WURMP Annual Reports.
2. As identified for both water and sediment in the RHMP 2008 Summary Reports.
3. As identified in the *La Jolla Shores Coastal Watershed Management Plan*, which is specific to the ASBS. No data are available to support medium or high priorities for the remainder of the Scripps shoreline.

2.1.4 Evidence of Erosional Impacts (Consideration 7)

Attachment A of the LTEA identified hydromodification and scouring of stream banks as well as total suspended solids (TSS) and turbidity transported via storm flows as potential causes of low to poor benthic community structure, as measured by the IBI. This information is considered evidence of erosional impacts in the Mission Bay WMA. The MS4 Permit Regional Monitoring Program was not designed to identify specific areas of erosion or hydromodification. More information is needed to characterize the spatial extent of these impacts and potential sources.

The Hydromodification Management Plan (HMP) (County of San Diego, 2011) outlines a monitoring program to assess the effectiveness of hydromodification management facilities. Monitoring activities are ongoing and include inflow and outflow monitoring from BMPs, baseline cross-sectional monitoring, and flow-based sediment monitoring. Monitoring data generated by the HMP monitoring program will be considered in future iterations of the Water Quality Improvement Plan.

The City of San Diego is participating in a regional effort to develop the Watershed Management Area Analysis (WMAA), as provided by the MS4 Permit. The purpose of developing the WMAA at the regional level is to ensure consistency among the Copermittees and between WMA. The WMAA will develop WMA-specific requirements for structural BMPs and identify a list of candidate projects related to hydromodification, stream restoration, and structural BMPs. The WMAA is being conducted simultaneously with the development of the Water Quality Improvement Plan. The results of the WMAA have been incorporated into Section 4 of the Water Quality Improvement Plan and are submitted as this submittal.

2.1.5 Evidence of Adverse Impacts (Consideration 8)

The data sources used in Section 2.1.3 (Considerations 5 and 6) were supplemented with the information gathered during the public workshop and data call to evaluate overall evidence of adverse impacts on the receiving waters. Examples of potential receiving water conditions were presented to the public in a workshop on September 7, 2013, together with the potential impacts of MS4 discharges described in Section 2.2. Public input was received during and after the workshop along with a call for data. The public was asked to respond with final data by September 13, 2013.

Data provided by the public consisted of observational data, information from regional non-governmental organizations, email communications from members of the public, and additional reports provided by the Responsible Agencies. The data provided information on the evidence of pollutants and stressors at several locations. The data generally supported the initial list of receiving water conditions. These data sources are summarized in Appendix D. Unless specified, the receiving water conditions generally apply to the Mission Bay WMA as a whole.

A list of the receiving water conditions provided by the public is as follows:

- Freshwater discharges
- Nutrients
- Sediment (Rose and San Clemente Creeks)
- Velocity (hydromodification)
- Trash (e.g., plastic bags, diapers)
- Human waste from transient encampments
- Bacteria
- Non-native vegetation and species
- Toxicity
- Flame retardants
- Metals
- Ash
- Sedimentation

2.1.6 Potential Improvements in the Overall Condition of the WMA That Can Be Achieved (Consideration 9)

The potential improvements in the overall condition of the WMA are discussed in Section 2.3. For the purposes of the Water Quality Improvement Plan, the potential improvements in the receiving waters and overall WMA are directly related to the potential improvements in the quality of the MS4 discharges; therefore, these considerations were combined in the evaluation of the priority conditions.

2.1.7 Receiving Water Conditions

An initial list of receiving water conditions was developed on the basis of the evaluation of the 2010 303(d) list, associated TMDLs, waterbodies with special biological significance, the priority pollutants or stressors identified from current and historical receiving water monitoring data, and public input. The criteria and data used to assess the receiving water conditions are detailed in Appendix E.

A receiving water condition was defined using the following four factors:

(1) The beneficial use(s) that may be associated with the water quality impairment as determined by the 303(d) listing

(2) The pollutant or stressor causing the impairment

(3) The spatial extent of the impairment, based on the 2010 303(d) listing or the area near the NPDES monitoring location

(4) The temporal extents of the impairment (i.e., wet or dry weather)

Receiving water conditions based on the evaluation of the 2010 303(d) list were assigned both dry and wet weather temporal extents. In some instances, this was not the case and only one temporal extent (i.e., dry weather only) is defined. This decision was based on best professional judgment.

When additional data become available that may change the assessment of the receiving water conditions, the data will be incorporated per the iterative and adaptive management processes described in Section 6. The list of receiving water conditions identified in the Mission Bay WMA and the determining factor(s) for each condition are summarized in Appendix F. Beneficial uses identified as impaired are defined in Appendix C.

2.2 Step 2: Determine Potential Receiving Water Impacts from MS4 Discharges

Receiving water conditions may be caused by a wide variety of pollutants and stressors, which may or may not result from human activity or urban development. The primary focus of the MS4 Permit is to regulate discharges from MS4 outfalls into receiving waterbodies. Priority water quality conditions in the WMA are defined as receiving water conditions that are impacted by MS4 discharges. Step 1 of the process to identify water quality conditions identified the receiving water conditions in the WMA. Step 2 was to assess whether MS4 discharges may cause or contribute to receiving water conditions.

The potential impacts on receiving waters from MS4 discharges were identified on the basis of the following considerations (MS4 Permit Provision B.2.b):

(1) The discharge prohibitions of Provision A.1 and effluent limitations of Provision A.3

(2) Available, relevant, and appropriately collected and analyzed storm water and non-storm water monitoring data from the Copermittees' MS4 outfalls

(3) Locations of each Copermittee's MS4 outfalls that discharge to receiving waters

(4) Locations of MS4 outfalls that are known to persistently discharge non-storm water to receiving waters and likely causing or contributing to impacts on receiving water beneficial uses

(5) Locations of MS4 outfalls that are known to discharge pollutants in storm water, causing or contributing to impacts on receiving water beneficial uses

(6) Potential improvements in the quality of discharges from the MS4 that can be achieved

The following subsections detail how Considerations 1 through 6 are incorporated into the assessment.

2.2.1 Discharge Prohibitions (Consideration 1)

MS4 Permit Provisions A.1 and A.3 prohibit discharges from MS4s that cause or contribute to a receiving water condition, and effectively prohibit all discharges of non-storm water into an MS4. Storm water discharges from an MS4 must be free of pollutants to the MEP and all discharges must comply with applicable WQBELs defined in the MS4 Permit. As described below, potential impacts from MS4 discharges were identified by assessing samples from MS4 outfalls that exceeded water quality standards or that persistently discharged non-storm water related to receiving water conditions identified in the previous section.

2.2.2 Available MS4 Monitoring Data (Consideration 2)

The LTEA and the WURMP Annual Reports described in Section 2.1 were the primary sources of monitoring data for MS4 outfalls in the Mission Bay WMA. The secondary sources listed in Appendix D.1 were also considered. The WURMP Annual Reports did not contain non-storm water MS4 outfall monitoring data, so the LTEA was the primary source of dry weather outfall data for assessing MS4 impacts.

The water quality results from one or more MS4 outfalls were compiled in the LTEA and WURMP Annual Reports and were considered representative of the MS4 within the subwatershed area related to the receiving water stations. The MS4 outfall data were applied in a manner consistent with that of the LTEA and WURMP Annual Reports, in which the data were used to characterize MS4 water quality in general areas of the WMA. The MS4 outfall data were considered representative of the MS4 to potentially cause or contribute to a receiving water condition on a subwatershed scale. However, data for direct MS4 discharges to a specific receiving water are not typically available.

Monitoring data were compiled from these documents and are summarized at the end of this section. The complete compilation is provided in Appendix D. In Section 2.3, these data were correlated with the receiving water conditions to determine priority water quality conditions.

The constituents identified as high or medium priority pollutants in the LTEA and recent WURMP Annual Reports are summarized in Table 2-4. Priorities are those identified in both the LTEA and recent WURMP Annual Reports.

Table 2-4
Medium Priority and High Priority Pollutants for Outfalls

Subwatershed	Dry Weather Conditions	Wet Weather Conditions
Rose Canyon	*Enterococcus*, fecal coliform, total nitrogen, total phosphorus, total dissolved solids (TDS)	Total suspended solids (TSS), fecal coliform
Tecolote Creek	pH, *Enterococcus*, fecal coliform, total nitrogen, total phosphorus	Fecal coliform
Mission Bay	No MS4 monitoring are data available	No MS4 monitoring data are available
Scripps	Shoreline: *Enterococcus*, fecal coliform, total nitrogen, total phosphorus ASBS: No MS4 monitoring data are available	Shoreline: No MS4 monitoring data are available ASBS: Indicator bacteria, copper, TSS

The current regional MS4 outfall monitoring program was designed to monitor the high priority constituents of concern on the basis of priorities at the time of the program plan development. This monitoring program design could not always directly link the MS4 outfall data to the quality of downstream receiving waters because of a limited data set available to correlate MS4 impacts on receiving water conditions. This limited data availability is identified as a data gap. Additionally, the constituents monitored under the MS4 outfall monitoring program include general physical and inorganic non-metals, organics, dissolved and total metals, and bacteriological parameters. As a result, some receiving water conditions lack supporting MS4 impact evidence because of the limited constituent list monitored under the MS4 outfall monitoring program. It is at the discretion of the Responsible Agencies to determine whether a receiving water condition merits additional monitoring to assess MS4 impacts.

2.2.3 Location of MS4 Outfalls (Considerations 3, 4, and 5)

The Responsible Agencies maintain maps of the conveyance systems within their jurisdictions. The locations and density of the outfalls may be a general indicator of MS4 sources in the WMA. Based on available data, Figure 2-4 illustrates the MS4 within the Mission Bay WMA and identifies major MS4 outfalls that discharge to receiving waters. The Responsible Agencies have updated their current inventories to only contain outfalls that meet the definition of a major MS4 outfall per the MS4 Permit.

The Responsible Agencies have reviewed their updated major MS4 outfall inventories to determine which of these outfalls have persistent discharges of non-storm water on the basis of the requirements of the MS4 Permit. This review involved visiting major outfalls during dry weather and recording observations including whether there was flow or ponding at each site. When determining whether a site had persistent flow, the Responsible Agencies referred to the most recent three monitoring visits in their flow databases. If a site had flow and/or ponding during the most recent three visits, it was determined to be persistent. If one of the visits had dry conditions, the site was considered transient. If all three visits were dry, it was considered a dry site. Dry weather field screening will continue during subsequent monitoring years according to the schedule provided in Section 5.1.3. The persistent flow outfall inventory will be updated accordingly.

The MS4 Permit defines persistent flow as *"…the presence of flowing, pooled, or ponded water more than 72 hours after a measureable rainfall event of 0.10 inch or greater during three consecutive monitoring and/or inspection events. All other flowing, pooled, or ponded water is considered transient."*

The Responsible Agencies have provided a preliminary list of major MS4 outfalls that may have persistent flow based on their Fall 2014 inventory. These outfalls are summarized in Appendix D.3.

The City is responsible for 19 outfalls in the Mission Bay WMA that may persistently discharge non-storm water. Caltrans has not identified any persistent non-storm water discharges in the WMA.

Intentionally Left Blank

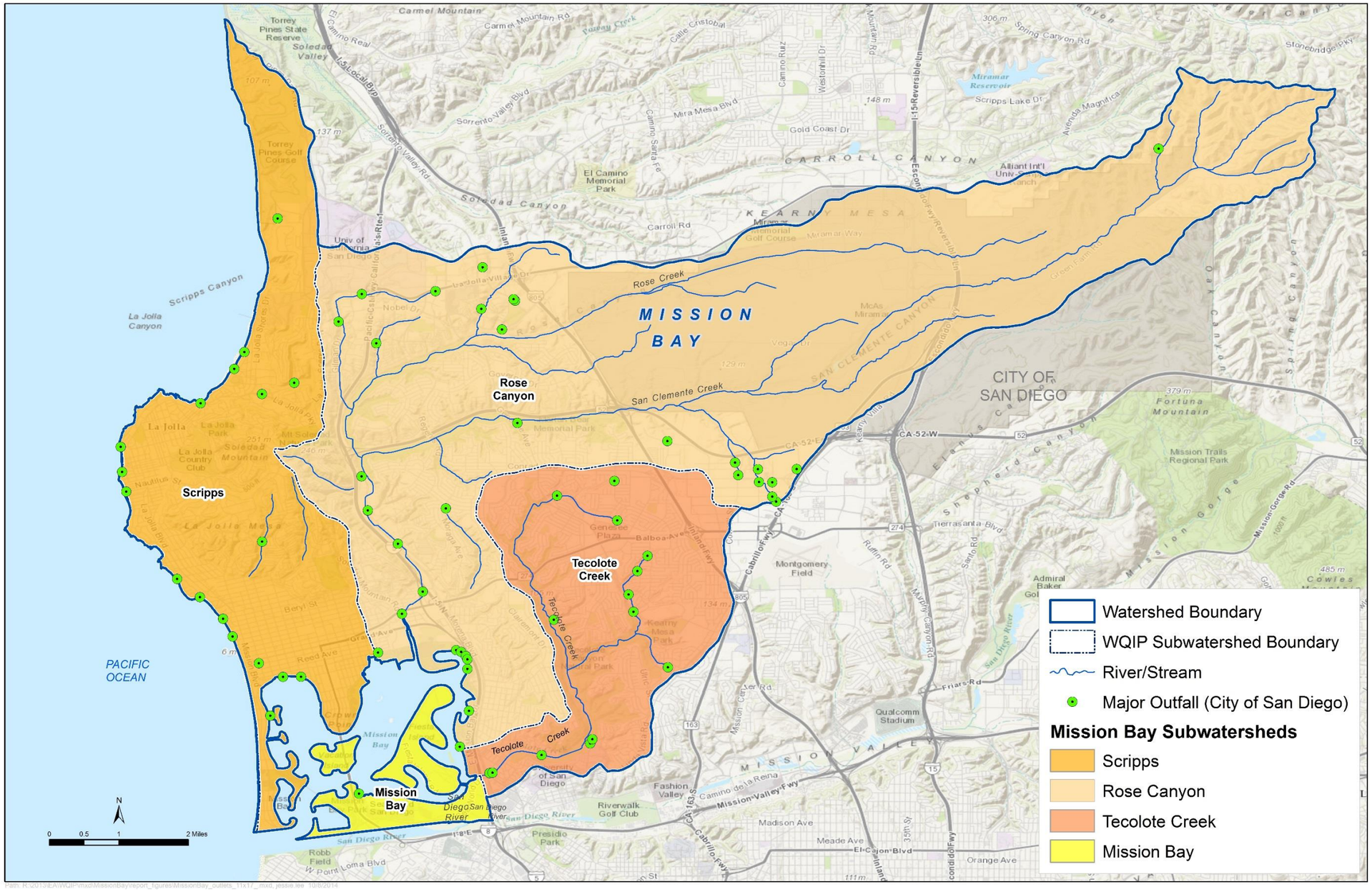


Figure 2-6
Mission Bay WMA Major MS4 Outfalls

Intentionally Left Blank

2.2.4 Potential Improvements in the MS4 Discharges That Can Be Achieved (Consideration 6)

Existing water quality regulations, such as TMDLs and the ASBS General Exception, have mandated water quality goals and schedules. Based on the resources available, the Responsible Agencies have diligently planned, developed, and implemented BMP programs throughout the WMA to meet the requirements of these regulations. For example, extensive resources and activities have been identified for the City of San Diego during the development of CLRPs for the Scripps and Tecolote Creek subwatersheds. These programs provide an opportunity to build on previous and planned efforts to improve water quality, which are directly linked to the potential for improvements in the receiving waters for the purposes of the Water Quality Improvement Plan. Therefore potential improvements are integral to, and included in, the evaluation of the priority water quality conditions provided in Section 2.3.1.

2.2.5 Potential Receiving Water Impacts from MS4 Discharges

An initial list of potential impacts from MS4 discharges on receiving water conditions was developed from the evaluation of MS4 outfall monitoring data and the MS4 maps. Impacts from MS4 discharges were identified when one or both of the following criteria were met:

- MS4 outfalls exhibit current or historical monitoring results that exceed water quality standards related to the receiving water condition, based on the subwatershed analysis allowed by the data presented in the LTEA or WURMP Annual Report.
- The MS4 or urban runoff was named as a source or potential source in the 2010 303(d) list of impaired waterbodies or in a TMDL.

The final list of potential impacts from MS4 discharges in the Mission Bay WMA is provided in Appendix F. The temporal extent of the MS4 impact is estimated on the basis of the monitoring data or best professional judgment, because the 303(d) list does not provide temporal extent. When additional data that may change the assessment of the potential impacts from MS4 discharges become available, the data will be incorporated per the iterative and adaptive management processes described in Section 6.

2.3 Step 3: Determine Priority Water Quality Conditions

The information gathered to identify receiving water conditions (Section 2.1, MS4 Permit Provision B.2.a) and impacts from MS4 discharges (Section 2.2, MS4 Permit Provision B.2.b) was assessed to “develop a list of priority water quality conditions as pollutants, stressors, or receiving water conditions that are the highest threat to receiving water quality or that most adversely affect the quality of receiving waters” (MS4 Permit Provision B.2.c.(1)).

Priority water quality conditions are defined as receiving water conditions for which there is evidence that MS4 discharges may cause or contribute to the condition. They are selected on the basis of the analysis of (1) the receiving water conditions, and (2) an assessment of the MS4 discharges.

An initial list of priority water quality conditions was developed by comparing receiving water conditions with evidence of MS4 contributions. Characterizing the receiving water quality and identifying the potential impacts caused by MS4 discharges to receiving waters in the WMA was necessary to identify the impacts to receiving waters associated with MS4 discharges that were of the most concern to the Responsible Agencies. This initial list was created in compliance with Provisions B.2.c.(1)(a)-(e). The initial list was then compared with the public input that was provided during the September 7, 2013, workshop and the public data call. The priorities identified in previous monitoring reports and/or planning documents were also considered. Finally, the overall potential for improvement in the MS4 discharges and the overall WMA was considered. The final list of priority water quality conditions is included in Appendix F.

2.3.1 Potential Improvements in MS4 Discharges and the Overall WMA

Regional reference studies led by Copermittees are underway to better understand the potential improvements in the Mission Bay WMA on the basis of reference receiving water conditions in the San Diego region. Reference receiving water conditions are determined by assessing the water quality in areas with minimal human impact. These conditions will provide an important background to understand and characterize the health of receiving waters impacted by human activities (SCCWRP, 2010). Copermittees have committed funds to study bacteria and other stressors throughout the San Diego region in the natural environment in wet and dry weather conditions to better inform solutions and regulations.

Given current regulations, the Bacteria TMDL, the ASBS General Exception and Special Protections, monitoring data, and public input, inputs into ASBS 29 and bacteria are the primary concerns in the WMA receiving waters that are well documented. ASBS 29 has been monitored by the City since 2004 and the final approval of the ASBS General Exception in 2012 has guided the development of the ASBS Compliance Plan (Appendix G). Additionally, since the Bacteria TMDL was adopted in 2011, the Responsible Agencies have been developing strategies and programs to address bacteria and to maintain REC-1 and Non-Contact Water Recreation (REC-2) uses throughout the Mission Bay WMA. As part of the development of the CLRPs for the Scripps and Tecolote Creek subwatersheds, extensive resources and activities have been identified to improve water quality in the City of San Diego alone. The WMA strategies to be included in Section 4 target bacteria and ASBS stressors, and provide secondary benefits to water quality by potentially reducing other pollutants and stressors. Most of the strategies that will be implemented through this Water Quality Improvement Plan are expected to address multiple receiving water conditions.

The Responsible Agencies are responsible for controlling their MS4 discharges and the impact of these discharges on the receiving waters. The potential improvement in MS4 discharge quality and how it will impact the health of the overall WMA is often unclear. In addition to the MS4 discharges, many factors, such as discharges outside the Responsible Agencies' jurisdiction, natural conditions, or climatic conditions such as drought, influence the receiving water quality. The previous MS4 Permit monitoring program design began to link the MS4 outfall data to the quality of downstream receiving waters and generated a limited data set that can begin to correlate MS4 impacts to receiving water conditions. However, the contributions from MS4 discharges are not well known for certain priority conditions and therefore the potential for improvement is unknown. These limitations were considered to be data gaps for these priority water quality conditions and are described in Section 2.3.3.

2.3.2 Priority Water Quality Conditions

The identified priority water quality conditions for each subwatershed are summarized in Appendix F. The following information is included for each priority water quality condition per the MS4 Permit:

(1) The beneficial use impairment(s) associated with the priority water quality condition

(2) The pollutant or stressor causing the beneficial use impairment, if known

(3) The temporal extent of the priority water quality condition (dry and/or wet weather)

(4) The geographical extent of the priority water quality condition within the WMA, if known

(5) Lines of evidence leading to identification as a priority water quality condition, including evidence of MS4 discharges that may cause or contribute to the condition

(6) An assessment of the adequacy of the monitoring data to characterize the factors causing or contributing to the priority water quality condition, including consideration of spatial and temporal variation

The impaired beneficial use, potential stressor, temporal extent of the priority water quality condition, lines of evidence clarifying the selection as a priority water quality condition (i.e., determining factors), and data gaps were determined during the assessment of the receiving water conditions and the MS4 impacts. Data gaps are discussed in more detail in Section 2.3.3. The geographical extent of the priority water quality conditions is based on the extent of the associated 303(d) listing or the location of the associated NPDES monitoring location. For each priority water quality condition, the associated Responsible Agencies were determined through an analysis of the geographical extent and jurisdictional boundaries.

2.3.3 Priority Water Quality Condition Data Gaps and Considerations

From a review of the priority water quality conditions presented in Appendix F, some of monitoring data associated with a number of conditions are not adequate to represent the spatial and temporal variations of the conditions (Appendix F Table F-2). There may be other considerations that should be taken into account when analyzing the data gaps. The priority water quality conditions with data gaps and considerations, where applicable, are briefly discussed below:

- Impairment of REC-1 and Shellfish Harvesting (SHELL) in the Rose Canyon subwatershed:
  - There are no receiving water monitoring sites located in Mission Bay; the receiving water monitoring site is located in Rose Creek.
  - MS4 outfall monitoring locations are limited around the 303(d)-listed waterbodies along the Mission Bay Shoreline. Therefore, it is unknown whether MS4 discharges cause or contribute to the receiving water condition.

  Consideration

  - The RHMP monitoring program did not find exceedances of water quality criteria for total coliform, fecal coliform, and *Enterococcus*.
- Impairment of the Marine Habitat (MAR) in Rose Canyon subwatershed:
  - There are no receiving water monitoring sites located at the mouth of Rose Creek in Mission Bay; the receiving water monitoring site is located upstream in the Rose Creek.
  - The 303(d) list includes the MS4 as a source of lead. Because the MS4 outfall monitoring program did not consistently monitor for lead, a full characterization of the MS4 impact on lead concentrations in MS4 discharges was not possible. Additionally, when lead was detected in MS4 discharges, concentrations did not exceed the water quality criteria. It is unknown whether MS4 discharges cause or contribute to the receiving water condition.
  - The physical and biological contributions to a nutrient impairment have not been characterized to allow for an analysis of impact of the MS4 discharges on the impairment.
- Impairment of Warm Freshwater Habitat (WARM) in Rose Canyon subwatershed:
  - The MS4 impact on the receiving water impairment due to toxicity is unclear. It is unknown whether MS4 discharges cause or contribute to the receiving water condition.

- The physical and biological contributions to receiving water toxicity have not been characterized.
- Direct discharges to the impairment have not been characterized.

❖ Impairment of REC-1 in the Tecolote Creek subwatershed:

- There are no receiving water monitoring sites located in Mission Bay; the receiving water monitoring site is located in Tecolote Creek.
- MS4 outfall monitoring locations are limited around the 303(d)-listed waterbodies along the Mission Bay Shoreline. Therefore, it is unknown whether MS4 discharges cause or contribute to the receiving water condition.

Consideration

- The RHMP monitoring program did not find exceedances of water quality criteria for *Enterococcus*.

❖ Impairment of REC-2 in Tecolote Creek subwatershed:

- The physical and biological contributions to a nutrient impairment have not been characterized to allow for an analysis of the impact of the MS4 discharges on the impairment.
- Turbidity is not measured in MS4 samples, but TSS is measured. TSS concentrations did not exceed water quality standards during the most recent round of sampling. It is unknown whether MS4 discharges cause or contribute to the receiving water condition.

❖ Impairment of REC-1 and SHELL in the Scripps subwatershed:

- There are no receiving water monitoring sites located near the 303(d)-listed waterbodies (Mission Bay and Pacific Ocean).
- MS4 outfall monitoring locations are limited around the 303(d)-listed waterbodies along the Mission Bay and Pacific Ocean Shoreline. Therefore, it is unknown whether MS4 discharges cause or contribute to the receiving water condition.

Consideration

- The RHMP monitoring program did not find exceedances of water quality criteria for total coliform, fecal coliform, and *Enterococcus*.

2.4 Step 4: Determine Highest Priority Water Quality Conditions

Once the list of priority water quality conditions was developed, "a subset of the water quality conditions (pursuant to Provision B.2.c.(1))" were identified as the highest priorities. The MS4 Permit provides the Copermittees with the discretion to justify the highest priority water quality conditions for program development and implementation on the basis of a number of factors, including the potential to improve watershed health, available resources, and best professional judgment. The methodology used to select the priority and highest priority water quality conditions is described in Appendix A. According to the methodology, the highest priority water quality conditions are priority water quality conditions that are either (1) associated with a TMDL, ASBS requirements, or other water quality regulations, or (2) have been elevated to highest priority on the basis of an evaluation of four additional selection criteria. These four additional selection criteria are described later in this section. Each priority water quality condition identified in Appendix F was screened against these criteria and the results are summarized below.

Three highest priority water quality conditions in the Mission Bay WMA were identified on the basis of a review of TMDLs, ASBS requirements, and other water quality regulations, and are summarized in Table 2-5. Two of the highest priority conditions are associated with the Bacteria TMDL, which includes the research conducted and the programs implemented to reduce the contribution of MS4 discharges to bacteria impairments. The bacteria impairment has the greatest potential for near-term improvement in water quality that can be achieved by controlling discharges from the MS4. Over the past five years, tremendous effort has been invested by the Responsible Agencies to develop and plan BMPs to control bacteria.

Additionally, since 2004, the ASBS General Exception has guided studies within ASBS 29 that have identified potential stressors impacting the BIOL beneficial use of the ASBS. The City's Phase II CLRP for Scripps (City of San Diego, 2013a) determined copper to be the critical pollutant (stressor) requiring the largest load reduction (i.e., requires the greatest implementation of BMPs to meet the water quality target). However, the Phase II CLRP also noted that when the City's ASBS Site-Specific Dilution and Dispersion Model (dilutor factor) (City of San Diego, 2013d) is applied to the ASBS water quality objectives, the critical stressor in the ASBS changes from copper to sediment. As such, the strategies described in the Phase II CLRP (to be considered for this plan) would focus on and reduce indicator bacteria and sediment along with all other priority water quality conditions for all four subwatersheds identified in Appendix F, including copper.

Table 2-5
Highest Priority Water Quality Conditions in the Mission Bay WMA

Highest Priority Condition	Potential Stressor	Temporal Extent		Subwatershed
		Wet	Dry	
Impairment of REC-1 in Tecolote Creek	Indicator Bacteria	✓	✓	Tecolote Creek
Impairment of ASBS 29	Sediment[2]	✓	–	Scripps
Potential Impairment of REC-1 at the Pacific Ocean Shoreline[1]	Indicator Bacteria	✓	✓	Scripps

1. Applies to the following Pacific Ocean Shoreline locations only: Casa Beach at Children's Pool, La Jolla Shores Beach at Avenida de la Playa, La Jolla Shores Beach at Caminito del Oro, La Jolla Shores Beach at El Paseo Grande, Pacific Beach at Grand Avenue, South Casa Beach at Coast Boulevard, Tourmaline Surf Park, Vallecitos Court, Windansea Beach at Bonair Street, Windansea Beach at Palomar Avenue, Windansea Beach at Vista de la Playa, and Whispering Sands Beach at Ravina Street.
2. Application of the City's ASBS Site-Specific Dilution and Dispersion Model changes the highest priority water quality condition for the ASBS 29 from copper to sediment.

Based on the review of the WMA regulatory drivers, no highest priority water quality conditions have been identified for the Rose Canyon or Mission Bay subwatersheds because priority water quality conditions for those waterbodies did not meet the criteria in the priority and highest priority water quality conditions selection methodology outlined in Appendix A. Furthermore, runoff from the Responsible Agencies is not the only source for the receiving water conditions in Rose Canyon. Specifically, the responsibility for managing storm water quality on some lands in the upper watershed areas of Rose Canyon is not under the jurisdiction of the Responsible Agencies and is outside the scope of the City's MS4 Permit and Caltrans' NPDES permit, as shown in Figure 1-1. Therefore, unless wet weather pollutant discharges from these lands enter the Responsible Agencies' storm drain systems, they are outside the scope and mandates of the Water Quality Improvement Plan development effort.

Priority water quality conditions not associated with regulatory drivers were further considered for elevation to a highest priority on the basis of four additional factors:

(1) The supporting data set is sufficient to adequately characterize the degree to which the priority water quality condition changes seasonally, and over geographic area, to support its consideration as a highest priority water quality condition.

(2) Storm water/non-storm water runoff is a predominant source for the priority water quality condition.

(3) The priority water quality condition is controllable by the Responsible Agencies.

(4) The priority water quality condition would not be addressed by strategies identified for other highest priority water quality conditions in this Water Quality Improvement Plan.

Each of these additional factors must be confirmed to determine whether the priority water quality condition should be elevated to a highest priority water quality condition. Appendix F summarizes the evaluation of the priority water quality conditions not associated with a regulatory driver. This analysis determined that all but two of the priority water quality conditions will be addressed by strategies applicable to the highest priority water quality conditions, and therefore provides justification for not elevating these conditions to highest priority. Furthermore, for some priority water quality conditions there is a lack of data to adequately characterize the condition and to definitively state that storm water or non-storm water runoff is the predominant cause of the condition. These data gaps were discussed in Section 2.3.3, and again justify not elevating these conditions to highest priority. When additional data become available to assess these priority water quality conditions, the data will be incorporated per the iterative and adaptive management processes described in Section 6, and the conditions may be reevaluated for potential elevation to highest priority. This Water Quality Improvement Plan is designed to concentrate efforts on the highest priority water quality conditions, while simultaneously developing programs to address the other priority water quality conditions.

3 MS4 Sources of Pollutants and/or Stressors

The previous section of this Water Quality Improvement Plan described the process for selecting the highest priority water quality conditions in the Mission Bay Watershed Management Area. Those highest priority water quality conditions include:

- Tecolote Creek subwatershed:
  - Limitation of contact recreational uses of Tecolote Creek due to the presence of bacteria indicating impairments during wet and dry weather
  - Scripps subwatershed:
  - Impairment of La Jolla Area of Special Biological Significance (ASBS 29) from sediment during wet weather
  - Limitation of contact recreational uses of the Pacific Ocean Shoreline at the following locations due to the presence of bacteria indicating impairments during wet and dry weather:
    - Casa Beach (Children's Pool)
    - La Jolla Shores Beach at Avenida de la Playa
    - La Jolla Shores Beach at Caminito del Oro
    - La Jolla Shores Beach at El Paseo Grande
    - Pacific Beach at Grand Avenue
    - South Casa Beach at Coast Boulevard
    - Tourmaline Surf Park
    - Vallecitos Court
    - Windansea Beach at Bonair Street
    - Windansea Beach at Palomar Avenue
    - Windansea Beach at Playa del Norte
    - Windansea Beach at Vista de la Playa
    - Whispering Sands Beach at Ravina Street

Section 3 Highlights

- Categorization and prioritization of sources of bacteria and sediment
- High Priority Sources for the City of San Diego:
  - Bacteria – Golf Courses/Parks, POTWs, Residential Areas, Sanitary Sewer Overflows, and Waste Disposal
  - Sediment – Agriculture, Construction, Home and Garden Care, Hydromodification, Land Use Alteration, Landscaping, Nurseries/Greenhouses, Mobile Landscaping, Parks and Recreation, and Residential Areas

As shown in the graphic below, the second step of the Water Quality Improvement Plan ("Sources") is to identify and prioritize sources and stressors in the Mission Bay WMA (Provision B.2.d). Source identification and prioritization in this Water Quality Improvement Plan are based upon the source assessments previously conducted as a part of the 2011 LTEA and refined by the 2012 WURMP Annual Report. Bacteria has 5 high priority sources and sediment has 10 high priority sources that have been previously identified for sediment. The goal of the source analysis is to identify and prioritize sources on the basis of the MS4 Permit requirements. It is not required or intended to be an independent source characterization.

Figure 3-1 outlines the process for identifying sources of the highest priority water quality conditions (Step 1) and the method for prioritizing the sources (Step 2). Data gaps identified as part of the source identification are highlighted to guide future analysis. As more source information is gathered, the source identification process may be refined as described in the iterative and adaptive management processes in Section 6, and priorities may vary by Responsible Agency.

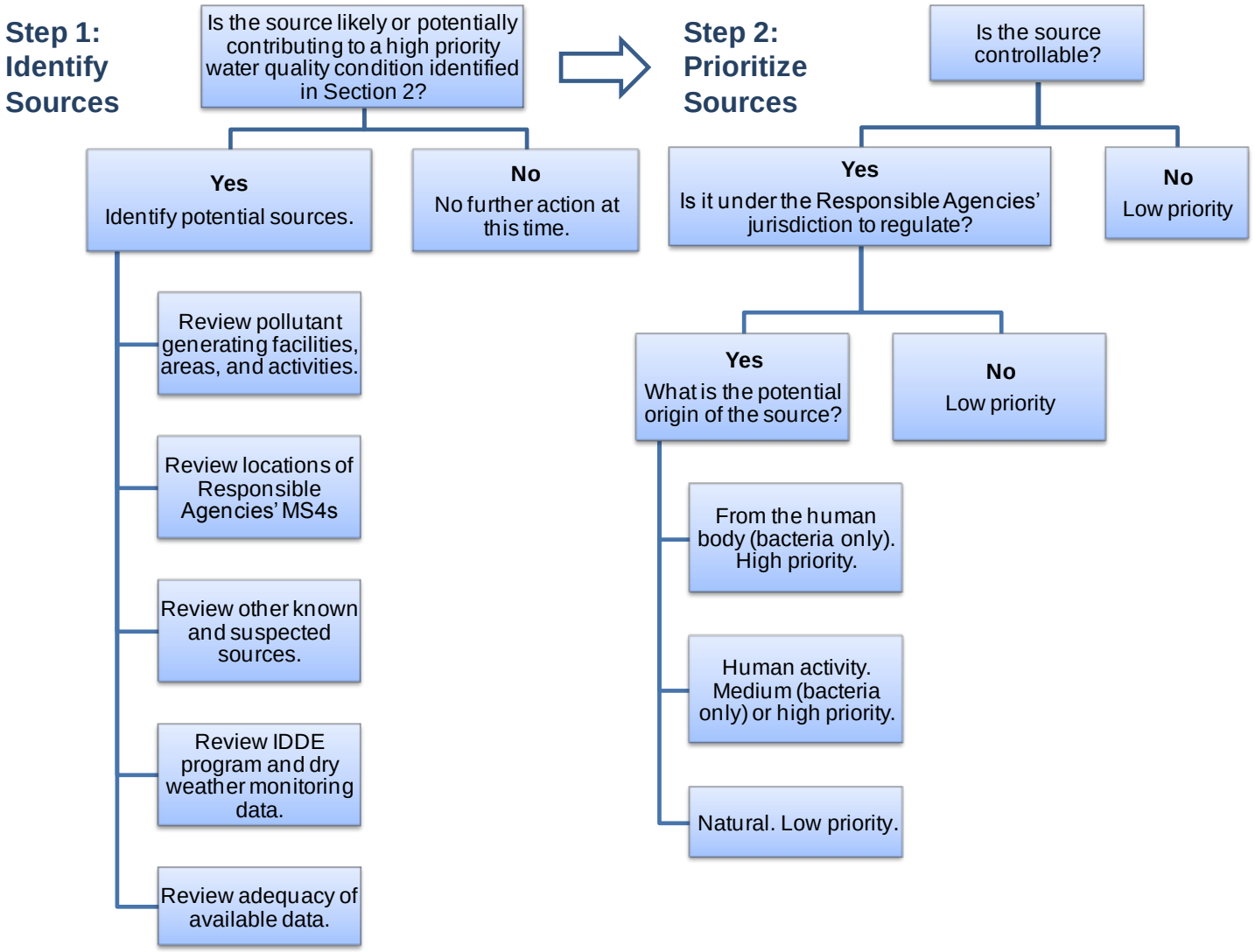


Figure 3-1
Highest Priority Water Quality Conditions Source Identification Process

Intentionally Left Blank

3.1 Step 1: Identification of Bacteria and Sediment Sources

Per the MS4 Permit (Provision B.2.d), sources of bacteria and sediment were identified on the basis of the following five considerations:

(1) Pollutant-generating facilities, areas, and activities within the WMA

(2) Locations of the Responsible Agencies' MS4s

(3) Other known or suspected sources of non-storm water or pollutants in storm water discharges to receiving waters

(4) Available data from the Responsible Agencies' monitoring and IDDE

(5) Adequacy of available data

Seven primary resources provided the information for these considerations:

(1) 2011 LTEA as described in Section 2

(2) 2010–2011 WURMP Annual Report as described in Section 2

(3) 2011–2012 WURMP Annual Report as described in Section 2

(4) Maps of the MS4 system maintained by each Responsible Agency

(5) JURMP Annual Reports submitted by the Responsible Agencies, which contain agency-specific monitoring data and IDDE data, including the identification of outfalls that persistently flow during dry weather (City of San Diego, 2012c)

(6) Bacterial Conceptual Models and Literature Review that were developed by the San Diego County Municipal Copermittees in 2012 and are included as an appendix to the Tecolote Creek Watershed CLRP (City of San Diego, 2012b) and duplicated as Appendix H in this Water Quality Improvement Plan

(7) Stakeholder input

Additional data sources were used to augment the primary sources and a complete list is provided in Appendix D.1. These include the Bacteria TMDL (Regional Board, 2010) and the 2010 303(d) list, as well as the Phase I and Phase II CLRPs for Scripps (City of San Diego, 2012a; 2013a) and Tecolote Creek (City of San Diego, 2012b; 2013b) subwatersheds.

3.1.1 Pollutant-Generating Facilities, Areas, and Activities in the WMA

The LTEA evaluated the known facilities, areas, and activities that generate bacteria and sediment in the San Diego region, which are defined as follows:

- A **facility** is a type of existing development, such as a commercial or industrial business, a parking structure, a municipal airfield, a landfill, or an automotive repair shop. An MS4 is considered to be a facility.

- An **area** is a communal area such as the trash dumpsters in a commercial strip mall, open space, a wildlife preserve, a parking lot, or a residential neighborhood.

- **Activities** include practices such as irrigation, portable toilet cleaning, storage of pet wastes, and vehicle washing (Regional Board, 2013).

To identify sources, the LTEA evaluated the available wet and dry weather receiving water and outfall monitoring data and IDDE program results, as well as the adequacy of the data. The 2011 LTEA began with sources identified in the previous MS4 Permit (R9-2007-001) and updated the list on the basis of the most recent inventory. The sources were scored using a matrix that accounted for the number of pollutant-generating activities associated with each source (in categories of 0, 1–4, and >4 activities) and the potential for wet weather discharge from each source (from 1 = no discharge potential to 5 = high discharge potential). These scores were then converted into the following qualitative loading potentials:

- **None (N)** includes sources with no identified pollutant-generating activities and low discharge potential.

- **Unknown (UK)** includes sources with one or more identified pollutant-generating activities, but very low discharge potential.

- **Unlikely (UL)** includes sources with no pollutant-generating activities, but high discharge potential, or sources with moderate discharge potential and one or more pollutant-generating activities.

- **Likely (L)** includes sources with high discharge potential and identified pollutant-generating activities.

Beginning with the sources identified in the 2007 MS4 Permit and updating the list with the most recent research, the 2011 LTEA evaluated a total of 37 facilities, areas, and activities (sources) and identified a number of likely sources of bacteria and sediment. The WURMP Annual Reports identify the likely sources from the LTEA that are found within the Mission Bay WMA. In addition, the reports identify the quantity of each of the sources that are in the WMA. These sources, land use categories, and quantities are summarized in Table 3-1. Sources classified as having an unknown loading potential in the 2011 LTEA are included in the assessment of the adequacy of available data (Section 3.1.6).

Table 3-1
Likely Sources of Bacteria and Sediment Identified in WURMP Annual Reports

Source Type	Category	Total Number of Sources in WMA[1]	Highest Priority Water Quality Conditions	
			Bacteria	Sediment
Agriculture	Other	2 (80 acres)	–	✓
Animal Facilities	Commercial	77	✓	–
Construction	Construction	NA	–	✓
Eating/Drinking Establishments	Commercial	1281	✓	–
Golf Courses/Parks	Municipal	14	✓	✓
Home and Garden Care	Residential	11,463 acres	✓	✓
Hydromodification	Construction	NA	–	✓
Landscaping	Commercial	32	✓	✓
Land Use Alteration	Construction	NA	–	✓
Mobile Eating/Drinking Establishments	Commercial	2	✓	–
Mobile Landscaping	Commercial	205	✓	✓
Nurseries/Greenhouses	Commercial	7	–	✓
Publicly Owned Treatment Works (POTWs)	Municipal	1	✓	–
Waste Disposal	Municipal	3	✓	–

1. Sources are quantified by facility counts or acreage. Facility counts help define the sources during dry weather and land uses help defines sources during wet weather.

NA = not available. The number of sources is either variable, as with construction, or is not currently assessed by the jurisdiction because of the difficulty in obtaining an accurate count.

"✓" = Source applies to highest priority water quality condition.

"–" = Source does not apply to highest priority water quality condition.

The WURMP also identified sanitary sewer overflows and bacteria regrowth in the MS4 as potential sources of bacteria, and land use alteration and hydromodification as potential sources of sediment.

3.1.2 Other Known and Suspected Sources

Sources other than those within the Responsible Agencies' jurisdictions and under their regulatory authority may also contribute to the bacteria and sediment impairments within the Mission Bay WMA. Discharges from these sources are often conveyed to receiving waters by the Responsible Agencies' MS4s. The principal sources outside the Responsible Agencies' jurisdictions, which are described below, are:

- Phase II MS4 outfalls
- Other permitted discharges
- Other potential point sources
- Other non-point sources

Phase II MS4 Outfalls

Phase II MS4s are smaller agencies (relative to municipalities) or areas that are regulated under the State's Phase II MS4 Permit (State Board Order No. 2013-0001-DWQ) (State Board, 2013b). They are outside the authority of the Responsible Agencies and, within the San Diego region, can include, but are not limited to, correctional, transit, educational, and federal facilities. Phase II MS4 permittees are responsible only for the runoff from their facilities and activities, whereas the Responsible Agencies are responsible for receiving runoff from other sources. Phase II MS4s may contribute to the impairment of beneficial uses in the Mission Bay WMA. Some Phase II MS4s have been named in the Bacteria TMDL (Regional Board, 2010).

The following Phase IIs are located in the Mission Bay WMA:

- University of California (UC), San Diego
- Veterans Administration (VA) San Diego Healthcare System
- North County Transit District (NCTD)
- Marine Corps Air Station Miramar

Contributions from Phase II MS4s are a suspected source of bacteria and sediment in both storm water and dry weather non-storm water discharges. The Responsible Agencies will collaborate with the Regional Board and Phase II MS4s when possible to collect data to quantify the Phase II MS4s' contribution to the bacteria and sediment impairments.

Other Permitted Discharges

Other permitted discharges, such as discharges covered under the State's Construction General Permit (Order No. 2012-0006-DWQ) (State Board, 2012a) and the Industrial General Permit (Order No. 2014-0057-DWQ) (State Board, 2014a), may also contribute to the highest priority water quality conditions. Industrial waste treatment facilities, for

example, can contribute sediment by increasing erosion and aerial deposition of sediment during land disturbance activities. That sediment may also contain and transport bacteria, which are commonly found in industrial waste. Agricultural discharges, which are generally covered under a conditional discharge waiver from the Regional Board, are discussed below as an example of non-point source discharges. Such discharges may be conveyed to receiving waters by the Responsible Agencies' MS4s.

In addition to the MS4 Permit, four other types of storm water permits are present within the Mission Bay WMA, as presented in Table 3-2.

Table 3-2
Storm Water Discharge Permits

Permit Type	Number of Permits[1]
Municipal Storm Water	2
Industrial Storm Water	6
Construction Storm Water	15
Caltrans Storm Water	1
Other Individual NPDES Discharges	4
Total	**28**

Sources: State Board, 2011a; State Board, 2011b.

1. Number of permits in Tecolote and Scripps subwatersheds only.

Waste sites (e.g., landfills and waste transfer stations) and construction sites have also been identified as significant point sources of bacteria in the San Diego region (Regional Board, 2010). They are also likely contributors of sediment (City of San Diego, 2013c). Although there are three municipal landfills in the Mission Bay WMA, none were identified as a likely source of bacteria or sediment in the 2012 WURMP Annual Report. Miramar Landfill, operated by the City, is located adjacent to San Clemente Creek in the Rose Canyon subwatershed (California Department of Resources Recycling and Recovery [CalRecycle], 2013). The Responsible Agencies will collaborate with the Regional Board and other permitted dischargers when possible to collect data to quantify their contribution to the bacteria and sediment impairments.

Other Point Sources

A point source is a discrete conveyance, such as a pipe or ditch. Private outfalls are point sources that may discharge bacteria and/or sediment to the MS4 or receiving waters; however, no private outfalls have been identified by the Responsible Agencies in the Mission Bay WMA. Industrial sites with individual NPDES permits may also be considered point sources.

Other Non-Point Sources

Non-point sources typically flow over land and discharge to receiving waters over a broad area, as opposed to a point location. Potential non-point source discharges include agriculture, wildlife, sewage infrastructure, transient encampments, and other natural sources (City of San Diego, 2009; Regional Board, 2013).

During wet weather, storm water runoff may carry bacteria and sediment from agricultural lands to the MS4. Per the Bacteria TMDL, bacteria carried by agricultural discharges that enter the MS4 conveyance system are considered to be controllable by the MS4s. Agricultural sites operate under a conditional discharge waiver from the Regional Board (Resolution No. R9-2007-0104), meaning that they are exempt from the discharge requirements of the current MS4 Permit. This waiver expired in 2014, and a new Agricultural Order is expected to go into effect in 2015. A draft tentative order detailing waste discharge requirements for commercial agricultural and nursery operations was released by the Regional Board on January 17, 2014. Responsible Agencies will look for opportunities to collaborate with the Regional Board and agricultural dischargers when possible and appropriate.

The Bacteria TMDL identifies wildlife areas, which include open space land uses and are sometimes not under the jurisdiction of Responsible Agencies, as sources of bacteria. The wildlife areas partially account for bacteria contributions from wild animals and decaying plant sources.

The Bacterial Conceptual Models and Literature Review (City of San Diego, 2012a) identifies transient encampments as a bacteria source that can directly discharge bacteria from human origins to receiving waters. Transient encampments are temporarily located in both municipal and open space land uses. The issues raised by transient encampments are socio-economic by nature. Addressing the sources of homelessness requires coordination with law enforcement, social services, and the legal community. Sources related to sewage infrastructure (such as sewer collection systems, sanitary sewer overflows, illicit discharges to the sewer system, and septic tanks) have also been identified by the Responsible Agencies as potential sources of bacteria. Additionally, during dry periods, bacteria can regrow within the MS4 and create biofilms (City of San Diego, 2012a). These sources may be found within the Mission Bay WMA and are considered under the jurisdiction of the Responsible Agencies.

During dry weather, bacteria may enter the MS4 or receiving waters through groundwater infiltration or irrigation runoff into municipal drainage channels (County of Los Angeles, 2010). Also, groundwater may contribute to the bacteria in the MS4 and receiving waters (Regional Board, 2010).

The Tecolote Creek CLRP identifies aerial deposition (i.e., sediment blown and redeposited by wind) as both a natural source and a source influenced by human activity for sediment in the San Diego region (City of San Diego, 2012b).

3.1.3 Locations of the Responsible Agencies' MS4s

The MS4 maps discussed in Section 2 were reviewed as part of the source identification process. The Rose Canyon subwatershed has the largest number of major MS4 outfalls in the Mission Bay WMA. The Tecolote Creek and Scripps subwatersheds have roughly half the number of major MS4 outfalls compared with the Rose Canyon subwatershed. The Mission Bay subwatershed has only one major MS4 outfall.

3.1.4 IDDE Program and Dry Weather Monitoring Data

In addition to the evaluation in the LTEA, data from the illicit discharge detection and elimination program and receiving water monitoring programs were reviewed to determine whether known or suspected sources of bacteria and sediment may be controllable by the Responsible Agencies' MS4s. Dry weather field screening, inspections, and complaint responses have been shown to be effective means of detecting and eliminating illicit discharges (San Diego County Municipal Copermittees, 2011).

Dry Weather Field Screening and Persistent Flow

Dry weather field screening data collected as part of the MS4 Permit's transitional monitoring program were also considered on the basis of dry weather persistent flows, where available. Flow during dry weather may result from permitted, allowed, or illegal discharges. Dry weather flow provides a mechanism to transport bacteria from facilities, areas, or activities to receiving waters. Per MS4 Permit Provision D.2.a.2(b)(iv),

> *"Persistent flow is defined as the presence of flowing, pooled, or ponded water more than 72 hours after a measureable rainfall event of 0.1 inch or greater during three consecutive monitoring and/or inspection events. All other flowing, pooled, or ponded water is considered transient."*

Based on a review of the MS4 outfall map in Section 2, the Responsible Agencies have identified a total of 18 major MS4 outfalls in the Scripps subwatershed, 37 major MS4 outfalls in the Rose Canyon subwatershed, 14 major MS4 outfalls in the Tecolote Creek subwatershed, and 1 major MS4 outfall in the Mission Bay subwatershed. The City has identified 19 major MS4 outfalls in the Mission Bay WMA that may persistently discharge non-storm water. These outfalls are presented in Appendix D.3. Caltrans has not identified any persistent non-storm water discharges in the WMA.

Facility Inspections

Facility inspections complement the IDDE program and include informing the public about storm water and dry weather runoff. Inspections also detect potential dry weather flows discharging from facilities. Inspections may confirm whether specific types of facilities are significant sources. Although information is available on facility inspections based on the previous permit JURMP annual reporting requirements, the JURMP data assessment did not provide detailed information linking facility inspections to sources of bacteria and sediment. Section 5 (Monitoring and Assessment) and Section 6 (Iterative Approach) describe how JRMP report requirements will be used to answer water quality-related questions.

Storm Water Complaints

The City of San Diego has implemented regional and jurisdictional storm water telephone hotlines since the issuance of Order R9-2001-01 in 2001. Members of the public may call in complaints to the Regional Hotline, which is maintained by the County of San Diego. The County contacts the appropriate jurisdiction to follow up on complaints received by the Regional Hotline and websites. In addition, the City responds to complaints received by its own hotlines. Complaints received via the hotlines have helped the City identify and eliminate illicit discharges, particularly during dry weather (San Diego County Municipal Copermittees, 2011).

As with facility inspections, storm water complaints were reported annually on the basis of the previous permit JURMP annual reporting requirements, but the JURMP data assessment did not provide detailed information linking storm water complaints and IDDE investigations to sources. Section 5 (Monitoring and Assessment) and Section 6 (Iterative Approach) describe how JURMP report requirements will be used to better report the water quality-related data associated with storm water complaints and their related follow-up IDDE investigations.

3.1.5 Summary of Bacteria and Sediment Sources

Bacteria and sediment sources were identified on the basis of the available resources and the considerations required by the MS4 Permit.

The Bacteria TMDL states that sources of bacteria are the same in wet and dry weather. However, while the wet and dry weather sources of bacteria may be the same, the transport mechanisms are different. During wet weather, bacteria are discharged to the MS4 and then to the receiving waters via storm water runoff, which occurs over a general area and can be well represented by land use. During dry weather, discharges are conveyed by means of non-storm water runoff, which includes illicit discharges, irrigation runoff, groundwater infiltration, and permitted discharges. These discharges are associated with specific facilities, areas, or activities. The different wet and dry weather transport mechanisms require different strategies to address the impairment and are discussed in Section 4. Wet and dry weather sources were also categorized by land use using the Responsible Agencies' inventories of facilities and land uses to help develop the goals, strategies, and schedules described in Section 4.

The TMDL for Sedimentation in Los Peñasquitos Lagoon (Resolution No. R9-2012-0033) does not apply to the Mission Bay WMA. However, it provided information on the potential sources of sediment in the San Diego region. For example, it states that sources of sediment are more significant in wet weather.

Table 3-3 presents facilities, areas, and activities identified by the Responsible Agencies as known or suspected sources of bacteria and sediment, and the typical land uses that were associated with the sources as part of the identification process.

Intentionally Left Blank

Table 3-3
Identified Pollutant-Generating Facilities, Areas, and Activities

Known or Suspected Source	Land Uses								
	Construction	Commercial	Industrial	Municipal	Residential	Parks and Recreational Areas	Open Space	Landfills	Other[1]
BACTERIA									
Facility									
Golf Courses/Parks	–	✓	–	✓	–	✓	–	–	–
Publicly Owned Treatment Works (POTWs)	–	–	–	✓	–	–	–	–	✓
Waste Disposal	–	✓	–	✓	–	–	–	✓	✓
Animal Facilities	–	✓	–	✓	–	–	–	–	✓
Eating and Drinking Establishments	–	✓	–	✓	–	✓	–	–	✓
Mobile Eating/Drinking Establishments	–	✓	–	–	–	–	–	–	–
Nurseries, and Greenhouses	–	✓	✓	✓	–	✓	–	–	✓
Area									
Residential Areas	–	–	–	–	✓	–	–	–	–
Activity									
Mobile Landscaping	–	✓	–	✓	✓	✓	–	–	–
Home and Garden Care	–	–	–	–	✓	–	–	–	–
Landscaping	–	✓	–	✓	✓	✓	–	–	–
Non-WURMP Identified Sources[2]									
Agriculture	–	–	–	✓	✓	–	–	–	✓
Bacteria Regrowth and Biofilms	–	–	–	✓	–	–	–	–	✓
Transient Encampments	–	–	–	–	–	–	–	–	✓

Table 3-3 (continued)
Identified Pollutant-Generating Facilities, Areas, and Activities

Known or Suspected Source	Land Uses								
	Construction	Commercial	Industrial	Municipal	Residential	Parks and Recreational Areas	Open Space	Landfills	Other[1]
Open Space Areas	–	–	–	–	–	–	✓	–	–
Sanitary Sewer Overflows	–	–	✓	✓	✓	✓	–	–	–
Wildlife	–	–	–	✓	–	✓	✓	–	✓
SEDIMENT									
Facility									
Nurseries and Greenhouses	–	✓	✓	✓	–	✓	–	–	✓
Parks and Recreation (including Golf Courses and Cemeteries)	–	✓	–	✓	–	✓	–	–	–
Area									
Agriculture	–	–	–	✓	✓	–	–	–	✓
Residential Areas	–	–	–	–	✓	–	–	–	–
Activity									
Construction	✓	–	–	–	–	–	–	–	–
Hydromodification	✓	–	–	✓	–	✓	✓	–	–
Home and Garden Care	–	–	–	–	✓	–	–	–	–
Landscaping	–	✓	–	✓	✓	✓	–	–	–
Land Use Alteration	✓	–	–	–	–	–	–	–	–
Mobile Landscaping	–	✓	–	✓	✓	✓	–	–	–

Table 3-3 (continued)
Identified Pollutant-Generating Facilities, Areas, and Activities

Known or Suspected Source	Land Uses								
	Construction	Commercial	Industrial	Municipal	Residential	Parks and Recreational Areas	Open Space	Landfills	Other[1]
Non-WURMP Identified Sources[2]									
Atmospheric Deposition	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ocean Sediment Contribution	–	–	–	–	–	✓	–	–	✓
Open Space Areas	–	–	–	–	–	–	✓	–	–

1. Other sources are those sources outside of the Responsible Agencies' jurisdictions and regulatory authorities. See Section 3.1.2.
2. Non-WURMP identified sources have been categorized separately because this information comes from secondary sources that have not gone through the same regulatory review process as have the WURMP identified sources.

Intentionally Left Blank

3.1.6 Adequacy of Available Data

The Copermittees' monitoring and inspections programs, along with the MS4 inventory, provide sufficient data to categorize the known or suspected sources of bacteria and sediment within the Mission Bay WMA. However, additional potential sources have been identified during the source identification that cannot be directly linked to bacteria and sediment MS4 contributions on the basis of the data available. The contributions of these potential sources to bacteria and sediment concentrations in the MS4 are unknown. Table 3-4 presents potential sources that require additional data to determine whether they are likely contributors to impairments within the Mission Bay WMA.

Table 3-4
Potential Bacteria and Sediment Sources with Data Gaps

Pollutant/ Stressor	Potential Source Where Magnitude of Impact Is Unknown	Potential Origin of the Source	Source of Data
Bacteria	Land surface erosion	Human activity and natural	CLRP
	Industrial activities	Human body and human activity	CLRP
	Municipal activities	Human body and human activity	CLRP
	Fertilizers (residential and agricultural)	Human activity	CLRP
	Reclaimed water use	Human activity	CLRP
Sediment	Land surface erosion	Human activity and natural	CLRP
	Vehicle washing	Human activity	CLRP
	Pavement erosion	Human activity	CLRP
	Sewer leaks, sanitary sewer overflows, illicit discharges, and septic systems	Human body and human activity	CLRP

CLRP = Scripps Watershed Comprehensive Load Reduction Plan (City of San Diego, 2012a) and/or Tecolote Watershed Comprehensive Load Reduction Plan (City of San Diego, 2012b)

Additionally, the following sources require further study to determine whether they may be contributing to the impairment of beneficial uses in the Mission Bay WMA:

- Phase II MS4 contribution of bacteria and sediment detailed in Section 3.1.2
- Non-point source contribution of bacteria and sediment detailed in Section 3.1.2
- Locations and discharge characteristics of private outfalls and industrial point sources
- Persistent outfalls identified from the Responsible Agencies' transitional monitoring program (in progress)

3.2 Step 2: Prioritization of Bacteria and Sediment Sources

Based on the findings of Section 3.1, sources were prioritized according to two factors: (1) the ability of the Responsible Agencies to control the source, and (2) the level of human influence. To determine whether a potential source is controllable, the following factors were considered: (1) the locations of the MS4s and potential contributing land uses during wet weather, (2) known outlets with persistent dry weather flow, and (3) jurisdictional authority.

The relative level of human influence was evaluated on the basis of the origin of the bacteria and/or sediment along with the relationship to urban development and human activity. For bacteria, the levels of FIB in a waterbody can be related to recreational health risks. For example, a non-human-impacted waterbody with high FIB densities can pose less risk for water recreation than a human-impacted waterbody with low FIB densities (Soller et al., 2010; Schoen and Ashbolt, 2010). For sediment, the amount of erosion is often dependent on soil type, but also the amount of human activity. Highly erodible sediment near the coast may naturally erode but the rate of erosion will increase with human activity. The prioritization of the known and suspected sources is described in the following subsections.

3.2.1 Source Controllability

Sources were ranked on the basis of the ability of the Responsible Agency to control the associated discharges. Controllable sources are controllable activities by humans, although in some instances (e.g., agricultural activities), Responsible Agencies have limited jurisdictional authority to regulate them. Most point sources were considered controllable, whereas many non-point sources were not. Controllable sources are those sources that are anthropogenic (i.e., influenced by humans) in origin (Regional Board, 2010).

The Bacteria TMDL provides a definition of controllable sources. This definition was also applied to sediment sources for consistency in the WMA. These controllable sources of stressors include:

- Discharges from municipal land uses
- Discharges from Caltrans
- Discharges from agricultural land uses that flow into the Responsible Agencies' MS4

Sources of stressors that are not controllable according to the Bacteria TMDL include:

- Discharges from open space and undeveloped land
- Wildlife (except secondary wildlife)
- Bacteria bound in soil and humic material
- Other natural sources not influenced by human activity

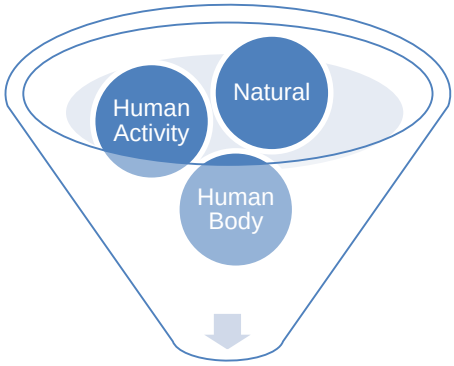
Sources that are outside the Responsible Agencies' jurisdictional boundaries, non-point sources that are not considered controllable, and sources over which the Responsible Agencies do not have regulatory authority were considered to be non-controllable.

Based on this definition, sources in the Mission Bay WMA were categorized as follows:

- Controllable:
  - Discharges from a municipal land use, Caltrans, or an agricultural land use
  - Identified land uses associated with the facility, area, or activity within the Responsible Agencies' jurisdictions
- Not controllable:
  - Discharges not from a municipal land use, Caltrans, or an agricultural land use
  - No identified land uses associated with the facility, area, or activity within the Responsible Agencies' jurisdictions

3.2.2 Level of Human Influence and Source Prioritization

Sources for bacteria and sediment were prioritized on the basis of the level of human influence. The Bacterial Conceptual Models and Literature Review, in Appendix H, was developed for the San Diego County Municipal Copermittees' 2011-2012 Urban Runoff Monitoring Final Report and was described in the Tecolote Creek CLRP (City of San Diego, 2012b). It provides a methodology to characterize the sources of bacteria (*Enterococcus*, fecal coliform, and total coliform) by the level of human influence. Sediment source prioritization utilized the same methodology as that for bacteria, excluding sources from the human body that are not applicable.



Indicator Bacteria Sources

The three categories of source origin are the human body, human activity, and natural:

- Human body: Bacteria carried or shed by humans (e.g., bather shedding and sewage)
- Human activity: Sources from non-human anthropogenic origins (the source is not from the human body, but may be increased by human influence or activities such pet waste and secondary wildlife generation for bacteria, or land disturbing activities from construction for sediment)

- Natural: Sources from non-human non-anthropogenic origins (not increased by human influence), such as natural sources, including wildlife and natural plant decay for bacteria and naturally occurring erosion for sediment

Sources were ranked on the basis of the category of the stressor origin. Bacteria sources from the human body were given the highest priority, followed by sources associated with human activity, and finally by sources known or suspected to be natural in origin. For sediment, sources associated with human activity were assigned a high priority and sources identified with a potential natural origin were assigned a low priority.

For the Mission Bay WMA, the final stressor prioritization was determined as follows:

- High:
  - Bacteria:
    - Source is controllable, and
    - Human body is identified as a potential origin.
  - Sediment:
    - Source is controllable, and
    - Human activity is identified as a potential origin.
- Medium (bacteria only):
  - Source is controllable, and
  - Human activity is identified as a potential origin.
- Low (bacteria and sediment):
  - Source is not controllable, or
  - Source is controllable and natural is identified as a potential origin.

Table 3-5 prioritizes the identified known and suspected sources of bacteria and sediment in the Mission Bay WMA.

Table 3-5
Prioritized Sources

Known or Suspected Source	Controllability Based on Copermittee Jurisdiction	Potential Origin of the Source
BACTERIA		
Facility—High		
Golf Courses/Parks	Controllable	Human body and human activity
Publicly Owned Treatment Works (POTWs)	Controllable	Human body and human activity
Waste Disposal	Controllable	Human body and human activity
Facility—Medium		
Animal Facilities	Controllable	Human activity
Eating and Drinking Establishments	Controllable	Human activity
Mobile Eating/Drinking Establishments	Controllable	Human activity
Nurseries, and Greenhouses	Controllable	Human activity
Area—High		
Residential Areas	Controllable	Human body and human activity
Area—Medium		
Agriculture	Controllable[1]	Human activity
Area—Low		
Open Space Areas	Not controllable	Natural
Transient Encampments	Not controllable[2]	Human body and human activity
Activity—High		
Sanitary Sewer Overflows	Controllable	Human body and human activity

Table 3-5 (continued)
Prioritized Sources

Known or Suspected Source	Controllability Based on Copermittee Jurisdiction	Potential Origin of the Source
Activity—Medium		
Mobile Landscaping	Controllable	Human activity
Home and Garden Care	Controllable	Human activity
Landscaping	Controllable	Human activity
Wildlife (Secondary)[3]	Controllable	Human activity
Activity—Low		
Bacteria Regrowth and Biofilms	Controllable[4]	Natural
Wildlife	Not controllable	Natural
SEDIMENT		
Facility—High		
Nurseries, and Greenhouses	Controllable	Human activity
Parks & Recreation (including Golf Courses & Cemeteries)	Controllable	Human activity
Area—High		
Agriculture	Controllable[1]	Human activity
Residential Areas	Controllable	Human activity
Area—Low		
Open Space Areas	Not controllable	Natural
Activity—High		
Construction	Controllable	Human activity
Hydromodification	Controllable	Human activity and natural
Home and Garden Care	Controllable	Human activity
Landscaping	Controllable	Human activity
Land Use Alteration	Controllable	Human activity
Mobile Landscaping	Controllable	Human activity

Table 3-5 (continued)
Prioritized Sources

Known or Suspected Source	Controllability Based on Copermittee Jurisdiction	Potential Origin of the Source
Activity—Low		
Atmospheric Deposition	Not controllable	Human activity and natural
Ocean Sediment Contribution	Not controllable	Natural

1. Per the Bacteria TMDL, discharges from agricultural lands are controllable.
2. Transient encampments are temporarily located in both municipal and open space land uses. The issues raised by transient encampments are socio-economic by nature. Addressing the sources of homelessness requires coordination with law enforcement, social services, and the legal community. Therefore, it has been designated as an uncontrollable source.
3. Secondary wildlife includes vermin and other wildlife species associated with human presence and habitation.
4. Bacteria regrowth is a natural phenomenon that is hard to track or predict. The regrowth of bacteria in pipes is influenced by multiple factors, some that are under the direct control of the MS4s and some that are not.

3.3 Summary of Priority Sources for City of San Diego

The JURMP Annual Report for the City of San Diego was reviewed to determine whether priority sources could be found in the Mission Bay WMA (City of San Diego, 2012c). Land use information provided in the JURMP Annual Report was used to determine whether agriculture and residential sources were found in the jurisdiction. Because Caltrans is not subject to the MS4 Permit, it has not developed a JURMP Annual Report that presents the priority sources. Therefore, only sources for the City are provided in this section. Priority sources for the City are summarized in Tables 3-6 and 3-7.

Table 3-6
Summary of Priority Indicator Bacteria Sources

Source Type	City of San Diego
High Priority	
Golf Courses/Parks	✓
Publicly Owned Treatment Works (POTWs)	✓
Residential Areas	✓
Sanitary Sewer Overflows	✓
Waste Disposal	✓
Medium Priority	
Agriculture	✓
Animal Facilities	✓
Eating/Drinking Establishments	✓
Home and Garden Care	✓
Landscaping	✓
Mobile Eating/Drinking Establishments	✓
Mobile Landscaping	✓
Nurseries/Greenhouses	✓
Wildlife (Secondary)[1, 2]	✓
Low Priority	
Transient Encampments	NA[3]
Bacteria Regrowth and Biofilms	✓
Open Space Areas	✓
Wildlife[1]	✓

1. This includes wildlife assumed to be present in the City of San Diego's jurisdiction.
2. Secondary wildlife includes vermin and other wildlife species associated with human presence and habitation.
3. NA= Not available; the number of transient encampments is not currently assessed by jurisdiction because of the challenges in obtaining an accurate count of encampments, which (by definition) are temporary. A point-in-time count is prepared annually by the Regional Task Force on the Homeless, and can be found on their website (http://www.rtfhsd.org/).

Table 3-7
Summary of Priority Sediment Sources

Source Type	City of San Diego
High Priority	
Agriculture	✓
Construction	✓
Home and Garden Care	✓
Hydromodification	✓
Land Use Alteration	✓
Landscaping	✓
Nurseries/Greenhouses	✓
Mobile Landscaping	✓
Parks & Recreation (Including Golf Courses and Cemeteries)	✓
Residential Areas	✓
Low Priority	
Atmospheric Deposition	✓
Ocean Sediment Contribution	✓
Open Space Areas	✓

Intentionally Left Blank

4 Water Quality Goals, Strategies, and Schedules

Section 2 established three highest priority water quality conditions in the Mission Bay WMA. The highest priority water quality condition in the Tecolote Creek subwatershed is the potential impairment of contact recreation beneficial uses in Tecolote Creek caused by indicator bacteria during both wet and dry weather. Within the Scripps subwatershed, two highest priority water quality conditions have been selected: (1) the potential impairment of ASBS 29 caused by sediment during wet weather, and (2) potential impairment of 13 segments of the Pacific Ocean Shoreline for contact recreation caused by indicator bacteria during wet and dry weather. Four of those 13 segments are also located in the ASBS.

Section 3 identified and prioritized sources and stressors potentially contributing to the impairments in the Mission Bay WMA. Golf courses and parks, POTWs, residential areas, sanitary sewer overflows, and waste disposal are the highest priority sources likely to be contributing to the bacteria impairment. Agriculture, construction, home and garden care, hydromodification, land use alteration, landscaping, parks and recreation, residential areas, and nurseries and greenhouses are the highest priority sources likely to be contributing to the sediment impairment.

Section 4 Highlights

- Goals for the highest priority water quality conditions (Section 4.1).
- Details on the planned strategies:
  - A description of the nonstructural and structural strategies to be implemented to achieve the goals (Section 4.2). Collaborative strategies will also be highlighted (Section 4.2.5).
  - Each Responsible Agency's strategies, with an implementation schedule (Appendix J).
  - The basis for strategy selection and prioritization, along with implementation assumptions used to estimate strategy effectiveness within the compliance analysis (Appendix K).
- Specifics of the compliance analysis modeling results:
  - A percent load reduction for each BMP category to demonstrate that final goals will be met by implementing the strategies (Section 4.3.1).
  - The schedule for implementation to demonstrate that interim and final goals will be achieved by implementing the strategies (Section 4.3.2).
  - Detailed modeling results, including anticipated load reductions by each strategy type, subwatershed, jurisdiction, and pollutant (Appendix K).

As shown in the graphic below, the third step of Water Quality Improvement Plan development process is to identify the goals, strategies, and implementation schedules for the Mission Bay WMA to address sources and stressors that are contributing to the bacteria and sediment impairments (Provision B.3).

The following section presents the goals (Section 4.1) and strategies (Section 4.2) selected by the Responsible Agencies to address the highest priority water quality conditions in the Mission Bay WMA. A compliance analysis using a watershed model was completed to demonstrate the anticipated progress toward achieving these goals through the proposed strategies and their implementation schedules (Section 4.3). The modeling results are summarized in Section 4.3.

Although this section identifies and details the goals, strategies, and schedules targeting the highest priority water quality conditions in the Tecolote Creek and Scripps subwatersheds, many strategies selected are applied across the Responsible Agencies' jurisdictions and will also benefit conditions in the Rose Canyon and Mission Bay subwatersheds. The City of San Diego's (City) JRMPs are implemented across the City's jurisdiction, and thus across the WMA. Therefore, most of the strategies identified in this Water Quality Improvement Plan are or will be implemented throughout the WMA.

4.1 Goals

Numeric goals have been developed to support Water Quality Improvement Plan implementation and are used to measure progress toward addressing the highest priority water quality conditions. Numeric goals may take a variety of forms, but are quantifiable so that progress toward and achievement of the goals are measurable. Each highest priority water quality condition may include multiple criteria or indicators. In accordance with the MS4 Permit and applicable regulatory drivers, final goals and reasonable interim goals have been developed. An interim goal is required for each five-year period from Water Quality Improvement Plan approval to the anticipated final goal compliance date (including an interim goal for this permit term).

Within the Mission Bay WMA, the Bacteria TMDL dictates the bacteria goals for both wet and dry weather in the Tecolote Creek and Scripps subwatersheds to address and attain REC-1 beneficial uses. MS4 Bacteria TMDL targets may be met in the receiving water (at the Bacteria TMDL listed segment), in MS4s discharges, by determining that the MS4 is not causing or contributing to receiving water exceedances, by demonstrating that exceedances are due to loads from natural sources, or by implementing an approved Water Quality Improvement Plan that used a watershed model or other watershed analytical tools to identify BMPs required to achieve

compliance with the final receiving water or effluent goals. The percent load reduction by jurisdiction is also the metric produced by the compliance analysis, which used a watershed model to demonstrate that selected strategies will meet interim and final goals.

In addition to the Bacteria TMDL-listed segments of beach in the Scripps subwatershed, a portion of the subwatershed drains into the La Jolla ASBS 29 and is subject to regulation under the Ocean Plan and the ASBS General Exception and Special Protections. The City's Phase II CLRP for the Scripps subwatershed (City of San Diego, 2013a) determined copper to be the critical pollutant (stressor) requiring the largest load reduction. This means that it requires the greatest implementation of BMPs to meet the water quality target. However, the Phase II CLRP also noted that when the City's ASBS Site-Specific Dilution and Dispersion Model (dilutor factor) (City of San Diego, 2013d) is applied to the ASBS water quality objectives, the critical stressor in the ASBS changes from copper to sediment. For the purposes of Water Quality Improvement Plan development, the dilution factor was applied and, therefore, sediment during wet weather is the highest priority water quality condition within the ASBS drainage areas.

Compliance with the Special Protections is measured by comparing monitoring results with the 85th percentile threshold of reference water quality, which is currently being developed. The primary regulatory driver, identified by the largest required load reduction, is used for planning purposes to determine the strategies needed to comply with the most stringent interim and final goals for each of the small coastal drainages that make up the Scripps subwatershed. Most of the ASBS area is regulated by the Bacteria TMDL. Only one drainage area is solely regulated by the ASBS Special Protections and not the Bacteria TMDL. The remaining areas in the Scripps subwatershed are not identified in the Bacteria TMDL and are outside of the ASBS and are therefore not considered in the highest priority water quality condition. Implementing strategies to attain the most stringent goal is anticipated to result in attainment of all goals. Monitoring and assessment may determine whether modifications to the strategies are necessary if the Water Quality Improvement Plan interim goals are not being achieved.

Ultimately, protection of the receiving water is the desired outcome. As discussed in Section 1, discharges from sources other than the Phase I MS4s are outside of the jurisdiction and regulatory responsibility of this Water Quality Improvement Plan and may contribute to exceedances of receiving water or subwatershed goals. Therefore, multiple compliance pathways are included in the Water Quality Improvement Plan numeric goals that mirror the Bacteria TMDL compliance pathways. The final and interim numeric goals for the Mission Bay WMA were derived from WQBELs identified in the Bacteria TMDL and incorporated into the MS4 Permit. Appendix I presents the Bacteria TMDL numeric targets and Ocean Plan effluent limitations and provides the basis for the Water Quality Improvement Plan numeric goals. The Bacteria TMDL allows for final exceedances of water quality objectives during wet weather to account for natural sources of bacteria and these are reflected in the allowable exceedance frequency goals.

Performance-based goals are also included to measure the short-term individual progress toward achieving goals given that sustained water quality improvement is typically demonstrated over a longer timeframe. Performance measures are intended to measure an outcome from a strategy or suite of strategies that provide an interim link to reasonable incremental progress in the quality of MS4 discharges and receiving waters by FY18. The strategies or suite of strategies presented have been selected as goals because they are measurable and provide a direct benefit in the short term. Section 4.2 and the associated appendices present the full suite of strategies. Section 4.3 presents the anticipated schedule for implementation of all strategies and the associated load reduction benefit estimated by strategy category.

Section 4.1.1 presents the interim and final Water Quality Improvement Plan numeric goals for the Tecolote Creek subwatershed. Section 4.1.2 presents the interim and final numeric goals for the Scripps subwatershed.

4.1.1 Tecolote Creek Subwatershed

The highest priority water quality condition in the Tecolote Creek subwatershed was identified within Tecolote Creek; therefore, numeric goals have been identified within the creek at the creek mouth. Bacteria TMDL modeling and Water Quality Improvement Plan BMP optimization used a downstream location within the creek (creek mouth) to quantify exceedance frequencies and subwatershed load reductions required to protect REC-1 beneficial uses. An iterative approach will be used as needed to assess sources and strategies upstream. Note that a low-flow diversion is located within Tecolote Creek, upstream of the confluence with the Mission Bay Shoreline that diverts dry weather flows from entering Mission Bay. The diversion at 4674 Tecolote Road does not divert all dry weather flows from Tecolote Creek, only those from that outfall. As with all low-flow diversions, it is checked and maintained at least once per month.

The City of San Diego and Caltrans developed goals both collaboratively and individually to best address the sources and stressors within the Mission Bay WMA and individual jurisdictions. An individualized approach provides flexibility in selecting interim goals on the basis of jurisdiction-specific strategies and schedules, and provides the framework for a more accurate assessment of progress toward achieving goals within each jurisdiction. Performance-based goals are included, in addition to goals based on TMDL targets, to measure the short-term individual progress toward achieving goals given that demonstrating sustained water quality improvement requires monitoring over time.

The Water Quality Improvement Plan interim and final goals for the City of San Diego for wet and dry weather are presented in Table 4-1 and Table 4-2, respectively. The final and interim numeric goals for the Tecolote Creek subwatershed were derived from TMDL targets identified in the Bacteria TMDL and incorporated into the MS4 Permit for freshwater creeks. As discussed in Appendix I, multiple compliance pathways are provided for the Bacteria TMDL. Water Quality Improvement Plan interim goals identified for each five-year assessment period not required by the Bacteria TMDL have been estimated considering the planning and assessment efforts described above and in the strategies and schedules discussion (Sections 4.2 and 4.3). In addition to goals based on TMDL targets, which demonstrate sustained water quality improvement over longer periods of time, performance-based goals were selected to measure short-term individual progress toward achieving goals during the current permit cycle.

Intentionally Left Blank

Table 4-1
Tecolote Creek Subwatershed Wet Weather Goals for the City of San Diego

Compliance Pathways		Baseline	Goals by Assessment Period and Fiscal Year				
			Current Permit Term (FY14 – FY18)	FY 16-20	FY 21-25	FY 26-30	FY 31-36
			FY18	FY19	FY24[1]	FY29	FY31[1]
Receiving Water % Days Exceeding WQO	Fecal coliform	75% Days Exceeding WQO (2002 TMDL Model)	See performance measures	75%[2]	49%	36%	22%
	Enterococcus	81% Days Exceeding WQO (2002 TMDL Model)		81%[2]	51%	37%	22%
OR							
MS4 Discharges % Days Exceeding WQO	Fecal coliform	Historical MS4 wet weather data will be used to identify the baseline in the first Water Quality Improvement Plan Annual Report.	See performance measures	22%	22%	22%	22%
	Enterococcus			22%	22%	22%	22%
	Total coliform[3]			22%	22%	22%	22%
OR							
MS4 Discharges % Load Reduction	Fecal coliform	0% Load Reduction (2002 TMDL Model)	See performance measures	4.0%	9.0%	12.0%	17.9%
	Enterococcus			3.0%	6.0%	8.0%	11.8%
	Total coliform[3]			2.0%	5.0%	7.0%	10.0%
OR							
MS4 Discharges Implement Accepted Water Quality Improvement Plan		Metric for compliance analysis is MS4 discharge % load reduction (above). Interim compliance is implementation of strategies and schedule (presented in Appendix J) based on analysis results. Final compliance is implementation of BMPs based on analysis results and demonstration of compliance with any of the compliance pathways through monitoring and assessment. See Section 4.3.2 and Appendix K for compliance analysis results.					

Table 4-1 (continued)
Tecolote Creek Subwatershed Wet Weather Goals for the City of San Diego

Compliance Pathways		Baseline	Goals by Assessment Period and Fiscal Year				
			Current Permit Term (FY14 – FY18)	FY 16-20	FY 21-25	FY 26-30	FY 31-36
			FY18	FY19	FY24[1]	FY29	FY31[1]
OR							
MS4 Discharges # of Direct or Indirect MS4 Discharges to Receiving Water	Discharges	Number of flowing major MS4 outfalls during wet weather monitoring (Section 5 of this Water Quality Improvement Plan)	See performance measures	0	0	0	0
OR							
% Exceedances of Final Receiving Water WQOs Due to Natural Sources[4]	Fecal coliform	Unknown at this time. A detailed source study that differentiates between human and non-human sources would be needed to establish the baseline.	100%	100%	100%	100%	100%
	Enterococcus		100%	100%	100%	100%	100%

Table 4-1 (continued)
Tecolote Creek Subwatershed Wet Weather Goals for the City of San Diego

Compliance Pathways	Baseline	Goals by Assessment Period and Fiscal Year
		Current Permit Term (FY14 – FY18)
PERFORMANCE MEASURES		
Suite of Strategies to Measure Performance During First Permit Term	**Baseline**	**FY18**
Develop a green infrastructure policy, attain City Council approval, and construct green infrastructure BMPs to improve water quality during wet and dry weather	0 acres treated in 2002, the year used as baseline in the Bacteria TMDL	84.6 acres of drainage area treated through construction of 2 green infrastructure BMPs[5]

Note:

1. Denotes TMDL interim and final WQBEL.
2. Denotes existing wet weather frequency as modeled in the Bacteria TMDL. With limited baseline monitoring data available, this goal reflects a reasonable estimate considering the difficulty in demonstrating progress within the receiving water during wet weather in a short amount of time. Furthermore, development and redevelopment of the urban environment has occurred since the Bacteria TMDL baseline loads were calculated in 2001. As such, this goal demonstrates that progress has been made by the Responsible Agencies by maintaining the existing wet weather exceedance frequency.
3. Total coliform effluent limitations only apply to MS4 outfalls that discharge to the Tecolote Creek mouth.
4. Demonstration of exceedances of final receiving water limitations due to natural sources includes demonstration that pollutant loads from MS4s are not causing or contributing to exceedances.
5. The 84.6 acres of drainage area treated are associated with 2 green infrastructure projects that will be completed by FY18: (1) permeable pavement at Mt. Abernathy Road and Camber Drive draining 19.6 acres, and (2) permeable pavement at Bannock and Genesee Avenues draining 65 acres.

% = percent; FY = fiscal year; WQO = Water Quality Objective
All numeric goals are cumulative from the baseline assessment for each fiscal year

Intentionally Left Blank

Table 4-2
Tecolote Creek Subwatershed Dry Weather Numeric Goals for the City of San Diego

Compliance Pathways		Baseline	Assessment Period and Fiscal Year		
			Current Permit Term (FY14-FY18)	FY 16-20	FY 21-25
			FY18	FY19[1]	FY21[1]
Receiving Water % Days Exceeding WQO	Fecal coliform	100% Days Exceeding WQO (2002[2])	See performance measures	50%	0%
	Enterococcus	100% Days Exceeding WQO (2002[2])		50%	0%
OR					
MS4 Discharges % Days Exceeding WQO	Fecal coliform	Historical MS4 dry weather data will be used to identify the baseline in the first Water Quality Improvement Plan Annual Report.	See performance measures	0%	0%
	Enterococcus			0%	0%
	Total coliform[3]			0%	0%
OR					
MS4 Discharges % Load Reduction	Fecal coliform	0% Load Reduction (2002 TMDL Model)	See performance measures	49.5%	98.4%
	Enterococcus			50.0%	99.9%
	Total coliform[3]			50.0%	99.6%
OR					
MS4 Discharges Implement Accepted Water Quality Improvement Plan		Metric for compliance analysis is MS4 discharge % load reduction (above). Interim compliance is implementation of strategies and schedule (presented in Appendix J) based on analysis results. Final compliance is implementation of BMPs based on analysis results and demonstration of compliance with any of the compliance pathways through monitoring and assessment. See Section 4.3.2 and Appendix K for compliance analysis results.			

Table 4-2 (continued)
Tecolote Creek Subwatershed Dry Weather Numeric Goals for the City of San Diego

Compliance Pathways		Baseline	Assessment Period and Fiscal Year		
			Current Permit Term (FY14-FY18)	FY 16-20	FY 21-25
			FY18	FY19[1]	FY21[1]
OR					
# of Direct or Indirect MS4 Discharges to Receiving Water	Discharges	Number of persistently flowing major MS4 outfalls provided in Section 5.1 of the Monitoring and Assessment Program of this Water Quality Improvement Plan	See performance measures	0	0
OR					
% of Exceedances of Final Receiving Water WQOs Due to Natural Sources[4]	Fecal coliform	Unknown at this time. A detailed source study that differentiates between human and non-human sources would be needed to establish the baseline.	100%	100%	100%
	Enterococcus		100%	100%	100%

Table 4-2 (continued)
Tecolote Creek Subwatershed Dry Weather Numeric Goals for the City of San Diego

Compliance Pathways	Baseline	Assessment Period and Fiscal Year Current Permit Term (FY14-FY18)
PERFORMANCE MEASURES		
Suite of Strategies to Measure Performance During First Permit Term	**Baseline**	**FY18**
Develop a green infrastructure policy, attain City Council approval, and construct green infrastructure BMPs to improve water quality during wet and dry weather	0 acres treated in 2002, the year used as baseline in the Bacteria TMDL	84.6 acres of drainage area treated through construction of 2 green infrastructure BMPs[5]
Implement runoff reduction programs such as targeted education and outreach efforts, enhanced inspections, additional rebate programs[6], and increased enforcement	Historical dry weather monitoring data will be used to establish a baseline in the first Water Quality Improvement Plan Annual Report.	10% reduction in prohibited[7] dry weather flow from baseline measured at persistently flowing outfalls in the WMA

Note:

1. Denotes TMDL interim and final WQBEL.
2. The existing exceedance frequency was calculated on the basis of available monitoring data between 1996 and 2002 per MS4 Permit requirements and presented in more detail in Appendix I.
3. Total coliform effluent limitations only apply to MS4 outfalls that discharge to the Tecolote Creek mouth.
4. Demonstration of exceedances of final receiving water limitations due to natural sources includes demonstration that pollutant loads from MS4s are not causing or contributing to exceedances.
5. The 84.6 acres of drainage area treated are associated with 2 green infrastructure projects that will be completed by FY18: (1) permeable pavement at Mt. Abernathy Road and Camber Drive draining 19.6 acres, and (2) permeable pavement at Bannock and Genesee Avenues draining 65 acres.
6. City of San Diego rebates include grass replacement, rainwater harvesting, downspout disconnect, and micro-irrigation.
7. Does not include allowable discharges as defined in Provision A and Provision E.2.a of the MS4 Permit.

All numeric goals are cumulative from the baseline assessment for each fiscal year.

Intentionally Left Blank

Caltrans is not permitted within the MS4 Permit; however, Caltrans is subject to similar requirements through its MS4 Permit (State Board, 2012b). Caltrans has voluntarily contributed to the Water Quality Improvement Plan effort to provide a consistent and subwatershed-wide approach to meeting applicable TMDL requirements. The baseline strategies are continuously implemented and augmented as resources become available.

Attachment IV to the Caltrans MS4 Permit outlines a methodology for prioritizing stream segments included in TMDLs to which Caltrans is subject. The permit establishes BMP implementation requirements, evaluated in terms of compliance units. Caltrans is expected to achieve 1,650 compliance units per year through the implementation of retrofit BMPs, cooperative implementation, and post-construction treatment beyond permit requirements.

Impaired reaches throughout the state will be prioritized on the basis of several factors, including, but not limited to, percent reduction needed, Caltrans drainage area contributing to the reach, and proximity to receiving waters. Reaches with metals TMDLs will likely be prioritized. This prioritization list is currently under negotiation between Caltrans Headquarters and the State Water Resources Control Board.

Caltrans' jurisdiction areas include roadways, land adjacent to roadways, and facilities; Caltrans' jurisdictional strategies specifically focus on BMP implementation to reduce known pollutants within these areas. Caltrans' strategies vary from those of other Responsible Agencies (in both type and name) to best address freeway characterization discharges from its right-of-way. Strategies include programs developed by Caltrans Headquarters for statewide execution and District 11 implementation. Caltrans' implementation of strategies within the WMA is dependent on legislative approval.

For Bacteria TMDLs, Caltrans is expected to eliminate dry weather flows by implementing control measures to ensure effective prohibition (Provision B.2 of the MS4 Permit). For wet weather flows, Caltrans is expected to implement control measures/BMPs to prevent discharge of bacteria from the right-of-way, including source control and preemptive activities such as street sweeping, cleanup of illegal dumping, and public education on littering. Implementation of these controls is per the TMDL prioritization list currently under development.

Caltrans' Water Quality Improvement Plan interim and final goals for wet weather are presented in Table 4-3. Caltrans Water Quality Improvement Plan interim and final goals for dry weather are presented in Table 4-4.

Table 4-3
Tecolote Creek Subwatershed Wet Weather Goals for Caltrans

Goals	Unit of Measure	Assessment Metric
MS4 Discharges	Cooperative Implementation Agreement	Achievement of compliance units by contributing funds to a cooperative implementation
OR		
MS4 Discharges	Implementation of Nonstructural BMPs	Continued implementation of wet weather nonstructural BMP activities within the watershed
OR		
MS4 Discharges	Implementation of Structural BMPs	Continued implementation of wet weather structural BMP activities for proposed projects within the watershed

Table 4-4
Tecolote Creek Subwatershed Dry Weather Goals for Caltrans

Goals	Unit of Measure	Assessment Metric
MS4 Discharges	Reduction in Dry Weather Flow	Elimination of dry weather flows by implementing control measure to ensure effective prohibition
OR		
MS4 Discharges	Implementation of Dry Weather BMPs	Implementation of drought-tolerant landscaping and conversion to smart irrigation controllers within the WMA

4.1.2 Scripps Subwatershed

4.1.2.1 Scripps Subwatershed Goals

The goals for the Scripps subwatershed were based on the applicable regulatory driver for each segment or drainage area. Five sub-basins discharge to the ASBS. Of those five sub-basins, four also discharge to a Bacteria TMDL-listed shoreline segment. As presented in Appendix I, the load reduction required to meet the Bacteria TMDL is an order of magnitude larger than that required for sediment under the ASBS Special Protections. Therefore, for the four sub-basins regulated by both the Bacteria TMDL and the ASBS Special Protections, implementing strategies that target bacteria load reductions is expected to meet and exceed the reductions necessary for sediment. The drainage areas that are subject to the Bacteria TMDL and/or the ASBS Special Protections are presented in Table 4-5 and Figure 4-1.

Table 4-5
Scripps Subwatershed Drainage Areas

Shoreline Segment or Area	Regulatory Driver
La Jolla Shores Beach at El Paseo Grande	TMDL & ASBS
La Jolla Shores Beach at Caminito del Oro	TMDL & ASBS
La Jolla Shores Beach at Vallecitos	TMDL & ASBS
La Jolla Shores Beach at Avenida de la Playa	TMDL & ASBS
La Jolla Shores at Princess St	ASBS
Casa Beach, Children's Pool	TMDL
South Casa Beach at Coast Boulevard	TMDL
Whispering Sands Beach at Ravina Street	TMDL
Windansea Beach at Vista de la Playa	TMDL
Windansea Beach at Bonair Street	TMDL
Windansea Beach at Playa del Norte	TMDL
Windansea Beach at Palomar Avenue	TMDL
Tourmaline Surf Park	TMDL
Pacific Beach at Grand Avenue	TMDL

.

Intentionally Left Blank

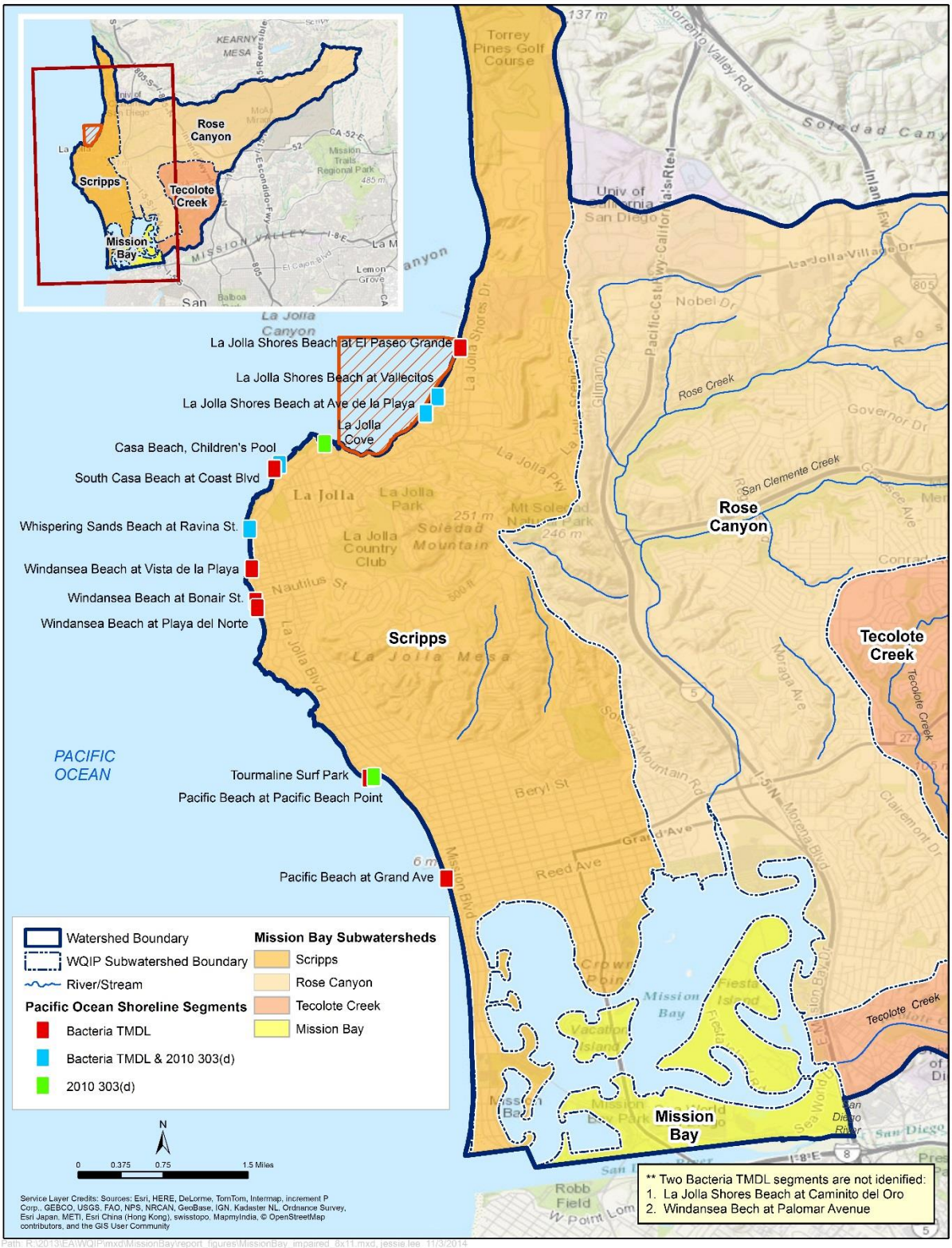


Figure 4-1
Scripps Subwatershed Bacteria TMDL-Listed Segments and ASBS Designation

The final and interim numeric goals for wet and dry weather are presented in Table 4-6 and Table 4-7, respectively. Multiple compliance pathways are provided. The receiving water goals (percent days exceeding a WQO) were translated into load reductions from the Mission Bay WMA and are two of the TMDL compliance pathways. In addition, actions providing that the Responsible Agencies are not causing or contributing to a receiving water exceedance (no direct or indirect discharge from the MS4, or exceedances within the receiving water that attributable to natural sources) are also pathways toward meeting compliance. Compliance can also be met by developing and implementing an accepted Water Quality Implementation Plan that incorporates BMPs required to meet receiving water or effluent goals using a watershed model or other watershed analytical tools to demonstrate compliance.

Water Quality Improvement Plan interim goals identified for each five-year assessment period not required by the Bacteria TMDL have been estimated considering the planning and assessment efforts described above and in the strategies and schedules discussion (Sections 4.2 and 4.3). In addition to goals based on TMDL targets, which demonstrate sustained water quality improvement over longer periods of time, performance-based goals were selected to measure short-term individual progress toward achieving goals during the current permit cycle.

Table 4-6
Wet Weather Numeric Goals for the Scripps Subwatershed

Compliance Pathways		Applicable Drainages[1]	Baseline	Goals by Assessment Period and Fiscal Year				
				Current Permit Term (FY14 – FY18)	FY 16-20	FY 21-25	FY 26-30	FY 31-36
				FY18	FY19	FY24[2]	FY29	FY31[2]
Receiving Water % Days Exceeding WQO	Fecal coliform	TMDL	52% Days Exceeding WQO (2002 TMDL Model)	See performance measures	52%[3]	37%	30%	22%
	Enterococcus				52%[3]	37%	30%	22%
	Total coliform				52%[3]	37%	30%	22%
OR								
MS4 Discharges % Days Exceeding WQO	Fecal coliform	TMDL	Historical MS4 wet weather data will be used to identify the baseline in the first Water Quality Improvement Plan Annual Report.	See performance measures	22%	22%	22%	22%
	Enterococcus				22%	22%	22%	22%
	Total coliform				22%	22%	22%	22%
OR								
MS4 Discharges % Load Reduction	Fecal coliform	TMDL	0% Load Reduction (2002 TMDL Model)	See performance measures	3.5%	5.0%	7.0%	10.0%
	Enterococcus	TMDL			2.0%	3.0%	5.0%	6.6%
	Total coliform	TMDL			2.0%	2.5%	4.0%	5.1%
	Sediment	ASBS			0.3%	0.3%	0.8%	0.6%
OR								
MS4 Discharges Implement Accepted Water Quality Improvement Plan		TMDL, ASBS	Metric for compliance analysis is MS4 discharge % load reduction (above). Interim compliance is implementation of strategies and schedule (presented in Appendix J) based on analysis results. Final compliance is implementation of BMPs based on analysis results and demonstration of compliance with any of the compliance pathways through monitoring and assessment. See Section 4.3.2 and Appendix K for compliance analysis results.					

Table 4-6 (continued)
Wet Weather Numeric Goals for the Scripps Subwatershed

Compliance Pathways		Applicable Drainages[1]	Baseline	Goals by Assessment Period and Fiscal Year				
				Current Permit Term (FY14 – FY18)	FY 16-20	FY 21-25	FY 26-30	FY 31-36
				FY18	FY19	FY24[2]	FY29	FY31[2]
OR								
MS4 Discharges # of Direct or Indirect MS4 Discharges to Receiving Water	Discharges	TMDL, ASBS	Number of flowing major MS4 outfalls during wet weather monitoring (Section 5 of this Water Quality Improvement Plan)	See performance measures	0	0	0	0
OR								
% Exceedances of Final Receiving Water WQOs Due to Natural Sources[4]	Fecal coliform	TMDL, ASBS	Unknown at this time. A detailed source study that differentiates between human and non-human sources would be needed to establish the baseline.	100%	100%	100%	100%	100%
	Enterococcus			100%	100%	100%	100%	100%
	Total coliform			100%	100%	100%	100%	100%

Table 4-6 (continued)
Wet Weather Numeric Goals for the Scripps Subwatershed

Compliance Pathways	Baseline	Goals by Assessment Period and Fiscal Year
		Current Permit Term (FY14 – FY18)
PERFORMANCE MEASURES		
Suite of Strategies to Measure Performance During First Permit Term	**Baseline**	**FY18**
Develop a green infrastructure policy, attain City Council approval, and construct green infrastructure BMPs to improve water quality during wet and dry weather	0 acres treated in 2002, the year used as baseline in the Bacteria TMDL	8.9 acres of drainage area treated through construction of 1 green infrastructure BMP[5]

Note:

1. Denotes the regulatory driver triggering compliance within drainage areas. See Table 4-5 and Figure 4-1 to identify the applicable drainage areas.
2. Denotes TMDL interim and final WQBEL.
3. Denotes existing wet weather frequency as modeled in the Bacteria TMDL. With limited baseline monitoring data available, this goal reflects a reasonable estimate considering the difficulty in demonstrating progress within the receiving water during wet weather in a short amount of time. Furthermore, development and redevelopment of the urban environment has occurred since the Bacteria TMDL baseline loads were calculated in 2001. As such, this goal demonstrates that progress has been made by the Responsible Agencies by maintaining the existing wet weather exceedance frequency.
4. Demonstration of exceedances of final receiving water limitations due to natural sources includes demonstration that pollutant loads from MS4s are not causing or contributing to exceedances.
5. The 8.9 acres of drainage area treated are associated with 1 green infrastructure project that will be completed by FY18: (1) permeable pavement and bioretention at Kellogg Park draining 8.9 acres.

All numeric goals are cumulative from the baseline assessment for each fiscal year.

Intentionally Left Blank

Table 4-7
Dry Weather Numeric Goals for the Scripps Subwatershed

Compliance Pathways		Baseline	Assessment Period and Fiscal Year		
			Current Permit Term (FY14-FY18)	FY 16-20	FY 21-25
			FY18	FY19[1]	FY21[1]
Receiving Water % Days Exceeding WQO	Fecal coliform	15% Days Exceeding WQO (2002[2])	See performance measures	7%	0%
	Enterococcus	13% Days Exceeding WQO (2002[2])		6%	0%
	Total coliform	6% Days Exceeding WQO (2002[2])		3%	0%
OR					
MS4 Discharges % Days Exceeding WQO	Fecal coliform	Historical MS4 dry weather data will be used to identify the baseline in the first Water Quality Improvement Plan Annual Report.	See performance measures	0%	0%
	Enterococcus			0%	0%
	Total coliform			0%	0%
OR					
MS4 Discharges % Load Reduction	Fecal coliform	0% Load Reduction (2002 TMDL Model)	See performance measures	49.5%	99.0%
	Enterococcus			50.0%	99.9%
	Total coliform			50.0%	99.8%
OR					
MS4 Discharges Implement Accepted Water Quality Improvement Plan		Metric for compliance analysis is MS4 discharge % load reduction (above). Interim compliance is implementation of strategies and schedule (presented in Appendix J) based on analysis results. Final compliance is implementation of BMPs based on analysis results and demonstration of compliance with any of the compliance pathways through monitoring and assessment. See Section 4.3.2 and Appendix K for compliance analysis results.			

Table 4-7 (continued)
Dry Weather Numeric Goals for the Scripps Subwatershed

Compliance Pathways		Baseline	Assessment Period and Fiscal Year		
			Current Permit Term (FY14-FY18)	FY 16-20	FY 21-25
			FY18	FY19[1]	FY21[1]
OR					
# of Direct or Indirect MS4 Discharges to Receiving Water	Discharges	Number of persistently flowing major MS4 outfalls provided in Section 5.1 of the Monitoring and Assessment Program of this Water Quality Improvement Plan.	See performance measures	0	0
OR					
% of Exceedances of Final Receiving Water WQOs Due to Natural Sources[3]	Fecal coliform	Unknown at this time. A detailed source study that differentiates between human and non-human sources would be needed to establish the baseline.	100%	100%	100%
	Enterococcus		100%	100%	100%
	Total coliform		100%	100%	100%

Table 4-7 (continued)
Dry Weather Numeric Goals for the Scripps Subwatershed

Compliance Pathways	Baseline	Assessment Period and Fiscal Year
		Current Permit Term (FY14-FY18)
PERFORMANCE MEASURES		
Suite of Strategies to Measure Performance During First Permit Term	**Baseline**	**FY18**
Develop a green infrastructure policy, attain City Council approval, and construct green infrastructure BMPs to improve water quality during wet and dry weather	0 acres treated in 2002, the year used as baseline in the Bacteria TMDL	8.9 acres of drainage area treated through construction of 1 green infrastructure BMP[4]
Implement runoff reduction programs such as targeted education and outreach efforts, enhanced inspections, additional rebate programs[5], and increased enforcement	Historical dry weather monitoring data will be used to establish a baseline in the first Water Quality Improvement Plan Annual Report.	10% reduction in prohibited[6] dry weather flow from baseline measured at persistently flowing outfalls in the WMA

Note:

1. Denotes TMDL interim and final WQBEL.
2. The existing exceedance frequency was calculated based on available monitoring data between 1996 and 2002 per MS4 Permit requirements and presented in more detail in Appendix I.
3. Demonstration of exceedances of final receiving water limitations due to natural sources includes demonstration that pollutant loads from MS4s are not causing or contributing to exceedances.
4. The 8.9 acres of drainage area treated are associated with 1 green infrastructure project that will be completed by FY18: (1) permeable pavement and bioretention at Kellogg Park draining 8.9 acres.
5. City of San Diego rebates include grass replacement, rainwater harvesting, downspout disconnect, and micro-irrigation.
6. Does not include allowable discharges as defined in Provision A and Provision E.2.a of the MS4 Permit.

All numeric goals are cumulative from the baseline assessment for each fiscal year.

Intentionally Left Blank

As stated in Section 4.1, compliance with Water Quality Improvement Plan goals is met by achieving any one of the goals presented in the goal tables during an assessment period. One of the compliance pathways is implementing a Water Quality Improvement Plan that demonstrates that the selected strategies will meet the goals. Within the Mission Bay WMA, a compliance analysis using a watershed model was conducted to identify the strategies required to be implemented to meet interim and final goals. Modeling described in the following sections demonstrates that the jurisdictional strategies presented in Section 4.2 will meet the jurisdictional goals, expressed as a load reduction from the jurisdiction's MS4.

For efficiency, the modeling analysis to assess the load reduction and BMP optimization considered the entire subwatershed, including the ASBS drainage area (not including the southern area that drains to Mission Bay). The final jurisdiction goal, 9.6 percent load reduction of fecal coliform, was used as the target for BMP implementation across the subwatershed. Strategy implementation may occur City-wide or within targeted drainage areas of the Scripps subwatershed, but amounts were quantified cumulatively across the subwatershed to provide assurance that implementation would meet the goals. This approach also provides additional assurance shoreline goals will be met, as dispersion along the shoreline between the very small coastal drainages may affect water quality. The receiving water goals will be assessed only at the Bacteria TMDL segments.

4.2 Strategies

The Responsible Agencies were tasked with identifying water quality improvement strategies that may be implemented to address the highest priority water quality conditions. The strategies were selected on the basis of their ability to effectively and efficiently eliminate non-storm water discharges to the MS4, reduce pollutants in storm water discharges from the MS4 to the MEP, and achieve the interim and final numeric goals identified in Section 4.1. A compliance analysis was completed using a watershed simulation and BMP optimization model developed for the Tecolote and Scripps subwatersheds to quantify load reductions to support evaluation of TMDL compliance and select the most cost-effective BMP strategy for implementation. The compliance analysis modeled the outcome of applying a set of strategies to the watershed in the most cost-effective order, and demonstrated that implementation of the strategies would result in achievement of interim and final goals.

A brief description of the strategy selection process is provided in Section 4.2.1. A general discussion of nonstructural strategies, such as MS4 maintenance and street sweeping, administrative policies, enforcement of municipal ordinances, education and outreach programs, rebate and incentive programs, and collaboration with WMA partners, is presented in Section 4.2.2. Structural strategies, those strategies that can improve water quality by removing pollutants through filtration and infiltration, are introduced in Section 4.2.3. A description of example nonstructural and structural strategies selected by each Responsible Agency to target the highest priority water quality conditions by jurisdiction is presented in Section 4.2.4. A comprehensive list of

strategies, including the method for implementing each strategy, the cost, and Mission Bay WMA partners included in the effort, is presented in Appendix J. Strategies implemented on a WMA scale or through collaboration with WMA partners are discussed in more detail in Section 4.2.5. The modeling results, or outcome of the implementation of the strategies selected in terms of percent load reduction, are presented in Appendix K. Section 4.3 presents a summary of the compliance analysis results to demonstrate the anticipated progress toward achieving the interim and final goals.

4.2.1 Strategy Selection

A list of potential strategies (nonstructural and structural) was developed by the Responsible Agencies on the basis of JRMP activities and enhancements to JRMP activities, and augmented by public input and discussion with the Mission Bay WMA Consultation Committee (Mission Bay WMA Responsible Agencies, 2014). This list was used as a guide by each Responsible Agency to identify strategies appropriate for its jurisdiction.

Strategy selection considered the following:

- Emphasis was given to strategies that target highest priority water quality conditions and those that provide multiple benefits.
- The Responsible Agencies considered the triple bottom line, evaluating the environmental, economic, and social components of the strategies.
- Strategies that improve and promote cooperation and collaboration between the Responsible Agencies and other governmental agencies (WMA groups, Caltrans, water districts, school districts) and other entities, such as private or non-profit organizations, were also prioritized. Responsible Agencies are continually collaborating with internal jurisdictional departments, and these collaborating entities are presented in the jurisdictional strategies table, as well.

The City of San Diego and Caltrans evaluated their existing programs, the potential for incorporating enhancements and new administrative programs, and the types of structural BMPs that may be considered, if warranted and appropriate for the jurisdiction. The City of San Diego evaluated all aspects of its JRMPs, which provided the necessary background for existing nonstructural solutions and selected areas where enhanced or restructured activities may provide a greater benefit to water quality. Similarly, Caltrans evaluated the programs and practices required within its statewide Storm Water Management Plan (SWMP) Annual Report and District 11 Work Plan to identify existing nonstructural strategies and potential enhancements.

Efficiency in pollutant reduction is based partly on identifying the known and suspected areas or sources likely to be contributing to the highest priority water quality conditions and targeting those sources. To assist in the geographical identification of sources, watershed modeling and GIS tools were used to estimate the relative bacteria loading within the Mission Bay WMA, land ownership and availability of public land for implementation, and physical watershed characteristics such as slope and soil types for BMP selection. Appendix K provides additional information on strategy selection, including a description of the prioritization of drainage areas within Tecolote Creek and Scripps subwatersheds by bacteria loading, implementation assumptions used to estimate strategy effectiveness within the simulation models, and results of the modeling efforts, such as anticipated load reductions by strategy, subwatershed, jurisdiction, and pollutant.

4.2.2 Nonstructural Strategy Descriptions

Nonstructural strategies are defined as those actions and activities that are intended to reduce storm water pollution and that do not involve construction or implementation of a physical structure to filter and treat storm water. These strategies are also considered nonstructural by the nature of their programmatic implementation. MS4 maintenance and street sweeping, administrative policies, creation and enforcement of municipal ordinances, education and outreach programs, rebate and other incentive programs, and cooperation and collaboration with other WMA or regional partners are examples of nonstructural strategies. Jurisdictions across the region have implemented these types of programs for many years, either in response to MS4 Permit requirements or in response to jurisdiction- or WMA-specific needs (Regional Board, 2013).

The combination of existing efforts and new or enhanced efforts determines the final, expected load reduction (Figure 4-2). Fundamentally, strategies were chosen on the basis of their expected effectiveness in reducing pollutant sources and targeting pollutant-generating activities (PGAs) of concern in the Mission Bay WMA and their suitability for and potential for implementation by the Responsible Agencies.

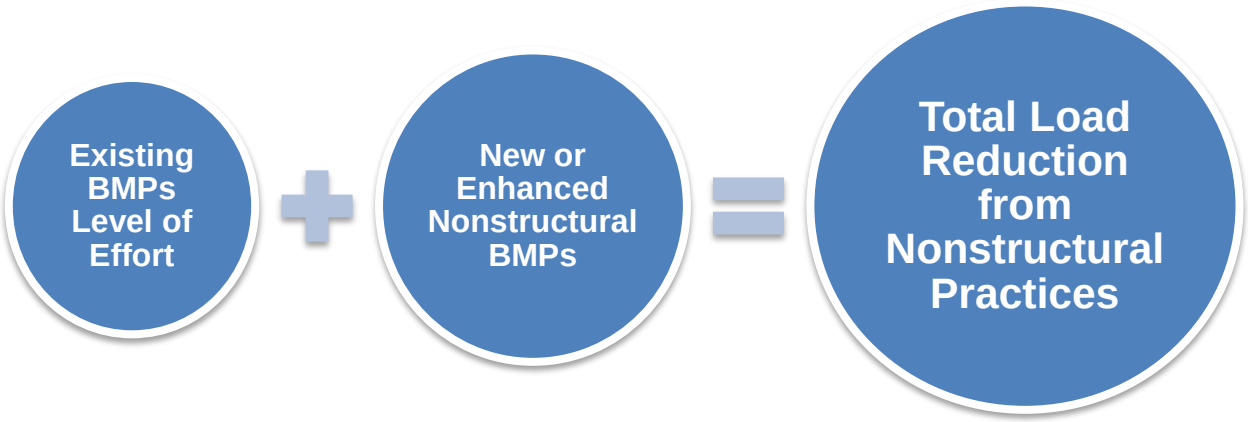


Figure 4-2
Determining Total Load Reduction from Nonstructural Strategies

The list of nonstructural strategies for each Responsible Agency is based on the following:

- Existing programs or actions that the Responsible Agencies are already implementing or must implement based on MS4 Permit requirements
- Opportunities for enhancing and refining existing programs or actions
- Identification of new actions or initiatives that are effective or potentially effective in other areas or programs

It is challenging to accurately quantify most nonstructural BMP benefits in terms of pollutant load reductions because quantification generally requires extensive survey and monitoring information. In addition, nonstructural strategies may target pollutants, land uses, or populations, resulting in different load reductions, depending on the implementation technique. Nevertheless, the modeling completed and discussed further in Appendix K estimates the effectiveness of current and future levels of implementation of select nonstructural strategies, building on the previous CLRP I and II efforts and using best available information. Nonstructural strategies that cannot be effectively modeled to determine their quantifiable benefits are referred to as non-modeled nonstructural strategies (Section 4.2.2.1). The nonstructural strategies with sufficient supporting data to estimate associated load reductions through modeling are discussed in Section 4.2.2.2.

4.2.2.1 Non-Modeled Nonstructural Strategies

Most nonstructural strategies implemented by the City of San Diego are part of the City's JRMPs. The MS4 Permit requires Responsible Agencies to control the contribution of pollutants to the MS4 and the discharges from the MS4 within their jurisdictions through JRMPs (MS4 Permit Provision E). The MS4 Permit requires the jurisdictions to identify the strategies being implemented by JRMP Provisions E.2 through E.7 as part of the Water Quality Improvement Plan for the highest priority water quality conditions. Caltrans is not included under the MS4 Permit; however, Caltrans is subject to similar requirements through its MS4 Permit (State Board, 2012b). Caltrans' strategies vary from those of the City (in both type and name) to best address typical discharges from its jurisdictions. Caltrans has voluntarily contributed to the Water Quality Improvement Plan effort to provide a consistent and subwatershed-wide approach to meeting applicable Bacteria TMDL requirements, as resources are available. Additional information on Caltrans' required programs is provided in its MS4 Permit (State Board, 2012b).

Nonstructural strategies may be broad, overarching administrative programs or activities targeting specific sources. The MS4 Permit provides guidelines for Responsible Agency implementation of each program; however, the programs are implemented differently depending on the unique characteristics of each jurisdiction. Responsible Agencies implement strategies within their JRMPs with a specialized approach to best achieve the numeric goals and meet permit requirements within their jurisdictions. Because the MS4 Permit provides flexibility in selecting strategies, not all jurisdictions may identify the same strategies within their JRMPs as some strategies may not be the most appropriate or efficient to achieve pollutant reductions.

For those nonstructural strategies where sufficient data existed to support modeling of effectiveness, load reductions were quantified. Those strategies are described in Section 4.2.2.2. The effectiveness of most nonstructural strategies, e.g., those non-modeled nonstructural strategies covered in this section, are difficult to quantify through modeling; however, the relative benefit associated with water chemistry, physical, and biological improvements for each of these non-modeled nonstructural strategies is shown in Table 4-9.

Table 4-8 describes the JRMP strategy categories. The relative benefit associated with water chemistry, physical, and biological improvements achieved by strategy implementation is presented in Table 4-9. The assumptions represent best professional judgment based on literature reviews, practical experience, and stakeholder input. The strategy benefits outlined in Table 4-9 are dependent on site characteristics, implementation, and the target pollutant of the program or strategy. Although the benefits are variable, estimates of the relative pollutant reduction benefits are provided for comparative evaluation. A compilation of references used to estimate the overall, relative benefit is included in Appendix L. Pollutant reductions identify the primary pollutants (●), the secondary pollutants (◗), and the pollutants that the strategy does not address (○). Estimated pollutant reductions assume typical design, land use, and geography, but can be modified to target pollutants or site-specific needs. For additional information on JRMP implementation, see each Responsible Agency's JRMP document (to be submitted in June 2015).

Table 4-8
Categories of JRMP Strategies

Strategy Category	Strategy Description
Development Planning	Uses Responsible Agencies' land use and planning authority to require implementation of best management practices (BMPs) to address effects from new development and redevelopment.
Construction Management	Addresses pollutant generation from construction activities associated with new development or redevelopment.
Existing Development	Addresses pollutant generation from existing development, including commercial, industrial, municipal, and residential land uses. Includes stream, channel, and habitat restoration and retrofitting in areas of existing development.
Illicit Discharge, Detection, and Elimination (IDDE) Program	Actively detects and eliminates illicit discharges and improper disposal of wastes into the MS4.
Public Education and Participation	Promotes and encourages behaviors to reduce pollutant discharges. Describes opportunities for public participation in water quality improvement planning.
Enforcement Response Plan	Describes escalating enforcement measures for each JRMP component.

Table 4-9
JRMP Strategy Benefits

STRATEGY	Average Water Chemistry Benefit[1]									Physical and Biological Benefit			
	Bacteria[2]	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
Development Planning													
All Development Projects	*Benefit varies by source control or low-impact development (LID) BMP type: Refer to Table 4-11 for a discussion of structural benefits.*												
Priority Development Projects (PDPs)	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗
Construction Management	○	○	○	●	○	○	◗	○	◗	●	●	○	●
Existing Development													
Commercial, Industrial, Municipal, and Residential Minimum BMP Requirements and Facility and Area Inspections	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗
MS4 Infrastructure Maintenance (including Catch Basin Cleaning)	◗	○	○	●	◗	◗	○	○	○	○	○	○	◗
Roads, Streets, and Parking Lots Maintenance (including Street Sweeping)	◗	●	◗	●	○	●	○	◗	●	○	○	○	◗

Table 4-9 (continued)
JRMP Strategy Benefits

STRATEGY	Average Water Chemistry Benefit[1]									Physical and Biological Benefit			
	Bacteria[2]	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
Pesticide, Herbicides, and Fertilizer Program	○	○	●	○	●	●	○	○	○	○	○	◗	●
Retrofit and Rehabilitation in Areas of Existing Development	*Varies by development area; potential benefit for all conditions.*												
IDDE Program	*Benefit varies; potential benefit for all conditions.*												
Public Education and Participation	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗
Enforcement Response Plan	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗

1. For references for the water chemistry benefits for each strategy, refer to Appendix L.
2. Orange-shaded cells indicate highest priority water quality condition for the Mission Bay WMA.

Responsible Agencies have also identified additional strategies that fall outside of a JRMP category. These additional strategies are not required by MS4 Permit Provision E, but the Responsible Agency has identified them as potentially effective in addressing priority water quality conditions within its jurisdiction. They may not be appropriate or effective within all jurisdictions.

The effectiveness of non-modeled, nonstructural strategies is difficult to quantify. Therefore, assigning a load reduction to each strategy or a suite of strategies is difficult. For the BMPs that are not represented in the model, a conservative load reduction of 10 percent is allocated. A 10 percent load reduction for nonstructural activities was estimated by averaging the range of measured and anticipated pollutant removal from the list of City of San Diego nonstructural strategies. Strategies were categorized as "high" percent removal, those with greater City control (operation and maintenance of MS4 infrastructure), or "low" percent removal, those requiring public behavior changes. The range of pollutant load reduction was as low as approximately 2 percent and as high as 72 percent. The overall average percent removal for all constituents and all activities is 10.1 percent. The average bacteria removal from the list of strategies was 11.7 percent (HDR, 2014).

4.2.2.2 Modeled Nonstructural Strategies

While the effectiveness of most nonstructural strategies is difficult to quantify, the pollutant and flow reduction benefits from rain barrels, downspout disconnections, and irrigation runoff reduction practices were estimated using quantitative methods, as described in Appendix K. The general effectiveness of each strategy was identified. The implementation assumptions, such as the number of rain barrels implemented per year, were then modeled independently of other nonstructural strategies because of their quantifiable properties. Appendix K describes the modeling process for the nonstructural strategies for each Responsible Agency. Because Caltrans' jurisdiction primarily consists of roadways, rain barrels and other incentive programs are not applicable.

Table 4-10
Modeled Nonstructural Strategies

Modeled Nonstructural Strategy[1]	Strategy Description	Example Photograph
Rain Barrels Incentive Program	Capturing storm water from rooftops in residential rain barrels is a simple method to reduce demand on the potable water system and help prevent pollution by reducing the amount of runoff entering municipal storm drain systems. Retained runoff can be reused for irrigation, or when reuse is not possible, the retained flows can be slowly released after a period of storage. Any released flows can be routed through landscaped areas, in which runoff load reduction can be attained through the processes of infiltration and evapotranspiration, or to bioretention BMPs as part of a treatment train. Through its residential BMP rebate program, the City of San Diego offers residential customers a cash-back rebate of $1.00 for every gallon of rain barrel storage capacity up to 400 gallons. Other rebate programs offered by regional water agencies and promoted by Responsible Agencies are also available.	
Downspout Disconnection Incentive Program	Implementing a downspout disconnection incentive program can promote load reductions by routing runoff over pervious surfaces, such as landscaped or grassed areas, rather than directly connected areas such as rooftops, where runoff flows onto sidewalks. Downspout disconnections provide a similar watershed impact as rain barrels and downspout disconnections are modeled similarly.	

Table 4-10 (continued)
Modeled Nonstructural Strategies

Modeled Nonstructural Strategy[1]	Strategy Description	Example Photograph
Irrigation Runoff Reduction and Turf Conversion	This nonstructural BMP, which doubles as a water conservation initiative, incorporates good landscaping practices to limit irrigation runoff. Turf conversion transforms areas with grasses that require regular irrigation to other, native pervious cover that does not require regular irrigation. The irrigation efficiency program sets the goal of eliminating irrigation overspray practices over the course of the 20-year implementation period.	

1. Assumptions about the modeling process and the extent of implementation are in Appendix K.

4.2.3 Structural Strategy Descriptions

Structural strategies can be used strategically throughout the contributing watershed to improve water quality by removing pollutants through a variety of chemical, physical, and biological processes, including filtration and infiltration. The effectiveness and feasibility of implementing different types of BMPs should be carefully considered in regard to the BMP impact and cost to implement and maintain. Long-term structural BMP effectiveness is often dependent on the successful construction and routine maintenance of each BMP. Note that there are many areas in the Mission Bay WMA that contain low-infiltrating soils types. These factors were acknowledged by the Responsible Agencies through consideration of non-infiltrating BMP systems in these areas such as detention ponds, wetlands, and bioretention and permeable pavement with underdrains, as well as through consideration of channel restoration projects or source control strategies. Before implementing structural strategies, Responsible Agencies will consult with appropriate resource agencies (e.g., California Coastal Commission, California Department of Fish and Wildlife, Fish and Wildlife Service, National Marine Fisheries Service, etc.) and will obtain required permits as necessary. Further, Responsible Agencies will identify and apply “lessons learned” during project development and post-development monitoring. Feasibility of maintenance and inspection will be incorporated in the design and site selection stages to ensure that structural BMPs meet engineered specifications and can be maintained for the life of the BMP without difficulty.

Similar to nonstructural strategies, structural strategies (BMPs) were chosen on the basis of their expected effectiveness in reducing pollutant sources and targeting PGAs of concern in the Mission Bay WMA and their suitability and potential for implementation by the Responsible Agencies.

Potential structural strategies were broken into three categories based on scale and overall function: (1) green infrastructure, (2) multiuse treatment areas, and (3) water quality improvement BMPs (Figure 4-3). These categories and their respective levels of implementation in the Mission Bay WMA are discussed in detail in the following sections.

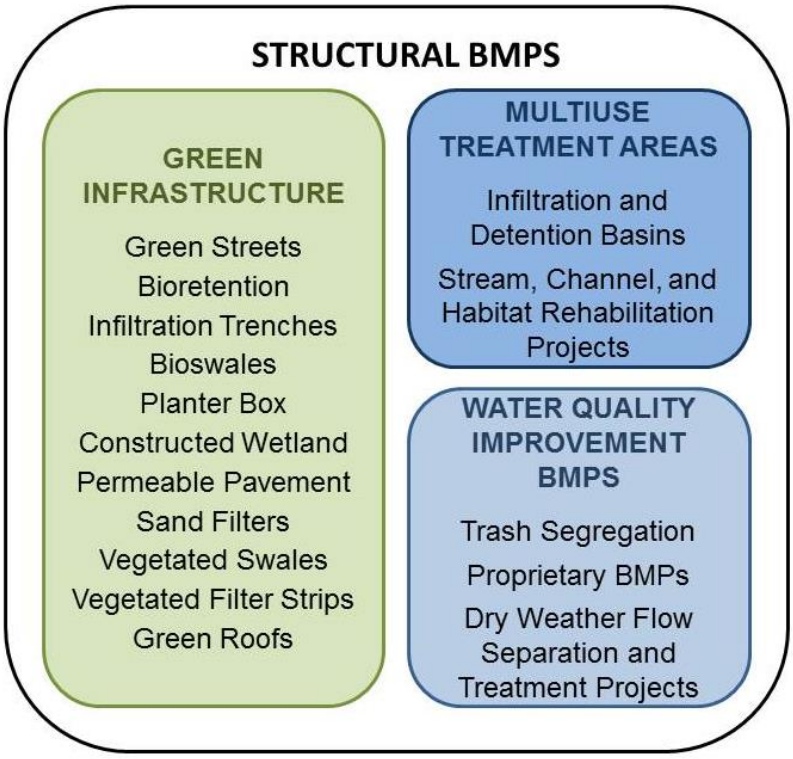


Figure 4-3
Summary of Structural Strategy Categories

Modeling was used to estimate the effectiveness of already-implemented structural BMPs and future levels of implementation of select structural BMPs, building on the previous CLRP I and II efforts and using best available information. Modeling assumptions and results are further detailed in Appendix K.

Table 4-11 provides the relative benefit to water quality improvement by structural BMP type. Although the benefits are variable, estimates of the relative pollutant reduction benefits are provided for comparative reference. As for the nonstructural benefits, these estimates are based on best professional judgment from literature reviews, practical experience, and stakeholder input. The site characteristics, BMP implementation, and pollutant of concern all influence the BMP benefits. Routine maintenance of these

structural strategies also significantly impacts their benefits. A compilation of references used to estimate the overall, relative benefit is included in Appendix L. Pollutant reductions identify the primary pollutants (●), the secondary pollutants (◗), and the pollutants that the strategy does not address (○). Estimated pollutant reductions assume typical design, land use, and geography, but can be modified to target pollutants or site-specific needs.

Table 4-11
Structural Strategies Benefits

STRUCTURAL STRATEGY	Water Chemistry Benefit[1]									Physical and Biological Benefit			
	Bacteria[2]	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
Green Infrastructure													
Green Infrastructure Outside the Right-of-Way													
Bioretention	●	●	●	●	●	◗	●	◗	●	●	●	○	◗
Infiltration Trenches	●	●	●	●	●	●	●	●	●	●	●	○	●
Bioswales	●	●	●	●	●	◗	●	◗	●	●	●	○	◗
Planter Boxes	●	●	●	●	●	◗	●	◗	●	◗	◗	○	◗
Permeable Pavement	◗	●	◗	●	●	◗	◗	◗	◗	●	●	○	◗
Constructed Wetlands	●	●	◗	●	●	●	◗	◗	●	●	◗	●	◗
Sand Filters	●	●	●	●	●	◗	●	○	●	◗	◗	○	◗
Vegetated Swales	◗	◗	◗	●	◗	◗	◗	○	●	◗	◗	○	◗
Vegetated Filter Strips	◗	◗	◗	●	◗	◗	◗	○	●	◗	◗	○	◗
Green Roofs	◗	◗	○	●	○	○	○	○	○	●	◗	○	◗
Green Streets													
Green Streets	●	●	●	●	●	◗	●	◗	●	●	●	○	◗

Table 4-11 (continued)
Structural Strategies Benefits

STRUCTURAL STRATEGY	Water Chemistry Benefit[1]									Physical and Biological Benefit			
	Bacteria[2]	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
Multiuse Treatment Areas													
Infiltration and Detention Basins	◗	●	◗	●	●	◗	◗	◗	◗	●	●	○	◗
Stream, Channel, and Habitat Rehabilitation Projects	Varies by project												
Water Quality Improvement BMPs													
Trash Segregation, Proprietary BMPs, and Dry Weather Flow Separation and Treatment Projects	Varies by project												

1. References for the water chemistry benefits for each strategy are in Appendix L.
2. Orange-shaded cells indicate the highest priority water quality condition for the Mission Bay WMA.

4.2.3.1 Green Infrastructure

A critical consideration in selecting and evaluating structural BMPs is scale. Structural BMPs that are built within the landscape at the site scale, which often requires retrofit of site designs to accommodate the re-routing and positioning of BMPs onsite, are called green infrastructure. Green infrastructure uses vegetation, soils, and natural processes to manage water and create healthier urban environments. At the scale of a city or county, green infrastructure refers to the patchwork of natural areas that provide habitat, flood protection, and cleaner water, and may also benefit the environment through cleaner air. At the scale of a neighborhood or site, green infrastructure includes storm water management systems such as bioretention areas, permeable pavements, and green roofs that use natural processes to soak up, store, and treat water.

Green infrastructure typically incorporates multiple BMPs using the natural features of the site in conjunction with the goal of the site development. Multiple BMPs can be incorporated into the site development to complement and enhance the proposed layout, while also providing water quality treatment and volume reduction. Green infrastructure practices are those methods that provide control and treatment of storm water runoff on or near locations where the runoff initiates, thus providing water quality improvement and volume reduction. The most common and effective green infrastructure BMPs implemented by the Responsible Agencies are listed in Table 4-12. Rain barrels are covered programmatically as a nonstructural strategy, but are also commonly incorporated as multi-benefit components of green infrastructure systems.

Table 4-12
Common Green Infrastructure Strategies

Green Infrastructure BMP	BMP Description	Example Photograph
Bioretention	Shallow vegetated features constructed in green spaces alongside roads, sidewalks, and other paved surfaces. Bioretention includes an engineered soil media designed to encourage pollutant treatment and water storage.	
Infiltration Trenches	Narrow, linear BMPs that have functions similar to those of bioretention areas with variable surface materials, including rock or decorative stone, designed to allow storm water to infiltrate into subsurface soils.	

Table 4-12 (continued)
Common Green Infrastructure Strategies

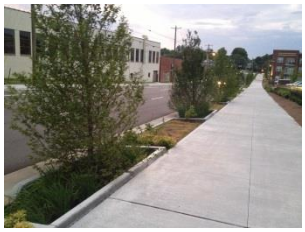
Green Infrastructure BMP	BMP Description	Example Photograph
Bioswales	Shallow, open channels designed to reduce runoff volume through infiltration and pollutant removal by filtering water through vegetation within the channel and infiltration into bioretention soil media. Bioswales can serve as a storm water conveyance, but the primary objective is water quality enhancement (often referred to as linear bioretention).	
Planter Box	Fully contained system containing soil media and vegetation that functions similarly to a small biofiltration BMP, but includes an impermeable liner and underdrain.	
Constructed Wetland	Engineered, shallow marsh system designed to control and treat storm water runoff. Particle-bound pollutants are removed through settling and other pollutants are removed through biogeochemical activity.	
Permeable Pavement	Material that allows streets, parking lots, sidewalks, and other impervious covers to retain their natural infiltration capacity while maintaining the structural and functional features of the materials they replace. Roads such as highways can include permeable friction course (PFC) overlays that provide water quality benefits when traditional permeable pavement is not suitable.	

Table 4-12 (continued)
Common Green Infrastructure Strategies

Green Infrastructure BMP	BMP Description	Example Photograph
Sand Filters	Treatment systems that remove particulates and solids from storm water runoff by facilitating physical filtration.	
Vegetated Swales	Shallow, open channels that are designed primarily for storm water conveyance. Pollutants such as trash and debris are removed by physically straining/filtering water through vegetation in the channel.	
Vegetated Filter Strips	Bands of dense, permanent vegetation with a uniform slope, designed to provide pretreatment of runoff generated from impervious areas before it flows into another BMP as part of a treatment train.	
Green Roofs	Roofing systems that layer a soil/vegetative cover over a waterproofing membrane and can reduce runoff through interception and evapotranspiration.	

Green infrastructure can provide water quality and community benefits at the site scale outside of the right-of-way or within the public street right-of-way (green streets). The following subsections discuss implementation of green infrastructure in these two settings.

Green Infrastructure Outside the Right-of-Way

Any single BMP or a combination of the BMPs listed in Table 4-12 can be applied at the site scale to capture and treat storm water runoff at the source. These potential small-scale projects are important to the WMA as a whole when incorporated near the top of the watershed because collectively they can provide an effective means toward pollutant load reduction, while also attenuating peak flow, reducing discharge volume, and providing aesthetic value and improved habitat quality. These potential small-scale BMPs can be implemented on public parcels by municipalities or incorporated into Priority Development Projects (PDPs) and redevelopment activities on private parcels. Examples of potential existing development retrofits for green infrastructure BMPs outside the right-of-way include converting parking lot medians into planter boxes and asphalt into permeable pavements.

A large portion of the impervious areas on most parcels, regardless of land use type, consists of a combination of parking lots and roof tops. Those areas can often be treated using a system of green infrastructure implemented in landscape areas and replacing hardscape with comparable permeable materials (see examples in Figure 4-4 and Figure 4-5). Other options for treatment to be considered for areas outside the right-of-way are green roofs, infiltration trenches, sand filters, vegetated filter strips, and vegetated swales.

Figure 4-4
Bioretention Areas in Parking Lots and Adjacent to Buildings Provide Multiple Benefits by Treating Runoff While Also Serving as Landscape Features and Habitat

Figure 4-5
Permeable Pavement Functions as a Parking and Driving Surface While Capturing and Treating Storm Water

Green Infrastructure in the Right-of-Way (Green Streets)

Green streets can consist of multiple BMP types implemented in a linear fashion within the road right-of-way. Placing BMPs within the right-of-way provides an additional opportunity to treat urban storm water runoff, attenuate peak flow, and reduce discharge volume while improving community pride, land value, and habitat quality. Given that green streets are in the right-of-way, they have no land acquisition costs and are more conveniently accessed for maintenance activities. Green streets also provide the added benefit of treating runoff from both the roadway and contributing parcel.

The most common approaches for green streets include bioretention areas located between the edge of the pavement and the edge of the right-of-way and permeable pavement installed in parking lanes. The configuration of the street, particularly the presence of curb and gutter, locations of underground utilities, road classifications, and sidewalk, parking, and right-of-way widths, often dictates the configuration of green streets. Options are presented below for streets with and without curb and gutter.

Streets With Curb and Gutter

Curb and gutter is often used to provide a clear delineation between the travel lanes and the parkway area of the right-of-way. With this configuration, storm water is often treated through permeable pavement in the parking lanes and bioretention areas in the space between the back of the curb and the sidewalk. Figure 4-6 provides examples of green infrastructure in the parking area and parkway within the right-of-way.

Figure 4-6
Examples of Bioretention and Permeable Pavement in the Right-of-Way With Curb and Gutter

Streets Without Curb and Gutter

Streets without curb and gutter provide direct connection for diffused runoff to be treated within the right-of-way. Often, without the delineation provided by curb and gutter, the right-of-way at the edge of the travel lane can become compacted and eventually cause erosion concerns. Implementing green street concepts could provide an opportunity to stabilize those areas using permeable pavers, as shown in Figure 4-7, or bioretention areas.

Figure 4-7
Permeable Pavers in the Right-of-Way Without Curb and Gutter

Example Green Infrastructure Project Within the Right-of-Way

The Bannock Avenue Green Street Retrofit Project, which is currently nearing completion, implements several surface and subsurface low-impact development (LID) BMP components to manage flows from a 20-acre drainage area. The plans include installing bioretention areas, treatment planters, and pervious pavement systems within the City's rights-of-way to treat the 85th percentile storm for the drainage area, reducing bacteria, heavy metal, nutrient, pesticide, and sediment loadings to Tecolote Creek (Figure 4-8).

Figure 4-8
Bannock Avenue During Construction

The project's initial design analysis included innovative use of the System for Urban Stormwater Treatment and Analysis Integration (SUSTAIN) model to optimize BMP combinations within the right-of-way, for both pollutant removal and cost benefits. Existing pervious areas between the edge of the sidewalk and edge of the curb were classified on the basis of current neighborhood use, such as areas altered by homeowners with plantings, or areas with mature trees. This allowed the City to optimize the design on the basis of neighborhood preferences and concerns and to understand how the project would affect day-to-day use of the area's streets and landscapes. Several new BMPs will provide traffic-calming benefits, supporting implementation of the City's recently updated Street Design Manual. Maintenance practices were also discussed in the design analysis to be considered in the final design (Figure 4-9.

Figure 4-9
Rendering of Completed
Bannock Avenue Green Street

Ongoing community outreach is central to the Bannock Avenue project. Many workshops have been held in the neighborhood for communication and feedback, and City staff members are working to identify key post-construction management and resident use issues. A strong BMP monitoring component has been built into the project to evaluate conditions and effectiveness, which will provide the City with valuable feedback to serve as a template to guide future BMP design guidelines and implementation of green streets and BMPs in the rights-of-way.

Implementation in the Mission Bay WMA

The pollutant and flow reduction benefits attributed to the implementation of potential green infrastructure BMPs in the Mission Bay WMA were estimated using quantitative methods and are summarized in Appendix K. These benefits were then applied to the areas that the City of San Diego identified for potential green infrastructure opportunities (some of which have already been constructed recently) throughout the Mission Bay WMA to meet numeric targets. The resulting total level of implementation of potential green infrastructure BMPs is outlined in Section 4.2.4 and further discussed in Section 4.3.

4.2.3.2 Multiuse Treatment Areas

Large structural treatment control BMPs, referred to as multiuse treatment areas, are regional facilities that receive flows from neighborhoods or larger areas. They often serve dual purposes for flood control and groundwater recharge. These BMPs are often located in public spaces and can be co-located within parks or green spaces to provide excellent ecosystem services and aesthetic value to stakeholders. Bioretention areas can enhance biodiversity and beautify the urban environment with native vegetation. Large-scale facilities, such as infiltration basins or dry extended detention basins, can provide dual use as athletic fields or open spaces.

The following components can be incorporated into multiuse treatment areas to promote multiuse benefits:

- Simple signage or information kiosks can be used to raise public awareness of storm water issues, educate the public, and provide a guide for native plant and wildlife identification.
- Volunteer groups can be organized to perform basic maintenance such as trash removal as an opportunity to raise public awareness.
- Public-private partnerships can be pursued where property owners are supportive of water quality improvement measures and parcels are identified for ideal multiuse treatment area locations.
- Larger BMPs can be equipped with pedestrian cross-paths or benches for wildlife viewing.
- Sculptures and other art can be installed within the BMP and outlet structures or cisterns can incorporate aesthetically pleasing colors, murals, or facades.
- Vegetation with canopy cover can provide shade, localized cooling, and noise dissipation.
- Bird and butterfly feeders can be used to attract wildlife to the BMPs.
- Ornamental plants can be cultivated along the perimeter and in the bed of vegetated BMPs (invasive plants should be avoided).

Infiltration and Detention Basins

Large multiuse BMPs considered in the Water Quality Improvement Plan will focus on surface BMPs (on public parcels) that provide treatment through the detention and infiltration of runoff. Examples include infiltration basins and dry extended detention basins. These BMPs are designed to hold runoff for an extended period of time to allow water to evaporate into the atmosphere, infiltrate into native soils, or be transpired by vegetation, while accommodating for overflow and bypass during large storm events. These BMPs are well suited to public spaces such as active (soccer fields) and passive (parks) recreation areas and raise public awareness of storm water management.

Example Multiuse Treatment Area Project

The Tecolote Canyon Park catchment is located in the southwestern portion of the Tecolote Creek subwatershed. It is bordered by State Route 52 on the north, Interstate 5 on the west, and Interstate 805 on the east, and culminates at the Tecolote Canyon Park. The 6,032-acre drainage area is predominantly single-family residential. Pending a geotechnical investigation by a licensed geotechnical engineer, an infiltration or detention basin would be appropriate to treat the drainage area.

Based on regional monitoring in residential areas and the characteristics of the drainage area, there is an expectation that nutrients, TSS, and bacteria will be prevalent in storm water runoff. Relative to similarly sized drainage areas, it is anticipated that there will be higher levels of (1) nutrients, due to expected fertilization of the Sam Snead All American Golf Course, (2) TSS, due to a significant amount of open space, and (3) bacteria, due to the dense housing configuration and potential for pet waste.

Locating a BMP in the park would provide an educational opportunity for children and adults through signage. If detention were to be implemented, there would be an opportunity to use the stored water for irrigation. Figure 4-10 shows the open space where an infiltration or detention basin could be implemented. Figure 4-11 shows an example of a park designed to function as a multiuse treatment area.

Figure 4-10
Example of an Athletic Field Designed to Function as an Infiltration Basin

Figure 4-11
Existing Ball Fields at Tecolote Canyon Park Could Be Converted to Infiltration or Detention Basins, Maintaining Their Function as a Community Amenity

Stream, Channel, and Habitat Rehabilitation Projects

Natural streams, channels, and habitats serve hydrologic and ecological functions that can be compromised when these natural systems are degraded or altered. For instance, increased runoff volumes and velocities can cause stream bank erosion of streams or channels, which can result in large quantities of sediment and sediment-binding pollutants entering the drainage system. Degraded coastal habitats such as salt

marshes, lagoons, and wetlands can disrupt biological productivity, which can lead to unhealthy or poor ecosystems.

Rehabilitation projects aim to improve stream or channel conditions or restore habitats through engineered enhancements. Stream or channel rehabilitation projects stabilize stream banks or enhance stream settings to achieve water quality benefits. Stream or channel rehabilitation projects can include grading; construction of check structures, drop structures, and channel bed and bank protection measures; vegetation planting to protect channel areas; and modified channel cross-sections to promote hydrologic connectivity. Habitat rehabilitation projects try to improve biological productivity or ecosystem functionality through the restoration of natural hydrologic processes, natural vegetation, and other baseline physical characteristics. In addition to water quality and habitat improvements, other benefits of rehabilitation projects include restoration of benthic macroinvertebrates and terrestrial wildlife, which are indirect measures of water quality. These rehabilitation projects can lead to greater public understanding of water quality while serving as recreational opportunities.

Implementation in Mission Bay WMA

The pollutant and flow reduction benefits attributed to the implementation of potential multiuse treatment areas (specifically infiltration and detention basins) in the Mission Bay WMA were estimated using quantitative methods and are summarized in Appendix K. These benefits were then applied to the areas that the City of San Diego identified for potential multiuse treatment area opportunities throughout the Mission Bay WMA to meet numeric targets. The resulting total level of implementation of multiuse treatment areas is outlined in Section 4.2.4 and Section 4.3.

4.2.3.3 Water Quality Improvement BMPs

The Responsible Agencies will implement green infrastructure as permitted and when feasible, but site constraints preclude use of green infrastructure in some areas. In such cases, water quality improvement BMPs may be required to protect water resources. Water quality improvement BMPs include trash segregation, proprietary BMPs, and dry weather flow separation and treatment projects. Maintenance of these BMPs is covered separately under nonstructural strategies as part of each Responsible Agency's MS4 infrastructure maintenance programs, where applicable.

Trash segregation includes inlet devices, such as trash guards or trash racks, which are installed to capture trash and debris before conveyance into receiving waters. Proprietary BMPs are prefabricated commercial products such as hydrodynamic separators or catch basin filter inserts that typically provide storm water treatment in space-limited areas, often using patented and innovative technologies.

Proprietary BMPs typically use settling, filtration, absorptive/adsorptive materials, vortex separation, and sometimes vegetative components to remove pollutants from runoff.

Dry weather flow separation and treatment projects are those identified and planned for by each respective Responsible Agency to target non-storm water dry season flows and divert these flows for treatment onsite or to sanitary sewer systems and ultimately wastewater treatment plants.

Implementation in Mission Bay WMA

Because of the relative scale of their pollutant-reduction benefits and the lack of published supporting data, trash segregation and proprietary BMPs were not modeled. However, the level of implementation of these BMPs is outlined in Section 4.2.4 and Section 4.3.

The pollutant and flow reduction benefits attributed to the implementation of dry weather diversions in the Mission Bay WMA were included in the model, as summarized in Appendix K. The total number of dry weather diversions is outlined in Section 4.2.4 and Section 4.3.

4.2.4 Jurisdictional Strategy Selection by Responsible Agency

Strategy selection within the Mission Bay WMA is discussed in Section 4.2.1 and Appendices J and K. Sections 4.2.4.1 and 4.2.4.2 provide examples of recommended strategies for each Responsible Agency, and jurisdiction-specific selection methodologies, if different from watershed-wide selection methodologies. The recommended strategies are those that are intended to specifically target the highest priority water quality conditions to achieve the numeric goals identified in Section 4.1. These strategies are a subset of each Responsible Agency's JRMP. A complete list of strategies and schedules by Responsible Agency, including the implementation approach, implementation year, and level of effort required, is presented in Appendix J.

As presented in Sections 4.2.2 and 4.2.3, the majority of nonstructural and structural strategies typically address multiple pollutants. For example, maintenance activities for catch basins and roads primarily target sediment, metals, and trash. In addition, bacteria and organics can also be removed. Green infrastructure systems such as bioretention and bioswales primarily target bacteria, sediment, and metals; however, they can provide dissolved solids and organics reductions as well. Permeable pavement primarily targets sediment, oil and grease, and metals, but can provide secondary benefits toward bacteria and organics reductions as well.

4.2.4.1 City of San Diego Example Strategies

The City of San Diego has identified administrative policies, urban development management programs, and innovative pilot projects as strategies to achieve its watershed goals. It is investing in research for site locations for green infrastructure and other treatment BMPs throughout its jurisdiction in multiple watersheds.

Additionally, the City is currently developing a framework to evaluate other[1] potential benefits that the recommended strategies may provide beyond improved water quality. These other benefits may be financial, environmental, or societal. Other benefits refer to additional outcomes of a strategy beyond water quality improvements. Other benefits can include reduced air pollution, increased water conservation, aesthetics-induced property value increases, and increased business investment. The recommended strategies will be scored on the basis of the number of other benefits they provide, and may guide future updates to the Water Quality Improvement Plan (Appendix M).

The following strategies are examples of those selected by the City of San Diego and planned for implementation. A complete list of strategies and schedules planned for implementation and a description of the strategy selection process are provided in Appendix J. These strategies will be implemented by the City; they are not intended to be implemented by private entities (e.g., development, business, industry, etc.); however, some of the City's strategies, such as development planning, may have implications for private entities. In the Mission Bay WMA, an analysis using a watershed model was conducted to identify the strategies required to be implemented to meet interim and final goals. The strategies and implementation schedules identified in Appendix J demonstrate that numeric goals will be met on the basis of that analysis. The adaptive management process provides the framework to evaluate progress toward meeting the goals and allows for modification of strategies, if necessary. If strategies are modified, the analysis will be updated as needed to provide assurance that numeric goals will be met. The strategies and schedules are subject to change and are contingent upon annual budget approvals and funding availability. The City acknowledges watershed stakeholder concerns that opportunities for optional strategies may occur prior to achieving or not achieving interim goals. The City will implement optional strategies, such as land conservation, at any time during the compliance period if opportunities become available and identified triggers are met. They will be modified through the adaptive management process as needed.

The City of San Diego will address wet weather discharges of bacteria, sediment, and other pollutants through activities on public land across its jurisdiction in the Mission Bay WMA. During dry weather, implementation will focus on the reduction of irrigation runoff. The following example strategies provide multiple benefits by addressing bacteria and sediment, as well as other water quality pollutants such as trash.

[1] Other benefits refer to outcomes of a strategy beyond water quality improvements. Other benefits can include reduced air pollution, increased water conservation, aesthetics-induced property value increases, and increased business investments.

Development Planning – Development and Implementation of a Green Infrastructure Policy and Program.

In FY16, the City will begin development of a policy that will require the inclusion of green infrastructure features on all suitable City projects, including non-SUSMP (Standard Urban Storm Water Mitigation Plan) projects. This policy will be coordinated with ongoing efforts to update City design manuals and LID design standards for public LID BMPs. To guide implementation of the new policy, a green infrastructure program will be initiated in parallel. The program will begin with research and recommendations for ideal methods for green infrastructure project siting and prioritization within the City. By FY18, the City will complete construction of green infrastructure and/or green streets projects as detailed in the City's corresponding structural strategies (see Appendix J for Green Infrastructure strategies and schedules).

Construction Management – Explore Enhanced Inspections for Construction Sites

In FY16, the City plans to establish standards and guidelines for storm water construction phase requirements. These standards and guidelines will include inspections at appropriate frequencies and will identify enforcements that can take place. Inspections and enforcements will be specifically focused in sediment TMDL watersheds, such as the Los Peñasquitos WMA, and ASBS in the Mission Bay WMA.

Existing Development – Enhanced Property-Based Inspection Program

In FY16, the City plans to administer a program that will require implementation of minimum BMPs for existing development (commercial, industrial, municipal, and residential) that are specific to the facility, area types, and PGAs. This program would increase the number of discharges identified compared with standard inspections. This program would also include the inspection of existing development at appropriate frequencies and methods, such as property-based inspections in lieu of traditional individual business inspections. The City conducted an extensive multi-year pilot study of its business inspection program and found that more discharges could be found and abated by inspecting large properties rather than individual businesses.

Existing Development – Increased Enforcement

The City intends to enhance enforcement responses by increasing the number of Code Compliance staff. Between FY16 and FY19, the City is planning to gradually hire additional Code Compliance Officers and support staff to increase compliance with statutes, ordinances, permits, contracts, orders, and other requirements for IDDE, development planning, construction management, and existing development as detailed in the City's Enforcement Response Plan. This effort will target increased enforcement of irrigation runoff and water-using mobile businesses.

Existing Development – Residential and Commercial Rebate Programs Targeting Water Quality

The City plans to continue and expand its landscape-based rebate program to target water quality impacts from residential and commercial areas in FY16 and beyond. Expansion of this program will occur by providing for additional rebates and/or through distribution of promotional and information material and brochures to community groups, libraries, and recreation centers. Educational material would emphasize watershed stewardship and encourage the implementation of designated BMPs through rebates for rain barrels, grass replacement, downspout disconnections, and micro-irrigation.

Existing Development – Erosion Control and Slope Stabilization

In FY16, the City plans to increase identification and enforcement of actionable erosion and slope stabilization issues on private and municipal property and require stabilization and repair. This strategy would be performed through an inventory and assessment of eroding areas and their risk to surface waters followed by the development of a schedule for ongoing inspection and stabilization.

Increased Public Education and Participation

The City conducts an extensive public education and outreach program through its Think Blue program. Examples include the following:

- The City will continue and expand several of its current outreach programs. Outreach programs would be widely implemented but targeted to home owners associations (HOAs), business owners associations (BOAs), maintenance districts, various community groups through organized community trash cleanup events, and water-using mobile businesses.
- Workshops will be held, community events will be organized, and informational material and brochures will be disbursed to reach community members and advise them of incentives, regulations, and training, and provide general information they need for implementation of good watershed stewardship practices or BMPs.

Structural Strategies – Green Infrastructure

Green infrastructure projects in the Scripps and Tecolote Creek subwatersheds in the Mission Bay WMA include a green lot in Kellogg Park (FY14) in the Scripps subwatershed, and green streets on Mt. Abernathy Avenue and Camber Drive (FY14) and Bannock Avenue (FY16) in the Tecolote Creek subwatershed. A multiuse treatment area in the Mission Bay WMA currently includes an infiltration system in the Torrey Pines Golf Course (in place) in the Scripps subwatershed. (Refer to Appendix K for information on BMP configurations and drainage area assumptions.) To meet load reduction targets, additional green infrastructure BMPs (in the form of bioretention and permeable pavement) and multiuse treatment areas are needed in the Tecolote Creek subwatershed. Potential multiuse treatment area project sites have been identified in previous site optimization and prioritization efforts in the Tecolote Creek subwatershed.

The operation and maintenance of new dry weather flow diversions (FY14-15) is also anticipated to start in FY16 in the Scripps subwatershed. Refer to Appendix K for information on BMP footprints, drainage areas treated, and additional green infrastructure details.

Cost of Service Study

The City plans to conduct a Cost of Service Study starting in FY15. This study will examine the full cost of flood control and storm water strategies needed to comply with storm water regulations for the City. The City of San Diego's Watershed Asset Management Plan will be used as the basis for the study.

4.2.4.2 Caltrans Strategies

Caltrans' jurisdiction areas include roadways, land adjacent to roadways, and facilities; Caltrans' jurisdictional strategies specifically focus on BMP implementation to reduce known pollutants within these areas. Caltrans is not permitted within the MS4 Permit; however, Caltrans is subject to TMDL requirements through its MS4 Permit (State Board, 2012b). Caltrans' strategies vary from those of other Responsible Agencies (in both type and name) to best address typical discharges from its jurisdictions. Strategies include programs being implemented by Caltrans Headquarters for statewide execution and District 11 for local implementation. Caltrans' implementation of strategies within the WMA is dependent on state funding. A complete list of strategies and their anticipated implementation schedules are provided in Appendix J. The strategies and schedules are subject to change and are contingent upon annual budget approvals and funding availability. They will be modified through the adaptive management process as needed.

4.2.5 Collaborative WMA Strategies

In addition to implementing strategies on a jurisdictional basis, Responsible Agencies may collaboratively implement projects within the WMA that improve water quality. The WMA strategies in the Mission Bay WMA include watershed-wide efforts to encourage water conservation, which targets dry weather goals through the reduction of irrigation and irrigation runoff.

4.2.5.1 Collaborative Approach to Irrigation Reduction

Responsible Agencies of the Mission Bay WMA are collaborating with water agencies to encourage implementation of water conservation efforts. In a Mediterranean climate such as that in southern California, water conservation efforts ensure a reliable water supply while keeping the region naturally beautiful. Water conservation that attempts to reduce irrigation and minimize storm water runoff can also improve water quality of receiving waterbodies. The Metropolitan Water District of Southern California (MWD) and San Diego County Water Authority (SDCWA) are the primary water providers in southern California who lead regional and multijurisdictional programs that incentivize water conservation efforts.

MWD's SoCal Water$mart Program and SDCWA's WaterSmart Program support conservation efforts by offering incentives in the form of rebates for rain barrels, rotating sprinkler nozzles, weather-based irrigation controllers, soil moisture sensor systems, and turf replacement (MWD, 2014; SDCWA, 2014). San Diego County's WaterSmart program also offers landscape training classes and plant fairs to educate and engage the community in water conservation efforts. Several Responsible Agencies and local municipal water districts promote and express interest in collaborating with MWD and SDCWA to support their water conservation incentive programs (Table 4-13). Funding and resources to support these region-wide water conservation efforts for each Responsible Agency are presented in Table 4-13. There is also potential to collaborate with retail water suppliers who have more direct contact with water users and who can more effectively monitor water consumption to identify possible sources of system leaks and over-irrigation.

Table 4-13
Responsible Agency Collaboration With Regional and WMA Water Conservation Programs

Responsible Agency	Responsible Agency Departmental Agency	Metropolitan Water District (MWD)	San Diego County Water Authority (SDCWA)	Other	Funding
City of San Diego	Transportation and Storm Water Department (T&SW); Public Utilities Department (PUD)	✓	–	–	Residential BMP Rebate program is intended to promote rebates for rain barrels, irrigation controls (turf conversion), and downspout disconnections. The program budget is approximately $425K annually.

4.2.5.2 Offsite Alternative Compliance Option (WMAA)

The MS4 Permit allows for the implementation of offsite alternative compliance methods in lieu of meeting structural BMP design standards and/or hydromodification management criteria on the project site. To implement an alternative compliance program, a jurisdiction must first complete an optional WMAA as detailed in MS4 Permit Provision B.3.b(4). The San Diego County Copermittees have collectively funded and provided guidance for development of a regional WMAA. Findings of the draft regional WMAA, specific to the Mission Bay WMA, are provided in Appendix N. The WMAA characterizes important processes of the watershed through creation of GIS layers that include the following information:

- A description of dominant hydrologic processes, such as areas where infiltration or overland flow likely dominates
- A description of existing streams in the watershed, including bed material and composition, and whether they are perennial or intermittent
- Current and anticipated future land uses
- Potential coarse sediment yield areas
- Locations of existing flood control structures and channel structures, such as stream armoring, constrictions, grade control structures, and hydromodification or flood management basins

Information from the WMAA can be used for the following purposes:

- To identify candidate projects that could potentially be used as offsite alternative compliance options in lieu of satisfying full onsite retention, biofiltration, and hydromodification runoff requirements
- To identify and/or prioritize areas where it is appropriate to allow certain exemptions from onsite hydromodification management BMPs

Alternative compliance methods can be implemented at the subwatershed scale (e.g., multiuse treatment area BMPs) or as green infrastructure BMPs (e.g., green streets). Regardless of scale, offsite alternative compliance BMPs mitigate for pollutants not reliably retained on the project site or hydromodification impacts not reliably mitigated onsite per requirements detailed in MS4 Permit Provisions E.3.c.(1) and E.3.c.(2). Note that onsite treatment control BMPs will still be required, although such BMPs would not be required to meet the onsite retention requirements. In addition to meeting site-specific structural BMP and hydromodification management requirements, alternative compliance methods can provide enhanced benefits for the WMA.

In addition to allowing for offsite alternative compliance program development, the WMAA findings can also assist in determining the feasibility of candidate projects for offsite alternative compliance implementation (MS4 Permit Provision B.3.b.(4)(b)). The Responsible Agencies are currently compiling a list of candidate projects that consider

the numeric goals of the Mission Bay WMA as well as projects previously identified in JRMPs and other regulatory documents. Draft candidate project lists currently available are provided in Appendix N. The Water Quality Improvement Plan will be updated to include the final candidate project list, as that list is made available.

The WMAA document was developed as part of a regional Copermittee effort and followed criteria set forth in the MS4 Permit. The effort included a call for data for information to be included in the analysis. Data included in the document are intended for guidance purposes. Where more site-specific information is available, then the more detailed information should be used.

The WMAA also provides an assessment of applicable exemptions to hydromodification management requirements, in addition to the MS4 Permit's allowed exemptions regarding direct discharges to exempt receiving waters including the Pacific Ocean and Mission Bay (or direct discharges to underground storm drains or concrete-lined channels directly discharging to the Pacific Ocean or Mission Bay). For the Mission Bay WMA, no additional potential exemptions are recommended with regard to exempt river reaches, stabilized conveyances, highly impervious watersheds, or tidally influenced lagoons.

4.2.5.3 Collaboration with the Regional Board

The Responsible Agencies will work with the Regional Board to identify solutions and address sources of potential water quality impairments within the Mission Bay WMA. Descriptions of the current priorities are provided below and will be updated as implementation, monitoring, and assessment continues.

Enforcement of Non-MS4 Dischargers

As discussed in Section 1, the MS4 Permit holds the Responsible Agencies responsible for pollutants originating from non-MS4 or non-municipal sources if those pollutants are ultimately discharged from an MS4 under the jurisdiction of the Responsible Agencies although inspection and oversight responsibility may be outside of the Responsible Agencies' jurisdiction. The Responsible Agencies, therefore, recognize the need for collaboration and improved communication with non-municipal sources and the appropriate regulatory agencies to (1) ensure that these discharges are appropriately regulated before entering the Responsible Agencies' MS4s, and (2) improve water quality throughout the WMA.

The Responsible Agencies will work with the Regional Board to identify and address Non-Phase I MS4 sources of potential water quality impairment within the WMA. These sources may include working with Phase II MS4 dischargers, school districts, nurseries and agricultural dischargers, non-compliant or non-filing industrial dischargers, or non-compliant construction dischargers, as the need arises.

Bacteria TMDL Updates

A number of Pacific Ocean Shoreline segments in the Scripps subwatershed were removed from the 303(d) list for REC-1 impairment in 2010. However, calculation of the Bacteria TMDL had already begun and the segments remained in the TMDL through TMDL adoption in 2011. The Pacific Ocean Shoreline segments were then incorporated into the TMDL requirements within the MS4 Permit in 2013. The Responsible Agencies will pursue removal of the beach segments from the Bacteria TMDL and Attachment E of the MS4 Permit.

In February 2010, the Regional Board adopted Resolution No. R9-2010-0001, *Resolution Amending the Water Quality Control Plan for the San Diego Basin (9) to Incorporate Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek),* referred to as the Bacteria TMDL. As part of the Bacteria TMDL Implementation Plan, the Regional Board included a planned milestone to consider revisions to the Bacteria TMDL on the basis of new technical information provided by the dischargers or other entities within five years after the effective date of the Bacteria TMDL (April 4, 2016). The Counties of San Diego and Orange and the City of San Diego are coordinating with the Regional Board to assess the scope of a third-party TMDL reopener process.

4.2.5.4 Refinement of Water Quality Regulations

A goal for Responsible Agencies is to protect human health and improve water quality in an effective and efficient manner. To achieve this goal the Water Quality Improvement Plan will be used as a tool to plan and cost the BMPs needed to protect human health and improve water quality for the highest priority water quality conditions in the Mission Bay WMA. The MS4 Permit clearly states that the "Copermittees need only comply with permit conditions relating from discharges from the MS4s for which they are operators." This objective is reflected in the discussion presented in Section 1.1 and Figure 1-1. However, it is worth noting that the MS4 Permit assigns TMDL discharge responsibility entirely to the Copermittees. As such, the Responsible Agencies will collaborate with the Regional Board to refine the accuracy of regulations to ensure non-MS4 dischargers are regulated appropriately. The Water Quality Improvement Plan provides an opportunity to present a scenario where discharges associated with areas within the Copermittees' jurisdictions covered by other NPDES permits or regulatory procedures, or owned by federal or state agencies or Indian tribes, are removed from the Copermittees' responsibility. In short, the goal of this exercise is to begin a dialogue with the Regional Board that may lead to the following outcomes:

(1) Remove non-MS4 discharges and the associated BMPs needed to treat those discharges from the Responsible Agencies' burden;

(2) Amend current TMDLs and the MS4 Permit to correctly assign responsibilities for non-MS4 discharges to the appropriate entities; and

(3) Strengthen non-MS4 NPDES permits that are directly tied to the requirements of existing and future TMDLs. For example, the City of San Diego and USEPA Region 9 are currently collaborating on a modeling study to evaluate the relative pollutant loads from various commercial, industrial, institutional, and MS4 Phase II sources and the costs to reduce loads from each source. Results of this analysis will inform the USEPA of the ability of the MS4 Permit to address these sources, potentially resulting in new specific requirements for the Industrial General Permit and General Phase II Permit to address TMDL discharges.

It is important to note that the Copermittees would continue to implement programs to inspect, enforce and oversee some of these dischargers because the MS4 Permit requires that "each Copermittee must implement a program to actively detect and eliminate illicit discharges and improper disposal into the MS4, or otherwise require the discharge to apply for and obtain a separate NPDES permit."

Other NPDES Permits

There are several active NPDES permits for dischargers within the Mission Bay WMA that are not addressed by the MS4 Permit, including:

- NPDES No. CAS000003 – Statewide Storm Water Permit, Waste Discharge Requirements for State of California Department of Transportation (Caltrans Permit)
- NPDES NO. CAS000002 – General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (General Construction Permit)
- NPDES General Permit No. CAS000001 – Waste Discharge Requirements for Dischargers of Storm Water Associated with Industrial Activities Excluding Construction Activities (Industrial General Permit)
- NPDES General Permit No. CAS000004 – Waste Discharge Requirements for Storm Water Discharges from Small MS4s (General Phase II Permit)

Caltrans is voluntarily participating in the Water Quality Improvement Plan, and is proposing BMPs within its jurisdiction to meet jurisdictional numeric goals. The General Construction Permit is difficult to assess because areas are never constant, and oversight of these areas by both the Copermittees and the Regional Board are addressed through separate processes. However, areas addressed by the Industrial General Permit and the General Phase II Permit are clear and their responsibilities can be considered in the Water Quality Improvement Plan. The Industrial General Permit states that "discharges addressed by this General Permit are considered to be point source discharges, and therefore must comply with effluent limitations that are consistent with the assumptions and requirements of any available waste load allocation for the discharge prepared by the state and approved by USEPA." Similarly, the General Phase II Permit states that "discharges from Small MS4s are point source discharges subject to TMDLs," and further states that "this Order requires Permittees to

comply with all applicable TMDLs." With TMDL pollutants representing the highest priority water quality conditions, it is logical to assume that the Industrial General Permit and General Phase II Permit are independently responsible for meeting associated wasteload allocations, and therefore can be separated from the Copermittees responsibility in the Water Quality Improvement Plan.

In addition to these NPDES permits, the Regional Board allows a Conditional Waiver of Discharges from Agricultural and Nursery Operations (Ag Waiver) that applies to discharges of storm water runoff and irrigation return water. Ag Waiver enrollment is accomplished in one of three ways. Operations can (1) join an established Monitoring Group; (2) submit a Notice of Intent (NOI) and form a new Monitoring Group; or (3) enroll as an individual by submitting a NOI. However, there are little data available to identify those areas in the Mission Bay WMA covered by the Ag Waiver.

Land owned by federal and state agencies or Indian tribes can also be considered in terms of removing responsibility of the Copermittees in the Water Quality Improvement Plan. Copermittees do not have authority to require BMPs to be placed within these lands, nor do they have authority to regulate discharges from these lands.

As a result of these considerations, the following land use categories will be assessed for potential removal from the responsibility of the Copermittees within the Water Quality Improvement Plan:

- Industrial Areas
- General Phase II Permittees
- Agricultural Areas
- Federal, State, and Indian Lands

Alternative scenarios are currently being developed to estimate the load contribution and associated BMP implementation implications for MS4s and Non-MS4 entities in the Mission Bay WMA. The results of this analysis will be summarized in Section 4.4 to be provided in the full Water Quality Improvement Plan (June 2015). The results will also provide important context for collaborative discussions with the Regional Board and non-MS4 entities in the future. The following paragraphs describe how the land areas for the four categories listed above are being selected for the alternative scenarios.

Industrial Areas

The Industrial General Permit addresses a range of industrial facilities and operations; however, the inclusion of specific industry owners within the permit is contingent on their registration within the permit. To date, the Industrial General Permit addresses only a limited number of registrants as identified in California's Stormwater Multiple Application and Report Tracking System (SMARTS). Industrial permit locations were geocoded on the basis of address information provided in SMARTS (if available) and the associated parcels were identified on the basis of SANDAG parcel ownership GIS data.

An additional consideration for assessing the impact of industrial areas on pollutant loadings, particularly those not currently registered in the Industrial General Permit, is the use of land use GIS to establish industrial areas. Assessment of industrial land use can provide an indication of the impact that additional registrants in the Industrial General Permit can have on reducing the responsibility of the Copermittees, should those areas be fully registered in the permit. Currently, the USEPA is providing similar analyses of the impact of industrial land uses (as well as commercial and institutional areas) in watersheds in the San Diego and Los Angeles Regions to evaluate the effectiveness of the NPDES program to regulate these areas. The intent of this study is to inform future discussions regarding revisions of the Industrial General Permit, including increased registration of all applicable industrial dischargers and stricter requirements to directly address TMDL requirements and other water quality impairments. Further analysis of industrial areas in the Water Quality Improvement Plan will provide additional assessment of the balance between responsibilities of the Copermittees, and the role of all industrial areas in the Industrial General Permit should full registration of industrial areas take place.

For the purpose of this analysis, SANDAG land use data were used to identify industrial areas in the WMA. This analysis will also provide important information in terms of cost implications of non-registered industrial dischargers on Copermittees.

General Phase II Permit

Several Small MS4s that are regulated under the Phase II General Permit are located within the Mission Bay WMA. Similar to the Industrial General Permits, further analysis is necessary to identify Phase II permit responsibilities to facilitate meeting the Water Quality Improvement Plan numeric goals. Existing Phase II Permits were spatially identified on the basis of information gathered from permit documentation on the Regional Board's website. In addition, it is understood that some school districts and other facilities that qualify will be incorporated into the General Phase II Permit program in the near future. These potential Phase II Permits were not spatially located, but could be included in future analyses.

Agriculture

Without specific information regarding agricultural areas enrolled in the Ag Waiver, SANDAG land use data were used to identify agricultural lands within the Mission Bay WMA to help with estimating the contribution from these areas.

Federal, State, and Indian Land

Multiple areas in the Mission Bay WMA are owned by federal or state governments, or Indian tribes. These lands were identified on the basis of SANDAG parcel ownership GIS data to help estimate the contribution from these areas.

4.3 Implementation Schedule to Meet Final Goals

Responsible Agencies must identify reasonable schedules that demonstrate progress toward achieving the interim and final numeric goals presented in Section 4.1. Compliance analysis results presented in Appendix K and summarized in Section 4.3.1 dictated the schedule for implementation, which is presented graphically in Section 4.3.2. This Water Quality Improvement Plan incorporates the 20-year Bacteria TMDL compliance schedule to attain wet weather goals and the 10-year Bacteria TMDL compliance schedule to attain dry weather goals. Strategy development and planning included an assessment of relative cost-effectiveness of each strategy and was one of the key drivers in phasing strategy implementation. Nonstructural BMPs are effective in reducing pollutant loads before they enter the storm drain and are generally cost-effective and require a shorter planning period. Therefore, most nonstructural strategies are planned for implementation before or upon approval of the Water Quality Improvement Plan. Structural BMPs can be cost-effective when greater load reductions are needed and treatment must occur after the pollutants enter the storm drain system, particularly when benefits other than water quality improvements are considered. However, planning for structural BMPs requires more time to secure resources, design BMPs, and obtain permits. Most of the potential structural BMPs are planned for later in the compliance period to allow more time to ensure that the implementation is necessary to meet numeric goals and that BMPs have been designed to achieve the load reductions required, and that alternatives to construction have been evaluated.

4.3.1 Jurisdictional Implementation (Compliance Analysis)

A summary of the implementation year and duration of each jurisdictional strategy is presented in Appendix J within each jurisdictional strategy table. If a jurisdictional strategy is not initiated upon approval of the Water Quality Improvement Plan, the expected implementation year is provided. The implementation description within the strategy table for optional strategies provides the circumstances for implementation and the resources needed. Optional strategies are those strategies that may be triggered in the future to achieve the interim and final numeric goals. The schedules and resources required to implement the WMA strategies are presented in Section 4.2.5, and within each jurisdictional strategy for those jurisdictions participating in the WMA strategy. This section describes the selection of the schedule for implementation, the benefits expected from the strategies, and the dates that the final and interim goals will be met by the Responsible Agency.

Jurisdictional schedules demonstrate how phased implementation of the nonstructural and structural strategies by jurisdiction, listed in Section 4.2.4, achieves Bacteria TMDL wet weather numeric goal compliance over 20 years and dry weather numeric goal compliance over 10 years. To demonstrate this progress and to select and schedule the most cost-effective strategies, the following steps were taken (graphically depicted in Figure 4-12):

(1) The combination of programmatic nonstructural strategies that could not be explicitly modeled were assumed to result in a combined pollutant load reduction of 10 percent, as described further in Appendix K. These are the most cost-effective strategies and were, accordingly, scheduled first.

(2) Pollutant reduction benefits realized by nonstructural strategies that could be explicitly represented in the model were then quantified. These strategies were scheduled along with the non-modeled nonstructural strategies (item 1 above).

(3) Potential structural strategies were then individually evaluated by category for the most cost-effective solution toward Bacteria TMDL numeric goal compliance. Because multiuse treatment areas are the most cost-effective strategy toward pollutant load reduction (Figure 4-12), this category of structural strategies was maximized and scheduled first.

(4) The remaining pollutant load reduction required to meet the final numeric goal was then assigned to potential green infrastructure BMPs, which, accordingly, follow next in the jurisdictional schedules.

The resulting jurisdictional schedules are outlined for the City of San Diego in Section 4.3.1.1.

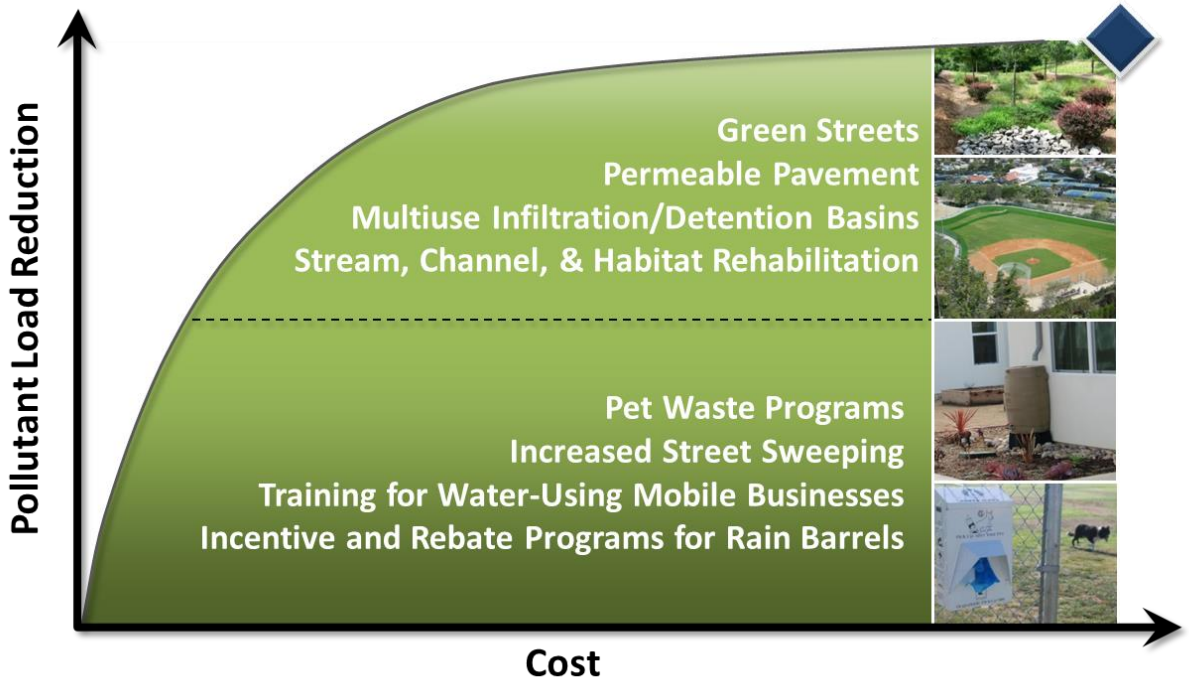


Figure 4-12
Conceptual Diagram Illustrating BMP Implementation (not to scale)

4.3.1.1 City of San Diego

The City of San Diego currently plans to implement the strategies outlined in Section 4.2 per the schedule provided in Appendix J. A combination of nonstructural strategies, multiuse treatment areas, and green infrastructure may be used to meet the interim and final numeric goals. Implementation of most of the nonstructural strategies is planned to occur prior to or upon approval of the Water Quality Improvement Plan.

In the Tecolote Creek subwatershed, most of the nonstructural strategies will be implemented by FY18. Two green infrastructure projects were implemented (2013 and 2014) and are currently being maintained. Additional implementation of multiuse treatment is planned for 20 acres between FY25 and FY29, with an assumed two years of planning and design and two years of construction for each project, after which long-term maintenance will begin.

In the Scripps subwatershed, implementation of the non-modeled and modeled nonstructural strategies will begin prior to FY16, are anticipated to achieve the maximum level of implementation in FY18, and will continue to be implemented throughout the full 20-year compliance period for the Bacteria TMDL. Given load reduction provided by the non-modeled, nonstructural strategies, the subwatershed goals will be met by employing of these BMPs. As an added benefit, one multiuse treatment area project and one green infrastructure project were implemented (2012

and 2008, respectively) in the Scripps subwatershed. These BMPs are currently being maintained as summarized in Appendix J.

In Mission Bay WMA, a compliance analysis using a watershed model was conducted to identify the strategies required to be implemented to meet interim and final goals. BMP optimization models were used to simulate associated pollutant reductions over the entire compliance period. A summary of the level of effort anticipated for each modeled strategy, the associated load reductions predicted for the highest priority water quality condition, and the predicted benefit to other water quality parameters for wet and dry weather conditions are presented in Table 4-14 and Table 4-15 for the Tecolote Creek and Scripps subwatersheds, respectively. The adaptive management process provides the framework to evaluate progress toward meeting the goals and allows for modification of strategies. As strategies are modified, the compliance analysis will be updated as needed to provide assurance that numeric goals will be met.

The dry weather results present the percent bacteria load reduction through implementation of two primary strategy types: (1) non-modeled nonstructural strategies, and (2) irrigation runoff reduction strategies. Irrigation reduction strategies include the implementation of turf conversion projects, micro-irrigation system conversions, weather-based irrigation controllers, education and outreach, and enforcement of regulations that prohibit runoff. Modeling simulations of 25 percent irrigation reduction and elimination of overspray have demonstrated a 99 percent bacteria load reduction for the City of San Diego within the Tecolote and Scripps subwatersheds. Complete elimination of dry weather runoff is the goal; however, there is also an anticipated load reduction from treatment of dry weather flows through structural BMPs as they are built. Infiltration and detention basins built to treat wet weather flows can also be designed to infiltrate or detain dry weather runoff, thus providing multi-season benefits. If monitoring and assessment demonstrate that compliance is not occurring, the City of San Diego will adapt its programs and assess the incorporation of optional strategies or amendments to ongoing strategies.

Intentionally Left Blank

Table 4-14
Water Quality Improvement Plan Wet and Dry Weather Reductions for the City of San Diego in the Tecolote Creek Subwatershed

Strategy and Level of Implementation[1]	City of San Diego Reduction – Tecolote Creek Subwatershed									
	Fecal Coliform[2]	Flow	Total Sediment	Total Cu	Total Pb	Total Zn	Total N	Total P	*Entero-coccus*	Total Coliform
Wet Weather										
Nonstructural, Non-Modeled[3]	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Rain Barrel Installations	0.01%	<0.01%	<0.01%	<0.01%	0.01%	0.01%	<0.01%	<0.01%	0.01%	0.01%
Downspout Disconnect	0.12%	0.04%	0.02%	0.04%	0.04%	0.07%	0.04%	0.04%	0.02%	0.02%
Irrigation Reduction[4]	<0.1%	1.6%	1.5%	0.4%	0.6%	0.1%	0.6%	1.6%	<0.1%	<0.1%
Multiuse Treatment Areas	4.2%	1.1%	0.4%	0.5%	0.5%	0.5%	2.1%	1.1%	5.0%	4.1%
Green Infrastructure	3.5%	2.0%	1.8%	1.1%	1.6%	1.7%	2.0%	2.6%	2.7%	0.8%
Total	**17.9%** ***Goal= 17.9%***	14.7%	13.7%	12.0%	12.7%	12.4%	14.7%	15.4%	**17.7%** ***Goal= 11.8%***	**14.9%** ***Goal= 10.0%***

Table 4-14 (continued)
Water Quality Improvement Plan Wet and Dry Weather Reductions for the City of San Diego in the Tecolote Creek Subwatershed

Strategy and Level of Implementation[1]	City of San Diego Reduction – Tecolote Creek Subwatershed									
	Fecal Coliform[2]	Flow	Total Sediment	Total Cu	Total Pb	Total Zn	Total N	Total P	*Entero-coccus*	Total Coliform
Dry Weather										
Nonstructural, Non-Modeled[3]	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Irrigation Reduction[4]	99%	32%	25%	25%	25%	25%	25%	25%	99%	99%
Total	**100%[5]**	42%	35%	35%	35%	35%	35%	35%	**100%[5]**	**100%[5]**
	Goal= 98.4%								***Goal= 99.9%***	***Goal= 99.6%***

Note: Orange-shaded cells indicate highest priority water quality conditions for the WMA.

1. Note that these numbers are planning-level calculated at a subwatershed scale; structural BMPs should be designed to meet both jurisdictional standards and the numeric goals outlined above at each respective project site. Reported BMP sizes include projects that have already been implemented.
2. Limiting impairment for highest priority water quality condition.
3. Nonstructural load reductions include both the modeled and non-modeled load reductions. Non-modeled load reductions are assumed to be 10% for all pollutants (HDR, 2014) and modeled load reductions vary by strategy and pollutant.
4. Irrigation reduction strategies include the implementation of turf conversion projects, micro-irrigation system conversions, weather-based irrigation controllers, education and outreach, and enforcement of regulations that prohibit runoff. These are the primary dry weather strategies; as structural strategies such as multiuse treatment areas are implemented, additional load reductions may be achieved.
5. Mechanistic, process-based assumptions were not applied to non-modeled nonstructural BMPs, resulting in the cumulative dry weather load reductions exceeding 100% (this implies that the combination of strategies will be more than sufficient to achieve dry weather load reduction goals).

Table 4-15
Water Quality Improvement Plan Wet and Dry Weather Reductions for the City of San Diego in the Scripps Subwatershed

Strategy and Level of Implementation[1]	City of San Diego Reduction – Scripps Subwatershed									
	Fecal Coliform[2]	Flow	Total Sediment[2]	Total Cu	Total Pb	Total Zn	Total N	Total P	*Entero-coccus*	Total Coliform
Wet Weather										
Nonstructural, Non-Modeled[3]	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Rain Barrel Installations	0.01%	<0.01%	0.01%	0.01%	0.01%	0.01%	<0.01%	<0.01%	0.01%	0.01%
Downspout Disconnect	0.13%	0.04%	0.03%	0.05%	0.05%	0.08%	0.04%	0.04%	0.02%	0.02%
Irrigation Reduction[4]	<0.1%	2.4%	1.4%	0.4%	0.6%	0.1%	1.0%	2.5%	<0.1%	<0.1%
Multiuse Treatment Areas	0.02%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	0.03%	0.02%
Green Infrastructure	0.4%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.3%	0.1%
Total	**10.6%**	**12.5%**	**11.6%**	**10.6%**	**10.7%**	**10.3%**	**11.1%**	**12.6%**	**10.4%**	**10.1%**
	Goal= 10.0%		***Goal= 0.6%***						***Goal = 6.6%***	***Goal = 5.1%***

Table 4-15 (continued)
Water Quality Improvement Plan Wet and Dry Weather Reductions for the City of San Diego in the Scripps Subwatershed

Strategy and Level of Implementation[1]	City of San Diego Reduction – Scripps Subwatershed									
	Fecal Coliform[2]	Flow	Total Sediment[2]	Total Cu	Total Pb	Total Zn	Total N	Total P	*Entero-coccus*	Total Coliform
Dry Weather										
Nonstructural, Non-Modeled[3]	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Irrigation Reduction[4]	99%	34%	25%	25%	25%	25%	24%	24%	99%	99%
Total	**100%[5]**	**44%**	**35%**	**35%**	**35%**	**35%**	**34%**	**34%**	**100%[5]**	**100%[5]**
	Goal= 99.0%								***Goal = 99.9%***	***Goal = 99.8%***

Note: Orange-shaded cells indicate highest priority water quality conditions for the WMA.

1. Note that these numbers are planning-level and calculated at a subwatershed scale; structural BMPs should be designed to meet both jurisdictional standards and the numeric goals outlined above at each respective project site.
2. Limiting impairment for highest priority water quality condition.
3. Nonstructural load reductions include both the modeled and non-modeled load reductions. Non-modeled load reductions are assumed to be 10% for all pollutants (HDR, 2014) and modeled load reductions vary by strategy and pollutant.
4. Irrigation reduction strategies include the implementation of turf conversion projects, micro-irrigation system conversions, weather-based irrigation controllers, education and outreach, and enforcement of regulations that prohibit runoff. These are the primary dry weather strategies; as structural strategies such as multiuse treatment areas are implemented, additional load reductions may be achieved.5. Mechanistic, process-based assumptions were not applied to non-modeled nonstructural BMPs, resulting in the cumulative dry weather load reductions exceeding 100% (this implies that the combination of strategies will be more than sufficient to achieve dry weather load reduction goals).
5. Mechanistic, process-based assumptions were not applied to non-modeled nonstructural BMPs, resulting in the cumulative dry weather load reductions exceeding 100% (this implies that the combination of strategies will be more than sufficient to achieve dry weather load reduction goals).

4.3.1.2 Caltrans

Caltrans will voluntarily implement the strategies outlined in Section 4.2, as resources are available, per the schedule provided in Appendix J within the Tecolote Creek subwatershed. Attachment IV to the Caltrans MS4 Permit outlines a methodology for prioritizing stream segments included in TMDLs to which Caltrans is subject. The permit establishes BMP implementation requirements evaluated in terms of compliance units, rather than load reduction targets. Caltrans is expected to achieve 1,650 compliance units per year through the implementation of retrofit BMPs, cooperative implementation, and post-construction treatment beyond permit requirements.

For Bacteria TMDLs, Caltrans is expected to eliminate dry weather flows by implementing control measures to ensure effective prohibition (Provision B.2 of the MS4 Permit). For wet weather flows, Caltrans is expected to implement control measures/BMPs to prevent discharge of bacteria from the right-of-way; this can be source control and preemptive activities such as street sweeping, cleanup of illegal dumping, and public education on littering. Implementation of these controls is per the TMDL prioritization list currently under development.

4.3.2 Progress Toward Achieving Numeric Goals

The City of San Diego currently plans to implement the strategies outlined in Section 4.2 per the schedule provided in Appendix J to achieve the subwatershed load reductions presented in Section 4.3.1. Implementation phasing is necessary to properly plan, assess, and adapt strategies that will be the most efficient and effective in addressing the highest priority water quality conditions. Caltrans is also within the Mission Bay WMA, but is covered under a separate MS4 permit; although not required to meet load reduction goals, Caltrans will continue to voluntarily collaborate with the watershed planning process to ensure a consistent approach in meeting Bacteria TMDL targets.

The City of San Diego has already demonstrated progress toward meeting the numeric goals by implementing a number of nonstructural and green infrastructure projects within the Mission Bay WMA. The City's expected progress toward meeting interim and final numeric goals is presented for wet weather in Figure 4-13 and Figure 4-15, and for dry weather in Figure 4-14 and Figure 4-16 in the Tecolote Creek and Scripps subwatersheds, respectively.

Modeling results demonstrate that the wet and dry weather goals in the Tecolote Creek subwatershed and the Scripps subwatershed will be met by implementing the City of San Diego's suite of planned strategies. Compliance with Water Quality Improvement Plan goals is met by achieving one of the compliance pathways for each highest priority water quality conditions during each assessment period (Section 4.1). The Responsible Agencies within the Mission Bay WMA will implement monitoring and adaptive management, coordinate with WMA stakeholders, and continue to pursue the necessary sustainable, effective, and efficient strategies to address the highest priority water quality conditions.

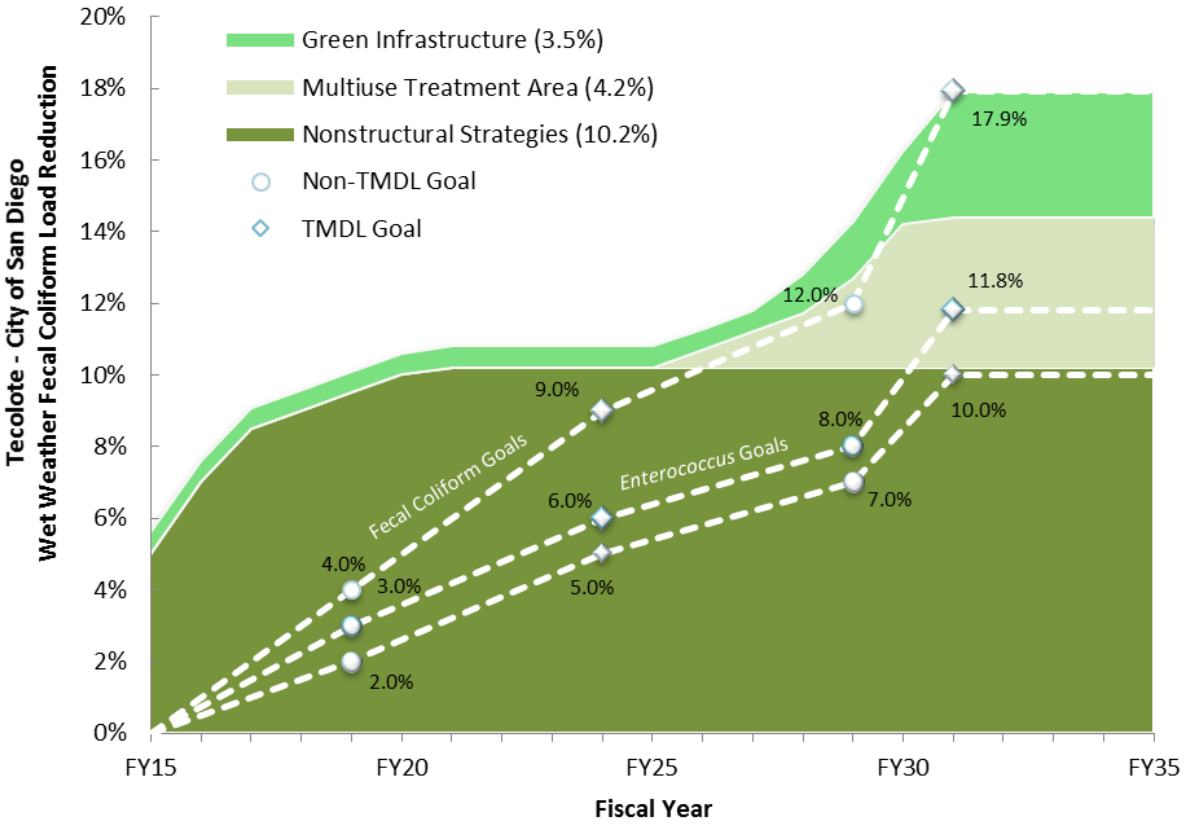


Figure 4-13
City of San Diego Wet Weather Compliance Schedule for the Tecolote Creek Subwatershed

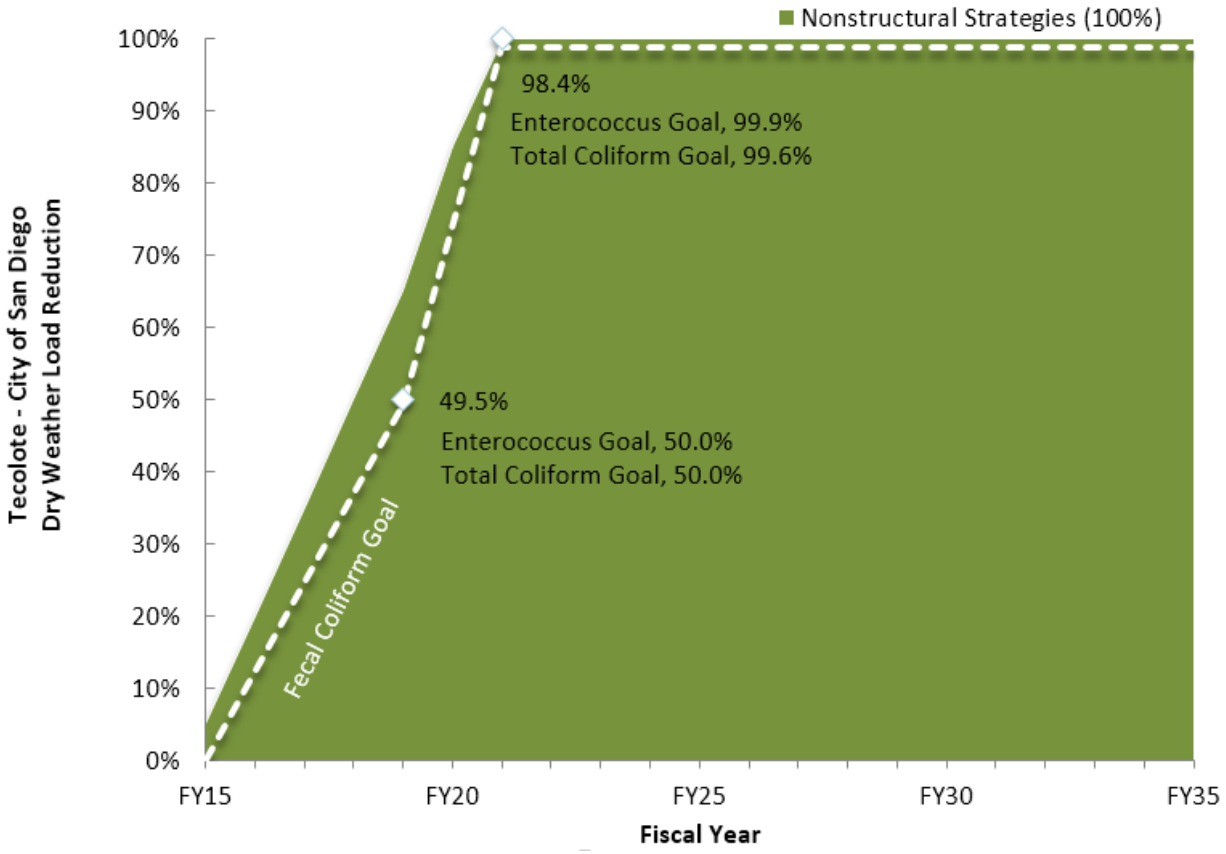


Figure 4-14
City of San Diego Dry Weather Compliance Schedule for the Tecolote Creek Subwatershed

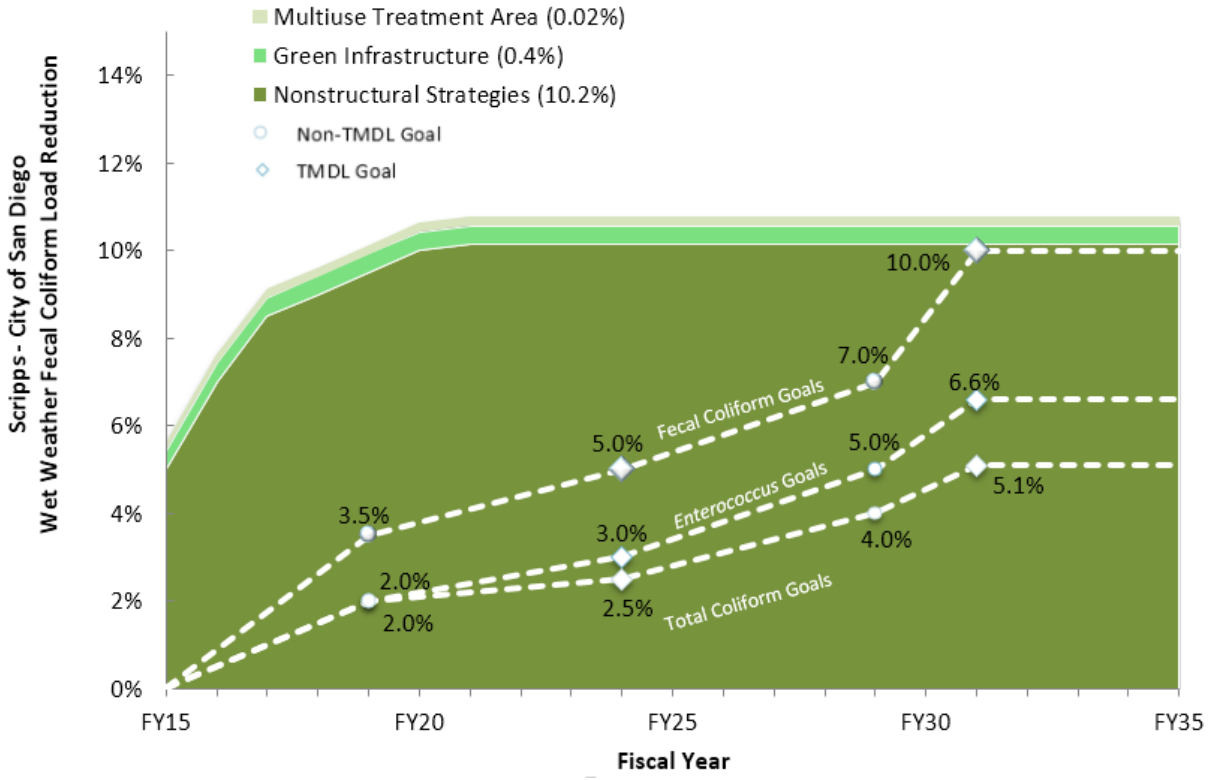


Figure 4-15
City of San Diego Wet Weather Compliance Schedule for the Scripps Subwatershed

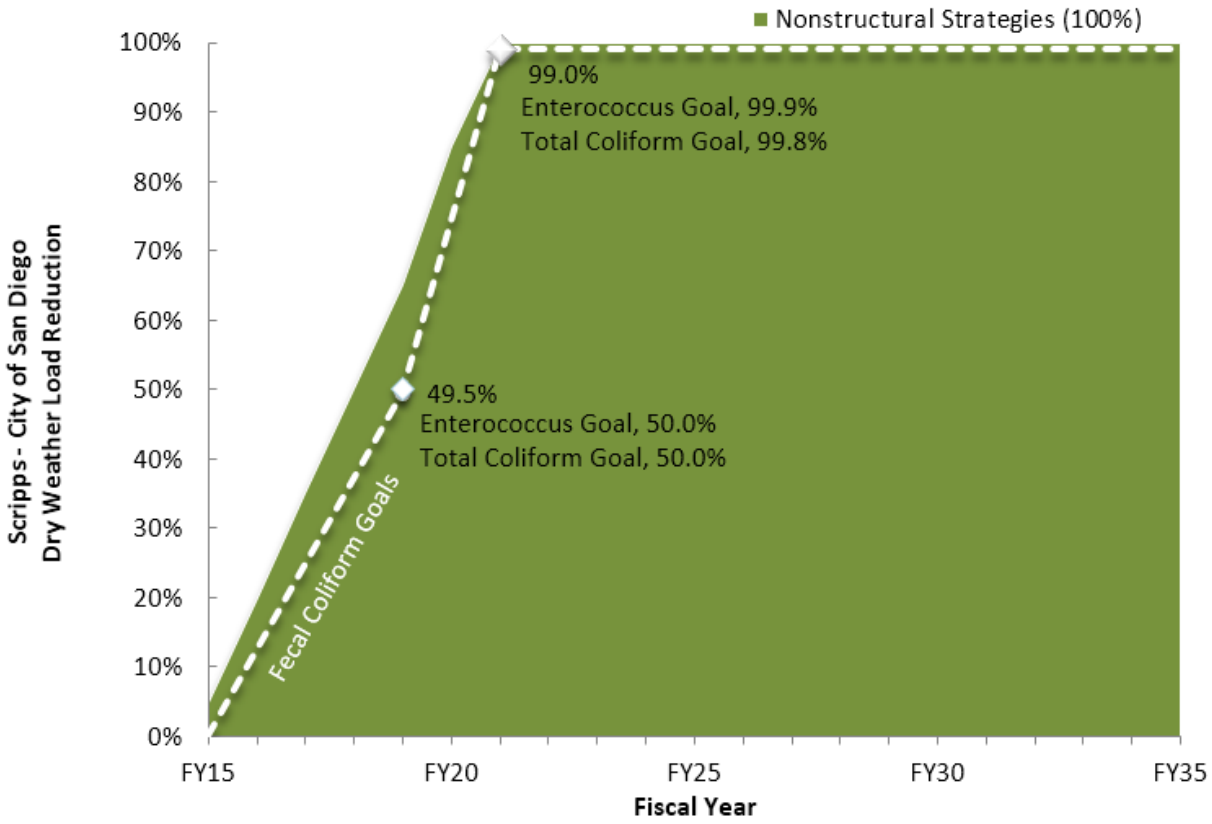


Figure 4-16
City of San Diego Dry Weather Compliance Schedule for the Scripps Subwatershed

Intentionally Left Blank

5 Water Quality Improvement Plan Monitoring and Assessment Program

This section of the Water Quality Improvement Plan describes the development of the Monitoring and Assessment Program for the Mission Bay WMA. The Monitoring Program includes three major components. The receiving water monitoring program measures the long term health of the watershed. The MS4 outfall monitoring program investigates the elimination of dry weather flows from MS4 outfalls and the condition of the water quality of the flows that exit the MS4 outfalls during rain events. Special studies take a further look into the highest priority water quality conditions presented in Section 2. The Assessment Program includes an annual analysis of the monitoring data and an integrated analysis that combines all analyses previously performed at the end of the MS4 Permit term.

Section 5 Highlights

- Presents the Monitoring and Assessment Program for the Mission Bay WMA Water Quality Improvement Plan
- Monitoring Program includes the following components:
  - Receiving Water Monitoring
    - Includes 49 total locations for 1 to 5 years of monitoring per location
    - Measures long-term health and attainment of beneficial uses
  - MS4 Outfall Monitoring
    - Includes 10 total locations
    - Dry weather: Includes inspections and inventory development with the goal of eliminating non-storm flow
    - Wet weather: Investigates whether there is a change in flow volumes and/or an improvement in discharge quality
  - Special Studies
- Assessment Program includes:
  - Annual assessments, including a review of the receiving water, MS4 outfall, and special studies data
  - A permit term assessment, combining all previous assessments into an integrated assessment

As shown in the graphic below, the fourth step of the Water Quality Improvement Plan (Monitoring & Assessment) is the development of an integrated Monitoring and Assessment Program for the Mission Bay WMA (Provision B.4, Provision D, Provision E, Provision F, and Attachment E). The Monitoring and Assessment Program moves into the second phase of the Water Quality Improvement Plan process.

The first three steps of the Water Quality Improvement Plan drive the City's program planning and budgeting processes:

(1) Determining the priority water quality conditions

(2) Identifying the sources

(3) Defining goals, strategies, and schedules in relation to the highest priority water quality conditions

The last three steps of the Water Quality Improvement Plan are designed to evaluate the progress in addressing the priority water quality conditions through monitoring and assessment, updating the Water Quality Improvement Plan where needed (Adaptive Management Process, Section 6 of the Water Quality Improvement Plan), and reporting the findings of the assessments along with any necessary changes. Annual Reporting is described under both Section 5 and Section 6 of this Water Quality Improvement Plan, as it draws on both the Monitoring and Assessment Program and the Adaptive Management Process. The Water Quality Improvement Plan Monitoring and Assessment Program applies only to the City because Caltrans' monitoring requirements are regulated under their own MS4 Permit.

Based on the requirements of the MS4 Permit and Water Quality Improvement Plan process, the City has developed an integrated Monitoring and Assessment Program for the Mission Bay WMA that:

(1) Assesses the progress toward achieving the numeric goals and schedules provided in Section 4

(2) Measures the progress toward addressing the highest priority water quality conditions established in Section 2

(3) Evaluates the City's overall efforts to implement the Water Quality Improvement Plan

Water Quality Improvement Plan Monitoring includes sampling, inspection, and data collection at beaches, creeks, estuaries, and storm drain outfalls to observe conditions, improve understanding, and inform the management within the watershed to improve water quality conditions.

The Monitoring and Assessment Program incorporates requirements of Provision D of the MS4 Permit along with the specific monitoring and assessment requirements for the Bacteria TMDL listed in Attachment E of the MS4 Permit. Table 5-1 presents an overview of planned monitoring activities for the Mission Bay WMA, including key monitoring elements and schedule for implementation by program. The program is designed to characterize the pollutant levels associated with the highest priority water quality conditions in the discharges from the MS4 outfalls, identify sources of the highest priority water quality condition pollutants, and assess the effectiveness of strategies designed to address the highest priority water quality conditions. Additionally, these programs will generate data to track priority water quality conditions and general health and condition within the WMA. As stated in Provision D of the MS4 Permit:

> *"The purpose of this provision is for the Copermittees to monitor and assess the impact on the conditions of receiving waters caused by discharges from the Copermittees' MS4s under wet weather and dry weather conditions. The goal of the Monitoring and Assessment Program is to inform the Copermittees about the nexus between the health of receiving waters and the water quality condition of the discharges from their MS4s. This goal will be accomplished through monitoring and assessing the conditions of the receiving waters, discharges from the MS4s, pollutant sources and/or stressors, and effectiveness of the water quality improvement strategies implemented as part of the Water Quality Improvement Plans."*

Translated into the Water Quality Improvement Plan process, the Monitoring and Assessment Program will provide the tools necessary to evaluate the main components presented in Sections 2 through 4 of the Water Quality Improvement Plan. In particular, the assessment focuses on the compliance pathways in Section 4. To do this, Section 5 is divided into two main components, Monitoring and Assessment. Figure 5-1 summarizes the main components of the Mission Bay WMA Monitoring and Assessment Program.

Intentionally Left Blank

Table 5-1
Water Quality Improvement Plan Monitoring

MS4 Permit Monitoring Programs				Monitoring Elements	Permit Schedule[1]				
					2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Monitoring to Assess Goals and Schedules			Dry/Wet	Varies by goal and jurisdiction	–	–	●	●	●
Receiving Water Monitoring	Long-Term Receiving Water		Dry	Conventionals[2], FIB, nutrients, metals, pesticides, toxicity (chronic), possible TIE/TREs, visual observations, field measurements	●[3]	–	–	–	–
				Hydromodification (channel conditions, discharge points, habitat integrity, evidence and estimate of erosion and habitat impacts)	●[3]	–	–	–	–
				Bioassessment (BMI taxonomy, algae taxonomy, physical habitat characteristics)	●[3]	–	–	–	–
			Wet	Conventionals[2], FIB, nutrients, metals, pesticides, toxicity (chronic), field measurements	●[3]	–	–	–	–
	Regional Monitoring	Bight	Dry	Chemistry, toxicity, benthic infauna	●	–	–	–	●[4]

Table 5-1 (continued)
Water Quality Improvement Plan Monitoring

MS4 Permit Monitoring Programs				Monitoring Elements	Permit Schedule[1]				
					2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Receiving Water Monitoring (continued)	Regional Monitoring (continued)	SMC	Dry	Bioassessment	●	●	●	●	●
		2011 Hydromodi-fication Monitoring Program (HMP)	Wet	Channel assessments; flow monitoring; sediment transport monitoring	●	●	●	–	–
		AB 411[5]	Dry	FIB	●	●	●	●	●
	Sediment Quality Monitoring	Sediment Quality Monitoring	Dry	Chemistry, toxicity, benthic infauna	●[6]	●[3]	–	–	–
	TMDL Monitoring	Bacteria TMDL for Tecolote Creek and the Pacific Ocean Shoreline	Dry	FIB, visual observations, optional field measurements	●	●	●	●	●
			Wet	FIB, visual observations, optional field measurements	●	●	●	●	●
	ASBS Monitoring	ASBS	Wet (pre/ during/ post storm)	Conventionals[2], nutrients, metals, organics, toxicity	●	●	–	●	●
					–	–	●	●	●

Table 5-1 (continued)
Water Quality Improvement Plan Monitoring

MS4 Permit Monitoring Programs[1]			Monitoring Elements[1]	Permit Schedule[1]				
				2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
MS4 Monitoring	MS4 Field Screening	Dry	Visual: flow condition, presence and assessment of trash in and around the station, IC/IDs, descriptions	●[3]	●[3]	●	●	●
	MS4 Outfall	Dry	Field parameters, conventionals[2], nutrients, metals, FIB	–	–	●	●	●
		Wet	Field parameters, conventionals[2], nutrients, metals, FIB	●[3]	●[3]	●	●	●
Special Studies	San Diego Regional Reference Streams	Dry	Field parameters, conventionals[2], FIB, instantaneous flow	2012-2014	●[7]	–	–	–
			Streams only: nutrients, metals, bioassessment (including physical habitat and chlorophyll a)	2012-2014	–	–	–	–
		Wet	Field parameters, conventionals[2], FIB	2012-2014	●	–	–	–
			Streams only: nutrients, metals, toxicity, flow, and precipitation (duration of storm)	2012-2014	●	–	–	–

Table 5-1 (continued)
Water Quality Improvement Plan Monitoring

MS4 Permit Monitoring Programs[1]			Monitoring Elements[1]	Permit Schedule[1]				
				2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Special Studies (continued)	Tecolote Creek Quantitative Microbial Risk Assessment Study (QMRA)	Dry	Scat survey, illicit discharge survey, visual observations, field parameters, conventionals[2], nutrients, FIB, MST markers, pathogens	●	●	TBD[8]	TBD[8]	TBD[8]
		Wet	Field parameters, MST markers, pathogens, FIB	●	●	TBD[8]	TBD[8]	TBD[8]
	Bannock Avenue BMP Effectiveness Study	Wet	Field parameters, FIB, conventionals[2], nutrients, metals.	–	–	●	–	–
	Stream Gauge Study	Dry/Wet	Temperature, water level, conductivity (location-dependent)	–	●	●	–	–

1. The MS4 Permit was adopted on May 8, 2013; the MS4 Permit became effective on June 27, 2013. Note the implementation of the programs will depend on the approval date of the Water Quality Improvement Plan and the fiscal year of implementation may be modified.
2. Definition of conventionals (conventional parameters) based on SWMP guidelines.
3. Completed under the Transitional Monitoring Program according to MS4 Permit Provisions D.1.a and D.2.a.
4. The 2018 Southern California Bight Regional Monitoring will occur during the summer of 2018 or 2019.
5. The AB 411 program is not required by the MS4 Permit. RPs are using the data to track beach water quality conditions related to the Highest Priority Water Quality Condition for the watershed.
6. Sediment Quality Monitoring was completed under the Regional Harbor Monitoring Program of the 2013 Southern California Bight Regional Monitoring Program.
7. Dry weather monitoring at reference streams was completed in spring 2014. Dry weather monitoring at reference beaches began in Fall 2014
8. QMRA is in a source abatement phase as of February 2015. Future schedule of QMRA will be determined by effectiveness of source abatement.

BMI = benthic macroinvertebrates; IC/ID = Illicit connection/illicit discharge; MST = microbial source tracking; TIE = toxicity identification evaluation; TRE = Toxicity Reduction Evaluation;

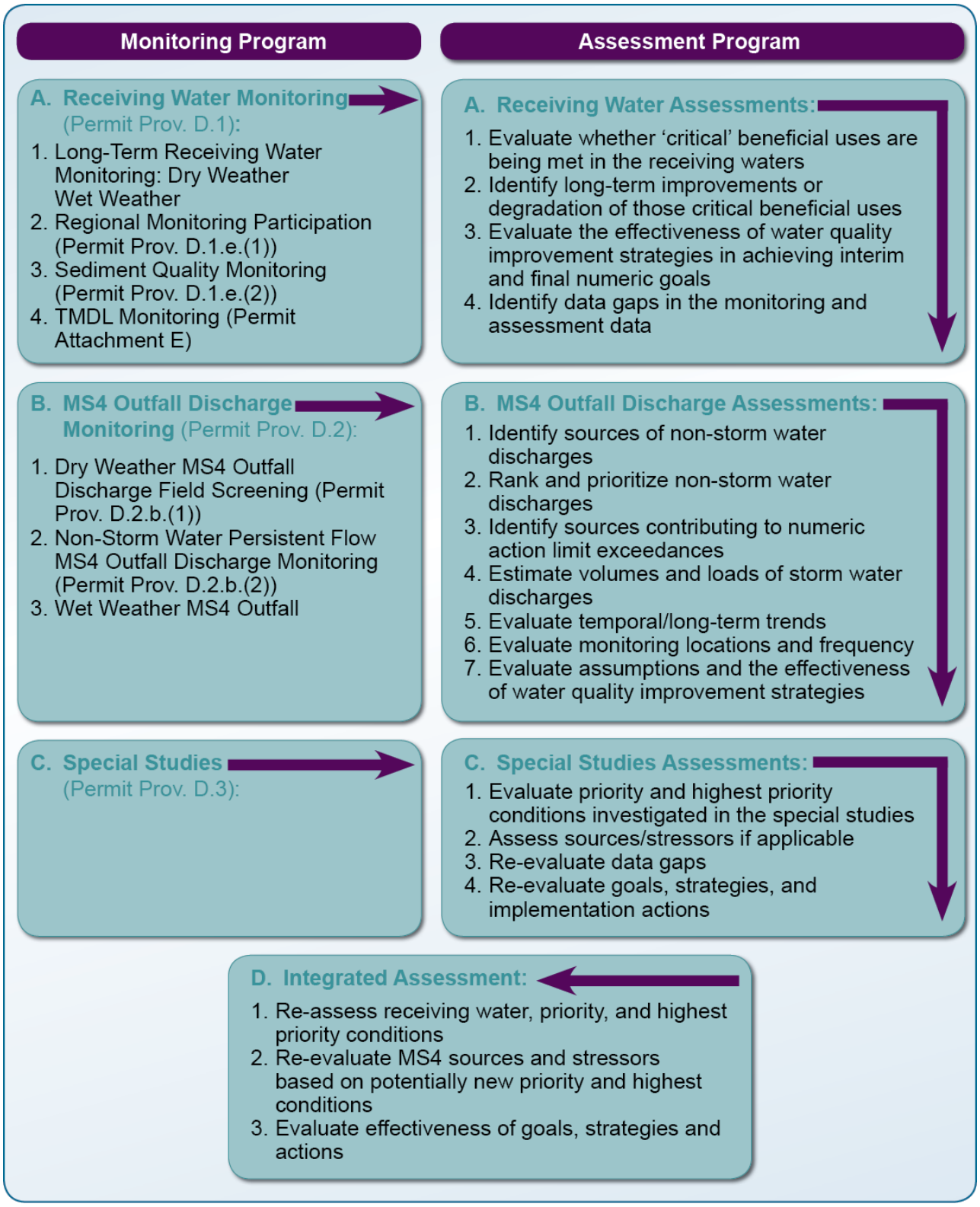


Figure 5-1
Monitoring and Assessment Program Components for the Mission Bay WMA

5.1 Water Quality Improvement Plan Monitoring Program

The Water Quality Improvement Plan Monitoring Program has four major components:

- Monitoring to assess progress toward achieving short-term goals and schedules
- Receiving water monitoring
- MS4 outfall discharge monitoring
- Special studies

A summary of the Water Quality Improvement Plan Monitoring Program (including detailed information required to complete the monitoring tasks) is in Appendix O. The associated monitoring plans for each of the various elements described in Sections 5.1.1 through 5.1.4 will be available on the Project Clean Water Website, http://www.projectcleanwater.org/index.php, by June 2015. The methods and procedures described in these plans may be modified on the basis of site-specific environmental conditions and updated analytical methodologies.

- Wet weather is defined as >0.1 inch of rainfall within a 24-hour period and the following 72 hours after the end of rainfall.
- Dry weather is defined as all other days where rainfall is <0.1 inch of rainfall within a given 24-hour period.

5.1.1 Monitoring to Assess Progress Toward Achieving Goals and Schedules

This section summarizes monitoring and assesses progress toward achieving goals related to the highest priority water quality conditions, which are bacteria and sediment for the Mission Bay WMA, as described in Chapter 2 of the Water Quality Improvement Plan. As outlined in Chapter 4 of the Water Quality Improvement Plan, bacteria goals are based on the multiple compliance pathways set forth for the Bacteria TMDL in Attachment E.6 of the MS4 Permit. Compliance with the TMDL may be demonstrated via one of the compliance pathways identified in the MS4 Permit. The proposed compliance dates for both the TMDL's interim goals and final goals are set outside of this Permit cycle. Table 5-2 presents the interim TMDL goals and monitoring that may be used to track progress toward achieving the goals.

The City has established jurisdictional goals for bacteria and sediment, the highest priority water quality conditions, during this MS4 Permit term to demonstrate progress toward compliance with the TMDL requirements. Caltrans has established jurisdictional goals for bacteria in the Tecolote Creek subwatershed. Generally, the Responsible Agencies have identified near-term goals to address potential bacteria and sediment sources and/or to reduce anthropogenic dry weather flow in MS4 outfalls. Data collection or monitoring elements that go beyond the prescribed Permit activities are tailored to measure progress towards meeting each goal. These elements, which are further detailed in the following subsections, may include visual surveys, inspections,

physical sampling or measurements, and development of new outreach and source control programs related to bacteria reduction.

Table 5-2
Monitoring Related to Bacteria TMDL Goals[1]

Compliance Pathway		TMDL Goal	Monitoring Elements
1 OR	Receiving Water Conditions	Meet allowable exceedance frequency of the interim or final Receiving Water Limitations (RWLs) in the receiving water	Bacteria data collected at compliance points as described in Section 5.1.2, TMDL Monitoring Program
2 OR	MS4 Outfall Discharges[2]	Meet allowable exceedance frequency in MS4 outfall discharges	Bacteria and flow data collected at outfalls as described in as described in Section 5.1.3, MS4 Outfall Monitoring Program
3 OR	MS4 Outfall Discharges[2]	Pollutant load reductions for discharges from the Responsible Agencies' MS4 outfalls greater than or equal to the final load reductions	Bacteria, sediment, and flow data collected at outfalls as described in as described in Section 5.1.3, MS4 Outfall Monitoring Program
4 OR	MS4 Outfall Discharges[2]	No direct or indirect discharge from the Responsible Agencies' MS4 outfalls to the receiving water	Visual observation of flow from outfalls to receiving waters as described in Section 5.1.3, MS4 Outfall Monitoring Program
5 OR	Receiving Water Conditions[2]	Exceedances of the final receiving water limitations in the receiving waters due to loads from natural sources	Data from Sections 5.1.1, 5.1.2, 5.1.4, and Jurisdictional Runoff Management Programs.
6	Water Quality Improvement Plan[2]	Implementation of Water Quality Improvement Plan and use of adaptive management	Data from monitoring and Jurisdictional Runoff Management Programs

1. The Responsible Agencies propose to meet the TMDL interim goals by 2019 for dry weather and 2024 for wet weather.
2. Monitoring for this compliance pathway will also provide data for the City of San Diego to assess compliance with sediment goals in the ASBS.

Wet Weather Monitoring Related to Performance Measures

Responsible Agencies have established wet weather goals for the 2013-2018 Permit term. Tables 5-3 and 5-4 summarize the data that will be collected to assess these goals by jurisdiction.

Table 5-3
Wet Weather Monitoring Related to Jurisdictional Goals in Tecolote Creek Subwatershed

Jurisdiction	Performance Metrics	Assessment Metric	Monitoring Elements
City of San Diego	Develop a green infrastructure policy, attain City Council approval, and construct 2 green infrastructure BMPs[1] to improve water quality from 84.6 acres of drainage area	Acres of drainage area treated by construction of 2 green infrastructure BMPs	Detail the completion of BMPs, including acres treated

1. The 84.6 acres of drainage area treated are associated with 2 green infrastructure projects that will be completed by FY18: (1) permeable pavement at Mt. Abernathy Road and Camber Drive draining 19.6 acres, and (2) permeable pavement at Bannock and Genesee Avenues draining 65 acres.

Table 5-4
Wet Weather Monitoring Related to Jurisdictional Goals in Scripps Subwatershed

Jurisdiction	First Permit Term Numeric Goals 2013-2018	Assessment Metric	Monitoring Elements
City of San Diego	Develop a green infrastructure policy, attain City Council approval, and construct 1 green infrastructure BMP[1] to improve water quality from 8.9 acres of drainage area	Acres of drainage area treated by construction of 1 green infrastructure BMP	Detail the completion of BMP, including acres treated

1. The 8.9 acres of drainage area treated are associated with 1 green infrastructure project that will be completed by FY18: (1) permeable pavement and bioretention at Kellogg Park draining 8.9 acres.

Dry Weather Monitoring Related to Performance Measures

The Responsible Agencies have established dry weather goals for the 2013-2018 MS4 Permit term. Tables 5-5 and 5-6 summarize the data that will be collected to assess these goals.

Table 5-5
Dry Weather Monitoring Related to Jurisdictional Goals in Tecolote Creek Subwatershed

Jurisdiction	Performance Metrics	Assessment Metric	Monitoring Elements
City of San Diego	Develop a green infrastructure policy, attain City Council approval, and construct 2 green infrastructure BMPs[1] to improve water quality from 84.6 acres of drainage area	Acres of drainage area treated by construction of 2 green infrastructure BMPs	Detail the completion of BMPs, including acres treated
	Reduce by 10% the prohibited[2] dry weather flow from baseline measured at persistently flowing outfalls during dry weather	Percent reduction in prohibited[2] dry weather flow	Collect flow measurements at persistently flowing outfalls

1. The 84.6 acres of drainage area treated are associated with 2 green infrastructure projects that will be completed by FY18: (1) permeable pavement at Mt. Abernathy Road and Camber Drive draining 19.6 acres, and (2) permeable pavement at Bannock and Genesee Avenues draining 65 acres.
2. Does not include allowable discharges as defined in Provision A and Provision E.2.a of the MS4 Permit.

Table 5-6
Dry Weather Monitoring Related to Jurisdictional Goals in Scripps Subwatershed

Jurisdiction	Performance Metrics	Assessment Metric	Monitoring Elements
City of San Diego	Develop a green infrastructure policy, attain City Council approval, and construct 1 green infrastructure BMP[1] to improve water quality from 8.9 acres of drainage area	Acres of drainage area treated by construction of 1 green infrastructure BMP	Detail the completion of BMP, including acres treated
	Reduce by 10% the prohibited[2] dry weather flow from baseline measured at persistently flowing outfalls during dry weather	Percent reduction in prohibited[2] dry weather flow	Collect flow measurements at persistently flowing outfalls

1. The 8.9 acres of drainage area treated are associated with 1 green infrastructure project that will be completed by FY18: (1) permeable pavement and bioretention at Kellogg Park draining 8.9 acres.
2. Does not include allowable discharges as defined in Provision A and Provision E.2.a of the MS4 Permit.

5.1.2 Receiving Water Monitoring

The purpose of the receiving water monitoring program is to characterize trends in the chemical, physical, and biological conditions of a receiving water to determine whether beneficial uses are protected, maintained, or enhanced. This program is designed to meet the requirements set forth in Provision D.1 of the MS4 Permit. Long-term monitoring occurs during both wet and dry conditions for water quality and physical and biological integrity, along with sediment quality monitoring and participation in regional monitoring. The MS4 Permit also stipulates how TMDL monitoring requirements are to be incorporated into the receiving water monitoring program, as described in Attachment E of the MS4 Permit. Receiving water monitoring comprises the following programs:

- Long-term receiving water monitoring
- Regional monitoring participation
- Sediment quality monitoring
- TMDL monitoring
- ASBS monitoring

Long-Term Receiving Water Monitoring

Long-term receiving water monitoring will track the overall health of the receiving waters and is designed to answer the following questions:

- Are conditions in the receiving water protective, or likely protective, of beneficial uses?
- What are the extent and magnitude of the current or potential receiving water problems?
- Are the conditions in the receiving water getting better or worse?

Dry and wet weather monitoring will continue at the historical mass loading station (TC-MLS) located on the lower reach of Tecolote Creek. Copermittees have monitored TC-MLS since 2001 to meet the requirements of previous MS4 Permits. The MLS is depicted on Figure 5-2. This site will be monitored three times during wet weather and three times during dry weather per permit cycle. This monitoring program is designed to monitor the highest priority water quality conditions in the receiving water, along with a comprehensive list of constituents based on the 303(d) list impairments, CLRP, non-storm water action levels (NALs) or storm water action levels (SALs), and Table D-3 of the MS4 Permit. During both dry and wet weather, water samples will be analyzed for conventional constituents, nutrients, metals, pesticides, bacteria, field parameters, and toxicity, when applicable. Toxicity identification evaluations (TIEs), if necessary, will be conducted in compliance with Provisions D.1.c.(4)(f) and D.1.d.(4) of the MS4 Permit and used to determine the causative agent(s) of toxicity. Once per term during dry weather, a bioassessment will be conducted to evaluate chemical, physical, and biological data, and hydromodification monitoring will be conducted to record the stream conditions and habitat integrity and impacts.

The 2013 and 2014 Transitional Monitoring Programs satisfied long-term receiving water monitoring requirements, including dry and wet weather water quality sampling, bioassessments, and hydromodification monitoring for this Permit term. These data can be used to re-evaluate priorities via the iterative approach as described in Section 6. For details of this monitoring program, refer to Appendix O. The methods and procedures provided in Appendix O may be modified on the basis of site-specific environmental conditions and updated analytical methodologies.

Intentionally Left Blank

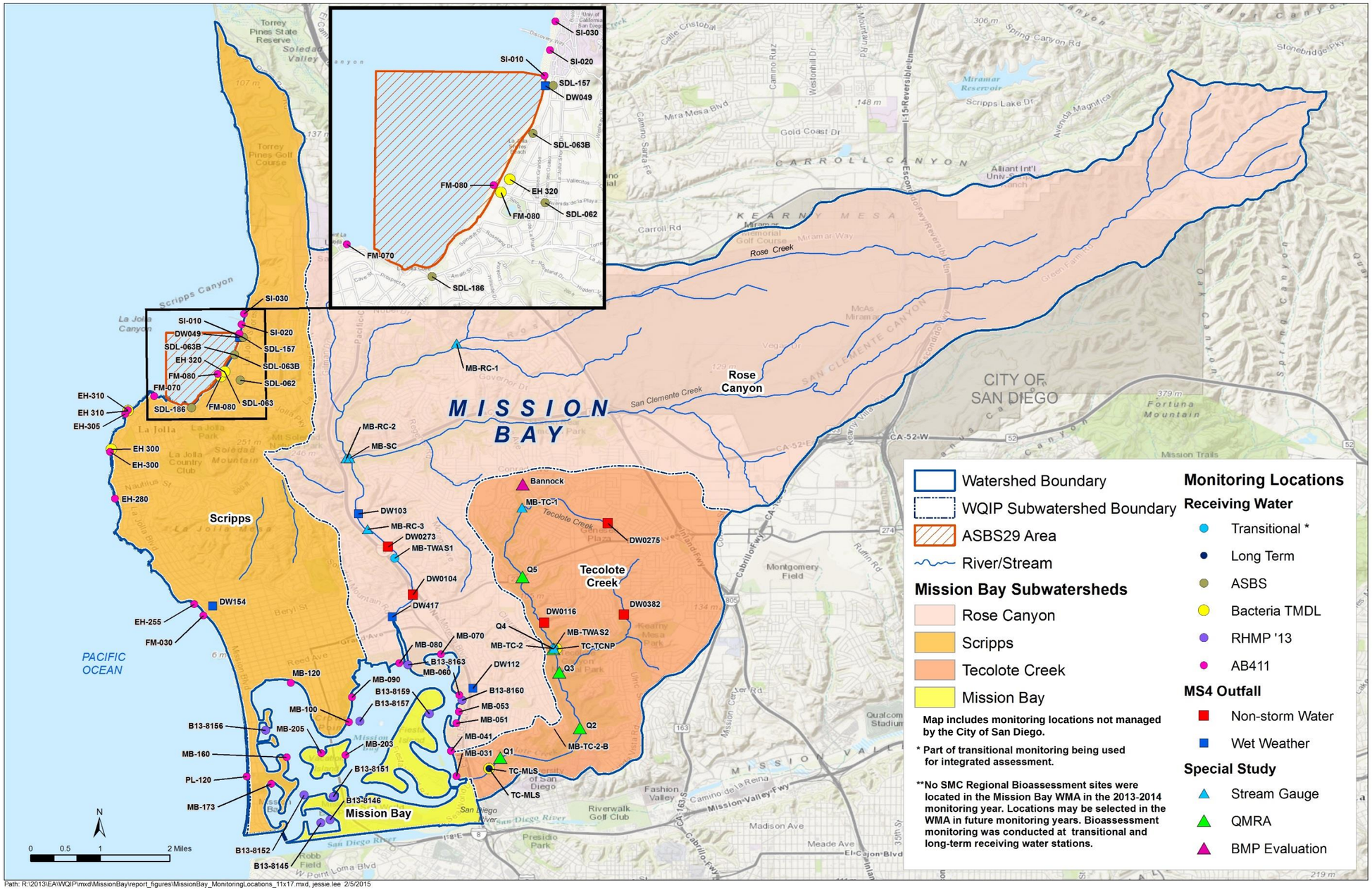


Figure 5-2
MAP Monitoring Locations for the Mission Bay WMA

Intentionally Left Blank

Regional Monitoring Participation

Regional monitoring includes separate studies that will evaluate various aspects of receiving water health on a regional scale. The data may be used by the City to answer the following questions:

- Are conditions in the receiving water protective, or likely protective, of beneficial uses?
- What are the extent and magnitude of the current or potential receiving water problems?

The City participated in the following regional programs:

- Bight

  The Bight regional monitoring program is a multi-agency collaborative effort developed to assess the ecological condition of the Southern California Bight from a regional perspective. The core monitoring program consists of sediment chemistry, sediment toxicity, benthic infauna, demersal fish, and epibenthic invertebrates. The goals of past Bight programs were to answer three primary questions:

  - What are the extent and magnitude of direct impact from sediment contaminants?
  - How does the extent and magnitude of the environmental impact vary by habitat?
  - What is the trend in extent and magnitude of direct impacts from sediment contaminants?

  The RHMP was conducted under the region-wide Bight ’13 monitoring program managed by SCCWRP to characterize the sediment quality. The RHMP was developed by the Port of San Diego, the City of San Diego, the City of Oceanside, and the County of Orange (RHMP Agencies) in response to a July 24, 2003, request by the Regional Board under §13225 of the California Water Code. The RHMP is a comprehensive effort to survey the general water and sediment quality and condition of aquatic life and to determine whether beneficial uses are being protected and attained in Dana Point Harbor, Oceanside Harbor, Mission Bay, and San Diego Bay. The program is composed of a core monitoring program supplemented by focused special studies warranted by the chemical, biological and toxicological results of this core monitoring.

- SMC Regional Monitoring

  Since 2001, the City has partnered with regulated storm water municipalities in southern California, the Regional Boards of Southern California, and the SCCWRP to form the Southern California SMC. The goals of the SMC are to standardize monitoring, improve understanding of storm water mechanics, and

identify receiving water impacts from storm water (SCCWRP, 2002). According to its 2014 Research Agenda, the SMC has identified 21 projects for the next 5-year term and is in the process of prioritizing its efforts on the basis of need and available funding (SMC, 2014a). The City will continue participation in the SMC Regional Freshwater Stream Bioassessment Monitoring Program (SMC Regional Bioassessment Program) that began as a five-year program in 2008–2013 and will be implemented for another five years (2015-2019).

The 2009–2013 SMC Regional Bioassessment Program was designed to address the following monitoring questions (SMC, 2014b):

- What is the extent of impact in streams of southern California?
- What are the stressors that impact southern California streams?
- Is the extent of stream impacts changing over time?

A final monitoring report was prepared on the basis of 2009–2013 results to identify lessons learned, data gaps, and recommendations to guide the design of the 2015–2019 program. In 2015, a new five-year SMC program will extend the initial survey to answer key management questions about the impacts of storm water on stream conditions. The program will have an added emphasis on detecting trends, including non-perennial streams and sampling sediment chemistry and toxicity.

The non-perennial stream monitoring was initiated in April 2014, with site revisits in May and June 2014. Sampling included benthic macroinvertebrates (BMI), algae, physical habitat, and California Rapid Assessment Method (CRAM). The trend site monitoring was conducted during the standard index period (i.e., from mid-May through July). Sampling for trend site monitoring included all of the parameters and constituents of the original SMC Regional Bioassessment Program (San Diego County Municipal Copermittees, 2014). The bioassessment monitoring was conducted at a total of 64 bioassessment stations; 30 stations were compliance stations; 28 stations were randomly placed SMC stations; and 6 stations were San Diego County reference stations (San Diego County Municipal Copermittees, 2014).

- Hydromodification Regional Monitoring Program

Copermittees have developed a regional HMP to address impacts on beneficial uses and stream habitat from increased erosive force potentially caused by an increase in runoff discharge rates and duration from all Priority Development Projects (County of San Diego, 2011). The HMP was initially developed to meet the requirements of the 2007 MS4 Permit. The Monitoring Plan is defined in Chapter 8 of the HMP, and was updated by the San Diego County Regional Copermittees and accepted by the Regional Board in February 2014. The HMP requires monitoring with a final report due to the Regional Board in December 2016. Monitoring consists of channel sediment transport assessments, and continuous flow monitoring of pre-project, post-project, and reference conditions

per MS4 Permit Provisions D.1.a and D.1c(6). Additional monitoring is required per MS4 Permit Provision D.1.a(2).

- San Diego County Beach Water Quality (AB 411) Monitoring

  San Diego County Department of Environmental Health (DEH) implements the Beach and Bay Water Quality Monitoring Program to support the statewide program funded by the Beach Safety Act (AB 411). This program is commonly referred to as AB 411 monitoring. The purpose of this monitoring program is to advise the public of potential health risks that could occur with water contact recreation at local beaches. DEH will post a health advisory notice or close a beach when FIB results are above REC-1 water quality standards. There are 26 AB 411 beach-monitoring stations in the Mission Bay WMA. All of these stations are monitored at least once weekly during dry weather (April 1 through October 31) and nine stations are monitored at least once weekly during the wet season (November 1 through March 30). The AB 411 monitoring program is not required by the MS4 Permit. RAs are using the AB 411 data to track beach water quality conditions related to the Highest Priority Water Quality Condition for the watershed.

Sediment Quality Monitoring

Sediment quality monitoring is designed to assess compliance with receiving water limits applicable to MS4 discharges to enclosed bays and estuaries in accordance with the State Water Board's Water Quality Control Plan for Enclosed Bays and Estuaries of California – Part I Sediment Quality (Sediment Control Plan). Part I of the State Board's Sediment Quality Control Plan provides sediment quality objectives for enclosed bays and estuaries and does not apply to ocean waters or inland surface waters (State Board, 2009). Sediment quality monitoring will be performed in compliance with Permit Provision D.1.e.(2), which requires preparation of a Sediment Quality Monitoring Plan that satisfies the requirements of the Sediment Control Plan.

The data generated will be used to answer the following question:

- What is the condition of sediments in enclosed bays or estuaries with respect to the statewide sediment quality objectives?

The Sediment Quality Monitoring Plan and Quality Assurance Project Plan (Attachment 4A-2) describe detailed proposed monitoring procedures and analytical methods that are illustrative and may change on the basis of site environmental conditions. As indicated in Table 5-1, sediment quality monitoring of the Mission Bay was conducted in the summers of 2013 and 2014.

The participating agencies propose to conduct one round of sediment sampling each Permit term. The second required round of sampling will be satisfied by conducting additional follow up sampling in the vicinity of potentially impacted sites identified in the first round. Sediment quality monitoring will employ the following general approach to meet the requirements of the Permit:

(1) Conduct initial monitoring within each qualifying water body per the requirements of the state's Sediment Control Plan. These data will be used to assess the degree of potential impact at each site using the California SQO multiple-line-of-evidence approach in accordance with the assessment criteria specified in Sediment Control Plan Section V. These scores are derived using multiple metrics from three key lines of evidence: (1) sediment chemistry data, (2) toxicity data, and (3) benthic community data. Sites are then categorized as un-impacted, likely un-impacted, possibly impacted, likely impacted, or clearly impacted.

(2) Confirm and characterize pollutant related impacts for any sites that are considered possibly impacted, likely impacted, or clearly impacted, following an integration of all lines of evidence. In accordance with Sediment Control Plan criteria, the data assessment in this phase is required to determine whether the score(s) indicate potential impacts due to toxic pollutants (e.g., freshwater-related contaminant sources from the MS4), or non-toxic pollutants (e.g., physical habitat, freshwater inundation, legacy contaminants, or other potential factors). This phase would be considered the first phase of the level stressor/source identification (SSID) based on existing data. The requirements of this phase are dependent on the site as categorized in the previous phase as follows:

a. Monitoring Locations deemed to be possibly, likely, or clearly impacted based on initial monitoring for which the impact or impairment is determined to likely not be caused or contributed to by MS4 discharges will be monitored once more in the current Permit term. Follow-up monitoring is required to verify the findings from the first round of monitoring.

    i. If results from the follow-up monitoring are consistent (possibly impacted), or un-impacted, no additional follow-up will be required during the current Permit term.

    ii. If the second round of sampling reclassifies the station as likely or clearly impacted, an additional follow-up investigation may be needed or suspended pending future routine SQO monitoring. In this circumstance, results of the analytical assessments will be discussed with the Regional Board staff to determine whether/where any SSID studies should be undertaken, and to identify major elements of the approach for any identified studies. Prior to additional investigation, a site-specific Sediment Assessment Work Plan would be prepared that would outline specific steps and methodologies to be taken.

b. Stations deemed by assessment to be likely or clearly impacted by MS4 discharges will require additional follow-up investigation and this is deemed the first phase of SSID. A site-specific Sediment Assessment Work Plan will be prepared that will outline specific steps and methodologies to be taken. Per the Sediment Control Plan, SSID

comprises three steps: (1) confirmation and characterization of pollutant impacts, (2) pollutant identification, and (3) source identification and management actions.

(3) In the annual Sediment Monitoring Report, describe the planned follow-up monitoring, including any planned SSID studies, and revisions the Sediment Monitoring Plan, accordingly.

According the Permit Provisions D.1.e(2), sediment monitoring is required to assess compliance with sediment quality receiving water limits applicable to MS4 discharges to enclosed bays and estuaries. Therefore, of the RHMP sites monitored, the freshwater-influenced sites are considered most applicable to evaluate or be representative of MS4 discharges. There were a total of 9 sediment sampling sites monitored in Mission Bay as part of the RHMP. Of those, 2 were designated as freshwater-influenced locations; one at the base of Rose Creek and one at the base of Cudahy Creek (Table 5-7). It is worth noting however that a number of additional sites were classified under other categories that were located in areas that also receive freshwater influence. There are also several other locations in the marinas and elsewhere that are close enough to storm drain inputs to have considerable influence from freshwater as well during large storm events.

Table 5-7.
Freshwater-Influenced RHMP'13 Site IDs and Locations

RHMP Waterbody	Number of Sites	Site ID	Sediment Sampling	
			Latitude	Longitude
Mission Bay	2	B13-8163	32.78720	-117.20868
		B13-8160	32.79458	-117.21997

During the transitional (pre-Water Quality Improvement Plan) monitoring phase, the RHMP, in coordination with the Bight '13 program, may satisfy all or a portion of the requirements of the state's Sediment Control Plan (adopted in 2009) for monitoring of sediments in Mission Bay. The analysis is in progress and is focused on the most recent Bight '13/RHMP 2013 freshwater-influenced monitoring stations. Additional sediment monitoring data from Southern California Bight Monitoring Bight '08/RHMP efforts in 2008 are also available for these locations. The Bight '08/RHMP 2008 will be used in conjunction with the Bight '13/RHMP 2013 data to assess consistency both temporally and spatially for the same freshwater-influenced areas, when possible. The Mission Bay Responsible Agencies will determine if additional monitoring locations are needed to represent other areas influenced by freshwater in Mission Bay pending the completion of the RHMP assessment and reporting (i.e., Tecolote Creek is a major source of freshwater and sediments to Mission Bay, but has not been monitored directly as a part of the regional Bight '08/Bight '13 or RHMP monitoring efforts).

Final analysis of the data collected for RHMP in 2013 are currently underway, and not currently available for decision-making purposes. A draft RHMP report containing these results is due to be submitted to the RHMP agencies in the summer of 2015, this report will most likely satisfy the requirements for the Sediment Monitoring Program. The Sediment Monitoring Plan (Appendix B) is considered to be the template and will be modified based on the completed RHMP assessment and reporting. Modifications will include specifications for monitoring stations and schedule of implementation. The schedule of implementation shown in the Sediment Monitoring Plan (Appendix B) reflects the pending data and will be amended upon completion of the RHMP analytical assessments described above to reflect any planned follow-up monitoring.

During the transitional (pre-Water Quality Improvement Plan) monitoring phase, the Southern California Regional Bight ’13 Monitoring Program (Bight ’13) satisfied the initial monitoring requirements of the state's Sediment Control Plan.

TMDL Monitoring

TMDL provisions, schedules, and monitoring requirements are provided in Attachment E of the MS4 Permit. The purpose of TMDL monitoring programs is to track progress toward achieving compliance with interim and final numeric targets.

The Bacteria TMDL is the only applicable TMDL in the Mission Bay WMA. Compliance monitoring is designed to meet the receiving water monitoring requirements of the Bacteria TMDL. Compliance monitoring, including wet and dry weather sampling, will be conducted each year at the compliance monitoring locations. The data generated will be used to address the following questions:

- Are TMDL numeric targets for bacteria indicators being met at the compliance monitoring locations?
- Are bacteria levels improving at the compliance monitoring locations?

Dry weather monitoring will be conducted weekly during the recreation season (April 1 through October 31) to be consistent with AB 411 monitoring frequencies, and monthly (at a minimum) during the wet season per the MS4 Permit requirements. Samples are to be collected on dry weather days, after an antecedent dry period of 72 hours with less than 0.2 inch of rainfall. Wet weather monitoring will be conducted at the compliance monitoring locations for up to three storm events during each wet season (October 1 through April 30). Storms resulting in greater than 0.2 inch of precipitation will be targeted for analysis. FIB are the target constituents for multiple segments within the Mission Bay WMA, as indicated by the MS4 Permit. Grab samples at beach locations will be collected in a manner consistent with requirements of the AB 411 program and will be analyzed for total coliform, fecal coliform, and *Enterococcus*. Grab samples at creek locations will be analyzed for fecal coliform, *Escherichia coli*, and *Enterococcus*. For details of this monitoring program, refer to Appendix O. The methods and procedures described in Appendix O may be modified on the basis of site-specific environmental conditions and updated analytical methodologies.

Bacteria TMDL compliance monitoring has been conducted in the receiving water since Fall 2012.

Areas of Special Biological Significance Monitoring

ASBS monitoring is used to assess the maintenance and protection of natural water quality conditions in areas of special biological significance that support an unusual variety of aquatic life, and often host unique individual species. Sampling includes up to five outfall monitoring locations and one receiving water monitoring location at the end of Avenida de la Playa. One to three wet weather events are monitored per year and include both grab samples in the receiving water and flow-weighted composite samples at the outfall locations. The program also includes additional flow monitoring to continue to calibrate a hydraulic model of the Avenida de la Playa subwatershed.

5.1.3 MS4 Outfall Monitoring

The purpose of the MS4 outfall monitoring program is to evaluate the potential contribution from MS4 discharges to the receiving water quality. This program is designed to meet requirements set forth in Provision D.2 of the MS4 Permit. The MS4 outfall monitoring program has both dry and wet weather monitoring components. The outfall monitoring seeks to answer the question:

- Do non-storm water or storm water discharges from the MS4 contribute to receiving water quality problems?

This program is composed of the following two components:

- Dry Weather
  - Field screening
  - MS4 outfall dry weather monitoring
- Wet Weather
  - MS4 outfall wet weather monitoring

Table 5-8 provides the number of major outfalls to be monitored under each component of the MS4 Outfall Monitoring Program by the City. The number of major outfalls monitored per year as shown in Table 5-8 are subject to change on the basis of new information, updates to the City's MS4 outfall inventories, changes in transient or persistent flow classifications, and/or changes or updates to the priority water quality conditions over the life of the Water Quality Improvement Plan. Detailed proposed monitoring methods and procedures are presented in the MS4 Outfall Monitoring Plan. These methods and procedures may be modified on the basis of site-specific environmental conditions and updated analytical methodologies.

Table 5-8
Number of Major MS4 Outfalls

Jurisdiction	Number of Major Outfalls Per Year		
	Field Screening[1,2]	Dry Weather Monitoring	Wet Weather Monitoring
City of San Diego	71 (71)	5	5

1. Total number of major outfalls within the City's jurisdiction in the WMA is provided in parentheses.
2. For Copermittees with portions of their jurisdictions in more than one WMA and more than 500 major MS4 outfalls in its jurisdiction, at least 500 major outfalls must be inspected once per year.

MS4 Outfall Dry Weather Monitoring

The purpose of the MS4 Outfall Dry Weather Monitoring Program is to evaluate the potential contribution from MS4 discharges to the receiving water quality during dry conditions and to effectively eliminate non-storm water discharges. The dry weather MS4 outfall monitoring component has two phases. For the first phase, each Copermittee will perform a field screening of a certain number of outfalls on the basis of the total number of outfalls in its jurisdiction. Using this outfall review, the Copermittees will prioritize the persistently flowing outfalls on the basis of their potential to impact receiving water quality. For the second phase, the highest priority dry weather MS4 outfalls will then be monitored, using more in-depth methods than those used in the field screening program.

Dry Weather Field Screening

Field screening is visual monitoring of all MS4 outfalls to identify and eliminate sources of persistently flowing non-storm water discharges. Dry weather MS4 outfall discharge field screening is designed to answer the following questions:

- Which non-storm water discharges are transient and which are persistent?
- Which discharges should be investigated as potential illicit connection/illicit discharges?

The frequency of field screening is determined on a jurisdictional basis and is dependent on the number of major outfalls. Provision D.2.b(1) of the MS4 Permit outlines three categories as the basis for frequency, as described below:

- 0-125 major outfalls, 80% of major outfalls 2 times per year
- 125-500 major outfalls, all major outfalls 1 time per year
- 500+ major outfalls, at least 500 major outfalls 1 time per year

Field screening activities will be conducted during dry weather with an antecedent dry period of at least 72 hours with less than 0.1 inch of rainfall. Field observations will include flow condition (pooled, ponded, flowing, or no flow), estimate of flow, characteristics of flow and water, likely source(s), presence of trash, or evidence or signs of illicit connections or illegal dumping. Follow-up investigations will be employed on the basis of jurisdictional IC/ID programs.

Prioritization of Non-Storm Water Persistently Flowing Outfalls

The City ranked its major outfalls on the basis of their highest priority water quality conditions, PGAs, and specific site considerations. The City considered the following factors to prioritize persistently flowing outfalls:

- Potential to contribute to a highest or priority water quality condition
- Historical monitoring or inspection data
- Controllability
- Surrounding land uses/potential sources
- Flow rate

Highest Priority MS4 Outfall Dry Weather Monitoring

The purpose of this program is to determine which major persistent-flow MS4 outfalls impact receiving water quality during dry weather. MS4 outfall dry weather monitoring is designed to answer the following questions:

- Do dry weather discharge concentrations at MS4 outfalls meet MS4 Permit action levels?
- What is the relative contribution of MS4 outfalls to priority water quality conditions during dry weather?
- What are the sources of persistent non-storm water flows?

The City will monitor a minimum of five major MS4 outfalls during dry weather. Each outfall will be monitored semi-annually during dry weather conditions. During each event, field observations will be recorded, and, when measureable flow is present, in-situ field measurements and analytical data will be collected. Analytical constituents will include constituents contributing to the highest priority conditions, 303(d) list impairments, TMDLs, NALs, and Table D-7 of the MS4 Permit as described in the MS4 Outfall Monitoring Plan (the Plan will be available on the Project Clean Water Website, http://www.projectcleanwater.org/index.php, by June 2015). When historical data demonstrated or justified that analysis of a constituent is not necessary for a particular waterbody or outfall, then it has been removed and its removal notated in the analytical table provided in the Water Quality Improvement Plan Annual Report. The methods and procedures described in the MS4 Outfall Monitoring Plan may be modified on the basis of site-specific environmental conditions and updated analytical methodologies.

Based on the data collected at the MS4 outfalls per jurisdiction as shown in Table 5-8, monitoring at these outfalls may be reprioritized to eliminate monitoring entirely or to reduce it to field screening activities only to address higher priority non-storm water persistent flows. Reprioritization of outfalls may occur if one of the following conditions is met:

- Non-storm water discharges have been effectively eliminated for three consecutive monitoring events; or
- Source(s)s of the persistent flows have been identified as not an illicit or a source of pollutants; or
- Pollutants in the persistent flow do not exceed NALs; or
- The threat to water quality has been reduced by the Participating Agency.

Wet Weather MS4 Outfall Monitoring

The purpose of this program is to identify pollutants in storm water discharges from the MS4s, guide pollutant source identification efforts, and track progress in achieving the goals set forth in Section 4. The City's five monitoring locations for the wet weather MS4 outfall discharge monitoring component are chosen to be representative of the residential, commercial, industrial, and mixed-use land uses within the Mission Bay WMA. These five locations will be monitored during one storm event annually. Wet weather MS4 outfall discharge monitoring is designed to answer the following questions:

- Do wet weather discharge concentrations at MS4 outfalls meet MS4 Permit action levels?
- What is the relative contribution of MS4 outfalls to priority water quality conditions during wet weather?
- How do representative MS4 outfalls discharge concentrations, loads, and flows change over time?

A minimum of five outfalls will be monitored once per year during a storm event with greater than 0.1 inch of rainfall. During each event, observational and hydrologic data will be recorded, including duration of the storm, rainfall estimates, and estimated or measured flow rates and volumes. Grab samples will be collected to analyze for pH, temperature, specific conductivity, dissolved oxygen, turbidity, hardness, and indicator bacteria. A composite sample must be collected and analyzed for constituents contributing to the highest priority conditions, 303(d) list impairments, TMDLs, and SALs, as described in the MS4 Outfall Monitoring Plan (the plan will be available on the Project Clean Water Website, http://www.projectcleanwater.org/index.php, by June 2015). The methods and procedures described in the MS4 Outfall Monitoring Plan may be modified on the basis of site-specific environmental conditions and updated analytical methodologies. If historical data demonstrate or justify that analysis of a constituent is not necessary for a particular waterbody or outfall, then it will be removed and its removal noted in the Water Quality Improvement Plan Annual Report.

The 2013 Transitional Monitoring Programs began implementation of the wet weather MS4 outfall monitoring requirements at the five Mission Bay WMA outfall monitoring locations.

5.1.4 Special Studies

Special studies have been selected to further investigate the highest priority water quality conditions set forth in Section 2 to meet requirements set forth in Provision D.3 of the MS4 Permit. The special studies will include a regional special study and a special study specific to the Mission Bay WMA.

San Diego Regional Reference Streams and Beaches Studies

The regional special studies selected for the Mission Bay WMA is the San Diego Regional Reference Streams and Beaches Studies currently being conducted by the San Diego and Orange County Copermittees. The studies will develop numeric targets that account for “natural sources” to establish the concentrations or loads from streams in a minimally disturbed by anthropogenic activities or “reference” condition. The Reference Stream Study also collected nutrients, metals, and toxicity data as secondary constituents, with a goal of collecting the data necessary to derive reasonable and accurate numeric targets for bacteria, nutrients, and heavy metals on the basis of a reference approach. This studies will provide a scientific basis for evaluating bacteria compliance levels in the Bacteria TMDL. The results of these studies will be used to support the forthcoming reopener of the recently adopted Bacteria TMDL and to support numeric targets in future TMDLs for bacteria, nutrients, and metals.

The San Diego Regional Stream Reference Study will address the following questions (SCCWRP, 2013):

- How does the WQO exceedance frequency vary between summer dry weather, winter dry weather, and wet weather?

- How does the WQO exceedance frequency vary by hydrologic factors, including:
  - Size of storm (wet weather only)?
  - Discharge flow rate and volume (wet and dry weather)?
  - Beginning versus end of storm season (wet weather only)?
- How does the WQO exceedance frequency vary by input factors such as:
  - Size of catchment?
  - Geology?
- How does the WQO exceedance frequency vary by biotic and abiotic factors, including:
  - Algal cover and/or biofilms?
  - Water quality (temperature, pH, conductivity, dissolved oxygen, total suspended solids concentration)?

The San Diego Regional Reference Beaches Study will address the following questions (SCCWRP, 2013) in beaches minimally influenced by anthropogenic activities:

- How does the WQO exceedance frequency vary between summer dry weather, winter dry weather, and wet weather?
- How does the WQO exceedance frequency vary by hydrologic factors, including:
  - Discharge flow rate (wet and dry weather)?
  - Status of estuary mouth (open/closed; dry weather only)?
- What are the wet and dry weather exceedance frequencies of fecal indicator bacteria in estuaries?

For the stream study, a total of 6 locations were selected for wet weather monitoring and up to 10 locations were selected for dry weather monitoring in the San Diego region. Sites were selected to represent 95 percent undeveloped land uses (reference conditions), two major geologic settings, and the target catchment sizes. Wet weather sampling frequency at the six locations consists of three targeted events throughout the wet season (October 1 through April 31). Dry weather sampling frequency consists of weekly sampling for up to 40 weeks at flowing locations during winter and summer dry weather periods. Dry weather sampling occurs if there has been no measurable rainfall for at least 72 hours.

Water samples will be analyzed for a combination of conventional constituents, nutrients, metals, fecal indicator bacteria, microbial source testing, and algae. Of these constituents, *Enterococcus*, *E. coli*, fecal coliform, total coliform, Bacteroides, and *in-situ* parameters are of primary importance; all other analytes are considered secondary.

During dry weather sampling, reference stream sites will be assessed for algal percent cover, algal biomass, ash-free biomass, and factors that control the growth of algae (stream bankful dimensions, canopy cover, and pebble count). Flow discharge rates were estimated for seven reference streams using recorded continuous water level data during both wet and dry weather conditions and measured velocity and flow during sampled wet weather events.

Tecolote Creek Quantitative Microbial Risk Assessment

The special study selected to represent the Mission Bay WMA is the Tecolote Creek QMRA that is currently being conducted in response to the Bacteria TMDL (the plan will be available on the Project Clean Water Website, http://www.projectcleanwater.org/index.php, by June 2015). The study is designed to characterize the predominance of non-human sources in the watershed, quantify the potential risks associated with water contact recreation (e.g., swimming), and, if appropriate, calculate WQOs to reflect the watershed's site-specific conditions. The QMRA is a tool to aid in the development of site-specific WQOs for watersheds and conditions not well represented by the "default" WQOs (i.e., watersheds or conditions that are not dominated by treated sewage sources).

The QMRA study was developed with the following questions in mind:

- Are the bacteria sources to Tecolote Creek predominantly non-human, as concluded by previous studies?
- Which waterborne pathogens of concern are present in the Tecolote Creek watershed, and at what concentrations are they expected to occur at REC-1 or REC-2 sites?
- What is the risk of gastrointestinal illness (GI) from water contact recreation in Tecolote Creek due to the pathogens of concern?
- What site-specific WQOs would reflect those GI risks and protect water contact beneficial uses?
- Which best management practices are expected to be most cost-effective in reducing GI risks in coastal watersheds?
- Which "lessons learned" from the QMRA study could be used to develop and guide other risk assessment and management activities in the San Diego region?

Five sites were selected for wet and dry weather monitoring, with three wet weather and seven dry weather events targeted each year. Because the program is adaptive, the number of sampled events may vary. During wet weather events, receiving water composite and pollutograph grab samples will be collected throughout the hydrograph at one site. Grab samples during peak hydrograph conditions will be collected at the other four sites. Dry weather sampling will consist of one grab sample collected from each monitoring location, following an antecedent dry period of at least seven days.

Samples will be analyzed for field parameters, FIB, microbial source tracking (MST), and reference pathogens.

5.1.5 Other Special Studies

The City has planned projects and studies to fill data gaps, further investigate priority and highest priority water quality conditions, or evaluate MS4 discharges and potential impacts. These projects exceed the monitoring requirements of the MS4 Permit. These studies will be implemented on the basis of available resources.

Stream Gauge Study

Many water bodies in the San Diego region have not been subject to regular flow monitoring. Knowledge of water level is essential for programs, including TMDL implementation, bio-objectives, and bioassessment. The stream gauge study attempts to fill in some of the gaps in the information regarding the level of flow at seven stream locations in Mission Bay WMA. Monitoring will answer the questions:

- What is the level of flow in local streams?
- Which streams are perennial and which are ephemeral?

The study, which began in spring of 2014 and will continue until spring 2015, includes installation of datalogger units. Dataloggers will gather water level, temperature, and conductivity data at 5-minute intervals. There are three locations in Rose Creek, one location in San Clemente Creek, and three locations in Tecolote Creek.

Bannock Avenue Neighborhood Enhancements and Bacteria Treatment for Tecolote Creek Watershed Protection – BMP Effectiveness Assessment

The Bannock Avenue Neighborhood Enhancements employ LID BMPs to reduce indicator bacteria loads in storm water runoff. One goal of the project is to help the City meet requirements of the Bacteria TMDL in Tecolote Creek. A BMP effectiveness assessment is being employed to answer the following question:

- Can LID BMPs effectively reduce storm water runoff pollutant contributions entering the storm drain system in the Tecolote Creek watershed?

Sampling will occur at 10 inlet/outlet monitoring locations, corresponding to 5 BMP configuration monitoring sites, as well as 1 drainage area outfall monitoring location. Five storm events will be targeted. Time-weighted composite samples and flow-weighted composite samples will be collected at the inlet/outlet and drainage area outfall sites, respectively. Pollutograph samples will also be collected, as required by protocol. Analyses will include field parameters, conventional parameters, nutrients, metals, and indicator bacteria.

5.1.6 Remaining Data Gaps

The data gaps discussed in Section 2 were compared with each of the monitoring program components described in the previous subsections. Most of the data gaps will be addressed by the Monitoring and Assessment Program. The long-term monitoring locations include a larger suite of pollutants than previously monitored on the basis of the new MS4 Permit requirements and provide more detail on hydromodification. In addition, because the MS4 outfall monitoring locations for dry and wet weather are prioritized on the basis of the priority water quality conditions identified in Section 2, over time there will be more MS4 data near the waterbodies included in the priority water quality conditions. It is expected to take a few years of monitoring to potentially assess the MS4 contribution to the priority water quality conditions because of the typical high variability of constituent concentrations in storm water. MS4 monitoring locations may also need to change because it is unlikely that MS4 locations will be monitored near each priority water quality condition during one monitoring season.

Some data gaps can be filled by working collaboratively with other agencies to access the data that they collect. For example, the County of San Diego County DEH collects data on bacteria counts at local beaches along the Pacific Shoreline. The City can work with DEH to obtain these data and use them to assess the receiving water impacts of total coliform, fecal coliform and *Enterococcus* on Pacific Shoreline segments during the summer months that are currently not being monitored by the City.

Some data gaps remain because the present state of science does not allow for the full characterization of the cause of the priority water quality condition. The impairment caused by nutrients is affected by the physical and biological conditions of the receiving water. The link between these factors and concentration of nutrients in the priority water quality condition waterbodies will not be determined as part of this iteration of the Monitoring and Assessment Program. Similarly, for receiving waters impaired by toxicity, factors other than runoff from the MS4 contribute to toxicity levels. The Monitoring and Assessment Program currently does not include analyses of non-MS4 contributions to toxicity in receiving water. For pollutants such nutrients, groundwater may be a contributing source, as noted throughout the San Diego Region (City of San Diego, 2011).

5.1.7 Regional Clearinghouse

The Responsible Agencies will use existing data-sharing templates to facilitate compilation of watershed-wide data sets for assessment and reporting purposes. To support reporting under previous Permit cycles, regional data-sharing templates were developed for receiving water monitoring, MS4 outfall monitoring, field screening, and illicit connection/illicit discharge (IC/ID) reporting. The Responsible Agencies will make the following data and documentation available to the public on the Project Clean Water website:

- Mission Bay WMA Water Quality Improvement Plan and all updated versions with date of update

- Annual Reports for the WMA
- Jurisdictional Runoff Management Program documents for each Responsible Agency within the WMA and all updated versions with date of update
- BMP Design Manual for each Responsible Agency within the WMA and all updated versions with date of update
- Reports from special studies conducted in the WMA
- Monitoring data uploaded to the California Environmental Data Exchange Network (CEDEN) with links to the uploaded data
- Available GIS data, layers, and/or shape files used to develop the maps to support the Water Quality Improvement Plan, Annual Reports, and Jurisdictional Runoff Management Programs

5.2 Water Quality Improvement Plan Assessment Program

The assessment portion of the Monitoring and Assessment Program will evaluate the data collected under the monitoring programs described in Section 5.1, as well as the information collected as part of the JRMP. The data collected from these two programs will be used to assess progress toward achieving the Water Quality Improvement Plan numeric goals and schedules and to measure the progress toward addressing the highest priority water quality conditions.

Project Clean Water is a web-based portal for San Diego County watersheds. It is used as a centralized point of access to share educational materials, water quality information, and MS4 Permit-required reports with the public.

www.projectcleanwater.org.

This section summarizes the requirements of the four primary assessments listed in Figure 5-1. Depending on permit requirements, some assessments will be reported annually, as part of the Water Quality Improvement Plan Annual Report, while others will be included in the Report of Waste Discharge that the City must submit prior to the issuance of the next MS4 Permit. The timeframe for each of the assessments is as follows:

- Annual Reporting
  - Receiving Water Assessment
  - MS4 Outfall Discharge Assessment
  - Special Studies Assessment
- MS4 Permit Reporting (Report of Waste Discharge at end of MS4 Permit Cycle)
  - Integrated Assessment.

The Monitoring and Assessment Program will be evaluated and adapted in the context of the Annual Reporting and the Report of Waste Discharge. The re-evaluation will consider data gaps and the results of all monitoring program elements. Required elements of the Water Quality Improvement Plan Annual Report are provided in Table 5-9.

Modifications may be made to the Monitoring and Assessment Program, but the core elements required by the MS4 Permit and described in Section 5.1 must be maintained. This limits the amount of adaptation that is possible. Potential changes could be to change the frequency of sampling, add a new analyte of concern, or move a monitoring location.

Table 5-9
Annual Reporting Components

Assessment and Documentation	Detailed Data and Information
Summary of data collected, findings, interpretations, and conclusions from the assessments required per MS4 Permit Provisions F.b.(3)(a), (b), and (c)	❖ Receiving Water Assessments per Provision D.4.a. ❖ Sediment Quality Assessments per Provision D.1.e(2) ❖ TMDL Assessments per Provision E.6 ❖ MS4 Outfall Discharger Assessments D.4.b ❖ IDDE relevant information and findings per Provision E.2 ❖ Special studies: findings and progress per Provision D.4.c ❖ Re-evaluation of the priority water quality conditions, numeric goals, strategies, schedules, and/or monitoring and assessment, as needed per Provision D.4.d.(1)
Progress of implementing the Water Quality Improvement Plan per MS4 Permit Provision F.b.(3)(d)	❖ Progress toward interim and final numeric goals for the highest priority water quality conditions for the watershed ❖ Status of water quality improvement strategies by each Responsible Agency ❖ Proposed modifications to water quality improvement strategies and supporting rationale ❖ Water quality improvement strategies planned for implementation during the next reporting period ❖ Proposed modifications to Water Quality Improvement Plan and/or each Copermittee's jurisdictional runoff management program document ❖ Previous modifications or updates incorporated into the Water Quality Improvement Plan and/or each Copermittee's jurisdictional runoff management program document

Table 5-9 (continued)
Annual Reporting Components

Assessment and Documentation	Detailed Data and Information
A completed Jurisdictional Runoff Management Program Annual Report Form for each Copermittee in the WMA, certified by a Principal Executive Officer, Ranking Elected Official, or Duly Authorized Representative per Provision F.b.(3)(e)	❖ City of San Diego
Any data or documentation utilized in developing the Water Quality Improvement Plan Annual Report for each Responsible Agency, upon request by the Regional Board. Monitoring data must be uploaded to CEDEN and available for access on the Regional Clearinghouse per Provision F.b.(3)(f)	❖ Receiving water and data collected per Provision D. 1 ❖ MS4 outfall discharge monitoring data collected per Provision D.2 ❖ Special Study data ❖ IC/ID investigation data

1. This re-evaluation is not required annually; at minimum, it must be completed as part of the Report of Waste Discharge.

5.2.1 Integrated Assessment

The integrated assessment builds on the receiving water assessment, MS4 outfall discharge assessment, and special studies assessment described in Sections 5.2.2 through 5.2.4. Additionally, the integrated assessment will evaluate the data collected as part of the transitional monitoring program implemented after the approval of the 2013 MS4 Permit and before the implementation of the monitoring program detailed in Section 5.1 Transitional monitoring components from the 2007 MS4 Permit consisted of:

- Continuation of the receiving water monitoring programs performed under the previous MS4 Permits (including monitoring at the two TWAS locations in Rose Creek and Tecolote Creek.)
- Continuation of the Hydromodification Management Plans monitoring program
- Continued participation in regional receiving water monitoring programs
- Implementation of the Bacteria TMDL CLRPs

The City will integrate the data collected as part of the Monitoring and Assessment Program with information collected during the implementation of the JRMP. The integrated assessment will evaluate the main components of the Water Quality Improvement Plan and will follow the assessment process outlined in the MS4 Permit, as summarized in Table 5-10. The priority water quality conditions will be re-evaluated using the receiving water and MS4 outfall discharge assessments on the basis of the methodology presented in Appendix A. The compliance pathways that comprise the goals and schedules presented in Section 4 will be reviewed on the basis of the results of the receiving water and MS4 outfall discharge assessments, along with data collected as part of the JRMP. This evaluation will highlight the progress in achieving the compliance goals. Finally, water quality monitoring data and maintenance/observational data related to BMP effectiveness will be used to assess the strategies implemented by the City. Table 5-10 summarizes the assessment program components.

The integrated assessment for all three Water Quality Improvement Plan components will be performed during the development of the Report of Waste Discharge. Strategies will be evaluated in the Water Quality Improvement Plan Annual Report on the basis of the data collected as part of the JRMP and any new relevant BMP effectiveness data collected by the City.

Table 5-10
Integrated Assessment Components

Water Quality Improvement Plan Components	MS4 Permit Assessment Methodology	Evaluation Assessment
Priority Water Quality Conditions	<u>Re-assess receiving water, priority, and highest priority conditions.</u> (1) Re-evaluate the receiving water conditions per methodology and any new methodology provided in Appendix A. (2) Re-evaluate the impacts of MS4 discharges on receiving waters per methodology provided in Appendix A. (3) Identify beneficial uses in receiving waters that must be protected per Receiving Water Assessment (Section 5.2.2). <u>Re-evaluate MS4 sources and stressors based on potentially new priority and highest priority conditions.</u> (4) Re-evaluate the identification of MS4 sources and/or stressors performed in Section 3.	❖ Receiving Water Assessments ❖ MS4 Outfall Discharge Assessments
Goals and Schedules (Compliance Pathways)	<u>Evaluate effectiveness of goals.</u> (1) Evaluate the progress toward achieving interim and final numeric goals for protecting impacted beneficial uses in receiving waters.	❖ Receiving Water Assessments ❖ MS4 Outfall Discharge Assessments ❖ JRMP Assessments

Table 5-10 (continued)
Integrated Assessment Components

Water Quality Improvement Plan Components	MS4 Permit Assessment Methodology	Evaluation Assessment
Strategies	<u>Evaluate effectiveness of strategies and actions.</u> (1) Identify the non-storm water and storm water pollutant loads from the MS4 outfalls on the basis of the MS4 Outfall Discharge Assessment (Section 5.2.3). (2) Identify the non-storm water and storm water pollutant load reductions, or other improvements that are necessary to attain the interim and final numeric goals. (3) Identify the non-storm water and storm water pollutant load reductions, or other improvements, that are necessary to demonstrate that non-storm water and storm water discharges are not causing or contributing to exceedances of receiving water limitations. (4) Evaluate the progress of the strategies toward achieving interim and final numeric goals for protecting beneficial uses in receiving waters.	❖ MS4 Outfall Discharge Assessments ❖ Special Studies Assessments for BMP Effectiveness ❖ JRMP Assessments

Performance-Based Goals Assessment

Of particular interest for the integrated assessment to be performed during this MS4 Permit cycle is a review of the performance-based goals presented in Section 4. These goals will be reviewed during the development the Report of Waste Discharge. Section 6.3.2 summarizes the jurisdictional goals put forth by the City and the measures that will be used to assess the goals.

5.2.2 Receiving Water Assessments

The assessment of receiving waters involves evaluating the physical, chemical, and biological conditions of the receiving waters and the condition of the sediment. The City must assess the status and trends of receiving water quality conditions in coastal waters, enclosed bays, harbors, estuaries, and streams in the Mission Bay WMA. This assessment includes evaluation of both dry weather and wet weather conditions. The receiving water assessment to be presented in the Water Quality Improvement Plan Annual Report will:

- Assess whether the conditions of the receiving waters are meeting the numeric goals established in Section 4.
- Identify the most critical beneficial uses that must be protected to ensure the overall health of the receiving water.
- Evaluate whether those critical beneficial uses are being protected.
- Identify short-term and/or long-term improvements or degradation of those critical beneficial uses.
- Consider whether the strategies established in the Water Quality Improvement Plan contribute toward progress in achieving the interim and final numeric goals of the Water Quality Improvement Plan.
- Identify gaps in the monitoring data needed to assess the provisions above.

Additionally, the Water Quality Improvement Plan Annual Report will incorporate a Sediment Monitoring Report in accordance with the schedule included in the Sediment Monitoring Plan. The Sediment Monitoring Report will contain the following information:

- ***Analysis***. Evaluation, interpretation, and tabulation of the water and sediment monitoring data
- ***Sample Location Map***. Identification of the locations, types, and number of samples on a site map
- ***California Environmental Data Exchange Network***. A statement certifying that the monitoring data and results have been uploaded into CEDEN

A human health risk assessment may be conducted on the basis of the Sediment Monitoring Report conclusions and at the direction of the Regional Board. This assessment will determine whether the human health objective contained in the Receiving Water Limitations has been attained at each monitoring location.

5.2.3 MS4 Outfall Discharge Assessments

The MS4 outfall discharge assessments include evaluating both the dry weather monitoring associated with the IDDE program and the wet weather monitoring data collected by the City. Details of these two separate assessments are provided below. The City will assess its MS4 programs individually and will compile the reports as part of the Mission Bay WMA Water Quality Improvement Plan Annual Report. The key elements of the MS4 Outfall Discharge Assessments are summarized in Table 5-11.

Table 5-11
Key Elements of the MS4 Discharge Assessments

Dry Weather Outfall Assessment	Illicit Discharge	Wet Weather Outfall Assessment
❖ Identify sources of non-storm water discharges on the basis of field screening data or IDDE activities ❖ Rank and prioritize non-storm water discharges ❖ Identify sources contributing to numeric action limit exceedances ❖ Estimate volumes and loads of non-storm water discharges ❖ Evaluate non-storm water discharge monitoring locations ❖ Evaluate the effectiveness of the water quality improvement strategies	❖ All IC/ID investigations ❖ IC/IDs eliminated within the jurisdiction	❖ Estimate volumes and loads of storm water discharges ❖ Evaluate temporal trends ❖ Evaluate storm water discharge monitoring locations and frequency ❖ Evaluate Water Quality Improvement Plan analysis ❖ Evaluate the effectiveness of water quality improvement strategies

Dry Weather Outfall Assessments and Illicit Discharges

The City must assess and report the progress of its IDDE program (required pursuant to MS4 Permit Provision E.2) toward effectively prohibiting non-storm water and illicit discharges into the MS4s within its jurisdiction, including the following elements:

- **Identify sources of non-storm water discharges**.

  Based on the dry weather MS4 outfall discharge field screening monitoring described in Appendix O, the City must assess and report as follows (Provision D.4.b(1)(b)):

  - Identify the known and suspected controllable sources (e.g., facilities, areas, land uses, and pollutant-generating activities) of transient and persistent flows within the City's jurisdiction in the Mission Bay WMA.
  - Identify sources of transient and persistent flows within the City's jurisdiction in the Mission Bay WMA that have been reduced or eliminated.
  - Identify modifications of the field screening monitoring locations and frequencies for the MS4 outfalls in the City's inventory necessary to identify and eliminate sources of persistent flow non-storm water discharges (Provision D.2.b).

  The JRMP Annual Report will be used to guide this assessment in the Water Quality Improvement Plan Annual Report. Known and suspected sources will be identified during the implementation of JRMP activities. These activities include the facility inspections that complement the IDDE program and information gathered by the storm water hotline or other public complaints. The JRMP Annual Report now consists of a one-page form that summarizes the JRMP activities in Attachment D of the MS4 Permit, along with supporting information. Section IV of the JRMP Annual Report Form summarizes the findings of the IDDE Program. The back-up that may be provided along with the form may include the following information to help identify sources:

  - Subwatershed of the source or complaint
  - Potential receiving water of the source or complaint
  - Potential pollutant or pollutant category that could be contributed by the source or complaint

- **Rank and prioritize non-storm water discharges**.

  Based on the data collected and applicable numeric action levels as described in Section 2 and detailed in Appendix O, the City must rank the MS4 outfalls in its jurisdictions according to the potential threat to receiving water quality and produce a prioritized list of persistently flowing major MS4 outfalls. The Water Quality Improvement Plan will be updated as described in Section 6 on the basis of these findings and with the goal of implementing (in the order of the ranked

priority list) targeted programmatic actions and source investigations to eliminate persistent non-storm water discharges and/or pollutant loads.

- **Identify sources contributing to numeric action level exceedances**.

  For the highest priority major MS4 outfalls with persistent flows that exceed numeric action levels, the City must identify the known and suspected sources within its jurisdiction in the Mission Bay WMA that may cause or contribute to the numeric action level exceedances.

- **Estimate volumes and loads of non-storm water discharges**.

  Annually, the City must (1) analyze the data collected as part of the Non-Storm Water Persistent Flow MS4 Outfall Discharge Monitoring Program from the highest priority major MS4 outfalls and (2) use a model or another method to calculate or estimate the non-storm water volumes and pollutant loads collectively discharged from all the major MS4s outfalls in its jurisdiction that have persistent dry weather flows during the monitoring year. These calculations or estimates must include:

  - The percent contribution from each known source for each MS4 outfall
  - The annual non-storm water volumes and pollutant loads collectively discharged from the City's major MS4 outfalls to receiving waters within the City's jurisdiction
  - The annual volumes and pollutant loads for sources of non-storm water not subject to the City's legal authority that are discharged from the City's major MS4 outfalls to downstream receiving waters

- **Evaluate non-storm water discharge monitoring locations**.

  Based on an evaluation of the data collected from the highest priority non-storm water persistent flow MS4 outfall monitoring locations, the outfall monitoring locations may be reviewed and the list reprioritized according to one or more of the following criteria (Provision D.2.b.(2)(b)(ii)):

  - The non-storm water discharges have been effectively eliminated (i.e., there is no flowing, pooled, or ponded water) for three consecutive dry weather monitoring events.
  - The sources of the persistent flows have been identified as a category of non-storm water discharges that do not require an NPDES permit and do not have to be addressed as an illicit discharge because they were not identified as sources of pollutants (i.e., the constituents in the non-storm water discharge do not exceed numeric action levels) and the persistent flow can be reprioritized to a lower priority.

- The constituents in the persistent flow non-storm water discharge do not exceed numeric action levels.
- The source(s) of the persistent flows has (have) been identified as a non-storm water discharge authorized by a separate NPDES permit.

Where these criteria have not been met but the threat to water quality has been reduced by the City, the highest priority persistent flow MS4 outfall monitoring stations may be reprioritized accordingly for continued dry weather MS4 outfall discharge field screening monitoring as part of the dry weather MS4 outfall discharge field screening program.

The City must document removal or reprioritization of the highest priority persistent flow MS4 outfall monitoring stations identified under the non-storm water persistent flow MS4 outfall discharge monitoring program in the Water Quality Improvement Plan Annual Report. When the City removes a persistent flow MS4 outfall monitoring station, it will be replaced with the next highest prioritized major MS4 outfall designated by that jurisdiction in the Mission Bay WMA. If there are no remaining qualifying major MS4 outfalls within the jurisdiction, the number of major MS4 outfalls monitored will be reduced.

- **Evaluate the effectiveness of the water quality improvement strategies**.

As part of the Report of Waste Discharge, the City will review the data collected as part of the Dry Weather MS4 Outfall Discharge Monitoring Program and findings from annual dry weather MS4 discharge monitoring assessments described above (Provisions D.4.b.(1)(c)(v)[a]-[c] and Provision D.4.b.(c)(c)(vi)). The evaluation will incorporate the following:

- Identification of reductions and progress in achieving reductions in non-storm water and illicit discharges to the City's MS4s in the Mission Bay WMA
- Assessment of the effectiveness of the water quality improvement strategies being implemented by the City within the Mission Bay WMA toward reducing or eliminating non-storm water and pollutant loads discharging from the MS4s to receiving waters, and, if possible, estimation of the non-storm water volume and/or pollutant load reductions attributable to specific water quality strategies
- Identification of modifications necessary to increase the effectiveness of the water quality improvement strategies implemented by the City toward reducing or eliminating non-storm water and pollutant loads discharging from the MS4s to receiving waters within its jurisdiction
- Identification of data gaps in the monitoring data necessary to assess the provisions above

Wet Weather Outfall Assessments and Illicit Discharges

The City must assess and report the progress of the water quality improvement strategies implemented as part of the Water Quality Improvement Plan and the JRMP toward reducing pollutants in storm water discharges from the MS4s. This is designated as the Wet Weather MS4 Outfall Discharge Monitoring Program. The assessment of this program will:

- **Estimate volumes and loads of storm water discharges**.

  As part of the Water Quality Improvement Plan Annual Report, the City must analyze the monitoring data collected as part of the Wet Weather MS4 Outfall Discharge Monitoring Program. This includes using a watershed model or another method to calculate or estimate the following for each monitoring year:

  - The average storm water runoff coefficient for each land use type within the Mission Bay WMA
  - For storm events with measurable rainfall greater than 0.1 inch, the volume of storm water and pollutant loads discharged from the monitored MS4 outfalls to receiving waters within the Mission Bay WMA
  - The total flow volume and pollutant loadings discharged from the City's jurisdiction within the Mission Bay WMA over the course of the wet season, extrapolated from the data produced from the monitored MS4 outfalls
  - For storm event with measurable rainfall greater than 0.1 inch, the percent contribution of storm water volumes and pollutant loads discharged from land use type within (1) each hydrologic subarea with a major MS4 outfall to receiving waters or (2) each major MS4 outfall to receiving waters

- **Evaluate temporal trends**.

  To evaluate all the data collected as part of the Wet Weather MS4 Outfall Discharge Monitoring Program, the City must:

  - Incorporate new outfall monitoring data into time series plots for each long-term monitoring constituent for the Mission Bay WMA.
  - Analyze statistical trends on the cumulative long-term wet weather MS4 outfall discharge water quality data set.

❖ **Evaluate storm water discharge monitoring locations and frequency**.

The City may identify modifications to the wet weather MS4 outfall discharge monitoring locations and frequencies necessary to identify pollutants in storm water discharges from the MS4s in the WMA (Provision D.2.c.(1)). The two methods available per the MS4 Permit to modify the Wet Weather MS4 Discharge Outfall Program are the following:

- The City may adjust the wet weather MS4 outfall discharge monitoring locations in the Mission Bay WMA, as needed, to (1) identify pollutants in storm water discharges from MS4s, (2) guide pollutant source identification, and (3) determine compliance with the WQBELs associated with the Bacteria TMDL in Attachment E of the MS4 Permit. The number of stations should be at least equivalent to the number of stations required under the MS4 Permit (Provision D.2.a.(3)(a)). Additional outfall monitoring locations (above the minimum per jurisdiction) may be required to demonstrate compliance with the WQBELs associated with the Bacteria TMDL and the Draft Sediment TMDL.
- The City may adjust the analytical monitoring required for the Mission Bay WMA if historical data or other supporting information demonstrate or justify that analysis of a constituent is not necessary.

❖ **Evaluate Water Quality Improvement Plan analysis**.

The City will evaluate the Water Quality Improvement Plan analysis on the basis of the wet weather MS4 outfall monitoring data collected and the applicable storm water action levels (Provision C.2). This evaluation will include analyzing and comparing the monitoring data used to develop the Water Quality Improvement Plan, particularly the strategies presented in Section 4. Additionally, the City will evaluate whether those analyses should be updated as a component of the adaptive management described in Section 6.

❖ **Evaluate effectiveness of water quality improvement strategies**.

As part of the Report of Waste Discharge, the city will review the data collected pursuant to Wet Weather MS4 Outfall Discharge Monitoring Program and findings from the annual wet weather MS4 discharge monitoring assessments described above (Provisions D.4.b.(2)(c)(i)-(ii)). The evaluation will:

- Identify progress in achieving reductions in pollutant concentrations and/or pollutant loads from different land uses or drainage areas discharging from the City's MS4s in the Mission Bay WMA.

- Assess the effectiveness of water quality improvement strategies being implemented by the City within the Mission Bay WMA toward reducing pollutants in storm water discharges from the MS4s to receiving waters within the WMA to the maximum extent practicable (if possible, include an estimate of the pollutant load reductions attributable to specific water quality strategies implemented by the City).
- Identify modifications necessary to increase the effectiveness of the water quality improvement strategies implemented by the City in the Mission Bay WMA toward reducing pollutants in storm water discharges from the MS4s to receiving waters in the WMA to the maximum extent practicable.
- Identify data gaps in the monitoring data necessary to assess the above provisions.

5.2.4 Special Studies Assessments

As part of the Water Quality Improvement Plan Annual Report, the City will evaluate the results and findings from the special studies described in Appendix O. They will use the resulting data to (1) assess their relevance to the City's characterization of receiving water conditions, (2) understand sources of pollutants and/or stressors, and (3) control and reduce the discharges of pollutants from the MS4 outfalls to receiving waters. As with the other monitoring programs, the results of the special studies assessment may warrant modifications of or updates to the Water Quality Improvement Plan.

The Mission Bay WMA special studies will attempt to answer questions concerning the natural "reference" concentration of bacteria and other pollutants in the region and to quantify specifically the natural sources of bacteria in Tecolote Creek. The special studies will help guide the implementation of the strategies for the highest priority water quality conditions.

Future special studies related to BMP effectiveness that are implemented by the City in the Mission Bay WMA will be included in this assessment. The City may elect to report the results of BMP effectiveness studies that are being performed in other WMAs if they relate to the highest priority water quality conditions and results are expected to be transferrable to strategies planned for the Mission Bay WMA.

5.2.5 Regional Monitoring Report

The regional monitoring and reporting requirement from Provision F.3.c of the MS4 Permit requires integration of all data on a regional scale to recommend modifications to the implementation or assessment of the Water Quality Improvement Plan and jurisdictional runoff management programs. The report must assess the following:

- The beneficial uses of the receiving waters within the San Diego Region that are supported and not adversely affected by the Responsible Agencies' MS4 discharges

- The beneficial uses of the receiving waters within the San Diego Region that are adversely affected by the Responsible Agencies' MS4 discharges
- The progress toward protecting beneficial uses of the receiving waters within the San Diego Region from Responsible Agencies' MS4 discharges
- Pollutants or conditions of emerging concern that may impact beneficial uses of the receiving waters within the San Diego region

Intentionally Left Blank

6 Iterative Approach and Adaptive Management Process

The iterative approach that facilitates the adaptive management process for the Mission Bay WMA is presented in this section. The iterative approach re-evaluates the water quality conditions and priorities, goals, and strategies on the basis of the requirements of the MS4 Permit. The adaptive management process details how the Water Quality Improvement Plan (including the Monitoring and Assessment Plan) will be revised when new priorities and/or highest priorities are added, how goals will be adjusted or new goals are added, and how strategies will be modified to meet the latest goals.

As shown in the graphic below, the fifth step of the Water Quality Improvement Plan (adaptive management process) is to develop and outline the iterative approach that facilitates the adaptive management process for the Mission Bay WMA (Provisions A.4, B.5, and D.4.d). The sixth step of the Water Quality Improvement Plan (annual reporting) is to compile and analyze the information collected as part of the MS4 Permit implementation. Annual reporting is described in both Sections 5 and 6 of this Water Quality Improvement Plan, as it draws on both the Monitoring and Assessment Program and the adaptive management process.

Section 6 Highlights

- Presents the iterative approach to facilitate the adaptive management process for the Mission Bay WMA
- Iterative approach re-evaluates the following on the basis of the requirements of the MS4 Permit:
  - Conditions and priorities
  - Goals
  - Strategies
- Adaptive management process explains how the Water Quality Improvement Plan will be revised when:
  - New priorities and/or highest priorities are developed
  - Goals are adjusted or new goals are added
  - Strategies are modified to meet the latest goals

The MS4 Permit describes various triggers that may require program adaptation, including exceedances of water quality standards in receiving waters, new information, Regional Board recommendations, and public participation.

The results of effectiveness assessments of JRMP programs and strategies may also trigger adaptations of the Water Quality Improvement Plan. Each trigger will result in specific adaptive management processes or actions within timeframes specified in the MS4 Permit. The timing of the adaptive management requirements is typically either annually or at the end of the MS4 Permit term. Other adaptations, especially those driven by TMDLs, will likely occur outside of the MS4 Permit term.

The adaptive management process provides the framework to evaluate progress toward meeting the requirements in the compliance pathways of the Bacteria TMDL and ASBS that are reflected in the goals presented in Section 4. The adaptive management process will be used in conjunction with the data collected as part of the Monitoring and Assessment Program to evaluate whether modifications to goals, schedules, and/or strategies are necessary to achieve compliance with the interim and final TMDL compliance options provided in Attachment E of the MS4 Permit. Figure 6-1 provides an overview of the adaptive management process.

MS4 Permit requirements, annual assessments and adaptation, and Report of Waste Discharge assessments and adaptations, including triggers and resulting actions, are described in Sections 6.1 through 6.3.

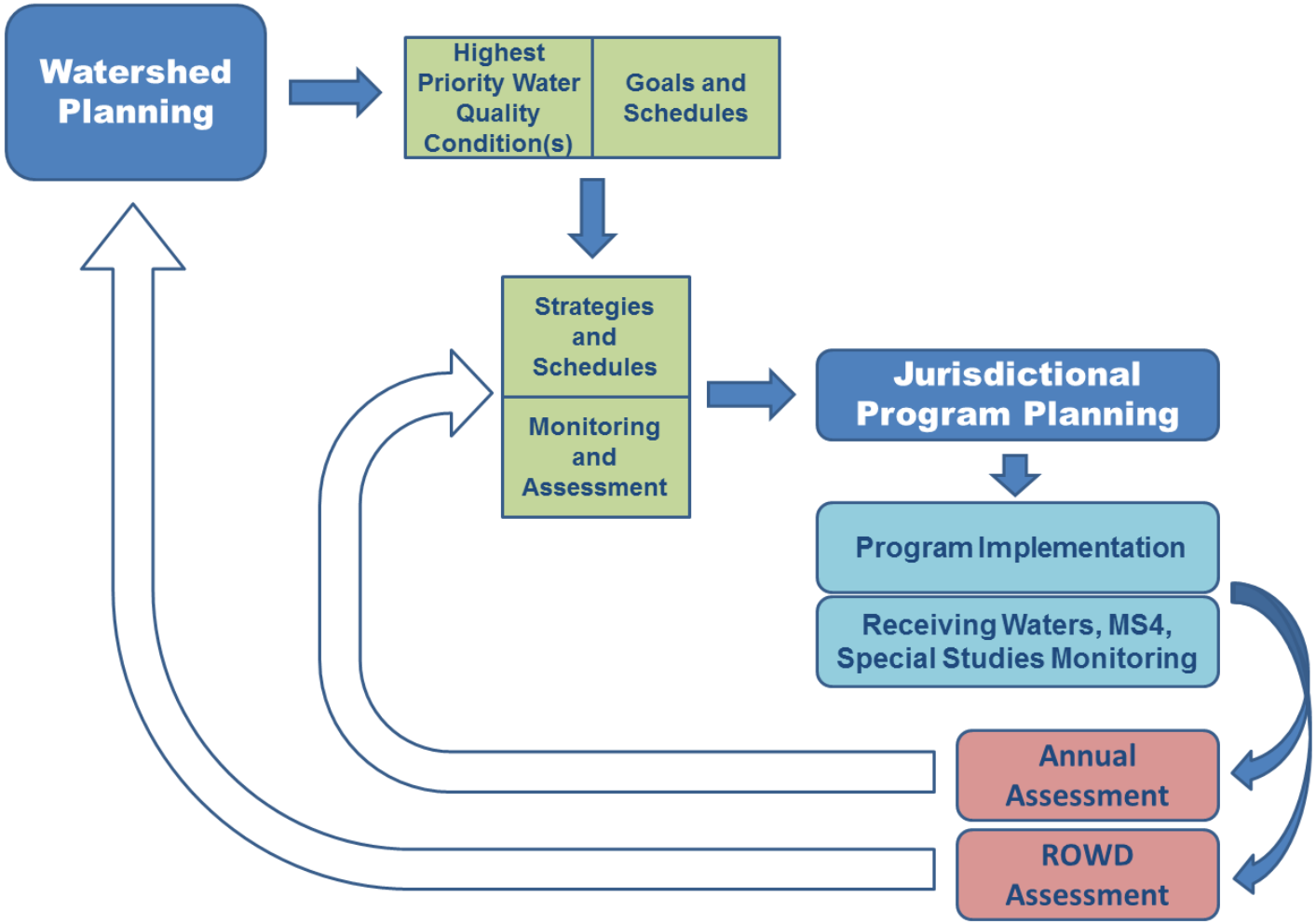


Figure 6-1
Water Quality Improvement Plan Assessment Adaptive Management Process

Intentionally Left Blank

6.1 MS4 Permit Requirements: Iterative Approach and Adaptive Management

The MS4 Permit includes the requirements for adaptive management in multiple provisions. Provisions A.4, B.5, D.4.d, and F.2.c each contain requirements related to adaptive management, as summarized below:

- Provision A.4 requires the Water Quality Improvement Plan to be designed and adapted to ultimately comply with the discharge prohibitions (Provisions A.1.a and A.1.c) and receiving water limitations (Provision A.2.a) specified in the MS4 Permit. The provision addresses the adaptive management process that may be triggered when exceedances of water quality standards persist in receiving waters.
- Provision B.5 contains specific considerations that must be included in the adaptive management process, whether performed as part of the Water Quality Improvement Plan Annual Report or as part of the Report of Waste Discharge. This includes the re-evaluation of priority water quality conditions; adaptation of goals, strategies, and schedules; and adaptation of the Monitoring and Assessment Program.
- Provision D.4.d contains the processes for the assessments and adaptive management that must occur in preparation of the Report of Waste Discharge.
- Provision F.2.c describes the requirements for updates to the Water Quality Improvement Plan that could result from implementation of the adaptive management requirements.

The following sections elaborate on the adaptive management processes, including the frequencies of adaptation required by the MS4 Permit (annual versus MS4 Permit term), triggers, and resulting actions

Figure 6-2 provides a tentative timeline for the adaptive management process.

The first Water Quality Improvement Plan Annual Report is scheduled to be submitted by the Responsible Agencies in January 2017. This will include an abbreviated monitoring and JRMP implementation period, because the Monitoring and Assessment Program and JRMP will not be effective until after the approval of the Water Quality Improvement Plan. The timeline below assumes that the Water Quality Improvement Plan will be approved by the Regional Board during fall 2015, with the earliest implementation potentially beginning in October 2015.

The second Annual Report for the current MS4 Permit cycle will be submitted in January 2018. This submittal would be after the submittal of the Report of Waste Discharge that is due to the Regional Board in December 2017.

Intentionally Left Blank

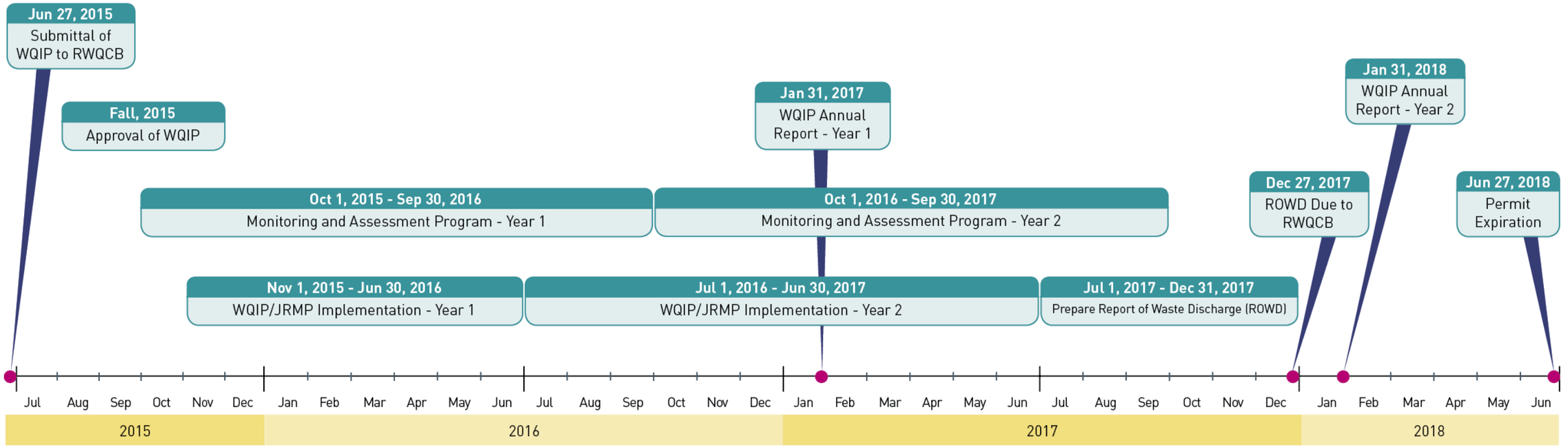


Figure 6-2
Water Quality Improvement Plan Assessment and Reporting Timeline

Intentionally Left Blank

6.2 Annual Assessments and Adaptive Management

The MS4 Permit contains two conditions that may trigger adaptation annually:

(1) Exceedance of water quality standards in receiving waters, and

(2) New information.

In either case, modifications may be appropriate for the water quality goals, strategies, schedules, and/or Monitoring and Assessment Program. The priority water quality conditions may be modified as needed during the MS4 Permit term, but would likely be modified only as a result of assessments conducted for the Report of Waste Discharge. A summary of the triggers and adaptive management processes that are required annually is presented in Table 6-1.

Table 6-1
Adaptive Management on an Annual Basis (Annual Report)

Plan Element	Trigger[1]	Adaptive Management Process Considerations
Water Quality Strategies and Schedules	Persistent Exceedances Not Addressed (A.4.a.(2))	***Provision A.4.a(2), Integrated Assessment Considerations (Summarized in Figure 6-3)[2]*** ❖ Water quality standard exceedances for pollutants that are addressed by the Water Quality Improvement Plan; continuing implementation of the accepted plan and updating as necessary; ❖ If MS4 discharges are causing or contributing to a new exceedance of an applicable water quality standard for pollutants that are not addressed by the Water Quality Improvement Plan, updating of the plan as part of the Water Quality Improvement Plan Annual Report (unless directed by the Regional Board to update it earlier ❖ Following Regional Board approval of modifications to the Water Quality Improvement Plan, update of the JRMP accordingly by the City
	New Information (B.5.b)	***Provision B.5.b, Iterative Approach and Adaptive Management Considerations*** ❖ Modifications to the priority water quality conditions based on Provision B.5.a ❖ Progress toward achieving numeric goals for the highest priority water quality conditions

Table 6-1 (continued)
Adaptive Management on an Annual Basis (Annual Report)

Plan Element	Trigger[1]	Adaptive Management Process Considerations
Water Quality Strategies and Schedules (continued)	New Information (B.5.b) (continued)	❖ Progress in meeting established schedules ❖ New policies or regulations that may affect goals ❖ Reductions of non-storm water discharges ❖ Reductions of pollutants in storm water discharges from MS4s to the MEP ❖ New information resulting from the re-evaluation of impacts from MS4 discharges and/or pollutants and stressors ❖ Efficiency in implementing the Water Quality Improvement Plan ❖ Recommendations of the Regional Board ❖ Recommendations received through a public participation process
Monitoring and Assessment Program	Persistent Exceedances Not Addressed (A.4.a.(2))	***Provision A.4.a(2), Integrated Assessment Considerations (Summarized in Figure 6-3)[2]*** ❖ Following the process as described in Figure 6-3, which might include revising the monitoring program to fill data gaps with modifications such as moving monitoring locations, adding additional sample collection, or changing type of sample collected.
Monitoring and Assessment Program	New Information (B.5.c)	***Provision B.5.c, Iterative Approach and Adaptive Management Considerations*** ❖ Re-evaluation based on new information such as modified priority water quality conditions, goals, strategies, or schedules ❖ New information that might include new regulations ❖ Inclusion in the Monitoring and Assessment Program of the monitoring required by the MS4 Permit

1. Following approval of a TMDL with wasteload allocations by the OAL and the USEPA, Responsible Agencies must initiate an update of the Water Quality Improvement Plan within six months.
2. This procedure does not have to be repeated for continuing or recurring exceedances of the same water quality standard(s) once scheduled strategies are implemented unless Responsible Agencies are directed to do so by the Regional Board.

.

6.2.1 Receiving Water Assessments

Evaluation of receiving water and MS4 outfall discharge data will be performed annually as part of the Water Quality Improvement Plan Annual Report and is described in Section 5. More comprehensive evaluations of receiving water data will be performed for the Transitional Monitoring and Assessment Program Report and for the Report of Waste Discharge (Provision D.4.a.(1)). These evaluations will summarize receiving water data collected within the Mission Bay WMA and provide information with the potential to trigger the adaptive management process to achieve compliance with MS4 Permit discharge prohibitions and receiving water limitations as prescribed in Provision A.

Provision A.4 describes adaptive management procedures that the Responsible Agencies must implement "if exceedance(s) of water quality standards persist in receiving waters." Thus, the trigger for the adaptive management process under this provision is indication of exceedances of water quality standards that persist in receiving waters. If the adaptive management process is triggered under this provision, the process will assess two key questions:

- Is the MS4 a source of a pollutant causing the exceedances to persist in the receiving waters?
- Are the exceedances addressed by the Water Quality Improvement Plan?

If the MS4 is determined to be a source of pollutants causing the receiving water exceedance(s) and the receiving water exceedances are addressed under the Water Quality Improvement Plan, the Responsible Agencies will continue implementing the Water Quality Improvement Plan. If the MS4 is determined to be a source of pollutants causing the receiving water exceedance(s) and the receiving water exceedances are not addressed, the Responsible Agencies will update the plan to address the exceedances as described in Provision A.4.a.(2) and submit the updates with the Water Quality Improvement Plan Annual Report. The updates will include, as applicable:

- A description of strategies that are currently being implemented, are effective, and will continue
- A description of strategies that will be implemented to reduce or eliminate pollutants or conditions that are a source of the receiving water exceedances
- Updates to the implementation schedules for existing, revised, or additional strategies
- Updates to the Monitoring and Assessment Program to track progress toward achieving compliance with Provisions A.1.a, A.1.c and A.2.a

The adaptive management process as required under Provision A.4 is illustrated in Figure 6-3.

6.2.2 Annual Evaluation of New Information

The adaptive management process may also be triggered as new information becomes available (Provision B.5.b). Where appropriate, modifications may be made to goals, strategies, schedules, and/or the Monitoring and Assessment Program and reported in the Water Quality Improvement Plan Annual Report. Types of new information that may trigger the adaptive management process as part of the annual assessment process are discussed below, including the potential trigger(s) for modification(s), and the resulting adaptive management process to be used.

Regulatory Drivers

Where new regulations or policies are adopted that impact Mission Bay WMA planning and implementation processes in the near term, modifications to the Water Quality Improvement Plan goals, strategies, schedules, and/or Monitoring and Assessment Plan may be warranted, and (in some cases) required. For example, an update to the Water Quality Improvement Plan will be initiated no later than six months following approval of a TMDL Basin Plan Amendment by the California Office of Administrative Law (OAL) and the USEPA. The trigger applies to TMDLs containing WLAs assigned to Responsible Agencies within the watershed during the term of the MS4 Permit (Provision F.2.c.(2)). Other examples of regulatory drivers that may trigger modifications to the Water Quality Improvement Plan include new state policies (e.g., those related to trash, toxicity, biological objectives, and bacteria) and changes resulting from modifications to existing MS4 Permit requirements (e.g., as a result of a re-opener).

Special Study Results

As part of the Monitoring and Assessment Program, the Responsible Agencies are performing special studies related to the highest priority water quality conditions for the Mission Bay WMA. The special studies are designed to provide information related to sources of the highest priority water quality condition within the Mission Bay WMA, will be implemented during the MS4 Permit term, and are typically performed over multiple years. As relevant data, conclusions, and lessons learned become available from these studies, the Water Quality Improvement Plan may be modified. The study results may impact the goals, strategies, schedules, and the monitoring and assessment plans. Additionally, lessons learned and study results from outside the Mission Bay WMA, especially those related to sediment and bacteria impairments, may also be incorporated into the Water Quality Improvement Plan.

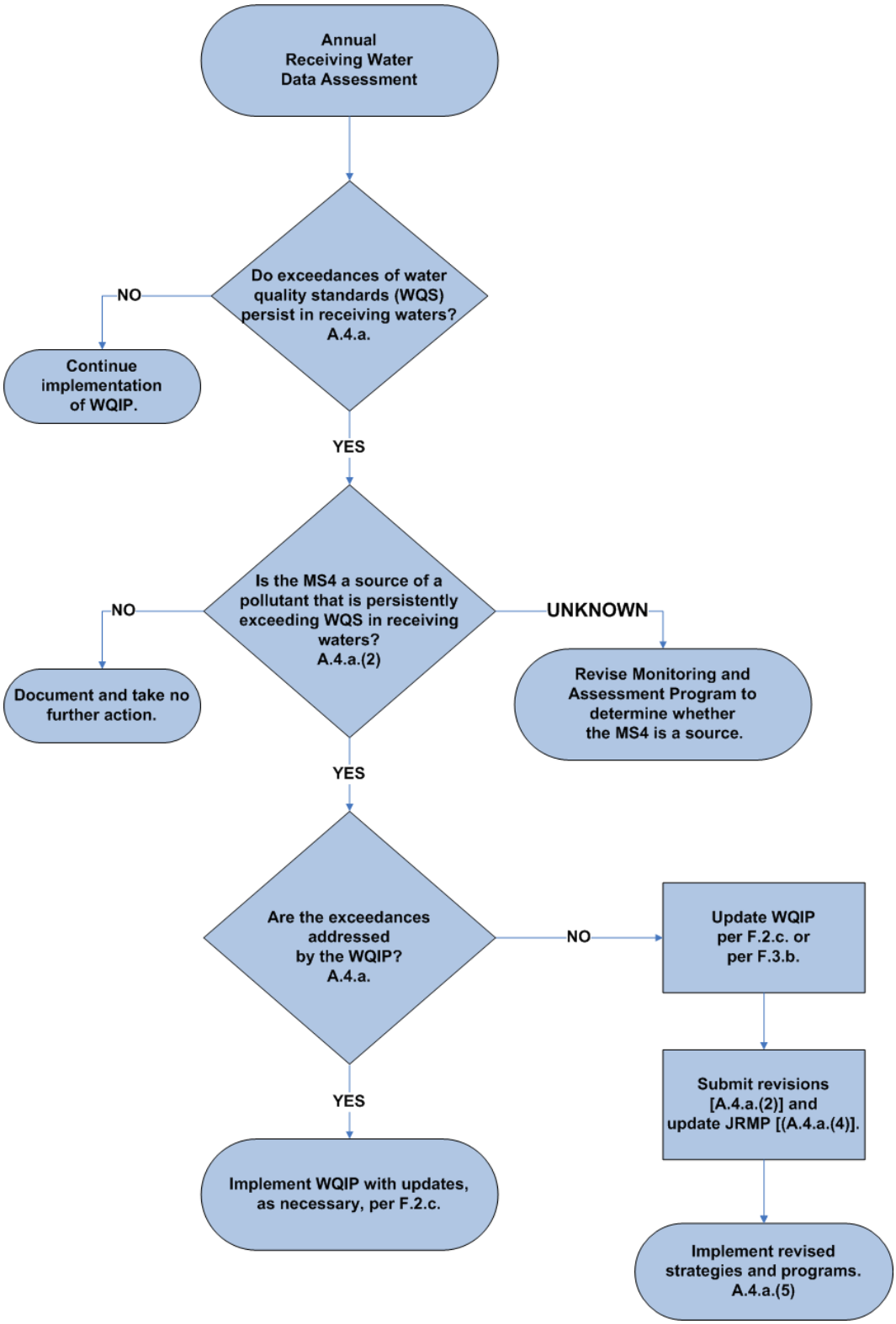


Figure 6-3
Receiving Water Exceedance Process (Provision A.4)

Program Effectiveness Assessments

Strategies developed within the Water Quality Improvement Plan will be incorporated into individual Responsible Agency programs through implementation of the JRMP or the SWMP, as applicable. Each Responsible Agency is implementing programs that are focused on addressing the highest priority water quality conditions within the Mission Bay WMA. While implementation of these programs has been ongoing in many cases, refinements to the programs provide additional focus on the particular water quality issues identified in the Water Quality Improvement Plan. Over time, Responsible Agencies will use various assessment methods to determine which program refinements are effective and which are not. In some cases, the program effectiveness assessment results may provide useful information leading to adaption of elements of the Water Quality Improvement Plan. As new information is applicable, it may be used to modify goals, strategies, schedules, and the Monitoring and Assessment Program.

Regional Board Recommendations

Adaptation of the Water Quality Improvement Plan may also be required on the basis of recommendations from the Regional Board. Recommendations may be from the public participation process, the Consultation Committee, review of submitted reports, or other Regional Board interests.

6.3 MS4 Permit Term Assessments and Adaptive Management

The MS4 Permit also contains specific assessments to be performed during the preparation of the Report of Waste Discharge. The assessments are longer term, occurring only once during the MS4 Permit cycle. Because the updates to the Water Quality Improvement Plan are required to undergo a full public participation process per Provision F.2.c, including reconvening the Consultation Committee, modifications will consider input from the public and the Regional Board. Adaptation of Water Quality Improvement Plan elements will also consider new regulations or policies as appropriate. In the Report of Waste Discharge preparation, all elements of the Water Quality Improvement Plan are eligible for modifications through the required adaptive management processes. Elements that will be evaluated include the water quality conditions (i.e., priorities), goals and accompanying schedules, strategies and accompanying schedules, and the Monitoring and Assessment Program. Table 6-2 summarizes the triggers and adaptive management processes that are required as part of the Report of Waste Discharge.

Table 6-2
Adaptive Management on a Permit Term Basis (Report of Waste Discharge)

Plan Element	Adaptive Management Process Considerations
Priority Water Quality Conditions (B.5.a, D.4.d.(1))	***Provision B.5.a, Iterative Approach and Adaptive Management Considerations*** ❖ Achievement of the outcome of improved water quality through the implementation of strategies identified in the Water Quality Improvement Plan ❖ New information developed in the re-assessment of receiving water conditions, impacts from MS4 discharges, and subsequent re-evaluation of priorities ❖ Spatial and temporal accuracy of monitoring data ❖ Availability of new information and data from sources outside the JRMP programs that inform the effectiveness of implementation strategies and actions ❖ Recommendations of the Regional Board ❖ Recommendations received through a public participation process
	Provision D.4.d(1), Integrated Assessment Considerations ❖ Re-evaluation of the receiving water conditions and the impacts of MS4 discharges on receiving waters per the process developed in Section 2 of the Water Quality Improvement Plan and included in Appendix A, including the identification of beneficial uses in receiving waters that are protected per the Monitoring and Assessment Program ❖ Re-evaluation of the identification of MS4 sources and/or stressors that correspond to elevation of a new highest priority
Water Quality Goals and Schedules (B.5.b, D.4.d.(1))	***Provision B.5.b, Iterative Approach and Adaptive Management Considerations*** ❖ Modifications to the priority water quality conditions based on Provision B.5.a ❖ Progress toward achieving numeric goals for the highest priority water quality conditions ❖ Progress in meeting established schedules ❖ New policies or regulations that may affect goals ❖ Reductions of non-storm water discharges

Table 6-2 (continued)
Adaptive Management on a Permit Term Basis (Report of Waste Discharge)

Plan Element	Adaptive Management Process Considerations
Water Quality Goals and Schedules (B.5.b, D.4.d.(1)) (continued)	❖ Reductions of pollutants in storm water discharges from MS4s to the MEP ❖ New information resulting from re-evaluating impacts from MS4 discharges and/or pollutants and stressors ❖ Efficiency in implementing the Water Quality Improvement Plan ❖ Recommendations of the Regional Board ❖ Recommendations received through a public participation process
	Provision D.4.d(1), Integrated Assessment Considerations ❖ Evaluation of the progress toward achieving interim and final numeric goals for protecting impacted beneficial uses in receiving waters
	Provision D.4.d(2), Integrated Assessment Considerations ❖ Identification of the non-storm water and storm water pollutant loads from the MS4 outfalls per Provision D.4.b ❖ Identification of the non-storm water and storm water pollutant load reductions, or other improvements that are necessary to attain the interim and final numeric goals ❖ Identification of the non-storm water and storm water pollutant load reductions, or other improvements, that are necessary to demonstrate that non-storm water and storm water discharges are not causing or contributing to exceedances of receiving water limitations ❖ Evaluation of the progress of the strategies toward achieving interim and final numeric goals for protecting beneficial uses in receiving waters
Monitoring and Assessment Program (B.5.c)	***Provision B.5.c, Iterative Approach and Adaptive Management Considerations*** ❖ Review of Monitoring and Assessment Programs based on the requirements in Provision D ❖ Adjustment of the monitoring program to determine whether discharges from the MS4 are causing/contributing to exceedances in the receiving water when new exceedances persist; identification and addressing of data gaps via re-assessment of monitoring locations and frequencies; adjustment of the monitoring program to address results of special studies

6.3.1 Priority Water Quality Conditions

The process for selecting the highest priority water quality conditions is documented in Section 2 of this Water Quality Improvement Plan. Given the relatively short duration of the remainder of this MS4 Permit term after expected approval of the Water Quality Improvement Plan, the priority water quality conditions selected during the development of the Water Quality Improvement Plan will remain for the duration of the term. They will be modified only on the basis of new information assessed as part of the Report of Waste Discharge. Data collected during the MS4 Permit term will be used to update the analysis of the priority water quality conditions based on the methodology described in Appendix A and implemented in Section 2.

6.3.2 Progress toward Achieving Goals

As part of the preparation of the Report of Waste Discharge, the Responsible Agencies will evaluate the progress toward achieving the interim and final numeric goals established in Section 4.1. The Water Quality Improvement Plan interim goals identified for the current permit term are provided in Tables 6-3 through 6-4, along with the related assessment metric for each.

Table 6-3
City of San Diego Tecolote Creek Subwatershed Jurisdictional Goals, FY14–FY18

Numeric Goal	Unit of Measure	Assessment Period and Fiscal Year Current Permit Term (FY14-FY18)	Assessment Method
Wet Weather Performance Measures			
Performance Metrics		FY 18	
MS4 Discharges Bacteria and Sediment Reduction	Green Infrastructure Policy	Construct 2 green infrastructure BMPs to treat 84.6 acres of drainage area	Summarize the completed projects that capture and treat drainage from 84.6 acres in the January 2018 Water Quality Improvement Plan Annual Report.

Table 6-3 (continued)
City of San Diego Tecolote Creek Subwatershed Jurisdictional Goals, FY14–FY18

Numeric Goal	Unit of Measure	Assessment Period and Fiscal Year Current Permit Term (FY14-FY18)	Assessment Method
Dry Weather Performance Measures			
Performance Metrics		FY 18	
MS4 Discharges Dry Weather Flow, Bacteria, and Sediment Reduction	Green Infrastructure Policy	Construct 2 green infrastructure BMPs to treat 84.6 acres of drainage area	Summarize the completed projects that capture and treat drainage from 84.6 acres in the January 2018 Water Quality Improvement Plan Annual Report.
MS4 Discharges Reduce Pollutants in Dry Weather Discharges	Dry Weather Flow Reduction from Baseline	Achieve a 10% reduction in prohibited[1] dry weather flow from baseline measured at persistently flowing outfalls in the WMA	Summarize the prohibited[1] dry weather flow reduction observed through MS4 outfall monitoring program in the Mission Bay WMA in the January 2018 Water Quality Improvement Plan Annual Report.

1. Does not include allowable discharges as defined in Provision A and Provision E.2.a of the MS4 Permit.

Table 6-4
City of San Diego Scripps Subwatershed Jurisdictional Goals, FY14–FY18

Numeric Goal	Unit of Measure	Assessment Period and Fiscal Year Current Permit Term (FY14-FY18)	Assessment Method
Wet Weather Performance Measures			
Performance Metrics		FY 18	
MS4 Discharges Bacteria and Sediment Reduction	Green Infrastructure Policy	Construct 1 green infrastructure BMP to treat 8.9 acres of drainage area	Summarize the completed projects that capture and treat drainage from 8.9 acres in the January 2018 Water Quality Improvement Plan Annual Report.
Dry Weather Performance Measures			
Performance Metrics		FY 18	
MS4 Discharges Dry Weather Flow, Bacteria, and Sediment Reduction	Green Infrastructure Policy	Construct 1 green infrastructure BMPs to treat 8.9 acres of drainage area	Summarize the completed projects that capture and treat drainage from 8.9 acres in the January 2018 Water Quality Improvement Plan Annual Report.
MS4 Discharges Reduce Pollutants in Dry Weather Discharges	Dry Weather Flow Reduction from Baseline	Achieve a 10% reduction in prohibited[1] dry weather flow from baseline measured at persistently flowing outfalls in the WMA	Summarize the prohibited[1] dry weather flow reduction observed through MS4 outfall monitoring program in the Mission Bay WMA in the January 2018 Water Quality Improvement Plan Annual Report.

1. Does not include allowable discharges as defined in Provision A and Provision E.2.a of the MS4 Permit.

The goals and compliance pathways will be assessed using data collected per the Monitoring and Assessment Program and JRMP, along with the schedules developed in conjunction with each goal. Depending on the results of the assessment, it may be appropriate to adjust either or both of the numeric goals and/or the schedules associated with each goal. The exception is when the interim and/or final numeric goals and schedules are based on approved Bacteria TMDL compliance schedules; in this case, interim schedules may be modified. However, numeric targets (interim and final) and final schedules cannot be modified without changes to the Bacteria TMDL.

6.3.3 Strategies and Schedules

The strategies and implementation schedules developed to address the highest priority water quality conditions in the Mission Bay WMA will be re-evaluated as part of the preparation of the Report of Waste Discharge. Ultimately, the effectiveness of the strategies will be based on the progress toward achieving the interim and final numeric goals. However, an evaluation of strategies based on the achievement of the interim and final numeric goals may take many years of implementation and monitoring to assess. To supplement the "goal-based" assessments, water quality and programmatic data collected over the MS4 Permit term will be incorporated into the assessment and adaptive management process to modify strategies and implementation schedules as appropriate.

Water Quality Data Evaluation of Strategies

Receiving water data will be assessed as described in Section 5.1. The assessment will indicate progress toward goals and protection of beneficial uses. These data may be used to evaluate the collective effectiveness of the Water Quality Improvement Plan strategies. This information will provide a "big picture" assessment of the success of the strategies over the long term.

MS4 outfall data and special studies results may provide information that is more directly linked to the implementation of individual strategies. Where possible, this information will be used to modify, eliminate, and/or develop new strategies to address the highest priority water quality conditions in the Mission Bay WMA. Where appropriate, these assessments will include a comparison of the data with the NALs and SALs, as required by Provision C of the MS4 Permit. These data will provide the foundation for the MS4 outfall discharge assessments described in Section 5, which will examine the results of the Responsible Agencies' IDDE and MS4 outfall discharge monitoring programs. Where strategies can be linked to measurable or demonstrable reductions (or increases) of non-storm water discharges or of pollutants in storm water, appropriate modifications will be made.

Program Assessments

Where available, the results of program effectiveness assessments performed on the jurisdictional or WMA scale may also drive the adaptation of specific strategies. The level of information will vary by jurisdiction and by program, because these types of assessments are not explicitly required under the MS4 Permit. However, in many cases, the jurisdictions are performing programmatic assessments to ensure the most effective use of limited resources. These assessments have the potential to provide information to determine the effectiveness of specific strategies that is more relevant than water quality data collected at outfalls or in receiving waters, and the assessments may be a key driver in adapting strategies. In some cases, modifications to strategies may also be the result of internal jurisdictional opportunities or constraints, such as increases or decreases in available funding or staffing.

6.3.4 Monitoring and Assessment Program

As part of the Report of Waste Discharge, the Responsible Agencies will consider modifications to the Monitoring and Assessment Program, consistent with the requirements in Provision D.4.d.(3). During the MS4 Permit term, modifications must be consistent with the requirements of Provisions D.1, D.3, and D.3 (receiving water, MS4 outfall, and special study monitoring requirements, respectively), which limit the amount of adaptation that is possible. However, recommendations in the Report of Waste Discharge provide an opportunity to make more meaningful modifications to the Monitoring and Assessment Program. Examples of potential modifications include adjustments to:

- Determine whether discharges from the MS4 are linked to exceedances in the receiving water.
- Address data gaps via re-assessment of monitoring locations and frequencies.
- Address results of special studies.

Intentionally Left Blank

References

California Department of Resources Recycling and Recovery (CalRecycle). 2013. Solid Waste Information System. Last visited October 2013. http://www.calrecycle.ca.gov/SWFacilities/Directory/Search/.

City of San Diego. 2007. *Strategic Plan for Watershed Activity Implementation*. November. San Diego, CA.

City of San Diego. 2009. *Tecolote Creek Microbial Source Tracking Study*. Phase II. Final. June 30. San Diego, CA.

City of San Diego. 2012a. Scripps Watershed Comprehensive Load Reduction Plan. July. https://www.sandiego.gov/stormwater/pdf/mbljscrippsclrp.pdf.

City of San Diego. 2012b. Tecolote Watershed Comprehensive Load Reduction Plan. July. https://www.sandiego.gov/stormwater/pdf/mbljtecoloteclrp.pdf.

City of San Diego. 2012c. City of San Diego Jurisdictional Urban Runoff Management Plan Fiscal Year 2012 Annual Report. September 30. San Diego, CA.

City of San Diego. 2013a. Scripps Watershed Comprehensive Load Reduction Plan Phase II. July. https://www.sandiego.gov/stormwater/pdf/mbljscrippsclrpupdate.pdf.

City of San Diego. 2013b. Tecolote Watershed Comprehensive Load Reduction Plan Phase II. July. https://www.sandiego.gov/stormwater/pdf/mbljscrippsclrpupdate.pdf.

City of San Diego. 2013c. Mission Bay and La Jolla Watershed Urban Runoff Management Program Fiscal Year 2012 Annual Report. January 18. San Diego, CA.

City of San Diego. 2013d. La Jolla Area of Special Biological Significance Site Specific Dilution and Dispersion Model. Prepared by AMEC Environment & Infrastructure, Inc. on behalf of the City of San Diego. May, 2013. http://www.sandiego.gov/stormwater/pdf/ljasbsdilutionstudy.pdf.

Clean Water Act of 1972. 33 U.S. Code §1251 et seq.

County of Los Angeles. 2010. Multi-pollutant TMDL Implementation Plan for the Unincorporated County Area of Los Angeles River Watershed. County of Los Angeles, Los Angeles, CA.

County of San Diego. 2011. Hydromodification Management Plan. Prepared by Brown and Caldwell on behalf of the County of San Diego. January. http://www.waterboards.ca.gov/rwqcb9/board_decisions/adopted_orders/2010/R9-2010-0066_hydromodification.pdf.

Department of Pesticide Regulation (DPR). 1999. Environmental Fate of Bifenthrin. Andrew Fecko, Environmental Monitoring and Pest Management Branch, December 28, 1999.
http://www.cdpr.ca.gov/docs/emon/pubs/fatof San Diego, 2011ememo/bifentn.pdf.

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and J. Wickham. 2011. Completion of the 2006 National Land Cover Database (NLCD) for the Conterminous United States, PE&RS, Vol. 77(9):858-864.

HDR. 2014. *Draft Nonstructural Non-Modeled Activity Pollutant Load Reduction Research Technical Memo*. Prepared for City of San Diego.

Metropolitan Water District of Southern California (MWD). 2014. *SoCal Water$mart*. Available at http://www.socalwatersmart.com/index.php/home/?p=res. Accessed April 14, 2014.

Mission Bay WMA Responsible Agencies. 2014. *Mission Bay Watershed Management Area Water Quality Improvement Plan: Potential Water Quality Improvement Strategies.* Caltrans and City of San Diego.

National Institutes of Health (NIH). 2013a. Zinc Fact Sheet for Health Professionals. http://ods.od.nih.gov/factsheets/Zinc-HealthProfessional/. Accessed August 4, 2014.

National Institutes of Health (NIH). 2013b. Selenium Dietary Supplement Fact Sheet. http://ods.od.nih.gov/factsheets/Selenium-HealthProfessional/. Accessed August 4, 2014.

National Institutes of Health (NIH). 2014. Determinants of Copper Needs Across the Life Span. http://ods.od.nih.gov/News/Copper.aspx. Accessed August 4, 2014.

Port of San Diego, City of San Diego, City of Oceanside, and County of Orange. 2008. Regional Harbor Monitoring Program Pilot Project 2005-2008 Summary Final Report. Prepared by Weston Solutions, Inc., May, 2008. San Diego, CA.

Port of San Diego, City of San Diego, City of Oceanside, and County of Orange. 2010. Regional Harbor Monitoring Program 2008 Final Report. Prepared by Weston Solutions, Inc., May, 2010. San Diego, CA.

San Diego Association of Governments (SANDAG). 2009. 2009 Land Use GIS data. http://www.sandag.org/resources/maps_and_gis/gis_downloads/land.asp.

San Diego County Municipal Copermittees. 2007. 2003-2005 Ambient Bay and Lagoon Monitoring Review and Recommendations Final Report. January. http://www.projectcleanwater.org/pdf/science_mon/0506monitoring/appendix_j_ablm_report.pdf. Accessed February 5, 2012.

San Diego County Municipal Copermittees. 2011. Long-term Effectiveness Assessment Water Quality Report. http://www.projectcleanwater.org/index.php?option=com_content&view=article&id=185:2011-ltea-water-quality-report&catid=16.

San Diego County Municipal Copermittees. 2014. Transitional Monitoring and Assessment Report Appendix H Draft Bioassessment Monitoring Report. Prepared by Weston Solutions. December.

San Diego County Water Authority (SDCWA). 2014. *WaterSmart.* Available at http://www.watersmartsd.org/faq. Accessed April 14, 2014.

San Diego Regional Water Quality Control Board (Regional Board). 1994. Water Quality Control Plan for the San Diego Region (9). September. San Diego, CA.

Regional Board. 2007. Total Maximum Daily Loads for Dissolved Copper, Lead, and Zinc in Chollas Creek, Tributary to San Diego Bay. California Regional Water Quality Control Board, San Diego Region, San Diego, CA.

Regional Board. 2010. Revised TMDL for *Indicator Bacteria, Project I–Twenty Beaches and Creeks in the San Diego Region (including Tecolote Creek)*. Resolution No. R9-2010-0001. Approved February 10. http://www.waterboards.ca.gov/sandiego/water_issues/programs/tmdls/docs/bacteria/updates_022410/2010-0210_BactiI_Resolution&BPA_FINAL.pdf.

Regional Board. 2013. Order Number R9-2013-0001, National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer System (MS4) Draining the Watersheds Within the San Diego Region.

Schoen, M.E. and N.J. Ashbolt. 2010. Assessing Pathogen Risk to Swimmers at Non-Sewage Impacted Recreational Beaches. Environmental Science and Technology 44(7): 2286-2291.

Soller, J.A., Schoen, M.E., Bartrand, T., Ravenscroft, J., and T.J. Wade. 2010b. Estimated Human Health Risks from Exposure to Recreational Waters Impacted by Human and Non-Human Sources of Fecal Contamination. Water Research 44(16): 4674-4691.

Southern California Coastal Water Research Project (SCCWRP). 2002. Stormwater Research Needs in Southern California. Edited by: Brock Bernstein & Kenneth C. Schiff. SCCWRP Technical Report 358.

SCCWRP. 2010. Project Group: Reference Conditions. http://www.sccwrp.org/researchareas/Stormwater/RunoffCharacterization/ReferenceConditions.aspx. Accessed February 8, 2014.

SCCWRP. 2012. San Diego County *Enterococcus* Regrowth Study, Final Report. http://www.projectcleanwater.org/images/stories/Docs/MON/final%20work%20products/Bacteria_Regrowth_Study.pdf. Accessed February 5, 2014.

SCCWRP. 2013. San Diego Regional Reference Stream Study Quality Assurance Project Plan, Revised.

Southern California Stormwater Monitoring Coalition (SMC). 2014a. Southern California Stormwater Monitoring Coalition 2014 Research Agenda. SCCWRP Technical Report 828.

SMC. 2014b. Draft Southern California Stormwater Monitoring Coalition (SMC) Annual Report 2013-2014. Prepared by AMEC. December.

State Water Resources Control Board (State Board). 2009. Water Quality Control Plan for Enclosed Bays and Estuaries – Part I Sediment Quality. August.

State Board. 2011a. Storm Water Multiple Application and Report Tracking System (SMARTS). Accessed November 4, 2011. https://smarts.waterboards.ca.gov/smarts/faces/SwSmartsLogin.jsp.

State Board. 2011b. NPDES Permits (including Storm Water). Excel Spreadsheet Download. http://www.waterboards.ca.gov/water_issues/programs/ciwqs/publicreports.shtml#facilities. Accessed December 6, 2011.

State Board. 2012a. Order Number 2012-0006-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities.

State Board. 2012b. Order No. 2012-9911-DWQ, National Pollutant Discharge Elimination System (NPDES) Statewide Storm Water Permit Waste Discharge Requirements (WDRs) for the California Department of Transportation. Effective July 1, 2013.

State Board. 2013a. California Environmental Protection Agency, Surface Water Ambient Monitoring Program, Tools for Assessing the Biological Integrity of Surface Waters. Website visited October 2013. Website last updated October 4, 2013. http://www.waterboards.ca.gov/water_issues/programs/ swamp/tools.shtml.

State Board. 2013b. Order Number 2013-0001-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit for Waste Discharge Requirements for Discharges from Small Separate Storm Sewer Systems (MS4s).

State Board. 2014a. Order Number 2014-0057-DWQ. *National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Industrial Activities.*

State Board. 2014b. State Water Quality Protection Areas – Areas of Special Biological Significance. Website visited July 2014. Website last updated October 11, 2013. http://www.swrcb.ca.gov/water_issues/programs/ocean/asbs.shtml.

University of San Diego Department of Marine Science and Environmental Studies (USD). 2004. *Mission Bay Water and Sediment Testing Project Final Report*. January, 2004.

United States Environmental Protection Agency (USEPA). 2006. Pesticides: Reregistration, Permethrin facts, (Reregistration Eligibility Decision (RED) Fact Sheet. EPA 738-F-06-012. June 2006. http://www.epa.gov/oppsrrd1/REDs/factsheets/ permethrin_fs.htm.

USEPA. 2012a. Water: Total Maximum Daily Loads (303[d]) Glossary. Website visited November 2013. Website last updated May 21, 2012. http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/ glossary.cfm.

USEPA. 2012b. Water: Basic Information about Regulated Drinking Water Contaminants. Basic Information about Selenium in Drinking Water. Website visited October 2013. Website last updated May 21, 2012. http://water.epa.gov/drink/contaminants/basicinformation/ pentachlorophenol.cfm.

USEPA. 2014. Water: Aquatic Life Criterion—Selenium. Website last updated June 26, 2014. http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/selenium/index.cfm. Accessed July 2014.

World Resources Institute (WRI). 2013. Eutrophication and Hypoxia, Nutrient Pollution in Coastal Waters, About Eutrophication. http://www.wri.org/ project/eutrophication/about. Accessed 2013.

Intentionally Left Blank