June 29, 2018

David Gibson, Executive Officer
California Regional Water Quality Control Board, San Diego Region
2375 Northside Drive, Suite 100
San Diego, CA 92108

Subject: Final Certified South Orange County Watershed Management Area (San Juan Hydrologic Unit) Water Quality Improvement Plan, Orange County MS4 Co-Permittees, PIN 658018

Dear Mr. Gibson:

The County of Orange, in cooperation with the Orange County Flood Control District and the cities of Aliso Viejo, Dana Point, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, Mission Viejo, Rancho Santa Margarita, San Clemente, and San Juan Capistrano (Permittees), pursuant to requirements of Attachment B Provision 1.k.(1)(d) of Order No. R9-2013-0001, as amended by Order No. R9-2015-0001 and Order No. R9-2015-0100 (Regional Permit), is pleased to submit the following document:

- Final Certified South Orange County Watershed Management Area Water Quality Improvement Plan (WQIP)

The Final Certified WQIP incorporates the redline revisions associated with the June 2, 2018 revised WQIP and includes the certification statements from Permittees as requested in your Notice of Acceptance letter dated June 20, 2018.

If you have questions, please contact Cindy Rivers at (714) 955-0674.

Sincerely,

Amanda Carr
Deputy Director
OC Environmental Resources

City of San Clemente Utilities

RE: Final South Orange County (San Juan Hydrologic Unit) Water Quality Improvement Plan

SIGNED CERTIFIED STATEMENT:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Dave Rebensdorf
Utilities Director
City of San Clemente

June 29, 2018
Date

City of Mission Viejo

Public Works Department

Subject: **Final South Orange County (San Juan Hydrologic Unit) Water Quality Improvement Plan (PIN 240995)**

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Mark Chagnon
Director of Public Works
City of Mission Viejo

06/29/18
Date

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RE: Final South Orange County (San Juan Hydrologic Unit) Water Quality Improvement Plan
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Ziad Mazboudi
Engineering Services Manager
City of Laguna Niguel

June 29, 2018
Date

RE: Final South Orange County (San Juan Hydrologic Unit) Water Quality Improvement Plan

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Lisa Zawaski, CPSWQ
Senior Water Quality Engineer
City of Dana Point

3 July 2018
Date

OC Public Works
Integrity, Accountability, Service, Trust
Shane L. Silsby, Director

RE: Final South Orange County (San Juan Hydrologic Unit) Water Quality Improvement Plan

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Amanda Carr
Deputy Director
OC Environmental Resources

6/29/18
Date

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RE: Final South Orange County (San Juan Hydrologic Unit) Water Quality Improvement Plan

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Steve May
Public Works & Utilities Director
City of San Juan Capistrano

June 28, 2018
Date

CITY OF LAGUNA HILLS

June 28, 2018

Ms. Laurie Walsh
Senior Water Resource Control Engineer
Storm Water Management
San Diego Water Board
2375 Northside Drive, Suite 100
San Diego, CA 92108

SUBJECT: FINAL SOUTH ORANGE COUNTY (SAN JUAN HYDROLOGIC UNIT) WATER QUALITY IMPROVEMENT PLAN

Signed Certified Statement:

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Kenneth H. Rosenfield, P.E.
Public Services Director
City of Laguna Hills

6/28/2018
Date

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RE: Final South Orange County (San Juan Hydrologic Unit) Water Quality Improvement Plan

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Jennifer M. Cervantez
City Manager
City of Rancho Santa Margarita

6-28-18
Date

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David Shissler, P.E.
Director of Water Quality
City of Laguna Beach

6/28/18
Date

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RE: Final South Orange County (San Juan Hydrologic Unit) Water Quality Improvement Plan

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Moy Yahya
Water Quality Manager
City of Laguna Woods

6-27-2018
Date

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RE: Final South Orange County (San Juan Hydrologic Unit) Water Quality Improvement Plan

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Shaun Pelletier
Director of PublicWorks/City Engineer
City of Aliso Viejo

6/27/18
Date

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South Orange County Watershed Management Area

Water Quality Improvement Plan

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

The Orange County Copermittees (PIN 658018) which consists of the County of Orange (PIN 246113), Orange County Flood Control District (PIN 246115) and Cities of Aliso Viejo (PIN 205031, Dana Point (PIN 219073), Laguna Beach (PIN 236118), Laguna Hills (PIN 236131), Laguna Niguel (PIN 236133), Laguna Woods (PIN 236148), Lake Forest (PIN 236212), Mission Viejo (PIN 240995), Rancho Santa Margarita (PIN 251715), San Clemente (PIN 255215), and San Juan Capistrano (PIN 255344)

June 2018 – Final Certified Plan

Table of Contents

Table of Contents i
List of Appendices iii
List of Figures iii
List of Tables iv
Acronyms vi
Executive Summary ix
1 Introduction 1-1
1.1 Purpose and Scope 1-1
1.2 Physical Setting 1-2
1.1.1 Geographic Context 1-2
1.1.2 Urban Stream Syndrome 1-3
1.3 Regulatory Basis 1-3
1.4 South Orange County WQIP Process 1-4
2 Priority Water Quality Conditions 2-1
2.1 Data Compilation and Evaluation 2-2
2.1.1 Data Sources 2-2
2.1.2 Evaluation Approach 2-2
2.1.3 Data Evaluation 2-3
2.1.4 Aliso Creek Estuary Restoration Studies 2-6
2.2 Conditions Evaluation and Prioritization 2-7
2.2.1 Non-Priority Conditions 2-8
2.2.2 Priority Water Quality Conditions 2-10
2.2.3 Methodology for Selecting Highest Priority Water Quality Conditions 2-12
2.2.4 Data Adequacy and Gaps 2-20
2.3 Highest Priority Water Quality Conditions 2-20
2.3.1 Coastal Waters 2-20
2.3.2 Inland Waters 2-20
2.4 Potential Strategies 2-26
3 Goals, Strategies and Schedules 3-1
3.1 Pathogen Health Risk 3-2
3.1.1 Overview 3-2
3.1.2 Prohibitions and Limitations Compliance Option 3-4
3.1.3 Goals and Schedules 3-5
3.1.4 Strategies and Schedules 3-11
3.1.5 Summary 3-32
3.1.6 Annual Milestones for Next Permit Cycle 3-36
3.1.7 Other Compliance Determinations 3-37
3.2 Channel Erosion and Associated Geomorphic Impacts – Inland Receiving Waters 3-39
3.2.1 Overview 3-39
3.2.2 Goals and Schedules 3-43
3.2.3 Strategies and Schedules 3-56
3.2.4 Summary 3-67
3.2.5 Annual Milestones for Next Permit Term 3-68
3.3 Unnatural Water Balance and Flow Regime – Inland Receiving Waters 3-70

3.3.1 Overview ... 3-70
3.3.2 Goals and Schedules ... 3-74
3.3.3 Strategies and Schedules ... 3-78
3.3.4 Summary ... 3-95
3.3.5 Annual Milestones for Next Permit Term ... 3-97
3.4 Prohibitions and Limitations Compliance Option ... 3-99
3.4.1 General Approach for B.3.c Compliance ... 3-100
3.4.2 Highest Priority Water Quality Conditions ... 3-101
3.4.3 Priority Water Quality Conditions ... 3-101
3.4.4 Protection of Beneficial Uses ... 3-108
3.5 Watershed Management Area Analysis ... 3-113
3.5.1 Introduction ... 3-113
3.5.2 Watershed Characterization ... 3-114
3.5.3 Alternative Compliance Candidate Projects ... 3-117
3.5.4 Hydromodification Management Requirements for Coarse Sediment ... 3-118
3.5.5 Hydromodification Management Exemptions ... 3-121
4 Monitoring and Assessment program ... 4-1
4.1 WQIP Monitoring Program ... 4-9
4.1.1 High Priority Water Quality Condition Monitoring ... 4-9
4.1.2 Receiving Water Monitoring Program ... 4-16
4.1.3 MS4 Outfall Monitoring Program ... 4-29
4.1.4 TMDLs Monitoring Program ... 4-33
4.1.5 Special Studies ... 4-34
4.2 WQIP Assessment Program ... 4-39
4.2.1 High Priority Water Quality Condition Assessments ... 4-41
4.2.2 Receiving Water Assessments ... 4-42
4.2.3 MS4 Outfall Discharge Assessments ... 4-46
4.2.4 TMDL Assessments ... 4-50
4.2.5 Special Studies Assessments ... 4-51
4.2.6 Integrated Assessments ... 4-52
5 Iterative Approach and Adaptive Management Process ... 5-1
5.1 Background ... 5-1
5.2 Approach ... 5-4
5.2.1 Priority Water Quality Conditions ... 5-5
5.2.2 Adaptation of Goals, Strategies, and Schedules ... 5-7
5.2.3 Monitoring and Assessment Program ... 5-10
5.3 Stakeholder Involvement ... 5-10
6 References ... 6-1

List of Appendices

Appendix A: Map Exhibits

Appendix B: Inventory of Data Sources

Appendix C: Quantitative Data Sources and Associated Technical Documentation

Appendix D: Jurisdiction and Watershed Strategy Tables

Appendix E: Modeled Benefits for Wet Weather Non-Structural BMPs

Appendix F: Modeled Benefits for New Wet Weather Structural Treatment BMPs

Appendix G: Summary of Microbial Source Tracking Studies in Southern California

Appendix H: Geomorphic Impacted Reach Location Exhibits

Appendix I: Geomorphically-Referenced Basis of Design Guidance Document

Appendix J: Outfall Prioritization Methodology and Results for Unnatural Water Balance Management

Appendix K: Watershed Management Area Analysis

Appendix L: Monitoring and Assessment Map Exhibits

Appendix M: Monitoring and Assessment Fact Sheets

Appendix N: Glossary of Key Terms

Appendix O: Potential Strategies

List of Figures

Figure 1-1: Overview of Adaptive Assessment and Management Process 1-2

Figure 1-2: Overview of Water Quality Plan Elements and Process 1-4

Figure 2-1: Relationship among Water Quality Conditions 2-8

Figure 2-2: Overall Summary of ROWD Results of Prioritization Analysis 2-12

Figure 2-3: Function-Based Framework for Stream Restoration 2-14

Figure 2-4: Variation of Inland Stream Temporal Conditions 2-15

Figure 2-5: Causal Linkages – Dry Weather Stream Functions.. 2-17

Figure 2-6: Causal Linkages – Wet Weather Stream Functions 2-18

Figure 2-7: Dry Weather HPWQC Condition Thread for Inland Waters 2-22

Figure 2-8: Wet Weather HPWQC Condition Thread for Inland Streams 2-23

Figure 3-1: Scientific and Regulatory Advancements Underpinning the Recommendation for a MST-Based and Pathogen-Focused Compliance Approach 3-16

Figure 3-2: Steps for Comprehensive Human Waste Source Reduction Strategy 3-17

Figure 3-3: The total number of Beach Mile Days (the product of the length of beach posted times the length of beach posted) posted due to exceedances of standards during the April 1 – October 31 (2014) summer swimming season. 3-35

Figure 3-4: Tributary Area to Implemented Diversion and/or Treatment Systems in South Orange County 3-71

Figure 3-5: The Fecal Coliform Seasonal Geomean in the Aliso Creek Watershed Plotted in Comparison to the Average Dry Weather Flow Rate in the Creek. 3-72

Figure 3-6 Frequency of reference site based threshold exceedances for all parameters during all storm events at each Area of Special Biological Significance (ASBS) in southern California. Number above bar is total sample size. 3-107

Figure 3-7: GIS Methodology to Identify Potential Coarse Sediment 3-120

Figure 4-1: Conceptual Organization of Monitoring and Assessment Program 4-8

Figure 4-2: Annual and 5-Year Permit Term Assessments 4-41

Figure 4-3: Primary Components of the Annual Dry and Weather MS4 Outfall Assessments 4-47

Figure 4-4: Summary of Integrated Assessment 4-53

Figure 5-1. Mandatory WQIP Update Triggers 5-2

Figure 5-2. Adaptive Management/Stream Condition Relationship 5-3

Figure 5-3. Adaptive Management Process Flow 5-4

List of Tables

Table 2-1: Non-Priority Water Quality Conditions 2-8

Table 2-2: Priority Water Quality Conditions 2-10

Table 2-3: HPWQC for the South Orange County Watershed Management Area 2-25

Table 3-1: Pathogen Health Risk Numeric Goals – Wet Weather 3-7

Table 3-2: Pathogen Health Risk Numeric Goals – Dry Weather 3-8

Table 3-3: Interim Exceedance Frequencies [a] 3-9

Table 3-4: Fecal Coliform Load Reductions from Implemented BMPs in San Juan and Aliso Creek Watersheds 3-13

Table 3-5: Comprehensive Human Waste Source Reduction Program Milestones 3-22

Table 3-6: Summary of Schedule for Control Activities for Pathogen Health Risk HPWQC 3-29

Table 3-7: Summary of Responsibility for Control Activities for Pathogen Health Risk HPWQC 3-30

Table 3-8: Summary of Final Wet Weather Bacteria Load Reductions (Fecal Coliform) by BMP Type 3-33

Table 3-9: Annual Milestones for Pathogen Health Risk HPWQC 3-36

Table 3-10: Potential Reach Rehabilitation Information Summary 3-47

Table 3-11: Numeric Goals and Schedules for Channel Erosion HPWQC...................... 3-56

Table 3-12: Summary of Schedule for Control Activities for Channel Erosion HPWQC.. 3-63

Table 3-13: Summary of Time Requirements for Channel Erosion HPWQC 3-65

Table 3-14: Summary of Responsibility for Control Activities for Channel Erosion HPWQC 3-66

Table 3-15: Annual Milestones for Channel Erosion HPWQC 3-69

Table 3-16: Interim Goals of Water Balance/Unnatural Flow Regime HPWQC 3-78

Table 3-17: Anticipated Phasing of Outfall Control Strategies for Unnatural Water Balance HPWQC... 3-88

Table 3-18: Summary of Schedule for Control Activities for Unnatural Water Balance HPWQC 3-91

Table 3-19: Summary of Time Requirements for Unnatural Water Balance HPWQC .. 3-93

Table 3-20: Summary of Responsibility for Strategy Implementation Unnatural Water Balance HPWQC... 3-94

Table 3-21: Annual Milestones for Unnatural Water Balance HPWQC 3-98

Table 3-22: Summary of HPWQCs and PWQCs and Associated Basin Plan Parameters Enrolled in B.3.c Compliance Option 3-99

Table 3-23: Summary of Final and Interim Goals and Annual Milestones Relating to PWQCs 3-103

Table 3-24: Summary of Conformance to Provision B.3.c... 3-111

Table 3-24: Datasets and Data Availability Relative to Core WMAA Provisions 3-116

Table 3-25: Datasets Used to Identify Potential Coarse Sediment Areas....................... 3-119

Table 3-26: Summary of Reaches Evaluated for Permanent Exemption 3-123

Table 4-1: Summary of WQIP Monitoring Programs 4-3

Table 4-2: Dana Point Harbor Regional Harbor Monitoring Program Sampling Stations 4-27

Table 4-3. Summary of Permittee's Major MS4 Outfalls To Be Monitored 4-29

Table 4-4. Summary of HPWQC Assessments 4-41

Acronyms

ASBS	Areas of Special Biological Significance
BMI	Benthic macroinvertebrates
BMP	Best management practices
BPJ	Best Professional Judgment
CCME	Canadian Council of Ministers of the Environment
CEQA	California Environmental Quality Act
CFS	Cubic feet per second
CHWSRS	Comprehensive Human Waste Source Reduction Strategy
CRAM	California rapid assessment method
CSCI	California stream condition index
CWA	Clean Water Act
EMC	Event mean concentration
ESA	Federal Endangered Species Act
FC	Fecal Coliform
FIB	Fecal Indicator Bacteria
GIS	Geographic Information System
GLU	Geomorphic landscape unit
GPM	Gallons per minute
GRBOD	Geomorphically-referenced basis of design
HPWQC	Highest priority water quality conditions
HSA	Hydrologic Sub Area
HU	Hydrologic Unit
IBI	Index of Biological Integrity
IDDE	Illicit Discharge, Detection and Elimination
IRWM	Integrated Regional Watershed Management Plan
JRMP	Jurisdictional Runoff Management Plan
LID	Low impact development
LIPS	Local implementation plans
LTME	Long-term mass emission
MAP	Monitoring and Assessment Program
MPN	Most probable number
MS4	Municipal Separate Storm Sewer System
MST	Microbial source tracking
NEPA	National Environmental Policy Act
NOA	Notice of Applicability
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NSE	Natural Source Exclusion

OC	Orange County
OCFCD	Orange County Flood Control District
OCTA	Orange County Transportation Authority
OWTS	On-site wastewater treatment system
PWQC	Priority water quality conditions
RAA	Reasonable Assurance Analysis
RMV	Rancho Mission Viejo
ROMP	Runoff Management Plan
ROWD	Report of Waste Discharge
RWQCB	Regional Water Quality Control Board
SAL	Stormwater action level
SAMP	Special Area Management Plan
SBPAT	Structural BMP Prioritization and Analysis Tool
SCCWRP	Southern California Coastal Water Research Project
SDRWQCB	San Diego Regional Water Quality Control Board
SEEP	SmarTimer Edgescape Evaluation Project
SMC	Southern California Stormwater Monitoring Coalition
SOC	South Orange County
SOC WMA	South Orange County Watershed Management Area
SOP	Standard operating procedure
SSO	Site-specific objective
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Resources Control Board
TDS	Total dissolved solids
TIE	Toxicity identification evaluation
TLR	Target load reduction
TMDL	Total Maximum Daily Load
TSS	Total suspended solids
TWAS	Temporary Watershed Assessment Stations
WDID	Waste Discharger Identification
WDR	Waste Discharge Requirements
WIHMP	Watershed Infiltration & Hydromodification Management Plan
WLA	Waste load allocations
WMA	Watershed Management Area
WMAA	Watershed Management Area Analysis
WQBEL	Water quality based effluent limitation
WQIP	Water Quality Improvement Plan
WQMP	Water Quality Management Plan
WQO	Water Quality Objective
WY	Water Year

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Executive Summary

Provision B of the San Diego Regional Municipal Separate Storm Sewer Systems (MS4) Permit (Order R9-2013-0001 as amended by Order No. R9-2015-001 and Order No. R9-2015-0100) requires the development of a Water Quality Improvement Plan (WQIP, the "Plan") for the South Orange County Watershed Management Area (San Juan Hydrologic Unit). The Plan was developed in phases to meet the submittal requirements indicated in the Permit, facilitate public and Consultation Panel input, and build logically upon sequential efforts. The required Plan submittals and submission due dates were as follows:

- Provision B.2 – Priority Water Quality Conditions (April 1, 2016)
- Provision B.3 – Goals, Strategies and Schedules (October 1, 2016)
- Complete WQIP (meeting the requirements of Provision B) (April 1, 2017)

Each of the major sections of the Plan developed in accordance with Provision B of the Permit is described below, and applies to the following subwatersheds within the South Orange County Watershed Management Area:

- Laguna Coastal Streams Watershed
- Aliso Creek Watershed
- Dana Point Coastal Streams Watershed
- San Juan Creek Watershed
- San Clemente Coastal Streams Watershed
- San Mateo Creek Watershed

Water Quality Improvement Priority Conditions

Section 2 of this Plan describes the data sources and data evaluation approaches to identify Priority and Highest Priority Water Quality Conditions in the South Orange County Watershed Management Area (SOC WMA) in accordance with the MS4 Permit. The general approach applied a watershed-scale perspective combined with a focus on system value and function and the ways these are affected by the MS4. This approach involves defining broader concepts of "condition" that more closely relate to beneficial uses rather than focusing only or mainly on the values of individual water quality constituents to achieve better alignment with the Ocean Plan and Basin Plan.

For coastal waters, the clear Highest Priority Water Quality Conditions (HPWQCs) is:

- Pathogen Health Risk at Beaches

For inland receiving waters (i.e., streams, creeks and tidally influenced receiving waters, e.g., estuaries) a variety of interrelated stressors and conditions were characterized based on a holistic review of available watershed data. In order to identify HPWQCs, a function-based restoration framework was applied that focuses on restoring fundamental processes such as hydrology/water balance and physical habitat to support higher order outcomes such as improved biology/ecology and physio-chemical qualities, coupled with an emphasis on restoration of beneficial uses. Based on the available watershed data and the function-based restoration framework, the following HPWQCs were identified for inland receiving waters:

- Channel Erosion and Associated Geomorphic Impacts
- Unnatural Water Balance/Flow Regime

Other priority water quality conditions (PWQC) were also identified.

Water Quality Improvement Goals, Strategies, and Schedules

Section 3 of this Plan describes water quality improvement goals for each of the HPWQCs and describes the strategies and schedules for achieving these goals. This section is divided into planning "tracks" based on each HPWQC. Each planning track describes overall goals, specific numeric goals, strategies, and schedules to meet the requirements of the MS4 Permit. This Plan also demonstrates within each track that implementation of the Plan elements as described will reasonably achieve the goals, both interim and final. Each track is based on an adaptive approach, where the resulting monitoring and assessment efforts are expected to be considered in future updates and refinements of the Plan. Monitoring and assessment and adaptive management plans are described in Section 4 and 5.

Beyond the HPWQC planning tracks, Section 3 also describes how the Plan addresses the other priority water quality conditions. Finally, this section includes a Watershed Management Area Analysis (WMAA) pursuant to Permit Provision B.3.b.(4) that has specific significance for subsequent development of alternative compliance projects and demonstration of appropriate exemptions from hydromodification management.

Pathogen Health Risk

The overall goal for this track is to manage health risk associated with contact water recreation in coastal waters to an acceptable level and maintain existing high quality of water present at many swimming beaches. For the purpose of goal setting and strategy evaluation, fecal indicator bacteria (FIB) are used as indicators of pathogens because they are easier and less costly to measure. However, the ultimate goal of this Plan is to address actual pathogens that pose a risk to human health. Allowable FIB loads for the South Orange County Watershed Management Area (SOC WMA) are defined by the "Twenty Beaches and Creeks Bacteria Total Maximum Daily Load" and "Baby Beach in Dana Point Harbor" Total Maximum Daily Loads (Bacteria TMDLs). To demonstrate (quantitatively) compliance with the TMDLs, goals for this track are expressed as percent load reductions conforming to the mandated reductions indicated in Table 6.3 of Attachment E of the Permit.

The strategies that have been developed to achieve the goals include a primary emphasis on the control of human waste sources and a secondary emphasis on controlling more general sources of indicator bacteria. This Plan describes suites of programmatic (i.e., non-structural) and structural BMPs. Strategy implementation will prioritize a specific program for identification and abatement of human sources of pathogens. This includes extensive application of microbial source tracking (MST) methods followed by abatement and verification actions. This approach is supplemented by other programmatic and source control efforts as well as new structural treatment controls. Anticipated bacteria load reductions from strategy implementation were modeled to provide reasonable assurance that implementation of this Plan will achieve the targets by the compliance deadline of April 1, 2031. The majority of the strategies identified in this Plan are multi-benefit in nature, addressing multiple pollutants, beyond bacteria.

Channel Erosion and Associated Geomorphic Impacts – Inland Receiving Waters

Within the network of streams and creek systems in the South Orange County Watershed Management Area (SOC WMA), certain reaches are experiencing adverse geomorphic impacts resulting from severe erosion, such that the underlying physical form of the stream is impacted. This condition influences the physical habitat (i.e., channel geometry, substrate, vegetation) and hydraulic flow regimes (i.e., velocity distributions, erosive energy) of a channel. The Plan establishes as an overall goal for this HPWQC abatement of excess erosion where these processes are determined to be an active and primary source of impairment to geomorphic form and function within an impaired reach. A rapid aerial screening of approximately 170 lineal miles of inland receiving waters was conducted to identify reaches that appear to be experiencing erosion and associated geomorphic impacts associated with urbanization. As part of screening reaches, several factors were used to evaluate the degree of recent instability, extents of impact, potential for enhancement of beneficial uses via rehabilitation, opportunities and constraints. Based on these assessments, this Plan establishes a goal of rehabilitating 23,000 lineal feet of streams using a geomorphically-referenced approach to abate excess erosion and scour while maintaining dynamic morphology of the active channel (rather than full stabilization) and provide conveyance for design flood flows. The schedule for attainment of this final goal is 2042. Several interim goals are also defined.

The primary strategy to address these impacts is rehabilitation of geomorphically unstable channels within urbanized corridors and publicly owned rights-of-way using a multi-benefit geomorphically-referenced basis of design, where feasible. This design paradigm emphasizes a complete design approach that considers safe conveyance of flood flows (infrequent conveyance condition) while providing the ecological benefits of establishing a dynamically-stable channel reach to convey the geomorphically-significant flows (more frequent conveyance condition), while restoring or maintaining recreational uses. Near-term planning efforts are identified to better characterize candidate reaches and determine the scope and schedule of specific projects to meet the established goals. These efforts will include evaluation of combinations of upland (i.e., detention) and in-stream (i.e., rehabilitation) actions. This will be followed by implementation of specific projects. Periodic collection of high-resolution remote-sensed ground surface and vegetative cover data will be used to support project development, monitor project effectiveness, identify other areas of channel erosion and determine the need for future abatement efforts.

Unnatural Water Balance and Flow Regime – Inland Receiving Waters

Within the network of inland receiving waters, anthropogenic sources of dry weather flows are a major component of the current urban water balance and are known to contribute to unnatural quantity and timing of flows in many streams. Based on evaluation of spatial data relationships in the SOC WMA (See Section 2), there appears to be a correlation between dry weather MS4 discharges to stream channels, flows in these channels, and impairments to water quality and beneficial uses. Additionally, unnaturally high dry weather flows may have impacts on coastal estuaries, including frequency of breaching sand berms and/or water quality. As such, the overall goal for this HPWQC is to effectively eliminate unnatural dry weather flows from MS4 outfalls to inland receiving waters. This goal applies to all MS4 outfalls, subject to the definitions and exceptions that are identified in the Plan and will be conducted over a period extending to 2047. Exceptions apply to outfalls where it is appropriate for flows, such as rising groundwater, to continue and where specific criteria are met related to water quality.

The strategies identified in this Plan focus specifically on identifying and eliminating unnatural and unpermitted, non-exempted dry weather flows from the MS4 into inland receiving waters, with priority for the locations where unnatural dry weather flow inputs arising from an unnatural urban water balance are exacerbating in-stream water quality conditions and contributing to unnatural in-stream regimes. Strategies to address these flows include source control, incentives, and educational measures to promote water conservation and reduction of unnatural flows into the MS4 and structural BMP retrofit strategies to divert and capture water at high priority outfalls, where appropriate. An outfall prioritization approach is included in this Plan and will be updated over time to determine appropriate strategies for each outfall. These strategies are intended to be implemented within a broader watershed and water management context and align with water conservation and water recycling efforts.

Some of the strategies in this Plan are ongoing and have resulted in significant progress, while some strategies are new as part of this Plan. New near-term efforts include additional data collection and analysis to better characterize conditions within the WMA and determine specific new control actions.

Prohibitions and Limitations Compliance Option

As allowed per Provision B.3.c (Prohibitions and Limitations Compliance Option), the Permittees intend to rely on implementation of the WQIP to demonstrate compliance with the requirements of Provisions A.1.a, A.1.c, A.1.d, A.2, and A.3.b. The Plan lists the other PWQCs that are being optionally enrolled in B.3.c provision per the allowance stated in Provision B.3.c.(1)(a)(v) and the spatial extent to which these PWQCs apply.

Optional Watershed Management Area Analysis

The Permittees elected to perform the optional WMAA described in Permit Provision B.3.b.(4). This analysis is intended to characterize important processes and characteristics of each watershed through creation of GIS layers. The WMAA is specifically intended to be used for the following purposes:

- To identify candidate projects that could potentially be used as offsite alternative compliance options for Priority Development Projects 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 for Priority Development Projects.

It is important to note that the WMAA is separate from and has different purposes than the planning tracks for the HPWQCs presented in Section 3.

Monitoring and Assessment Program

In accordance with Permit Provision B.4, the Monitoring and Assessment Program (MAP) is presented in Section 4 of this Plan, which describes the strategies and methods that Permittees will use to monitor and assess the progress toward numeric goals and schedules presented in Section 3 of this Plan. The MAP also describes the approach the Permittees will use to monitor the conditions of receiving waters and discharges from the MS4 under wet and dry weather conditions. This MAP adheres to the prescriptive monitoring and assessment requirements of Permit Provision B, "Water Quality Improvement Plans,' Provision D, "Monitoring and Assessment Program Requirements," and Attachment E, "Specific Provisions for Total Maximum Daily Loads

Applicable to Order No. R9-2013-0001, as amended by Order Nos. R9-2015-0001 and R9-2015-0100." The specific field and laboratory methods and protocols and measurement quality objectives are contained within the *South Orange County Monitoring and Assessment Program Quality Assurance Program Plan*.

Iterative Approach and Adaptive Management Process

In accordance with Permit Provision B.5., Section 5 of this Plan describes the iterative approach and adaptive management process that the Permittees will use to periodically reevaluate the priority water quality conditions; water quality improvement goals, strategies, and schedules; and the MAP to provide recommendations for modifying those elements to improve the effectiveness of the Plan. This section also describes how the iterative approach and adaptive management process will be used to determine which additional BMPs are necessary to achieve WQIP goals and update the Plan, as needed, to support these goals.

Section
1

1 INTRODUCTION

1.1 Purpose and Scope

The Orange County Stormwater Program (the Program) is a regulatory compliance partnership comprising the cities of Aliso Viejo, Dana Point, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, Mission Viejo, Rancho Santa Margarita, San Clemente, San Juan Capistrano, the County of Orange and the Orange County Flood Control District (OCFCD) (collectively the Permittees [1]) who operate an interconnected municipal separate storm sewer system (MS4) which discharges stormwater and urban runoff. The Permittees are developing a Water Quality Improvement Plan (WQIP, the "Plan") for the South Orange County Watershed Management Area (SOC WMA) to address the adverse impacts to surface waters, often collectively referred to as "urban stream syndrome" that can arise from the imprint of urbanization on the landscape.

In order to further the Clean Water Act's primary objective to protect, preserve, enhance, and restore the water quality and designated beneficial uses of Orange County's creeks streams and coastal waters, the Plan applies a watershed-scale perspective combined with a focus on system value and function and the ways these are affected by the MS4. This approach involves defining broader concepts of "condition" that more closely relate to beneficial uses rather than focusing only or mainly on the values of individual water quality constituents to achieve better alignment with the Ocean Plan and Basin Plan. In doing so, this Plan seeks to focus management actions where they will have the most direct effectiveness toward valued outcomes. A more holistic watershed-scale approach also facilitates a stronger relationship between this Plan and various ongoing and future integrated water management efforts, recognizing that efforts to effectively manage water resources for water supply in the region are highly interrelated.

From prioritization through planning, monitoring, and adaptive management, this Plan extends the three key themes identified in the Program's Report of Waste Discharge (ROWD) report (2014) on the State of the Environment in the San Diego Region:

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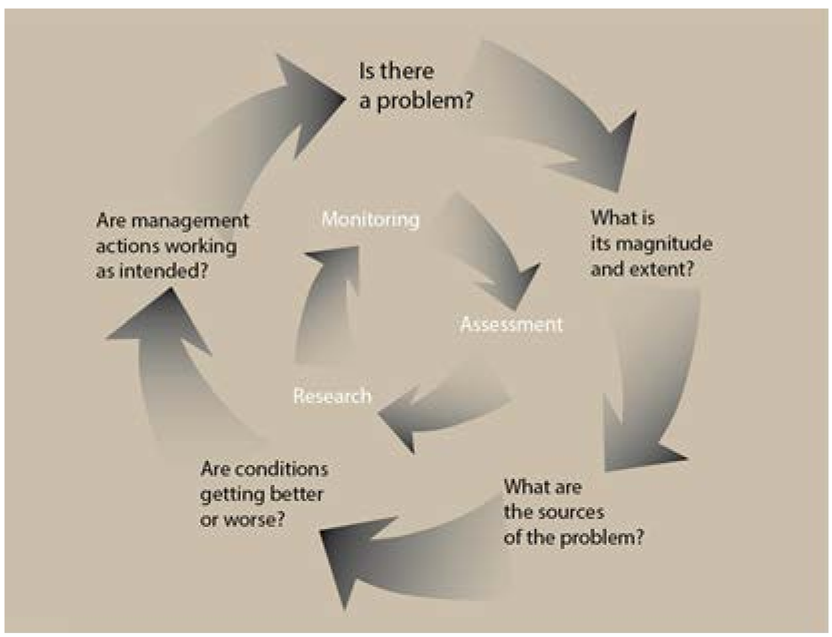
1 While the terms *Copermittee* and *Permittee* are synonymous, the municipal partners refer to themselves as *Permitttees.*

- Focus on priority areas and constituents rather than trying to monitor all constituents, potential issues, and locations
- Increase the integration of data from a wider range of sources
- Continue to evolve from a strictly discharge-specific approach to a risk-based prioritization approach

To help accomplish this objective, in addition to building upon these themes, the Plan includes an adaptive planning and management process that identifies watershed-specific priorities within the South Orange County watersheds and implements strategies through collective watershed-scale efforts and respective jurisdictional programs. The adaptive management process included in this Plan (**Figure 1-1**) reflects the iterative assessment process described in the ROWD, which in turn follows guidance contained in the Regional Board's Framework for Monitoring and Assessment (RWQCB, 2012).

Figure 1-1: Overview of Adaptive Assessment and Management Process



1.2 Physical Setting

1.1.1 Geographic Context

The Plan addresses direct MS4 discharges to the South Orange County coastline as well as MS4 discharges to the inland receiving waters (i.e., streams, creeks, and tidally influenced receiving water) within the South Orange County Watershed Management Area (San Juan Hydrologic Unit [901.00]) including the Laguna Coastal Streams, Aliso

Creek, Dana Point Coastal Streams, San Juan Creek, San Clemente Coastal Streams, and San Mateo Creek. Plan implementation will result in improvements in the quality of MS4 discharges and, in turn, these receiving waters.

Exhibit A-1 (**Appendix A**) shows the overall geographic extent and context of the SOC WMA, including the sub-watershed and catchment boundaries and major receiving waters. This exhibit also displays the approximate extent of catchments with MS4 infrastructure. To provide context for the current riparian system, **Exhibit A-2** displays observations of flow condition that have been made under dry weather (non-storm) conditions as part of monitoring efforts. Note that this exhibit displays data from different points in time with different antecedent conditions. Many of the stream reaches are ephemeral systems, and the presence or absence of flow during dry weather may vary by time of year and based on longer-term patterns, such as drought. Historically mapped springs from USGS quad maps provide a rough indication of whether dry weather flows are naturally occurring in stream reaches. **Exhibit A-3** also provides context for this Plan by displaying the general type of channel that is present; natural channels and channels that have been engineered for flood control to protect life and property.

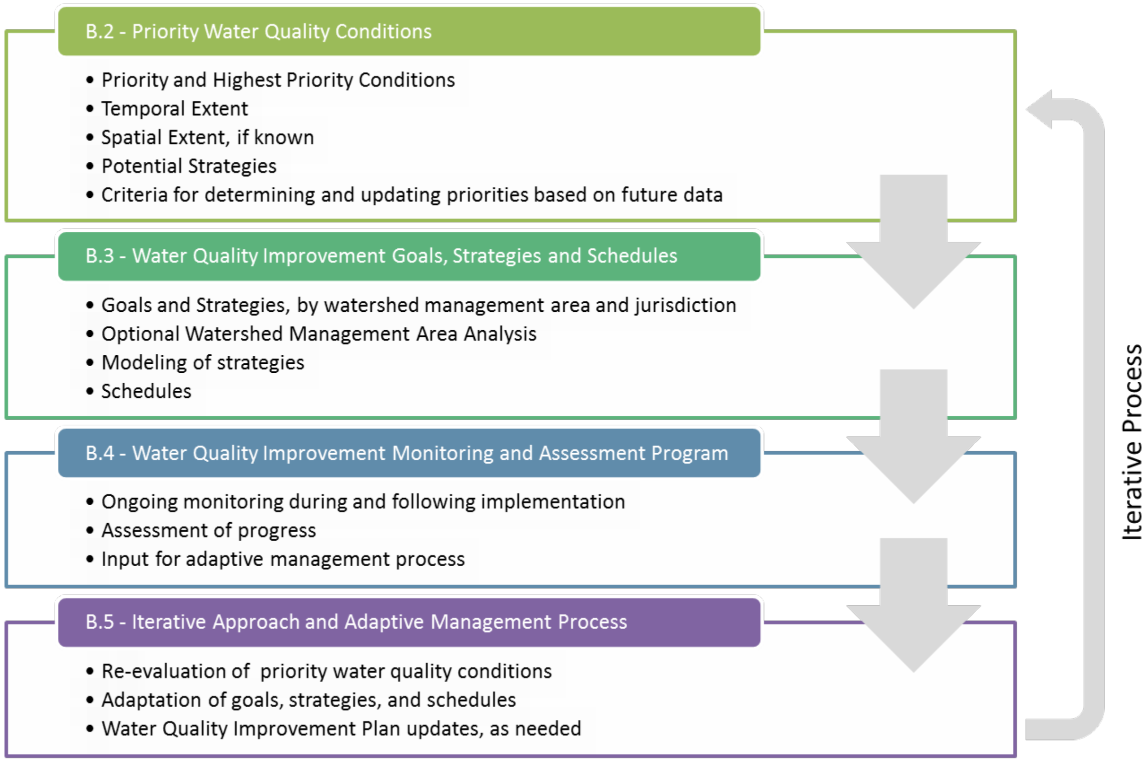
1.1.2 Urban Stream Syndrome

Many of the stream reaches in the SOC WMA suffer from "urban stream syndrome" (Walsh et al., 2005a) to varying degrees as a result of past modifications to stream form (i.e., channelization), increases in hydrologic loading, primarily from increases in imperviousness, dry weather nuisance water discharges, and/or increases in pollutant loads from urbanization. Except in certain reaches that are upstream of the limits of urbanization, most reaches are experiencing impacts associated with least two of these stressors. Conceptual relationships associated with urban stream syndrome are described in **Section 2.2** and have been considered as part of establishing priorities for this Plan.

1.3 Regulatory Basis

The development of this Plan is a requirement of the National Pollutant Discharge Elimination System (NPDES) Permit (Order R9-2013-0001, NPDES No. CAS0109266) (Permit) that was adopted by the San Diego Regional Water Quality Control Board (SDRWQCB) on May 8, 2013 and subsequently amended by Order No. R9-2015-001 and Order No. R9-2015-0100). The adoption of this Permit is intended to represent a shift from prescriptive, activity-based permit requirements to a strategic, outcome-driven approach focused on watershed-wide improvements through collaborative jurisdictional planning and implementation. Provision B of the Permit requires the phased development and implementation of a WQIP for the region's watersheds that is based on a systematic prioritization process that considers a number of related criteria. The sequence of Plan elements builds in an iterative process that allows the Permittees to adaptively manage changes in the watershed priorities as they are identified over time through Plan implementation. The main elements of this plan and the iterative process are described in **Figure 1-2**.

Figure 1-2: Overview of Water Quality Plan Elements and Process



1.4 South Orange County WQIP Process

The Plan has been developed in phases introduced above to meet the submittal requirements indicated in the Permit, facilitate public and Consultation Panel input, and build logically upon sequential efforts. The required Plan submittals and submission due dates are as follows:

- Provision B.2 – Priority Water Quality Conditions (April 1, 2016)
- Provision B.3 – Goals, Strategies and Schedules (October 1, 2016)
- Complete WQIP (meeting the requirements of Provision B) (April 1, 2017)

The Plan development process for Provision B.2 was initiated in September 2015 with a public participation kickoff meeting where the process for developing the Plan was described and a public solicitation was made for pertinent data to assist with Plan development. Consultation Panel meetings, which were open to the public, were also conducted on January 25, 2016, March 14, 2016, September 1, 2016 and March 1, 2017 to provide input on the development of the Plan.

2 PRIORITY WATER QUALITY CONDITIONS

The Program defines "water quality conditions" to include a range of related MS4-related factors that influence the status of beneficial uses of receiving waters. In addition to constituents in MS4 discharges, such factors can also include hydromodification, channel and habitat modification, composition and state of aquatic biota, changes to water balance, and others. This definition is consistent with Meybeck and Helmer's (1992) characterization of water quality as the composition and state of aquatic biota found in a waterbody in addition to a standardized set of concentrations, speciations, and physical partitions of organic and inorganic substances.

Consistent with these definitions, the priority water quality conditions (PWQCs) identified in this section are conditions within the receiving waters that, based on the best available data and information, warrant consideration for focused activity, manifested through the implementation of water quality improvement strategies. While improvement in the form, function, and achievement of beneficial uses of receiving waters is the ultimate goal of the Plan, the priority conditions identified in this section represent the functional "knobs and levers" that will be addressed through MS4 strategies and whose effectiveness can be monitored and adapted over time. Beneficial uses are much more likely to be achieved when watersheds and receiving waters exhibit "normal form and function." The priority conditions identified in this section provide a means of tracking progress toward this goal.

The Permit requires that this Plan identify the water quality priorities associated with MS4 discharges in the overall hydrologic unit. Additionally, the Permit allows the larger hydrologic unit to be separated into sub-watersheds to focus water quality prioritization and jurisdictional runoff management program implementation efforts. Conditions were evaluated for the six subwatersheds of the SOC WMA as listed below and shown in **Exhibit A-1** in **Appendix A**:

- Laguna Coastal Streams Watershed
- Aliso Creek Watershed
- Dana Point Coastal Streams Watershed
- San Juan Creek Watershed

- San Clemente Coastal Streams Watershed
- San Mateo Creek Watershed

In developing this plan, the Permittees have drawn upon their extensive knowledge of the conditions in the watersheds, supplemented by additional information provided by the public and other interested parties.

2.1 Data Compilation and Evaluation

The initial step conducted to evaluate the priority conditions in the SOC WMA was to identify available and applicable local data. The following sections describe the process used to acquire and evaluate all readily available information to satisfy the goal of identifying all priority conditions in the watershed. The evaluation focuses on data collected since 2010 in order to base the prioritization on current conditions and diminish problems associated with confounding due to increasing or decreasing trends. Historic (pre-2010) data is evaluated in the ROWD: State Of The Environment Report (County of Orange, 2014).

2.1.1 Data Sources

The process to evaluate conditions based on Permit provisions B.2.a through B.2.d included the compilation of available, local data from the Permittees, principally data from the MS4 outfall and receiving waters monitoring programs that have been conducted since 1990. To be certain that all possible information was considered, a public call for data was conducted between September 24, 2015 and October 23, 2015. An inventory of the initial plans, documents, and data sets considered in the development of this section appear in **Appendix B**. Where quantitative water quality analytical data and related geospatial data were available and applicable, and were collected as part of a monitoring program with formal collection and analysis protocols, the data were incorporated into the evaluation of conditions within the watershed as indicated in the following sections. Most of the quantitative monitoring data used for evaluation was collected after 2010, providing insight to the current conditions experienced in these watersheds. While older datasets were also available, these were generally not used to help reflect current conditions. Qualitative data were considered as well, to the extent feasible. For example, knowledge of potential plans to rehabilitate certain coastal estuaries (e.g., Aliso Creek Estuary) and/or streams was considered, as was knowledge of species reintroduction efforts.

2.1.2 Evaluation Approach

The overall approach to evaluate the applicable data was based on assessments of environmental significance and spatial extent. The first step was to evaluate water quality data using a combination of index-based water quality scoring systems, consistent with approaches utilized in the South and North Orange County ROWDs, as well as for water quality assessments conducted by the Central Coast Regional Water Quality Control Board and the Ventura Countywide Stormwater Quality Management Program. All indexing methods produce measures, scored from 0 – 100, that allowed for a consistent basis of comparison across indicators, as well as across sites and over time. All scoring was conducted so that lower scores represent worse conditions and higher scores better conditions. One method, the Canadian Council of Ministers of the Environment (CCME) index, was used to develop water quality scores for those constituents with applicable standards that could be used to assess exceedances. This index approach integrates several distinct metrics related to exceedance (i.e., scope, frequency, magnitude). This index provides a means of communicating water quality results that accounts for the number of indicators within each category (e.g., bacteria, metals) that exceed standards in each year, the percentage of individual samples that exceed standards, and the average magnitude of any such exceedances (CCME, 2001). A minimum sample count of 4 was used for each score to ensure statistical stability, consistent with the approach utilized by the Central Coast Regional Water Quality Control Board. Other indices included the Index of Biotic Integrity (IBI) and the H20 algal taxonomic index. Other indicators, such as percent impervious cover and percent of nontoxic toxicity tests, were also scaled from 0 – 100. An explanation of these indices and an inventory of the data inputs to index calculations are provided in **Appendix C**.

The second step was to utilize a GIS-based approach to visualize the spatial relationships and extents of measured water quality data. GIS tools were used to propagate water quality data or scores from discrete monitoring points moving upstream along stream reaches. Data propagation continued along stream reaches until a new monitoring station was reached that had the parameter of interest or until a limit of propagation was reached. Limits of propagation were instituted either where non-MS4 catchments were encountered or where structural facilities exist. This approach has been used by the Central Coast Regional Water Quality Control Board for stream report card purposes. It helps provide an assessment of the spatial extent of conditions. A GIS-based approach was also employed to aggregate properties from the portions of the watershed tributary to each reach segment to display metrics related to cumulative upstream stressors. For example, this aggregation approach was used to estimate composite imperviousness of the upstream watershed tributary to each reach. This analysis was used as a surrogate for degree of urbanization impacts likely present in each reach.

2.1.3 Data Evaluation

As indicated in the previous section, an extensive set of available and applicable local data was used to develop geospatial mapping exhibits, which display the spatial extent of both directly measured data and data translated into index-based scores. The particular quantitative data sets and the associated technical documentation regarding how they were utilized appear in **Appendix C**. To assist with data evaluation and interpretation, four functional groupings of individual metrics data were identified. These functional groups were constructed based on known or potential process-based linkages between monitoring metrics and beneficial uses, with the intent of focusing the prioritization effort on watershed-scale processes rather than simply on exceedances of individual monitoring metrics. Functional groups included:

- Human health risk related to recreation
- Eutrophication and nuisance conditions related to recreation and biology
- Geomorphic impacts related to biology
- Water quality related to biology

Metric groupings were mapped for both wet and dry conditions where data were available. Because interrelationships among factors within a watershed can be complex, the metric groupings displayed on the maps intentionally included stressors (e.g., nutrient levels), intermediate conditions (e.g., H20 algal taxonomic index), and endpoints (e.g., IBI). These maps were also plotted on a consistent base map and spatial reference that enables cross-referencing against supporting figures and across functional groups as well as interpretation of proximity to urban areas and sensitive resources. These conventions for data visualization enabled an improved understanding of the spatial relationships and apparent correlations between parameters. By applying the conceptual relationships explained in **Section 2.2.3**, these exhibits can be used to begin to understand the underlying stressors, intermediate conditions, and conceptual relationships/feedback loops that are most likely responsible for reduced form, function, and impairment of beneficial uses.

Scores for stream segments were propagated upstream from channel monitoring points until channel and watershed indicators established that propagation is no longer appropriate. Limits of propagation were specified based on significant transitions from MS4 to non-MS4 land uses. This approach may therefore overstate the spatial extent of issues, particularly where dry weather water quality issues are propagated through reaches that are dry. Additionally, a limit of propagation was specified at certain structural BMPs, and where BMPs are anticipated to be implemented in the near future, for example where San Juan Creek and tributaries enter the area to be developed as part of the Rancho Mission Viejo (RMV) project.

Map exhibits based on these functional groupings appear as follows in **Appendix A**:

<u>Human health related to recreation</u>

Exhibits in Appendix A display CCME indices for FIB, including fecal coliform (FC), *E. coli*, *Enterococcus*, and total coliform, plotted based on dry weather and wet weather conditions. FIB are currently used as the regulatory basis to predict the presence of human pathogenic bacteria, but do not themselves represent health risk to humans.

- Exhibit A-4 – Dry Weather Bacteria CCME Index
- Exhibit A-5 – Coastal Zone Dry Weather Bacteria CCME Index (zoomed version of Exhibit A-4)
- Exhibit A-6 – Wet Weather Bacteria CCME Index
- Exhibit A-7 – Coastal Zone Wet Weather Bacteria CCME Index (zoomed version of Exhibit A-6)

Eutrophication

- Exhibit A-8 – Eutrophication Issues
  - Single composite score based on average of nutrient CCME indices for Nitrogen and Phosphorus (wet and dry conditions) and H20 Algal index.

Geomorphic impacts related to biology

- Exhibit A-9 – Geomorphic Impact Related to Biology, independently showing:
  - Un-engineered (i.e., natural) stream reaches with estimated cumulative imperviousness of 10% or greater, estimated using land-used based methods and aggregated based on the tributary area to each stream reach.
  - IBI average of point measurements, propagated upstream through stream reaches.
  - Macro-scale hydromodification impacts, based on rapid aerial photographic assessment using historical aerials.

Water quality related to biology

- Exhibit A-10 – Water Quality Related to Biology
  - Single composite score for each reach, calculated based on average of dry and wet total dissolved solids (TDS) CCME indices, dry and wet weather pesticides CCME indices, and dry and wet toxicity (expressed as % non-toxic). All values ranged from 0 to 100 and were averaged with equal weighting.

In addition to the functional groups identified above, additional maps were prepared to assist with identifying impacts, resources, and mitigating/exacerbating factors.

- Exhibit A-11 – Trash Abundance
- Exhibit A-12 – Invasive Plant Species
- Exhibit A-13 – Sensitive Resources
- Exhibit A-14 – NPDES Permitted Discharges
- Exhibit A-15 – Structural Stormwater Control Measures
- Exhibit A-16 – High Value Areas

- Exhibit A-17 - Dry Weather Metals CCME Index
- Exhibit A-18 – Wet Weather Metals CCME Index

It should be noted that the maps are used as "tools" to facilitate understanding of watershed conditions, processes and linkages for the specific purpose of prioritizing water quality conditions. These maps were not intended to, nor are able to, represent all conditions at all times, nor are they intended to provide definitive proof of causal relationships.

2.1.4 Aliso Creek Estuary Restoration Studies

The *Draft Aliso Creek Estuary Restoration Existing Conditions Report* (ESA, 2015, final version was not available for review) and *Aliso Estuary Design Workshop Report* (Stein, 2016) were reviewed as part of prioritization of water quality conditions. These reports provide supplemental information about existing conditions within the Aliso Creek Estuary what is reflected in the County's datasets. These reports also provide the conceptual outline of potential restoration strategies being considered.

The Existing Conditions report summarizes the existing condition and restoration value of the Aliso Creek Estuary as follows:

> *"The Creek once drained to the Pacific through a broad, expansive estuary with extensive wetlands, as evidenced in historical photographs and maps (see Section 1.3). The creek's estuarine habitat has suffered degradation through modification of its hydrologic regime (from urbanization of the watershed) and physical modification of the mouth of the creek and its banks. The Aliso Estuary is a site of extremely high restoration value, due to its key geographic location between two regionally significant ecosystem reserve systems: the terrestrial greenbelt, or 'superpark' comprised of ~15,000 acres of preserved natural habitats in the San Joaquin Hills, and the bluebelt of the coastal and offshore Laguna State Marine Reserve recently established through the Marine Life Protection Act. The Aliso Creek estuary is the only location where a viable habitat linkage between these two systems can be developed. It is also the only location between San Mateo Creek (to the south) and Newport Back Bay (to the north) where the possibility exists to link protected freshwater and coastal ecosystems."*

The *Existing Condition Report* identifies key water quality impairments are identified as:

- Bacteria,
- Nutrients and eutrophication,
- Selenium, and
- Sedimentation from upstream stream erosion.

This report also identifies key physical/hydrological issues as:

- Historical fill, associated channelization and elevated potential for scour associated with channelized condition
- Constrictions and scour associated with the Pacific Coast Highway bridge
- Elevated freshwater inflows
- Unnatural berm breaching from Army Corps-permitted berm management activities and/or elevated freshwater inflows

Of the issues identified above, the following have a significant nexus to MS4-discharges:

- Bacteria loading,
- Nutrient loading,
- Elevated freshwater inflows, primarily associated with elevated dry weather runoff, and
- Sediment from channel erosion.

The *Aliso Estuary Design Workshop Report* provided a similar summary of issues and identified proposed restoration goals as:

- Promote resiliency by basing restoration on historically-informed ecosystem processes while considering climate change effects
- Develop a long-term management strategy that is proactive, adaptive, minimally intrusive and process based
- Develop restoration priorities that support the Wetland Restoration Project regional strategy
- Promote the use of Aliso Estuary for research, education and community engagement

The *Aliso Estuary Design Workshop Report* identified reduction in freshwater inflows, nutrients, and bacteria, as watershed management activities that are desirable to support restoration.

The information contained in these reports was considered in prioritization as discussed in Section 2.2.3.3 and 2.3.2.1.

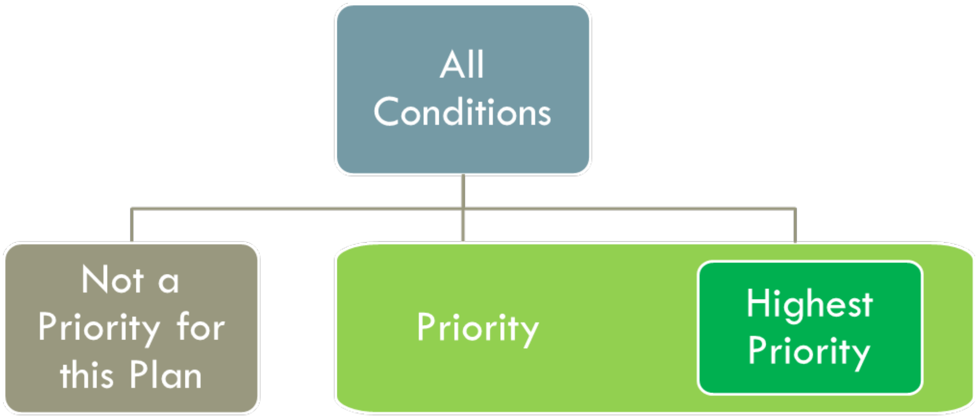
2.2 Conditions Evaluation and Prioritization

In accordance with Section B.2.c of the MS4 Permit, water quality conditions were evaluated and categorized as "priority" and "highest priority" based on (Permit references in parentheses):

- Assessment of receiving water conditions (B.2.a)
- Assessment of impacts from MS4 discharges (B.2.b)
- Assessment of MS4 sources of pollutants and/or stressors (B.2.d)

Figure 2-1 depicts the relationship between the levels of priority associated with water quality conditions.

Figure 2-1: Relationship among Water Quality Conditions



The following subsections provide the criteria and rationales associated with these categories and the results of the data evaluation, with initial findings regarding the temporal and spatial extent of each priority category provided to the extent information is available and adequate. Prioritization results will be regularly re-evaluated as part of the monitoring and adaptive management process, including filling data gaps and monitoring progress over time.

2.2.1 Non-Priority Conditions

Certain conditions that were evaluated do not appear to warrant consideration as priority conditions as part of this Plan. Conditions that are "non-priority" and are not included in this Plan include those that meet one or more of the following criteria described in **Table 2-1**.

Table 2-1: Non-Priority Water Quality Conditions

Category of Non-Priority Condition	Temporal Applicability	Spatial Applicability	Tentative Extent of Non-Priority Designation
Dry streams or reaches	Dry weather (outside of normal ephemeral flow period)	Stream reaches that are naturally ephemeral and are demonstrated to have no dry weather baseflow under normal conditions.	Reaches indicated as dry in Exhibit A-2, to be refined through monitoring and adaptive management.
Lack of ongoing exceedances or impairments	Dry or Wet	Stream reaches or coastal waters where monitoring data demonstrate reasonably good conformance with water quality objectives or	Toxicity (wet and dry) Pesticides (dry) Indicator bacteria (dry) at coastal points, except at isolated beaches

Category of Non-Priority Condition	Temporal Applicability	Spatial Applicability	Tentative Extent of Non-Priority Designation
		impairments near natural background levels.	Indicator bacteria in Sulphur Creek Reservoir/Laguna Niguel Lake Metals (wet and dry)
Very low intensity of a specific beneficial use (this results in non-priority for water quality conditions that impact that use)	Dry or Wet	Reaches where it is demonstrated that the intensity of a designated beneficial use is very low	Indicator bacteria in engineered channels, storm drain pipes, and similar non-accessible MS4 infrastructure
A specific beneficial use is not reasonably attainable (this results in non-priority for water quality conditions that impact that use)	Dry or Wet	Reaches where it is demonstrated that the designated beneficial use is not reasonably attainable	Biological, toxicity, and eutrophication indicators and related parameters in concrete or riprap channels, storm drain pipes, and similar drainage features
Not a source from or controllable by the MS4	Dry or Wet	Where appropriate studies show that MS4-related sources or impacts have been controlled to a satisfactory level and/or remaining impairments to receiving waters are predominantly of non-MS4 origin	TDS (dry) Phosphorus (dry) Selenium (wet and dry)

As a result of data gaps (see **Section 2.2.4** for additional discussion regarding data gaps), the current non-priority condition designations listed in **Table 2-1** are tentative and will be refined and re-evaluated on a regular and ongoing basis as part of the monitoring and adaptive management phases of this Plan.

2.2.2 Priority Water Quality Conditions

PWQCs include pollutants, stressors and/or receiving water conditions that are considered to threaten receiving water quality or adversely affect the quality of receiving waters. In effect, this group reflects the relevant water quality conditions that remain after excluding the non-priority categories and their tentative spatial extents per **Section 2.2.1**. A subset of these conditions is further categorized as Highest Priority Water Quality Conditions (HPWQCs) in **Section 2.2.3.** A summary of PWQCs is shown in **Table 2-2**, organized by the functional groupings introduced earlier. **Exhibits A-4 through A-13** identify the tentative temporal and spatial extent of these conditions.

Table 2-2: Priority Water Quality Conditions

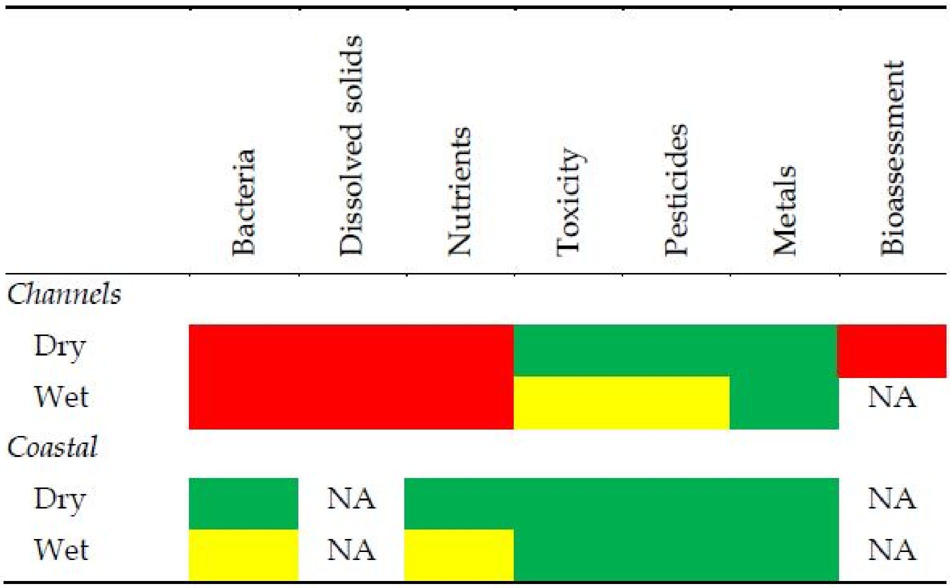
Category	Condition/ Parameter	Temporal Extent	Geographic Extent[1] (to extent known)
Human health risk related to recreation	Indicator Bacteria	Dry	Coastal, isolated Inland, where recreational access is allowed and supported
		Wet	Coastal, most locations
Eutrophication and nuisance conditions	Nutrients	Dry	Inland waters, most locations where dry weather flows are present
		Wet	Localized inland waters, extent of individual parameters to be refined
	Eutrophication indicators (e.g., algal, dissolved oxygen, turbidity)	Dry	Inland waters, most locations where dry weather flows present
	Turbidity	Wet	Inland, limited (limited to Prima and Segunda Deshecha Creeks)
	Trash	Wet and Dry	Coastal and inland, as indicated in Exhibit A-11 (data represented is from discrete round of inspections, does not represent long term trends)

Category	Condition/ Parameter	Temporal Extent	Geographic Extent[1] (to extent known)
	Stream erosion impacts	Wet and Dry	See below; also grouped with nuisance category due to safety and aesthetic issues
Geomorphic impacts related to biology	Macro-scale stream erosion and associated impacts	Wet and Dry	Reaches experiencing major erosive impacts, as indicated on Exhibit A-9, subject to refinement
	Likely or potential stream erosion and associated impacts	Wet and Dry	Natural reaches with greater than 10 percent estimated impervious cover, on Exhibit A-9, subject to refinement
	Sediment (turbidity, TSS) from stream erosion	Wet	Reaches experiencing impacts from upstream stream erosion.
	IBI or other bioassessment scores	Dry and Wet	Most locations where dry weather flow is present, as indicated on Exhibit A-9, and channel type supports biological functions
Water quality conditions related to biology	IBI or other bioassessment scores	Dry and Wet	Inland, where dry weather flow is present and channel type supports biological functions
	Toxicity	Wet	Inland channels, where indicated on Exhibit A-10 (extent of individual parameters to be refined) and where channel type supports biological functions
	Pesticides	Wet	Inland channels, where indicated on Exhibit A-10 (extent of individual parameters to be refined) and where channel type supports biological functions

[1] – Except where condition is non-priority based on criteria described in Section 2.2.1.

The outcome of the assessment of data establishing the Priority Water Quality Conditions presented in **Table 2-2** appears consistent with the conclusions of the ROWD that evaluated data in a similar manner (i.e., using CCME index scoring) from 2003-2013. The summary of conditions from the ROWD is depicted in **Figure 2-2**.

Figure 2-2: Overall Summary of ROWD Results of Prioritization Analysis



Red represents persistent and widespread exceedances of regulatory thresholds, yellow occasional exceedances, and green few if any exceedances. Measures of exceedance used in this analysis accounted for both the frequency and the magnitude of exceedance.

2.2.3 Methodology for Selecting Highest Priority Water Quality Conditions

The Permit requires that rationale be developed to select a subset of conditions and associated spatial and temporal extents as the HPWQCs. Goals, strategies, monitoring and adaptive management measures are required to be formulated for these conditions. As a result, the identified HPWQCs are expected to have the greatest influence in the development of the Plan. The following factors were considered to select the HPWQCs:

- **Severity of issue** – How extensively, frequently, and by what magnitudes are water quality objectives or standards being exceeded?
- **Causal linkages to other conditions** – How strong are the causal relationships between the condition and other dependent conditions? What is (are) the relative priority(ies) of the dependent conditions?
- **Linkage to intensity of beneficial use** – How strong is the relationship between the condition and an impairment of high intensity beneficial uses?

- **Nexus to controllable MS4 discharges** – How clearly do the data support a nexus to a controllable MS4 discharge? What is the relative role of MS4 discharges in the condition?
- **Existing regulatory driver** – Is there an approved TMDL?
- **Nexus with integrated water management activities** – What relationships does the condition have to other aspects of integrated water management (e.g., water conservation, groundwater management)?
- **Achievable improvements** - What degree of improvement can be reasonably achieved in the short and long term?
- **Ability to model improvement** – How well-established is (are) the predictive framework(s) for evaluating the likely response to management actions?
- **Phasing as part of adaptive process** – Based on the above factors, what are the most appropriate conditions to prioritize in the short term, with the understanding that the adaptive process will be ongoing and serve to fill data gaps, assess progress, improve understanding of causal relationships, and potentially update all elements of the Plan over time.

It should be noted that the establishment of HPWQCs is not a static process and is expected to be influenced by both short-term factors (i.e., what is known at this time about the best place to start?), mid-term factors (i.e., what has been learned from adaptive implementation and monitoring?), and long-term factors (i.e., what is the overall vision for protecting and restoring the form and function of resources? Have efforts resulted in the successful attainment of beneficial uses?). The following sections describe how these considerations were applied within the overall context of selecting highest priority conditions based on functions and values of the receiving waters.

2.2.3.1 Coastal Waters

The primary criteria used to assess coastal waters include a subsect of the overall list introduced above.

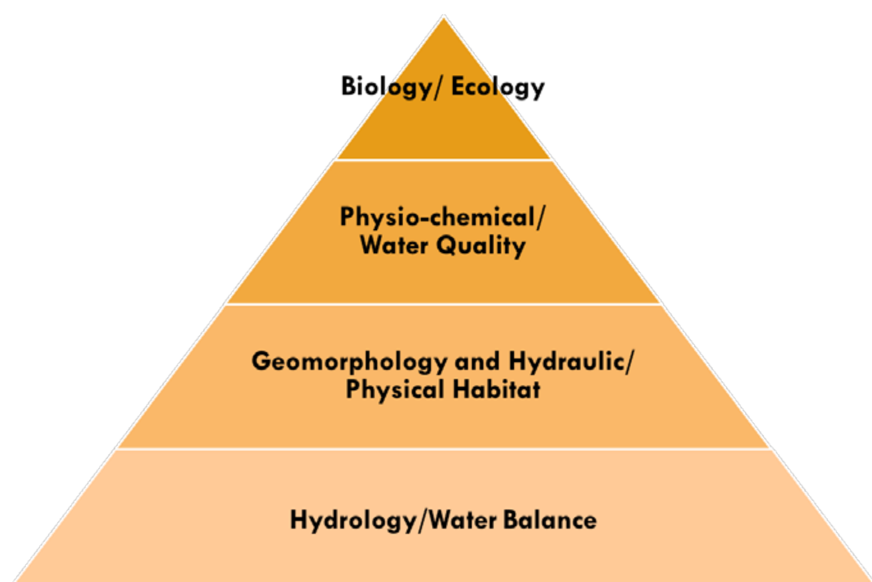
- **Severity of issue** – evaluated based on CCME indices for fecal indicator bacteria (FIB) and metals.
- **Linkage to intensity of beneficial use** – assessed based on known high recreational intensity (e.g., swimming beaches and surf locations) and sensitive areas (e.g., Areas of Special Biological Significance (ASBS); and Marine Protected Areas (MPAs)).
- **Nexus to controllable MS4 discharges** – assessed based on outfall locations and mouth of stream relative to recreational uses and sensitive areas.
- **Other regulatory drivers** – Considered presence of adopted TMDLs for indicator bacteria as well as regulations and standards related to ASBS.

These criteria were adequate to reach conclusions about the HPWQCs for coastal waters, which are discussed in **Section 2.3.1**. This use of the term coastal waters does not include estuary systems.

2.2.3.2 Inland Waters

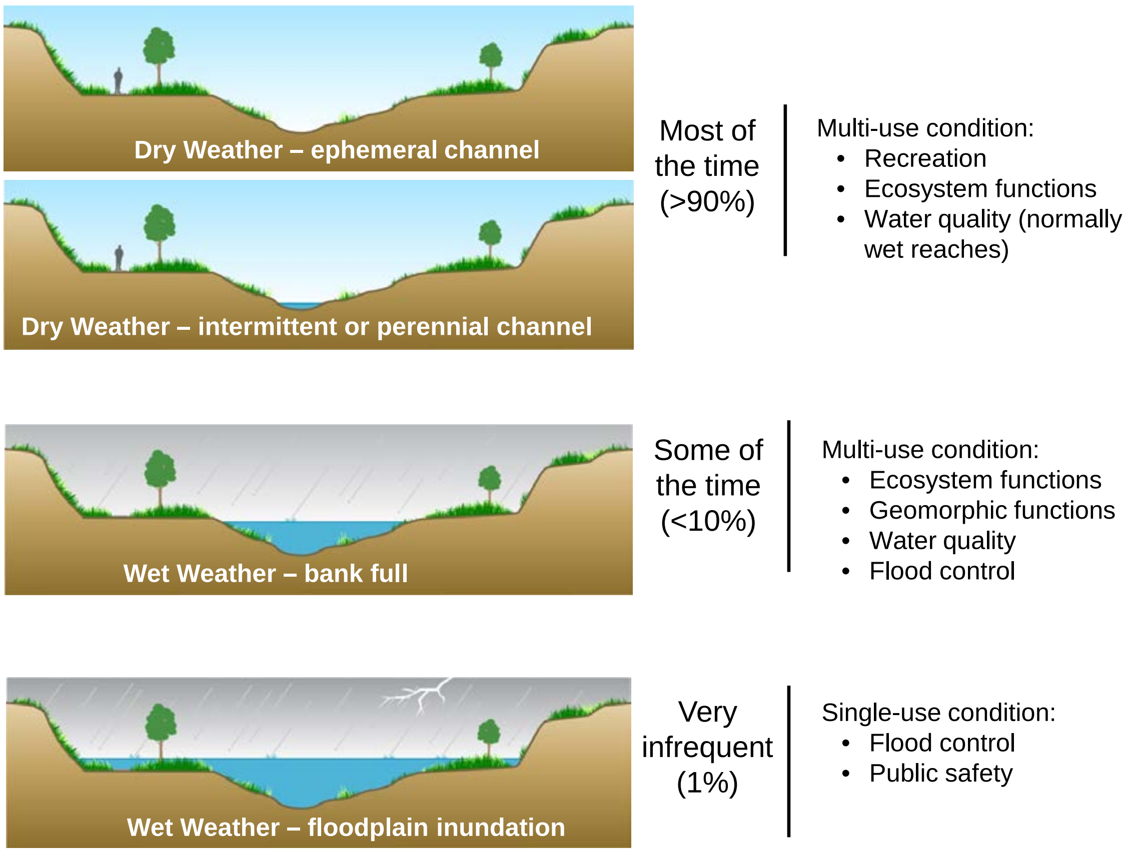
Establishment of the HPWQCs for the inland waters (i.e., stream, creeks and tidally influenced receiving waters, e.g., estuaries) involve evaluation of more complex interrelationships: inland waters experience a range of priority conditions related to flow, water quality, physical habitat, biological integrity, and geomorphology. Conditions are highly interrelated at a given reach and between upstream and downstream reaches, and it is common for two or more overlapping "urban stream syndrome" stressors (see **Section 1.1.2**) to be present within a given reach. Therefore, it can be a challenging and uncertain exercise to identify the specific metrics or indicators that are limiting the restoration of beneficial uses and establish predictive relationships. Finally, only certain conditions are related to the MS4 and are reasonably controllable to a significant degree by MS4 agencies. In considering the inland receiving waters (inclusive of estuaries) in South Orange County, a useful conceptual model adapted from Harman (2014) considers a function-based framework for stream restoration as depicted in **Figure 2-3**. This framework is inclusive of the conventional physiochemical elements of water quality as well as the aquatic and riparian biota that is part of the more holistic definition of water quality offered by Meybeck and Helmer (1992).

Figure 2-3: Function-Based Framework for Stream Restoration



In understanding potential priorities for inland streams, it is also important to recognize the timescales associated with stream processes and beneficial uses. Dry weather is the dominant condition based on period of time; however, wet weather conditions can have large episodic effects and exert a large, but short-lived demand on the system. The predominant beneficial uses under different temporal conditions are depicted in **Figure 2-4**.

Figure 2-4: Variation of Inland Stream Temporal Conditions



One premise of the framework described in **Figure 2-3** is that efforts to improve riparian biological communities (pinnacle of the Function-Based Framework for Stream Restoration) are likely to be most successful if the supporting foundational layers are in place. Additionally, an improvement implemented closer to the base of this hierarchy is likely to have the most far-reaching positive reinforcement cycle and/or reduce the degree of compensation needed to effect improvements at higher dependency levels. For example, maintaining a more natural flow regime can help improve physical habitat and moderate pollutant loadings to help reduce the sensitivity of the system to natural or unavoidable disturbances in water quality.

Combining the frameworks described in **Figure 2-3** and **Figure 2-4** provides a basis for understanding where conflicts or synergies between beneficial uses may arise and the most appropriate measures for mitigating or capitalizing on these effects. For example, many of the channels in the SOC WMA have long served a flood control beneficial use, which represents a departure from natural conditions at the base of the pyramid (hydrology) during wet weather and has predictably expressed itself in impacts to higher levels of the pyramid (i.e., channelized or piped reaches, erosion, and associated higher order impacts). However, this condition has very limited spatial and temporal extent. Therefore, if channels can be designed to accommodate very infrequent flood uses while also supporting more natural geomorphic processes and providing intact physical habitat (second tier) under dry weather conditions and smaller storms, the conflict between flood uses (to protect life and property) and other beneficial uses can be better managed.

This framework also highlights the linkages between stream restoration and other beneficial uses, such as recreation (positive correlation to geomorphology, physical habitat, water quality, and biology) and water supply (various relationships to water balance and water quality).

While wet and dry weather conditions are not independent, it is meaningful to describe separate relationships within the stream systems under each condition. An example of interrelation of conditions in inland stream systems in dry weather is depicted in **Figure 2-5**. Lighter to darker colors indicate the degree of ability for MS4-related strategies to directly influence the stressor or condition, which accounts for strength of causal relationship, degree of achievable improvement, and nexus to MS4 discharges. The arrows indicate lines of influence and can be used to assess the degree of cascading dependency on the stressor or condition (i.e., how much does it influence other parameters, which in turn influence others?). **Figure 2-6** uses a similar approach to introduce the conceptual relationships that are most dominant under wet weather conditions.

Figure 2-5 and **Figure 2-6** are interpreted in **Section 2.3** relative to their role in identifying highest priority water quality conditions. These schematics are not exhaustive or definitive but serve as a useful tool for understanding conceptual relationships. They are not intended to be self-explanatory in identifying the HPWQC.

Figure 2-5: Causal Linkages – Dry Weather Stream Functions

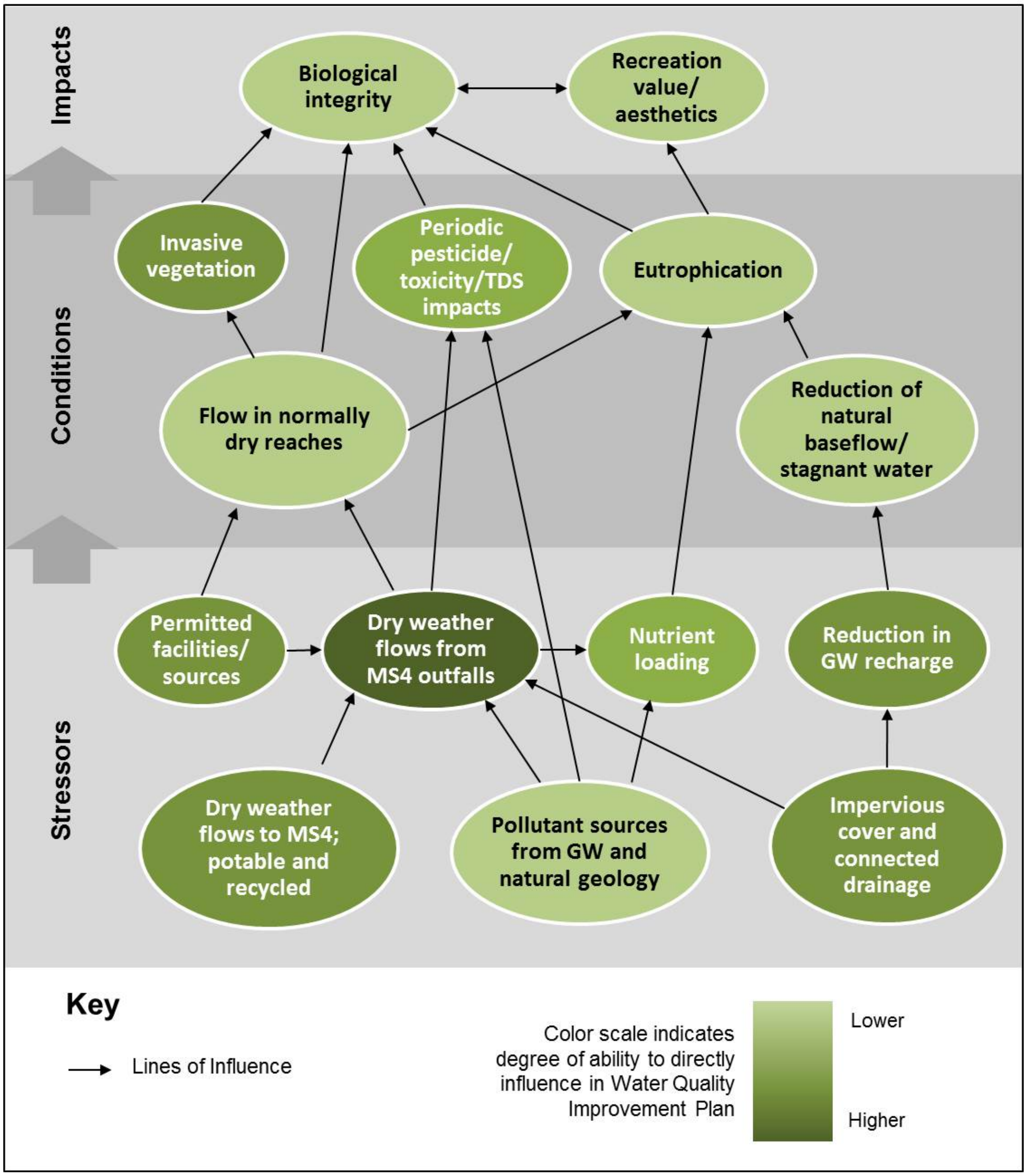
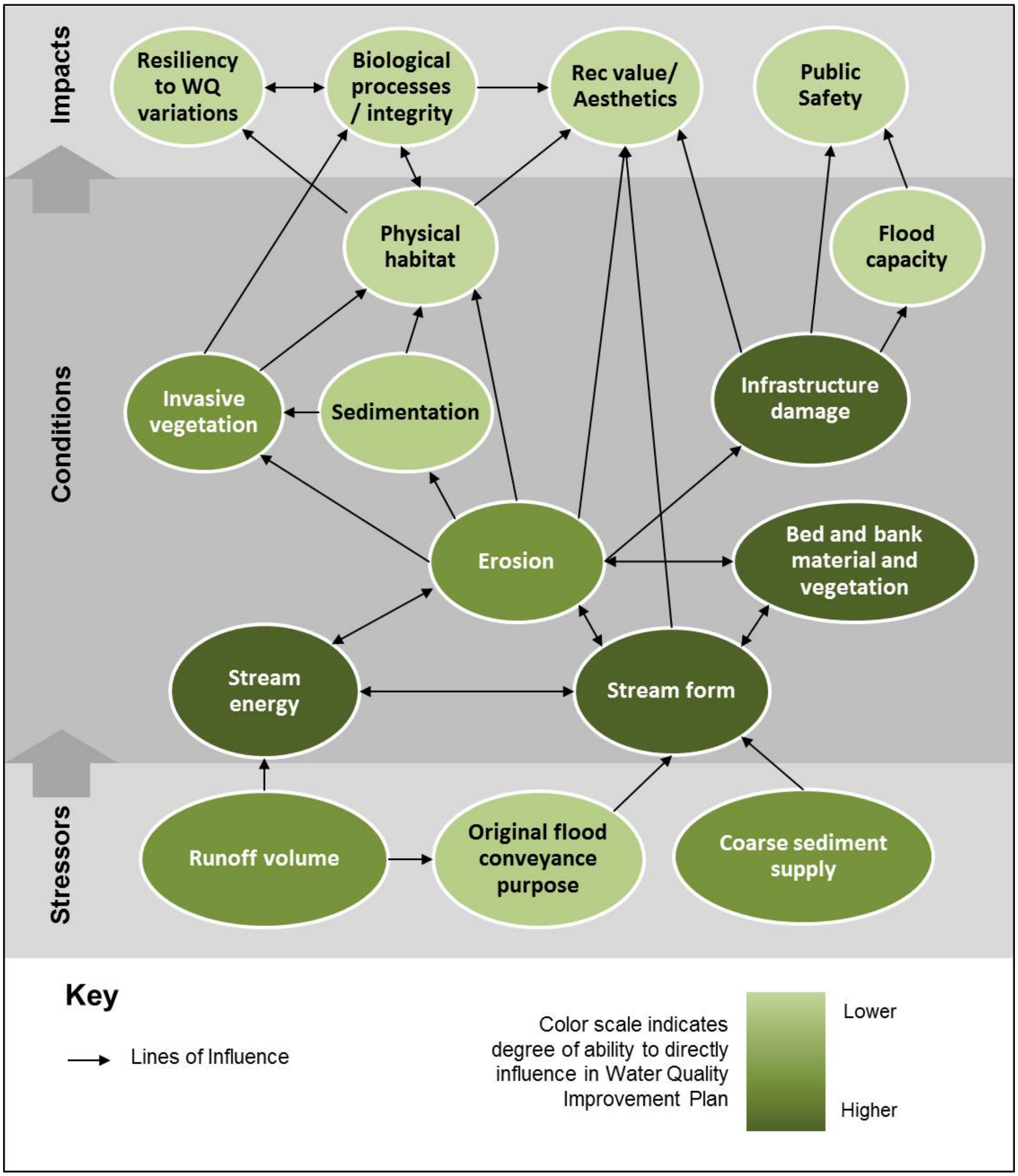


Figure 2-6: Causal Linkages – Wet Weather Stream Functions



In summary, the method for evaluating HPWQCs in inland waters and estuaries involved the full suite of considerations identified in opening paragraph of **Section 2.2.3**. The manner in which each consideration was assessed is summarized as follows:

- **Severity of issue** – Evaluated based on CCME indices introduced in **Section 2.1**.
- **Causal linkages to other conditions** – Evaluated based on functional groupings discussed in **Section 2.1**.
- **Linkage to intensity of beneficial use** – Evaluated based on functional groupings and most valued beneficial uses, including non- contact recreation, habitat/biology, flood conveyance, and water supply. Knowledge of potential estuary or stream rehabilitation efforts and/or species recover efforts was also considered.
- **Other regulatory drivers** – This was evaluated considering the absence of TMDLs within most inland waters, except at mouth in some cases.
- **Nexus to controllable MS4 discharges** – This was evaluated primarily via the causal linkages introduced in **Figure 2-5** and **Figure 2-6** as well as the spatial relationship of urbanization relative to channel reaches.
- **Nexus with integrated water management activities** – Evaluated primarily via causal linkages introduced in **Figure 2-5** and **Figure 2-6**, specifically the linkage between potable or recycled water use in the watershed and associated impacts within inland waters. This was also assessed based on the conceptual temporal model introduced in **Figure 2-4**. Knowledge of potential rehabilitation and species reintroduction efforts was also considered.
- **Achievable improvements** – Evaluated primarily via causal linkages introduced in **Figure 2-5** and **Figure 2-6**. This was also assessed based on the conceptual temporal model introduced in **Figure 2-4** and the constraints on channel functions during wet weather.
- **Ability to model improvement** – This factor was considered by focusing on the factors that are closer the base of Harman's hierarchy introduced in **Figure 2-3**. Improvement in these factors is simpler to model.
- **Phasing as part of adaptive process** – This factor primarily via the hierarchy introduced in **Figure 2-3** as well as consideration of the confounding factors introduced by urban stream syndrome in defining appropriate physiochemical endpoint prior to addressing hydrologic/flow regime and geomorphic/physical habitat issues.

2.2.3.3 Extension of Prioritization Methodology to Aliso Creek Estuary

As noted above, estuaries were grouped with inland receiving waters for overall prioritization. These systems experience similar inputs from the MS4 and similar overlapping stressors associated with urban stream syndrome. In addition, information from the *Draft Aliso Creek Estuary Restoration Project Existing Conditions Summary Report* (ESA, 2015), and the *Aliso Estuary Design Workshop Report* (Stein, 2016) was also considered in prioritizing water quality conditions of concern in these systems. Section 2.1.4, above, summarizes the content and findings from these reports. Section 2.3.2.1, below, discusses how these considerations influenced the identification of the HPWQCs that apply to the Aliso Creek Estuary.

2.2.4 Data Adequacy and Gaps

The previous sections present narrative criteria and conceptual approaches (rationale) for identifying the HPWQC in the South Orange County watersheds. While a large volume of data were evaluated, the size and complexity of SOC WMA resulted in significant data gaps related to geographic extents of conditions. Additionally, because of the relatively extreme variability in hydrologic conditions from year to year that is inherent in Southern California, it is challenging to define normal wet and dry weather conditions to understand temporal extents.

For example, it is known that the dry weather discharges noted in channels is from a limited data set used in this effort, but it is acknowledged that other data and information exist that may yield further insight and enhancement of the spatial extents. In general, some data gaps may be possible to fill through further investigation as part of the planning process (**Section 3**), while other data gaps may need to be filled as part of the implementation, monitoring, and adaptive management process (**Section 4**).

2.3 Highest Priority Water Quality Conditions

2.3.1 Coastal Waters

The assessment methodology described in **Section 2.2.3.1** clearly shows that indicator bacteria are the predominant water quality issue along the coastal waters. MS4 outfalls generally contribute bacteria loading in both dry and wet weather as indicated on **Exhibits A-5** and **A-7**, although there are certain sites that exhibit conditions where the MS4 discharge does not impact the coastal waters. The coastal beach and surf zone are high-valued recreational areas in both dry and wet weather and therefore have the potential for pathogenic human health risk. The direct relationship between the condition and the beneficial use clearly align to elevate this condition to a HPWQC. Additionally, the numeric criteria and schedule of compliance defined in the *Revised Total Maximum Daily Loads for Indicator Bacteria, Project 1 – Twenty Beaches and Creeks in the San Diego Region* and *Total Maximum Daily Loads for Indicator Bacteria: Project II - Baby Beach in Dana Point Harbor and Shelter Island Shoreline Park in San Diego Bay* (Bacteria TMDLs) establishes a high priority for addressing pathogenic human health risk.

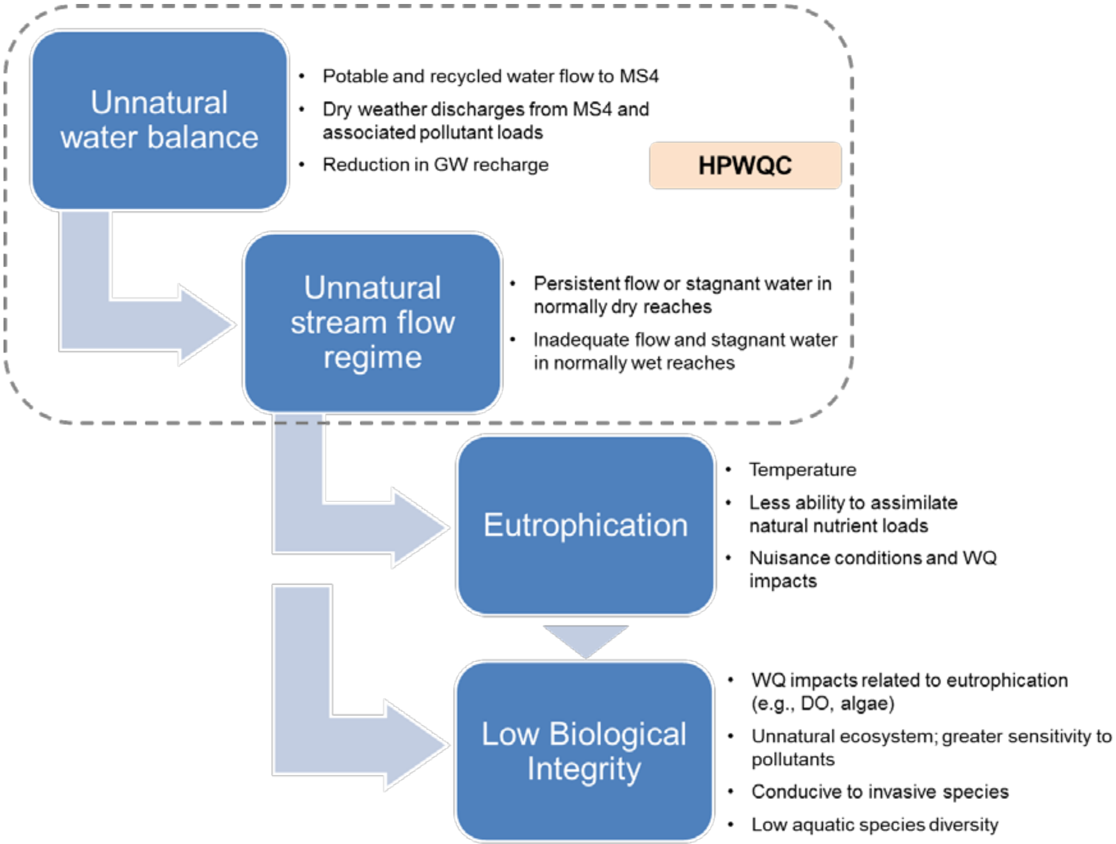
2.3.2 Inland Waters

Applying the criteria and framework established in **Section 2.2.3**, and based on inspection of the causal linkages shown in **Figure 2-5**, priority conditions in dry weather including eutrophic conditions and low IBI scores have a common thread that can be traced as shown in **Figure 2-7**. In **Figure 2-5**, both conditions pass through water balance related issues (flows in normally dry reaches, reduction in baseflow in normally wet reaches) that are controllable to a significant degree by MS4-related actions. The thread shown in **Figure 2-7** illustrates the impact of an unnatural water balance on the noted conditions and shows how the conceptual model and the functional groupings can be considered to identify HPWQCs. In this conceptual model, correcting unnatural water balance equates with restoring the base of the pyramid in **Figure 2-3**, increasing the chance of reducing IBI impacts and eutrophic conditions by addressing the key processes that promote such conditions. As long as the flow regime in channels is unnatural in its timing or magnitude, actions to compensate for IBI or eutrophication would likely be less efficient, less effective or would not be controllable by the MS4. For example, under dry weather conditions, natural sources of nutrients coupled with stagnant water create conditions that cannot likely be addressed through any level of nutrient reduction from the MS4 system. As such, **unnatural water balance and stream flow regime** (combination of the MS4 controllable elements in the first two boxes) is considered a HPWQC.

Unnatural flow regime (elevated dry weather flowrates) and associated dry weather pollutant inputs from the MS4 are also potentially significant stressors to estuary systems at the mouth of Aliso Creek and San Juan Creek. Efforts to address this HPWQC are expected to support potential efforts to rehabilitate these systems.

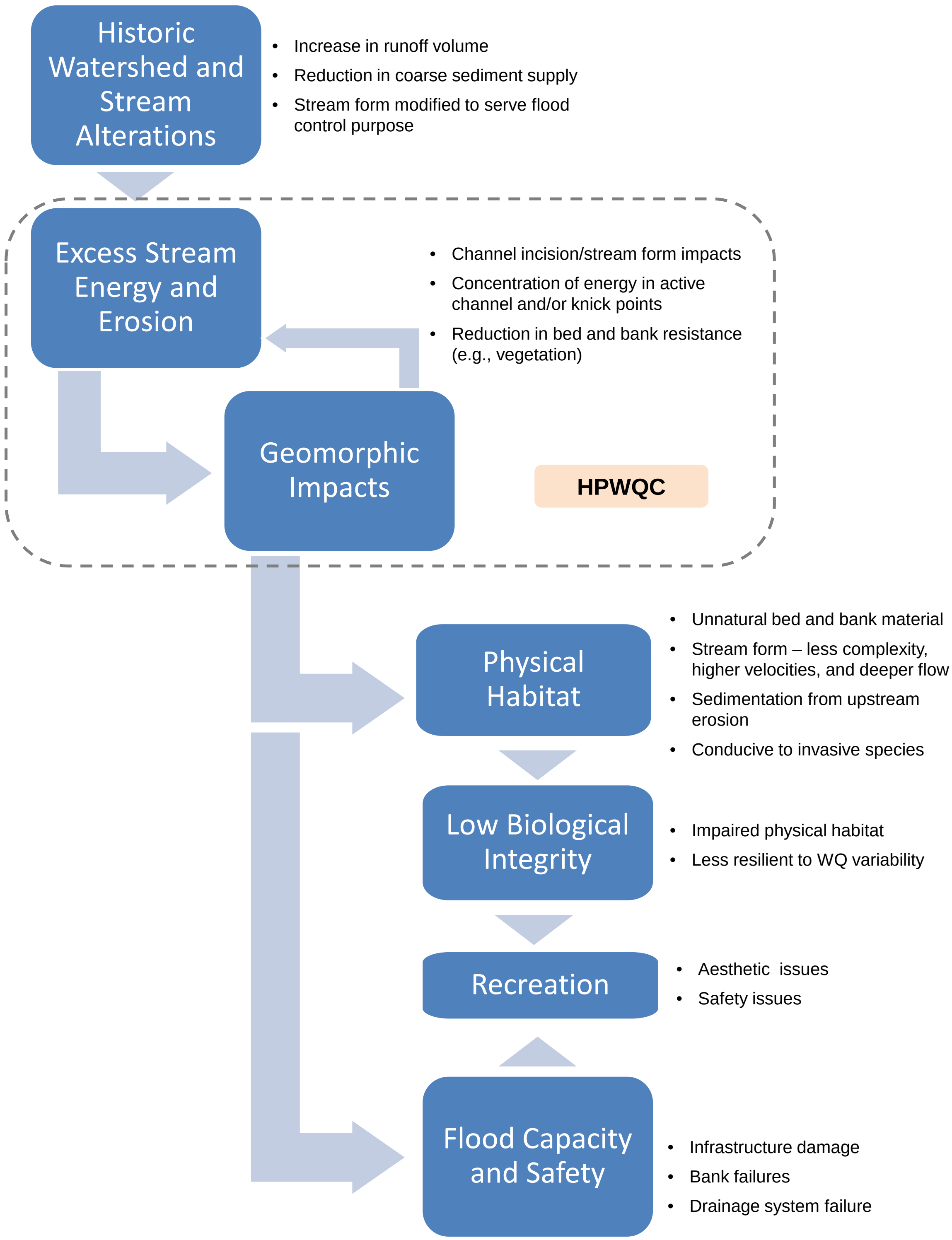
In addition, this condition was also elevated to a HPWQC because of: (1) nexus to integrated water management (i.e., water conservation, groundwater recharge), (2) nexus to recreational beneficial uses, (3) ability to quantitatively estimate improvements, (4) ability to achieve improvements through MS4 actions.

Figure 2-7: Dry Weather HPWQC Condition Thread for Inland Waters



A similar rationale to identify the critical path in the causal relationships for wet weather conditions can be developed through interpretation of **Figure 2-6**. Unlike dry weather discharges, MS4 agencies have more limited ability to influence the overall hydrologic load during extreme event (i.e., the flood control beneficial use) and the overall water balance (i.e., volume and energy of wet weather runoff) in watersheds that are predominantly built-out. However, because these conditions, particularly flood conditions, are relatively rare, it is possible to limit the extent to which these conditions influence other beneficial uses. Countering and rehabilitating geomorphic impacts (i.e., stream energy, stream erosion, stream form, and bed and bank material/vegetation) is expected to create physical habitats condition that are more likely to support biological and recreational beneficial uses. Based on this thread, **Figure 2-8** shows how the HPWQC for wet weather in inland streams relates to improvement and restoration of beneficial uses related to biological, recreational, and public safety end points.

Figure 2-8: Wet Weather HPWQC Condition Thread for Inland Streams



As depicted in **Figure 2-8**, adverse impacts to physical habitat and associated impacts to riparian biology can be traced back to excess hydraulic energy resulting in channel erosion. Given the degree of hydrograph modification (e.g., wet weather runoff volume and peak flow increases) and associated geomorphic impacts (i.e., erosion, incision) that have occurred as a result of past land development activities, this Plan specifically does not identify wet weather water balance/flow management as an individual HPWQC. While this could be part of a strategy, in many cases the degree of change that could be realized is minor. Additionally, where channel degradation has occurred, correcting hydrologic inputs is not adequate to restore stream form. Rather, this HPWQC is related to the combination of hydrograph modification and channel geomorphic conditions that has resulted or will potentially result in excess stream energy and unnatural levels of erosion. Macro-scale erosion impacts were noted from a rapid screening assessment of the watersheds as depicted in **Exhibit A-9**. **Adverse hydromodification (geomorphic impacts)** is another example of where the conceptual model and the functional groupings align to elevate a condition to HPWQC.

Controlling excess sediment loads originating from stream erosion is reduce unnatural sedimentation in downstream reaches and should provide support downstream ecosystem restoration projects, such as estuary rehabilitation and/or species recovery projects.

Based on the criteria and rationale presented in the previous sections, **Table 2-3** summarizes the HPWQC for the SOC WMA. It should be noted that identification of HPWQC does not imply that other conditions are not a priority. Rather, these conditions have been identified as being the highest priority at this time and represent a durable and actionable set of initial priorities for development of a long term, adaptive plan. It should also be noted that HPWQCs may change over time as more information becomes available about the watersheds and their response to improvements.

Table 2-3: HPWQC for the South Orange County Watershed Management Area

Condition	Temporal Extent	Geographic Extent (or narrative criteria for future effort to define geographic extent)
Pathogen Health Risk	Dry and Wet	Beaches • Where recreational use/high value and persistent exceedances of FIB standards (limited extent in dry; most beaches during wet)
Unnatural Water Balance/Flow Regime	Dry	Stream Reaches and Coastal Estuaries • Reaches and outfalls demonstrated to be ponded or flowing in dry weather • Areas with other observed issues exacerbated by unnatural water balance (e.g., low IBI, high eutrophication, high invasive species) • Areas with highest intensity of recreational use/visibility • Areas that contribute unnatural dry weather flow to Aliso Creek Estuary
Channel Erosion/ Geomorphologic Impacts	Dry and Wet[1]	Stream Reaches • Where impacted • Where degraded channel form has become limiting factor in channel ecology • Areas with highest intensity of recreational use/visibility • Where sediment or particulate-bound pollutants are contributing to downstream water quality impairment or complicating restoration efforts

1 – While channel erosion is primarily a wet weather process, impairments of stream function associated with channel erosion are relevant in both wet and dry weather.

2.3.2.1 Specific Consideration of Aliso Creek Estuary in Establishing HPWQCs

Specific consideration was given to Aliso Creek Estuary in recognition of the availability of a relatively detailed assessment of existing conditions of the Aliso Creek Estuary (ESA, 2015, See summary in 2.1.4) and ongoing efforts to develop a project description for restoring the estuary (Stein, 2016). The key question was whether specific HPWQCs should be established for the Estuary in addition to the overall HPWQCs that apply to inland and tidally-influence water bodies (Unnatural Water Balance and Channel Erosion).

We determined that the HPWQCs identified for inland and tidally-influenced receiving waters directly support improvements in estuary water quality and address the key

MS4-related stressors that affect this system, including freshwater inflows, sediment from upstream erosion, and nutrients. Implementation of strategies to address HPWQC for inland waters will result in less freshwater inflow, less sedimentation from upstream channel erosion, and less nutrients (N and P) loading from MS4 discharges and/or steam channel erosion. Other key stressors identified, including physical modification and berm management are not MS4-related issues and are not appropriate to be addressed as part of this Plan.

As more information about existing conditions and/or restoration plans becomes available, renewed consideration of HPWQCs is expected as part of the Plan update process.

2.4 Potential Strategies

As required by Provision B.2.e, the Permittees must identify potential strategies that may result in improvements to water quality in MS4 discharges and/or receiving waters within the watershed. Potential strategies considered include nonstructural and structural BMPs, retrofits, and stream restoration projects, as well as those included in the Permittees' robust jurisdictional programs that include management measures and baseline programs to reduce the discharge of pollutants in stormwater from jurisdictions' MS4 to the maximum extent practicable. Potential strategies as developed for the Provision B.2 submittal of the WQIP are presented in **Appendix O**. This list served an interim purpose in Plan development. The actual strategies included in this WQIP are identified in the Section 3.

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3 GOALS, STRATEGIES AND SCHEDULES

Provision B.3 of the Permit, "Water Quality Improvement Goals, Strategies and Schedules," describes the requirements to develop specific water quality improvement goals and strategies to address the water quality conditions identified for the SOC WMA. These goals and strategies must effectively prohibit non-stormwater discharges to the stormwater conveyance system, reduce pollutants in stormwater discharges from the stormwater conveyance system to the maximum extent practicable, and protect water quality standards in receiving waters. This provision requires interim and final numeric (i.e., quantifiable) goals for the HPWQCs. Additionally, this Plan contains numeric milestones for certain additional priority water quality conditions pursuant to the criteria and compliance pathways described in Provision B.3.c of the Permit (Prohibitions and Limitations Compliance Option).

In developing this section of the Plan to meet the requirements of Provision B.3, and as initiated during the development of the **Section 2**, efforts have been based on extending the three key themes identified in the Orange County Stormwater Program's Report of Waste Discharge (ROWD, 2014) on the State of the Environment in the San Diego Region:

- Focus on priority areas and constituents rather than trying to monitor all constituents, potential issues, and locations
- Increase the integration of data from a wider range of sources
- Continue to evolve from a strictly discharge-specific approach to a risk-based prioritization approach

Consistent with this approach, priority conditions were identified within the receiving waters that, based on the best available data and information, warrant consideration for focused activity, manifested through the implementation of water quality improvement strategies. While improvement in the form, function, and achievement of beneficial uses of receiving waters is the ultimate goal of the Plan, the priority conditions identified in the **Section 2** represent the functional "knobs and levers" that will be addressed through MS4 strategies and whose effectiveness can be monitored and adapted over time. Beneficial uses are much more likely to be achieved when watersheds and receiving waters exhibit "normal form and function." For purposes of developing actionable Plan strategies, form and function of receiving waters are conceptualized as a function-based framework of dependent layers where improvement in the integrity of an underlying layer makes it more likely to achieve positive outcomes for overlying layers.

An important premise of the framework established in **Section 2** is that efforts to improve riparian biological communities (pinnacle of the Function-Based Framework for Stream Restoration) are likely to be most successful if the supporting foundational layers are in place. Additionally, an improvement implemented closer to the base of this hierarchy is likely to have the most far-reaching positive reinforcement cycle and/or reduce the degree of compensation needed to affect improvements at higher dependency levels.

Based on this framework, a durable and actionable set of highest priorities were established in **Section 2**. These priorities have been translated into the overarching goals that form the basis of this Plan, and the resulting selection of strategies to achieve those goals. These goals include:

- Manage health risk associated with contact water recreation in coastal waters to an acceptable level;
- Maintain the existing high quality of water present at many swimming beaches, and
- Restore or maintain recreational and biological beneficial uses of inland receiving waters to the extent reasonably achievable.

As Plan implementation progresses, goals addressing priority water quality conditions will be regularly re-evaluated as part of the monitoring and adaptive management process, including filling data gaps and monitoring progress over time.

The following sections indicate the specific goals and strategies for each of HPWQCs identified in **Section 2.** In addition, the Plan also includes associated goals and strategies addressing PWQCs.

3.1 Pathogen Health Risk

3.1.1 Overview

Human pathogens refer to a wide category of microorganisms, such as bacterium, protozoa, and viruses that causes disease in humans. Waterborne, fecal-derived human pathogens are a key source of impairment of recreational beneficial uses. FIB are used as indicators of pathogens present in water because they are present at high concentrations and are easier and less costly to measure. FIB do not cause illness directly, but epidemiologic studies have shown correlations between indicator bacteria (*Enterococcus*, fecal coliform, *Escherichia Coli* and total coliform) presence and gastrointestinal illness caused by pathogens.

The control of FIB presents unique challenges, since they are ubiquitous in the environment and the presence of bacteria from regrowth as well as natural sources can be significant. In contrast to human pathogens, however, FIB originate from both anthropogenic and non-anthropogenic (natural background) sources which presents significant challenges to effectively address. Anthropogenic sources (e.g., pet waste, human waste, sewage leaks) and natural sources such as birds, wildlife, non-fecal environmental sources and resuspension from sediment and regrowth, all contribute to FIB within the watershed and receiving waters.

Allowable FIB loads for the SOC WMA are defined by the Bacteria TMDLs. The purpose of the Bacteria TMDLs are to protect the health of those who recreate in waterbodies receiving runoff from the SOC WMA by reducing the amount of human pathogens discharged to the waterbodies through dry weather urban runoff, stormwater, and other sources. The Bacteria TMDLs require Permittees to attain required load reductions during both dry weather and wet weather conditions within compliance timelines indicated in the respective sections of Attachment E of the Permit. The goals and strategies within the Plan are focused to attempt to demonstrate compliance with the Bacteria TMDLs.

Concurrent with the development of this Plan, as part of the 2014 triennial review, the SDRWQCB initiated a Basin Plan Amendment project to evaluate Primary Contact Water Recreation (REC-1) Water Quality Objectives (WQO) and subsequently revise the Bacteria TMDLs (aka “Reopener”). This update is timely and is expected to consider the results of related studies completed since the original adoption of the TMDL in 2010 to represent an improved linkage between WQOs and associated management actions, and reduction of pathogen-related human health risk. Under a Memorandum of Understanding by the County of San Diego, City of San Diego and the County of Orange and the SDRWQCB, an associated effort currently being conducted as an element of the Reopener is a Bacteria TMDL Cost Benefit Analysis & Recommendations for TMDL revisions. The purpose of this effort will be to identify and evaluate expected quantitative and qualitative costs of TMDL compliance measured against expected health and environmental benefits and the associated economic benefits. The analysis will consider relevant social, economic and environmental factors and explore the costs and benefits of keeping the existing wet weather TMDL targets for bacteria indicators. Other studies and efforts anticipated to be considered in the reopener include the recently completed or nearly completed following studies:

- Wet Weather Epidemiology: Surfer Health Study (SCCWRP, 2016a);
- Microbiological Water Quality at Reference Beaches and an Adjoining Estuary in Southern California during a Prolonged Drought (SCCWRP, 2016b), and

- Wet and Dry Weather Natural Background Concentrations of FIB in San Diego, Orange, and Ventura County, California Streams (SCCWRP, 2015).

The overall outcomes of this update cannot be foreseen; however, any significant update from this process will affect the current TMDL requirement and future TMDL implementation. The Plan described in this section has been developed with consideration of both the current regulatory requirements and potential future directions, recognizing the ongoing comprehensive work. In line with both contexts, the Plan identifies activities that directly address sources of human pathogens as well as FIB via a suite of non-structural (e.g., programmatic) efforts. Additionally, this Plan identifies structural strategies within the SOC WMA to achieve goals for reducing FIB to meet the Bacteria TMDL limits at the coastline.

These strategies are expected to have multi-pollutant benefits and will thereby address the other PWQCs in the watershed. PWQCs were identified according to the process described in **Section 2**, and typically includes conditions where water quality analysis or impairment listings have identified and confirmed that the constituent or condition is not meeting applicable water quality standards.

Section 3.1.3 describes interim and final goals and schedules. **Section 3.1.4** describes strategies and schedules the address the Pathogen Health Risk HPWQC. A summary of the plan is provided in **Section 3.1.5**. Annual milestones for the next Permit term are described in **Section 3.1.6.**

3.1.2 Prohibitions and Limitations Compliance Option

This Plan is being developed consistent with Permit Provision B.3.c that allows the implementation of the approved Plan to demonstrate compliance with the Permit. As such, required goals specific to the Bacteria TMDL in Attachment E of the Permit have been developed using load reduction metrics, which is one possible pathway for demonstrating compliance with the TMDL. Should monitoring data collected during the implementation of this Plan indicate that other compliance pathways are being satisfied e.g., there are no exceedances of the receiving water limits or effluent limits in MS4 discharges (as indicated in Attachment E of the Permit), then the Plan will be evaluated to determine if continued Plan implementation is warranted. The different compliance pathways indicated in Attachment E of the Permit includes:

- Elimination of direct or indirect discharges from MS4;
- No exceedance of the final receiving water limits in the receiving water or downstream of MS4 outfalls;
- No exceedance of the final effluent limitations at MS4 outfalls;

- Annual pollutant loads reductions for discharges from MS4 outfalls are greater than or equal to final effluent limitations;
- Exceedances of final receiving water limits are demonstrated to be due to natural sources, and pollutant loads from MS4 are not causing or contributing to exceedance, and
- Implement the accepted WQIP.

3.1.3 Goals and Schedules

Numeric goals were developed to support Plan implementation and will be used to measure progress toward addressing this HPWQC. Numeric goals may take a variety of forms but must be quantifiable so that progress toward and achievement of the goals are measurable. In accordance with the Permit and applicable regulatory drivers i.e., Bacteria TMDLs, final goals and reasonable interim goals have been developed. An interim goal is required for each five-year period from Plan approval to the anticipated final goal compliance date as indicated in Attachment E of the Permit (including an interim goal for this Permit term). To demonstrate (quantitatively) compliance with the Prohibitions and Limitations Compliance Option of the Permit (Provision B.3.c), goals are expressed as percent load reductions conforming to the mandated reductions indicated in Table 6.3 of Attachment E of the Permit. Interim and final goals for bacteria load reductions complying with Attachment E of the Permit are indicated in **Table 3-1** and **Table 3-2** for wet and dry weather conditions, respectively. Allowable exceedance frequencies for wet and dry weather are presented in **Table 3-3**. Numeric goals were set and associated estimated load reductions for wet weather strategies proposed in the Plan were modeled using FC as a surrogate for all FIB as the available monitoring datasets for BMP performance and land use–based loading for this parameter are more robust than other indicator bacteria at this time. Evaluation of the Heisler Park ASBS with respect to Plan goals appears in **Section 3.4.3.1.1.**

As noted above, goals based on reduction of FC loads are based on one of the six compliance pathways indicated in the Permit. Establishing goals based on this compliance pathway is for the purpose of Plan development and implementation. This approach is not intended to preclude eventual demonstration of compliance via one of the other compliance pathways identified.

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Table 3-1: Pathogen Health Risk Numeric Goals – Wet Weather

Hydrologic Sub-Area (HSA)	Metric	Annual Baseline Load (Fecal Coliform) [a]	Final Outcome [c]	Permit Term 2015 – 2018 [b, f]	Permit Term 2018 – 2023 [b, g]	Permit Term 2023 – 2028	Permit Term 2028 – 2033
						Meet TMDL Interim Compliance Date April 4, 2028 [b, d]	Meet TMDL Final Compliance Date April 4, 2031 [b]
San Joaquin Hills, Laguna Hills	Goal expressed as percent load reduction in MS4 discharges	1,115 x 10^{12} MPN	Reach mandatory reduction of wet weather bacteria loading from MS4 discharges identified in Attachment E of the Permit	5.9% Total Coliform 6.5% Fecal Coliform 6.4% *Enterococcus*	11.7% Total Coliform 13.0% Fecal Coliform 12.8% *Enterococcus*	23.43% Total Coliform 26.04% Fecal Coliform 25.63% *Enterococcus*	46.85% Total Coliform 52.07% Fecal Coliform 51.26% *Enterococcus*
Aliso		4,765 x 10^{12} MPN		3.2% Total Coliform 3.3% Fecal Coliform 3.4% *Enterococcus*	6.3% Total Coliform 6.7% Fecal Coliform 6.9% *Enterococcus*	12.65% Total Coliform 13.31% Fecal Coliform 13.76%/(13.69%)[e] *Enterococcus*	25.29% Total Coliform 26.62% Fecal Coliform 27.52%/(27.37%)[e] *Enterococcus*
Dana Point		1,542 x 10^{12} MPN		1.6% Total Coliform 1.9% Fecal Coliform 1.9% *Enterococcus*	3.3% Total Coliform 3.7% Fecal Coliform 3.8% *Enterococcus*	6.58% Total Coliform 7.43% Fecal Coliform 7.58% *Enterococcus*	13.15% Total Coliform 14.86% Fecal Coliform 15.16% *Enterococcus*
Lower San Juan		11,191 x 10^{12} MPN		2.4% Total Coliform 1.6% Fecal Coliform 3.4% *Enterococcus*	4.8% Total Coliform 3.2% Fecal Coliform 6.8% *Enterococcus*	9.61% Total Coliform 6.41% Fecal Coliform 13.56%/(13.45%)[e] *Enterococcus*	19.21% Total Coliform 12.82% Fecal Coliform 27.12%/(26.90%)[e] *Enterococcus*
San Clemente		2,553 x 10^{12} MPN		3.0% Total Coliform 3.1% Fecal Coliform 3.2% *Enterococcus*	6.0% Total Coliform 6.1% Fecal Coliform 6.3% *Enterococcus*	11.93% Total Coliform 12.29% Fecal Coliform 12.63% *Enterococcus*	23.85% Total Coliform 24.58% Fecal Coliform 25.26% *Enterococcus*

a- As modeled for Water Year 1993 (the 90th percentile rainfall year), based on land uses and BMPs as of 2001 (the TMDL baseline year)
b- Percent of FIB loads reduced from MS4 outfalls from baseline load as measured at the compliance points at the Pacific Ocean Shoreline
c- Or achieve new WLAs or site specific objectives if TMDL is modified
d- Request moving interim TMDL Compliance Date from April 4, 2021 (per Attachment E of Order R9-2015-0001, Table 6.4) to April 4, 2028 to allow adequate time to investigate and mitigate bacteria sources, monitor progress and adjust implementation through the adaptive management process.
e- Per Attachment E of Order R9-2015-0001: The alternative *Enterococcus* percent load reduction was calculated based on a numeric target of 104 MPN/100mL instead of 61 MPN/100mL, protective of the REC-1 "moderately to lightly used area" usage frequency that is protective of freshwater creeks and downstream beaches. Acceptable evidence that impaired freshwater creeks can be considered "moderately to lightly used areas" must be provided before these alternative pollutant load reductions can be utilized.
f- Values calculated as half of the 2nd Permit Term Goals
g- Values calculated as half of the 3rd Permit Term Goals

Table 3-2: Pathogen Health Risk Numeric Goals – Dry Weather

Hydrologic Sub-Area (HSA)	Metric	Annual Baseline Load (Fecal Coliform) [a]	Final Outcome [c]	Permit Term 2015 – 2018 [b, e]	Permit Term 2018 – 2023	
					TMDL Interim Compliance Date April 4, 2020 [b, d]	TMDL Final Compliance Date April 4, 2021 [b]
San Joaquin Hills, Laguna Hills	Goal expressed as percent load reduction in MS4 discharges	32.4 x10^{12} MPN	Reach mandatory reduction of dry weather bacteria loading from MS4 discharges identified in Attachment E of the Permit	22.9% Total Coliform 22.9% Fecal Coliform 24.6% *Enterococcus*	45.89% Total Coliform 45.86% Fecal Coliform 49.14% *Enterococcus*	91.78% Total Coliform 91.72% Fecal Coliform 98.28% *Enterococcus*
Aliso		65.6 x10^{12} MPN		23.9% Total Coliform 23.9% Fecal Coliform 24.8% *Enterococcus*	47.74% Total Coliform 47.79% Fecal Coliform 49.57% *Enterococcus*	95.47% Total Coliform 95.58% Fecal Coliform 99.13% *Enterococcus*
Dana Point		22.2 x10^{12} MPN		23.8% Total Coliform 23.8% Fecal Coliform 24.7% *Enterococcus*	47.52% Total Coliform 47.52% Fecal Coliform 49.49% *Enterococcus*	95.04% Total Coliform 95.03% Fecal Coliform 98.98% *Enterococcus*
Lower San Juan		77.4 x10^{12} MPN		18.2% Total Coliform 18.6% Fecal Coliform 23.7% *Enterococcus*	36.48% Total Coliform 37.11% Fecal Coliform 47.47% *Enterococcus*	72.96% Total Coliform 74.21% Fecal Coliform 94.94% *Enterococcus*
San Clemente		39.8 x10^{12} MPN		23.57% Total Coliform 23.6% Fecal Coliform 24.7% *Enterococcus*	47.14% Total Coliform 47.12% Fecal Coliform 49.42% *Enterococcus*	94.28% Total Coliform 94.23% Fecal Coliform 98.83% *Enterococcus*

a- 2010 TMDL (R9-2010-0001) – Attachment A, Table on page A27; the TMDL baseline year is 2001
b- Percent of Fecal Coliform loads reduced from MS4 outfalls from baseline load as measured at the compliance points at the Pacific Ocean Shoreline
c- Or achieve new WLAs or site specific objectives if TMDL is modified
d- Request moving interim TMDL Compliance Date from April 4, 2016/2017/2018 according to HSA (per Attachment E of Order R9-2015-0001, Table 6.4) to April 4, 2020 to allow adequate time to investigate and mitigate bacteria sources, monitor progress and adjust implementation through the adaptive management process.
e- Values calculated as half of the Interim Compliance Goals

Table 3-3: Interim Exceedance Frequencies [a]

Hydrologic SubArea (HSA)	Water Body	Segment	Interim Dry Weather Limitation			Interim Wet Weather Limitation		
			ENT	FC	TC	ENT	FC	TC
San Joaquin Hills(901.11) and Laguna Beach(901.12)	Pacific Ocean Shoreline	Cameo Cove at Irvine Cove Drive – Riviera Way [b]	NA	NA	NA	39%	37	38%
		At Heisler Park -- North	0%	0%	0%	39%	37	38%
	Pacific Ocean Shoreline	At Main Laguna Beach	1%	0%	0%	39%	37	38%
		Laguna Beach at Ocean Avenue	3%	0%	0%	39%	37	38%
		Laguna Beach at Cleo Street	3%	0%	0%	39%	37	38%
		Arch Cove at Bluebird Canyon Road	1%	0%	0%	39%	37	38%
		Laguna Beach at Dumond Drive	0%	0%	0%	39%	37	38%
Aliso (901.13)	Pacific Ocean Shoreline	Laguna Beach at Lagunita Place / Blue Lagoon Place at Aliso Beach	0%	0%	0%	41%	41%	42%
	Aliso Creek	Aliso Creek	50%	45%	50%	41%	41%	42%
	Aliso Creek Mouth	at mouth	50%	33%	41%	41%	41%	42%
DanaPoint(901.14)	Pacific Ocean Shoreline	Aliso Beach at West Street	0%	0%	0%	36%	36%	36%
		Aliso Beach at Table Rock Drive	0%	0%	0%	36%	36%	36%
		1000 Steps Beach at Pacific Coast Hwy at Hospital (9th Ave)	0%	0%	0%	36%	36%	36%
		At Salt Creek (large outlet)	11%	1%	0%	36%	36%	36%
		Salt Creek Beach at Salt Creek service road	2%	0%	0%	36%	36%	36%
		Salt Creek Beach at Dana Strand Road	0%	0%	0%	36%	36%	36%
Lower San Juan (901.15)	Pacific Ocean Shoreline	at San Juan Creek	39%	10%	3%	44%	44%	48%
	San Juan Creek	lower 1 mile	50%	36%	32%	44%	44%	47%
	San Juan Creek Mouth	at mouth	50%	50%	50%	44%	44%	47%

Hydrologic SubArea (HSA)	Water Body	Segment	Interim Dry Weather Limitation			Interim Wet Weather Limitation		
			ENT	FC	TC	ENT	FC	TC
San Clemente (901.16)	Pacific Ocean Shoreline	at Poche Beach	31%	2%	1%	35%	35%	36%
		Ole Hanson Beach Club Beach at Pico Drain	6%	0%	0%	35%	35%	36%
		San Clemente City Beach (SCCB) at El Portal Street Stairs [b]	NA	NA	NA	35%	35%	36%
		SCCB at Mariposa Street	3%	0%	0%	35%	35%	36%
		SCCB at Linda Lane	2%	0%	0%	35%	35%	36%
		SCCB at South Linda Lane [b]	NA	NA	NA	35%	35%	36%
		SCCB at Lifeguard Headquarters	1%	0%	0%	35%	35%	36%
		Under San Clemente Municipal Pier	13%	1%	0%	35%	35%	36%
		SCCB at Trafalgar Canyon (Trafalgar Lane)	6%	0%	0%	35%	35%	36%
		San Clemente State Beach (SCSB) at Riviera Beach	1%	0%	0%	35%	35%	36%
		SCSB at Cypress Shores [b]	0%	0%	0%	35%	35%	36%

a. Final Allowable Exceedance Frequencies are dictated in Tables 6.2a, 6.2b and 6.2c of Attachment E of Order R9-2015-000.

b. No historical monitoring station at this water segment, interim dry weather limitation not available

3.1.4 Strategies and Schedules

The Permit establishes that WQIP strategies should be identified based on their likelihood to "effectively prohibit non-stormwater discharges to the MS4, reduce pollutants in stormwater discharges from the MS4 to the maximum extent practicable, protect the beneficial uses of receiving water from MS4 discharges, and/or achieve the interim and final numeric goals identified under Provision B.3.a" [B.3.b].

Water quality improvement strategies selected for this Plan are categorized as either non-structural or structural BMPs. Non-structural BMPs are management actions or programs designed to reduce or eliminate pollutant loading at the source. Non-structural BMPs can be municipal programmatic or regulatory measures, public education and outreach, financial incentives, or other source management programs designed to effect behavioral changes. Structural BMPs can be either distributed (smaller scale) or regional (larger scale) facilities. Distributed BMPs are treatment or volume mitigation BMPs implemented at the neighborhood, parcel or site scale and includes features such as green streets, rainwater harvesting, and Low Impact Development-type solutions. Regional structural BMPs are treatment or volume mitigation BMPs implemented to treat subwatershed or catchment scale drainage areas.

This Plan prioritizes targeted non-structural BMPs for early implementation, with emphasis on those that most directly address risks to human health. Source control measures have been aggressively implemented to date and will continue to be aggressively implemented early in the implementation of this Plan to address dry weather compliance goals as discussed in detail in **Section 0**. Wet weather load reductions will be achieved primarily through implementation of source identification and control BMPs, where strategies targeting sources of human pathogens and FIB will be prioritized for early implementation. Source identification and abatement begins with non-structural activities and may result in identification and implementation of structural abatement approaches.

Achievement of dry weather goals is anticipated to be achieved mostly through the efforts that have already occurred to date (Implemented BMPs, see **Section 3.1.4.1**) and by new strategies indicated in subsequent sections that will investigate and abate dry weather sources of human pathogens and the efforts to eliminate anthropogenic dry weather flows. As noted in Section 2.3.2 of the 2014 ROWD, significant progress has already been made to address dry weather exceedances at the coastline.

Within this larger framework, the criteria for strategy selection included:

- Ability to most directly and effectively protect the beneficial use of interest, which is water contact recreation;
- BMP effectiveness, particularly for human pathogens and FIB, with consideration for incidental benefits to other priority water quality conditions;
- Provision of multiple benefits, including but not limited to habitat, recreation, economic, and water resources benefits;
- The degree to which the strategy is sustainable, implementable, and cost-effective, and
- Strategies that improve and promote cooperation and collaboration between responsible agencies and other governmental agencies (Caltrans, water and sewer agencies, etc.) and other agencies, such as private or non-profit organizations, as well are internal jurisdictional departments.

The following subsections describe the specific strategies within each of these categories to be implemented on jurisdictional or watershed-wide scales.

3.1.4.1 Implemented BMPs

Through diligent actions and program implementation in the SOC WMA since 2001 (the TMDL baseline year), structural BMPs have been implemented that contribute to dry and wet weather FIB load reductions. Implemented measures include:

- Redevelopment,
- Channel restoration,
- Landscape retrofits,
- Nuisance water diversions (dry weather),
- Ozone and UV disinfection systems (dry weather),
- Catch basin inserts (wet and dry), and
- Trash separation units (wet and dry).

Implemented BMPs are depicted on **Exhibit A-15** of **Appendix A**. For the purpose of demonstrating reasonable assurance that the strategies will achieve the goals, quantifications of dry and wet weather load reductions for implemented BMPs since 2001 are documented in two Comprehensive Load Reduction Plans (CLRPs) for the San Juan Creek (SDRWQCB, 2012 updated 2015) and Aliso Creek (SDRWQCB, 2012, updated 2014) watersheds. These plans document load reductions from implemented BMPs as listed above for both watersheds. **Table 3-4** presents the reported dry and wet weather fecal coliform load reductions from implemented BMPs in the respective watersheds.

Table 3-4: Fecal Coliform Load Reductions from Implemented BMPs in San Juan and Aliso Creek Watersheds

Watershed	Watershed Dry Reduction (%) (2003-2016)	Watershed Wet Reduction (%) (2003-2016)
San Juan Creek	90.0%	10.0%
Aliso Creek	103.6%	18.0%

Of these cumulative estimated load reductions from these watersheds, approximately 0.2 to 1.7% and 1 to 3% is derived from landscape retrofit projects and catch basin retrofits for dry and wet weather, respectively. These two strategies are the primary structural BMPs that have been implemented in the San Joaquin Hills, Laguna Hills, Dana Point, and San Clemente Hydrologic Sub -Areas (HSAs). As such, an average of 2% of FC load reduction from baseline loads is included in the estimated wet weather load reductions for implemented BMPs presented in **Table 3-8**. The wet weather load reductions for all of the structural BMPs implemented for San Juan Creek and Aliso Creek as reported in **Table 3-4** are brought forward into the cumulative load reduction accounting presented in **Table 3-8**.

3.1.4.2 Programmatic Strategies (Non-structural BMPs)

The non-structural strategies in the Plan are primarily strategies building on the required Jurisdictional Runoff Management Plans (JRMPs) elements in Provision E of the MS4 Permit. These include the JRMP requirements as well as modifications/ enhancements within the program elements to provide a more focused approach specifically addressing human pathogens and FIB. JRMP-based strategies for the respective Permittees in the SOC WMA are described in equivalent plans referred to as Local Implementation Plans (LIPs).

JRMP-Based Strategies: The strategies indicated in the LIPs primarily focus on non-structural and pollution prevention controls. The Permittees are required to identify jurisdictional strategies that will be implemented as part of their jurisdictional program that are designed to effectively prohibit non-stormwater discharges to the MS4, reduce pollutants in stormwater, and protect beneficial uses of receiving waters. Achievement of these outcomes will ultimately be measured against the interim and final numeric goals as discussed in **Section 3.1.3**. Summary tables of LIP strategies are presented in **Appendix D**. In addition to the load reductions anticipated from LIP implementation, additional strategies are proposed to specifically target control of sources of human pathogens. These strategies are discussed in **Section 3.1.4.3**.

Due to limited data quantifying the effectiveness of these programmatic strategies, wet weather load reductions of programmatic BMPs are not as readily modeled as those of structural BMPs. Programmatic, non-structural BMPs that fall into this category include:

- Identification and control of sewage and other sources of human fecal waste discharges to Permittees' MS4s,
- Trash cleanups,
- Onsite wastewater treatment system (OWTS) source reduction,
- Good landscaping practices,
- Commercial/industrial good housekeeping (emphasis on food outlets),
- Pet waste controls,
- Animal facilities management,
- Erosion monitoring and repair,
- Street and median sweeping,
- MS4 cleaning, and
- Education and outreach.

Each of these elements has either been phased in or greatly expanded since the baseline TMDL year of 2001. One such program is the Countywide Area Spill Control (CASC) Program. The CASC program began in 2000 as a pilot project between the County and the Orange County Sanitation District (OCSD) to proactively prevent and respond to sanitary sewer overflows (SSOs) in the unincorporated North Tustin area. During the 2009-10 reporting period, in response to Fourth Term Permit requirements, CASC evolved into a countywide program. The main focus of CASC remains the containment and recovery of large Sanitary Sewer Overflows (SSOs) which have the potential to significantly impact receiving waters resulting in beach closures and health advisory postings. The overall objectives of CASC are to:

- Create broader awareness regarding the causes of SSOs and development of measures that can be implemented in order to prevent them;
- Improve the interagency coordination when responding to SSOs;
- Identify the resources needed when responding and mitigating impacts;
- Develop predictive tools for identifying potential impacts; and
- Protect the beneficial uses of the local water bodies.
- Implement the program throughout the entire Orange County area.

Best professional judgment and the results of studies reinforce the qualitative effectiveness of these programmatic BMPs (HDR, 2014). To account for the expected pollutant load reduction from these non-modeled, nonstructural BMPs, a **ten percent** (10%) FIB load reduction from baseline loads is included in the quantification (HDR, 2014). The inclusion of these programmatic BMPs in the Plan and the assumed ten percent reduction could be evaluated and updated throughout the implementation period as pollutant loading and BMP performance data are collected.

3.1.4.3 Human Pathogen Source Control Strategy

In addition to the JRMP efforts that will support control of sources of human pathogens, this Plan includes a new aggressive plan for human waste source identification and abatement that will be implemented as a WMA strategy.

Numerous ongoing efforts throughout Southern California – which SDRWQCB staff are involved with, tracking, or are aware of – are beginning to show that a microbial source tracking (MST)-based and pathogen-focused compliance approach should result in greater public health benefit (i.e., the outcome desired by regulators, public, elected officials, and permitted dischargers) for significantly lower cost than traditional bacteria TMDL implementation planning approaches. For traditional approaches that primarily emphasize structural stormwater BMP retrofits to control FIB loading, post-implementation compliance may remain elusive based on monitoring results (due to the ubiquitous and uncontrollable nature of FIB). As a result, following the extensive structural retrofits, jurisdictions may then be prompted to begin source tracking as a special study (i.e., as a *regulatory modification* tool). In contrast, what is proposed in this Plan is a MST-based and pathogen-focused compliance approach which begins with source tracking (as an *implementation planning* tool) to focus pathogen abatement efforts and structural BMPs implementation based on targeted information regarding the nature and extent of human sources. This approach emphasizes MST in combination with advanced MS4 illicit discharge, detection and elimination (IDDE) strategies, followed by the human waste abatement/remediation measures that they identify, as a **comprehensive human waste control BMP** (not a "study") that is expected to result in significant long-term pathogen reduction benefit during both dry and wet weather. To further support the basis for this approach, a timeline of the key scientific and regulatory advancements underpinning this strategy is summarized in **Figure 3-1**.

Figure 3-1: Scientific and Regulatory Advancements Underpinning the Recommendation for a MST-Based and Pathogen-Focused Compliance Approach

2008
- **Natural Source Exclusion Policy** – San Diego Basin Plan amended to incorporate implementation provisions that account for natural uncontrollable sources of FIB

2010
- **Soller et. al., QMRA** – USEPA contractor's analysis shows recreational health risk is dependent on fecal source, with human waste representing the greatest health risk

2011
- **Sercu et. al., Sewage Exfiltration** – Study shows sanitary sewer exfiltration is a source of contamination to storm drains during dry weather

2012
- **2012 USEPA Recreational Criteria** – Acknowledges that source affects illness risk, establishes health-based criteria, and allows development of site specific objectives (e.g., based on QMRA)

2013
- **CA Microbial Source ID Manual** – MST methods for human and animal fecal sources are validated in laboratories and verified in field demonstrations, supporting method standardization

2014
- ***Pathogens in Urban Stormwater Systems*** – Practitioner-targeted ASCE report and webcasts establishes nationwide guidance on bacteria control planning, including use of MST

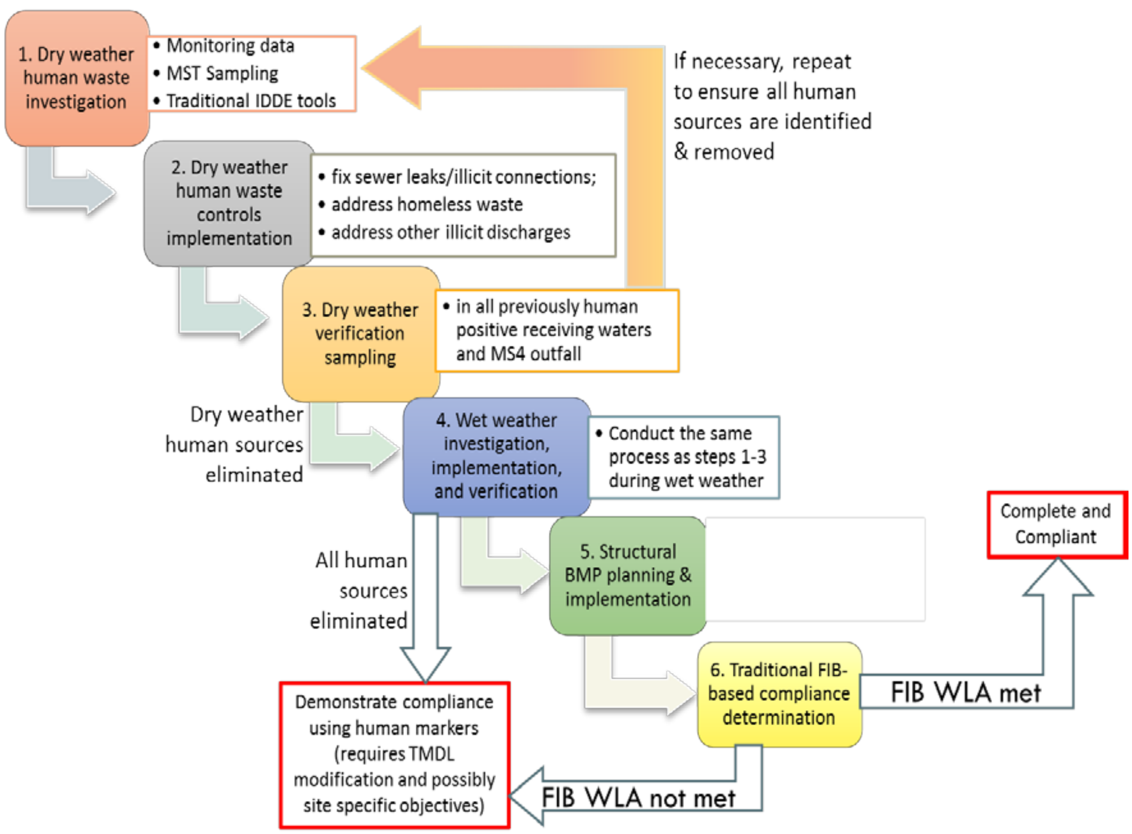
2016
- **San Diego Surfer Health Study** – Shows wet weather illness rates among surfers are below USEPA's tolerable levels, and that site specific objectives are appropriate at an urban runoff impacted beach

2017
- **CA Statewide Objectives** – Expected to incorporate 2012 USEPA's Recreational Criteria, which are health-based and allow for QMRA-based site specific objectives

Over 20 MST studies have been performed to identify and abate human sources in Southern California (**Appendix G**). At least two of these studies have been conducted in Orange County, sampled in the MS4, and used the State's recommended/validated MST markers for detection of human fecal contamination. Both of these studies were for dry weather. A study at Doheny State Beach frequently found multiple human markers in MS4 discharges, while a study at Poche Beach did not find any human marker detections. The Poche Beach study may be an outlier in that most other studies found at least some human markers in MS4 samples. While many of the studies did not use the latest validated human markers (HF183 and HumM2), in most cases the positive human results are still valid.

A new MST-based and pathogen-focused compliance approach (based on the key scientific and regulatory advancements) is proposed in the Plan to meet (or revise) the final Bacteria TMDL Waste Load Allocations (WLAs). This "Comprehensive Human Waste Source Reduction Strategy" (CHWSRS) will focus on aggressively and comprehensively investigating and effectively eliminating human waste sources in the watersheds, to reflect the fact that these sources are both higher risk (to public health) and more controllable than non-human anthropogenic and non-anthropogenic sources of FIB. **Figure 3-2** provides an overview of this proposed CHWSRS and the following text provides additional details for each of the steps.

Figure 3-2: Steps for Comprehensive Human Waste Source Reduction Strategy



CHWSRS Work Plan Development

The MST portion of this strategy will be planned in accordance with the California Microbial Source Identification Manual (Manual, SCCWRP, 2013b), which includes EPA-recognized markers for the identification of human fecal contamination. These methods are currently in the final stages of being standardized by the EPA. The CHWSRS work plan (Work Plan) will also reflect recent SCCWRP findings or recommendations regarding proper number of sampling events, and new statistical methods for translating MST results into a likelihood of human waste presence. The Work Plan will also reflect any other post-Manual advancements such as the California MST Marker Aging Study, which measured FIB/marker/pathogen decay rates in the environment (to support proper interpretation of MST results), and identification of appropriate thresholds for presence of human waste, as well as any other relevant publications or proven technological advancements that are available at the time of plan development. The Work Plan will also include consideration for and performance of prioritization of where investigations shall be conducted, i.e., which outfalls need investigation. Investigations will not be conducted for outfalls to receiving waters not (or no longer) listed as impaired for indicator bacteria or those receiving waters that meet the final receiving water limitations. Finally, the Work Plan will also indicate a process for plan adaption based on information obtained during plan execution.

Dry Weather Investigations, Controls, and Verification (Steps 1-3)

As indicated in the studies summarized in **Appendix G**, dry weather human marker detections are common, but their presence varies from one subcatchment/outfall to another. While it is recognized that dry weather control of FIB (and likely human pathogens, though not measured) has been effective through the implementation of approximately 40 low-flow diversion projects at MS4 outfalls discharging to beaches, dry weather sources of FIB and pathogens elsewhere in the watershed (upstream of diversions) or downstream of the diversions during bypass may still be contributing to exceedances of FIB standards during wet weather. Furthermore, performing investigations during dry weather better enables the identification of sewer leaks, illicit sewer connections, and other illicit waste discharges, as there are fewer inputs into the system during dry weather. For these reasons, the strategy begins with dry weather investigations to identify human pathogen sources that also contribute during wet weather. The dry weather investigation phase will be followed by wet weather investigations after dry weather source abatement is completed (since wet weather mobilizes additional waste sources from the watershed).

Step 1 - Dry weather human waste investigation, including:

a. Compiling and reviewing monitoring data (e.g., presence/frequency/locations of non-stormwater MS4 discharges, etc.), GIS datasets (e.g., sewer/storm drain locations, ages, material, condition at last inspection, invert elevation, etc.), and other relevant information. Additional desktop and field evaluations may be conducted, such as characterization of potential sources (e.g., homeless encampments, RV parking, and outdoor recreational areas);
b. Then dry weather human marker sampling of receiving water locations and flowing MS4 outfalls (sampling details such as number of samples and thresholds for determining "human positive" are to be determined in Work Plan); and
c. Then dry weather MS4 network investigations – using CCTV, dye testing, and/or MST markers – in the MS4 networks that drain to the human positive MS4 outfalls, to locate the specific human waste inputs within these sewersheds.

The intent of Step 1 is to comprehensively assess the network tributary to each receiving water identified as a HPWQC. This is anticipated to include initial investigations within a high percentage of outfalls, and subsequent investigation within the networks to those outfalls with identified human waste presence. The details regarding outfall sampling, number of samples per outfall, and subsequent investigations within the network will be described in the Work Plan.

Step 2 - Implementation of follow-on human waste control actions to abate identified human waste sources (e.g., coordinating with sewer collection agencies or private lateral owners to address identified sewer leaks and/or illicit connections, coordinating with enforcement officials on homeless waste sources, and addressing any other identified illicit discharges to the MS4). It is recognized that coordination with the ten South Orange County Wastewater Authority (SOCWA) member agencies is a significant step in the plan. It is anticipated that the limitations/authorities of the cities that operate sanitary sewer collection systems and sewer agencies will be evaluated during this step to facilitate necessary waste control actions within the context of each sewer agency's separate wastewater discharge permit, regulated individually by the SDRWQCB, and the respective Sanitary Sewer Management Plan (SSMP);

Step 3 – Dry weather verification sampling of the previously human positive MS4 outfalls (if human markers are again detected above thresholds, then repeat steps 1 and 2);

Step 4 - Wet Weather Investigations, Controls, and Verification - After dry weather results demonstrate an absence (or near absence) of human markers, repeat the human marker sampling investigation and follow-on control implementation during wet weather (since more widespread human waste sources would be mobilized within each watershed during wet weather compared to what was already investigated and abated during dry weather);

Step 4.1 - Wet weather human waste investigation to be conducted:

a. Wet weather human marker sampling in strategic receiving water locations to limit where further sampling might be required (locations and other sampling details are to be determined in the Work Plan);
b. Then wet weather human marker sampling of flowing MS4 outfalls upstream of human positive strategic receiving water locations; and
c. Then MS4 network investigations during both wet and dry weather – using CCTV, dye testing, and/or MST markers –of the networks that drain to the human positive MS4 outfalls, to locate the specific human waste inputs within these sewersheds.

As with Step 1, the intent of this investigation is to comprehensively assess the network tributary to each receiving water identified as a HPWQC where markers of human waste are present. Details regarding receiving water sampling locations, outfall sampling, number of samples per location, and subsequent investigations within the network will be described in the Work Plan.

Step 4.2 - Implementation of follow-on human waste control actions to abate identified human waste sources (e.g., coordinating with sewer collection agencies or private lateral owners to address identified sewer leaks and/or illicit connections, coordinating with enforcement officials on homeless waste sources, and addressing any other identified illicit discharges to the MS4);

Step 4.3 – Wet weather verification sampling of the previously human positive MS4 outfalls (if human markers are again detected, then repeat steps 4.1 and 4.2);

Step 5 - Stormwater BMP Planning and Implementation - As part of a separate strategy, structural treatment BMPs (infiltration, treatment, harvest and use) to address general stormwater runoff are planned later in the implementation phase of this HPWQC consistent with the schedules established to meet Plan goals in accordance with Attachment E of the Permit.

After the completion of Step 4, a Human Waste Investigation and Abatement (HWIA) Report will be developed and submitted for SDRWQCB review and approval. This report may have implications for whether the identified commitments to structural stormwater treatment BMPs will continue to be needed at the levels identified in this Plan. If the HWIA report demonstrates that persistent human marker detections and FIB exceedances have been eliminated, then a Plan revision could be considered to reduce or eliminate the need for structural stormwater treatment BMPs to address this HPWQC. If persistent human marker detections have been eliminated, but FIB exceedance continue, then either structural treatment BMPs will continue to be included in the plan or an alternative compliance approach will be necessary (Step 6).

Step 6 - Compliance Determination - At the completion of Step 5, compliance determination could occur through either:

a. FIB WLAs being met, or
b. FIB WLAs are not being met and therefore prompting either:
    i. pursue a TMDL modification (e.g., antidegradation-based Natural Source Exclusion (NSE), per existing San Diego Basin Plan policy), or
    ii. perform pathogen sampling at the compliance monitoring locations and Quantitative Microbial Risk Assessment (QMRA) calculations to compute potential new site-specific objectives (SSO) using bacteria indicator species consistent with approved Diego Basin Plan. QMRA is a multi-step approach used to assess human health risks associated with a specific exposure to a specific pathogen. It combines the use of pathogen dose-response relationships with a user-defined exposure pathway. Model parameters are described using probability distributions to capture variability and uncertainty. The validity of QMRA as an SSO-development tool is supported by USEPA's 2012 recommended recreational criteria technical support materials, QMRA articles published in peer-reviewed scientific journals authored by USEPA's risk assessment contractors, and the recent San Diego Surfer Health Study (which demonstrated the reliability of QMRA based on comparison with wet weather epidemiology study results). It should be noted, however, that QMRAs are expensive being estimated to be $500,000 to $1,000,000 each.[2]

The timeline over which the Work Plan development and execution is anticipated to occur is presented in **Table 3-5**.

2 Steven Weisberg, SCCWRP, Pers. Comm., 2017

Table 3-5: Comprehensive Human Waste Source Reduction Program Milestones

Action	Year[1]
Develop (CHWSRS) Work Plan (including Sampling & Analysis Plan, Quality Assurance Project Plan[2]) and submit for SDRWQCB review and approval	12 months from Plan acceptance
Conduct dry weather human source investigations (Steps 1)	2019 to 2021
Conduct dry weather source abatement and verification (Step 2-3)	Beginning 2021 [a]
Conduct wet weather human source investigations (Step 4.1)	2020 to 2023
Prepare source investigation report based on results of Steps 1 and 4.1 and submit to SDRWQCB for review	2023
Conduct follow-on wet weather human waste control actions and verification sampling (Steps 4.2 and 4.3)	Beginning 2023 [a]
If sampling indicates persistent FIB exceedances, consider implementation of BMP controls and/or alternative compliance efforts (Steps 5 and 6)	2027[a]

a – Completion of source abatement may be contingent on activities by others outside of the authority of the MS4 permittees

1 – Milestones refer to the end of each year shown (December 31) unless otherwise indicated. The status of attainment of these milestones will be reported in the following WQIP Annual Report, which is due by January 31 each year.

2 –Three Quality Assurance Project Plans (QAPPs) are identified in this Plan. One for the Comprehensive Human Waste Source Reduction Strategy, one that is specific to HMP effectiveness monitoring, and one that is an overall South Orange County Monitoring and Assessment Program QAPP that is more general.

3.1.4.4 Other Human Waste Source Control Efforts

Two specific programmatic efforts to be conducted under Permittee jurisdictional programs that support the CHWSRS include evaluating implementation of both unauthorized encampment and recreational vehicle waste management programs as described below.

Unauthorized Encampment Waste Management Program. In areas of the watershed where unauthorized encampments are determined to be a significant pollutant source, effective programs may include establishing ordinances that reduce encampments, enhancing programs to reduce the number of unauthorized encampments, and enforcing new and existing laws to decrease the negative impact on water quality. Options to reduce water quality impacts of unauthorized encampments can also be combined with efforts to reduce homelessness. For example, partnering with non-profit organizations to inspect and remove trash generated by encampments leverages existing social programs, watershed volunteer programs, and water quality programs to address a common concern. Another example would be to support partnership efforts by social service providers to provide sanitation and trash management for persons experiencing homelessness. The removal of invasive species in the watershed is an additional strategy for management of unauthorized encampments, as they provide shelter and allow encampments to remain hidden from view. Initial efforts may include identification and characterization of unauthorized encampments and other sources of open defecation waste sources. Implementation of efforts to reduce the impact of these human sources will be targeted for the areas identified in the initial characterization step.

Recreational Vehicle Waste Disposal Education Program. Recreational vehicles are a unique source of FIB because they are mobile sources that are largely unregulated by the Permittees. Although direct regulation is not always feasible, the Permittees have developed strategies to address discharges from recreational vehicles (RVs), as they do have the potential to contribute to FIB loading the MS4s and receiving waters.

Examples of additional programs that can be implemented by Permittees that address discharges from RVs include:

- Operation of robust illicit discharge detection and elimination programs that include public outreach and hotlines, staff training, and reporting, response, and clean-up of illegal discharges.
- Coordination and training with police and sheriff's departments so they understand the impacts of these types of discharges and how to respond.
- Operation of an RV dump station, which provides a facility for RV and boat owners to empty and clean their waste tanks without impacting the environment. The dump station includes educational signage to inform RV and boat owners of the impacts of their actions.

3.1.4.5 Other Modeled Non-Structural BMPs

FIB load reductions were quantified for anticipated redevelopment incorporating Low Impact Development (LID) BMPs within the SOC WMA. This includes both dry weather and wet weather runoff volume reduction and treatment. Additionally, FIB load reductions were quantified for forecasted implementation of incentive programs intended to convert turf to drought tolerant/absorbent landscaping combined with downspout disconnection/dispersion approaches. This program is expected to yield combined water conservation, dry weather flow reduction, and wet weather flow reduction benefits.

The wet weather load reduction quantification approach for these BMPs involved the following steps for each of these strategies. The first step was to identify the source addressed by the program. The next step was to calculate the targeted pollutant source area that the BMP will address. Once the targeted pollutant source area was calculated, the unit effectiveness of the selected BMP was modeled for a standard design (e.g., reduction of FIB per acre as a result absorbent landscaping with downspout disconnection). The potential load reduction benefit was then calculated by multiplying the unit effectiveness of the selected BMP by the targeted pollutant source area addressed. The following sections provide a brief description of the specific quantification approach for each wet weather non-structural strategy, along with relevant assumptions and explanations.

Redevelopment through Permit-Required LID Implementation. This Plan assumes that a portion of existing developed areas in the SOC WMA has been and will be redeveloped from when the TMDL was initiated to the end of the compliance period. This redevelopment is subject to the post-construction treatment requirements contained in the San Diego MS4 Permit (Provision E.3.b) and will therefore result in load reduction benefits. A bioretention system with underdrains was modeled for residential, commercial, industrial, education, and transportation land uses during the TMDL Critical Water Year (WY1993) to give the FIB load reductions per acre of redevelopment. For each land use, the load reduction per acre was multiplied by the land use specific redevelopment rate, the number of land use acres, and the number of years from when the TMDL was initiated to the end of the compliance period. The rate of redevelopment requiring LID implementation for each of these land uses was extrapolated based on the rate analysis done for the Ballona Creek Implementation Plan (City of Los Angeles, 2009). The annual redevelopment rates for the land uses evaluated are as follows:

- Residential Land Use Redevelopment Rate = 0.18%
- Commercial Land Use Redevelopment Rate = 0.15%
- Industrial Land Use Redevelopment Rate = 0.34%
- Education Land Use Redevelopment Rate = 0.16%
- Transportation Land Use Redevelopment Rate = 2.7%

During the 20-year compliance timeline, this rate will result in redevelopment of approximately 6% of the MS4 area in aggregate for all the land uses evaluated. Quantifications for this program are shown in **Appendix E**.

Absorbent Landscaping/Impervious Area Dispersion Incentive Program. The intent of this program is to leverage existing incentives for water conservation being implemented by water agencies and enhance these programs to accrue benefits for stormwater management. Conversion of turf to drought tolerant/absorbent landscaping and transition from conventional irrigation to smart irrigation systems are primary emphases of existing water conservation incentive programs, such as those identified in the OC Stormwater Program "Overwatering is Out" campaign. These approaches have dry weather runoff reduction benefits due to water conservation and overspray reduction. They also have wet weather runoff reduction benefits because absorbent landscaping tends to produce less runoff during rainfall, and smart irrigation systems, through incorporation of forecast data and/or soil moisture sensors, reduce the likelihood of irrigation before or during rainfall. By partnering with water agencies and the community, additional stormwater management benefits can be accrued by incorporating approaches within these incentive programs that manage runoff at its source. This could include incentives to install impervious area dispersion techniques as part turf replacement/absorbent landscaping/irrigation system replacement efforts. Impervious area dispersion could include routing of roof downspouts, paths or driveways over absorbent landscaping, or installation of rain barrels to temporarily detain and allow later dispersion/irrigation over these areas.

Impervious area dispersion practices, coupled with turf replacement/absorbent landscaping practices, were evaluated to determine the potential load reduction that may be accomplished in the SOC WMA. The average performance for FIB load reduction, during wet weather, of these programs per dispersed impervious acre was modeled for the WY1993, consistent with the baseline load calculations (see **Appendix F**). The area of implementation was based on land use information and a preliminary assessment of impervious areas that could be potentially disconnected in the SOC WMA. The extent of single-family residential areas that will participate in this program was estimated to be 10 to 40% of all residences in the SOC WMA over a 16-year period. This degree of implementation is believed to be reasonable give increasingly stringent mandates for water conservation and increasing public awareness of programs. Additionally, enhancement of incentives to achieve greater stormwater management benefit could result in greater participation.

Of those residencies assumed to implement this program, a representative distribution of residences opting for rain barrels (25%) versus those opting for direct dispersion (75%) was assumed for the purpose of load reduction quantification. Quantifications for this program are shown in **Appendix E**. Additional load reduction benefit could be achieved by expanding the LID incentive program to commercial and multi-family land uses as well.

3.1.4.6 New Structural Treatment Strategies

Wet Weather

Structural treatment strategies include a range of facility types to treat, infiltrate, or harvest and use runoff from existing developed areas. Structural treatment strategies are a lower priority within this Plan because (1) they address broad anthropogenic and non-anthropogenic sources of FIB and do not provide targeted control of human pathogens; as a result cost effectiveness for human pathogen control is expected to be relatively low compared to targeted source abatement, (2) while performance of stormwater treatment

BMPs for FIB is reasonably understood, there is very limited understanding of performance of these systems for actual pathogens.

For most HSAs within the SOC WMA, estimates of total load reductions from other strategies (see **Section 3.1.5**) indicate that new structural stormwater treatment strategies for wet weather load reductions comprise a relatively small proportion of the overall suite of strategies necessary to achieve target load reductions (see **Table 3-8**). However, given present uncertainty of the effectiveness of the programmatic/non-structural controls, commitments to new structural treatment strategies are included in this Plan as outlined in the following section and as indicated **Table 3-8,** which summarizes the analysis and demonstrates that the overall suite of strategies that includes structural controls will achieve the Plan numeric goals. These strategies will be planned for and implemented unless it is demonstrated as part of a subsequent plan update that these strategies can be reduced or are not needed.

Given the later phasing and lower priority of new structural treatment strategies, this Plan does not describe specific projects at this time. Rather, this plan follows a four-part process for providing reasonable assurance that goals will be met:

1) Types of BMPs within this strategy are identified and general implementation guidelines are provided;
2) Tables of representative area modeling results are presented to describe the load reduction estimated to be achieved by applying a BMP of a certain type and size to treat a representative unit area of urban land;
3) Reasonable implementation assumptions are applied to the urban land in each HSA, including degree of implementation, distribution of BMP types, and typical sizing factors to estimate load reduction that would be accrued by new structural treatment BMPs. The resulting load reduction for each HSA is presented to provide appropriate assurance that the target load reductions for each HSA can be met with a reasonable degree of implementation of structural treatment BMPs; and
4) Actual projects will be identified, and an approach is described for tabulating the actual benefits of projects that will be included in the Plan.

Types of BMPs and General Implementation Guidelines (Part 1)

Types of facilities that have been defined and modeled as part of the development of this Plan include:

- Distributed biofiltration, such as bioretention with underdrains, planter boxes, green streets, and proprietary biofiltration systems;
- Distributed media filters, such as sand filters or proprietary filtration systems;

- Distributed infiltration BMPs, where feasible, such as bioretention, permeable pavement or infiltration trenches;
- Regional treatment wetlands, including surface wetlands or subsurface gravel bed wetlands;
- Regional infiltration basins or chambers; and
- Runoff harvesting systems could be incorporated within wetland or infiltration systems.

These systems would be designed for both wet weather and dry weather flow treatment. Systems could be implemented within existing facilities, such as the floor of flood control facilities (if compatible with flood protection requirements), within public rights-of-way (distributed solutions only), or in open parcels. Designs will be developed based on the design criteria described in the Orange County Technical Guidance Document, or equivalent. Sizing could be less than the full design capture volume in order to optimize the use of available retrofit sites. Actual sizing of projects as they are built will be reflected in the accrued load reduction claimed toward target load reductions.

Representative Load Reduction for Unit Area of Developed Land (Part 2)

To characterize the pollutant load reduction benefits of these structural controls, a modeling analysis was conducted using the Structural BMP Prioritization and Analysis Tool (SBPAT) applied to representative urban land in the SOC WMA with various sizing factors. In general, land use runoff concentrations for FIB are similar among urban land uses (or are not statistically significantly different). Additionally, actual long-term BMP implementation is likely to address a distribution of land uses that is similar to the WMA total distribution of land uses. Therefore, a representative mix of land uses was modeled as the watershed area rather than individual land uses treated. This modeling analysis estimated fecal coliform load reductions resulting from each BMP type and size combination for the WY 1993. Additionally, long-term analysis was conducted for the period from 1990-2015 to estimate the long term average load reduction of a standard suite of water quality parameters, including total suspended solids (TSS), total dissolved solids (TDS), nitrogen (various species), phosphorus (dissolved and total), copper, lead, zinc (dissolved and total), and FC. Results for WY 1993 and for the long-term simulations were normalized to load reductions per acre of developed land treated. While some variability is expected based on land use type and tributary area characteristics, this uncertainty is considered lower than the underlying uncertainty in water quality data and BMP performance. Details of this analysis and results are provided in **Appendix F**.

Reasonable Implementation Assumptions for HSA Load Reduction Tabulations (Part 3)

For developing pollutant load reduction estimates, a representative mix of structural BMP types was assumed, including equal distribution of the following BMP types:

- Infiltration/bioretention
- Biofiltration/bioretention with underdrains
- Media filters (no infiltration)
- Subsurface flow wetlands (no infiltration)

The average sizing factor for BMP implementation was assumed to be half of the design capture volume, on average. As discussed above, the mix of BMP types and sizing factors is intended to represent a realistic and reasonable set of implementation assumptions. This is not intended to specify the only way in which BMPs may be implemented. As described in Part 4, below, the basis for actual load reduction credited for a given project will be based on the actual BMP type and sizing factor implemented and area treated.

In order to provide reasonable assurance that the TMDL target load reductions will be met, BMPs were assumed to treat different percentages of the **developed land** in each HSA:

- Aliso Creek - 20%
- Dana Point Coastal Streams - 5%
- Laguna Coastal Streams - 85%
- San Clemente - 5%
- San Juan Creek - 5%

Results are summarized in **Table 3-8** and details of this analysis are reported in **Appendix F**.

Based on the calculations presented in this section, a high level of implementation of structural treatment control measures appear necessary to implement for the Laguna HSA to provide additional load reductions to complement the identified strategies to achieve the TMDL target load reductions. The technical basis for the higher relative target load reduction for this HSA (compared to other HSAs) is not clear from the documentation provided in the TMDL and may warrant reevaluation as part of the re-opener and revision of the TMDL that is currently in progress.

<u>Identification and Crediting of Actual Projects (Part 4)</u>

Within five years of the acceptance of this Plan, specific structural BMP sites, types, and conceptual designs will be developed to address the deficiency in load reduction in each HSA. The representative unit area model results presented in **Appendix F**, or subsequent updated model results, will be applied to the actual tributary area, BMP type, and sizing factor to determine the load reduction for each proposed BMP. Projects will be identified that provide approximately equivalent load reduction as the representative assumptions described in *Part 3* above (and reported in **Table 3-8**).

Feasible BMPs adequate to satisfy the load reduction deficiency will be scheduled for implementation to conform to the schedule for interim goal attainment described in **Section 3.1.3**.

Dry Weather

For planning of dry weather load reduction performance, it is appropriate to assume that the following BMPs will achieve full removal of dry weather flow or treatment for the tributary area to the BMP:

- Distributed biofiltration BMPs
- Distributed infiltration BMPs
- Runoff harvesting systems incorporated within wetland or infiltration systems
- Diversion to sewer system – 100% load reduction

Other types of BMPs that could be considered include:

- Ozone treatment
- New and pilot technologies or applications that may arise

Section 3.3.3 describes the planning approach for addressing dry weather flows from MS4s via a comprehensive outfall control strategy.

3.1.4.7 Schedule Estimates

Table 3-6 summarizes the schedules for implementation of the strategies identified in this section. More specific discussion of scheduling and contingences is provided in the previous subsections.

Table 3-6: Summary of Schedule for Control Activities for Pathogen Health Risk HPWQC

Strategy	Implementation Period Ending in:					
	2023	2028	2033	2038	2043	2045
JRMP Program Implementation	Initiated on Plan approval, ongoing implementation thereafter					
Human Pathogen Source Control Strategy	Initiated upon Plan acceptance. Work Plan execution through 2027 (see Table 3-5)		As needed effort on a continuing basis.			

Strategy	Implementation Period Ending in:					
	2023	2028	2033	2038	2043	2045
Redevelopment through Permit-Required LID Implementation	Ongoing implementation – anticipate aggregate 6% redevelopment of urban area by 2028 (see section 3.1.4.5 for discussion and assumptions)					
Absorbent Landscaping/ Impervious Area Dispersion Incentive Program	Initiated on Plan approval, ongoing implementation thereafter					
New development program	Program updates were completed in 2017. Ongoing program implementation and refinements to guidance, criteria, and inspections					
Dry weather flow retrofits/diversions within existing stormwater facilities	Identify as part of outfall feasibility studies; implement as identified and determined to be appropriate	Dry weather flow retrofits within existing stormwater facilities				
New Structural BMP Implementation	Within 5 years of Plan Acceptance, new structural projects identified to meet load reduction goals.	Final TMDL compliance required by April 4, 2031.				

3.1.4.8 Responsibility for Strategy Implementation

Table 3-7 categorizes strategies as WMA strategies, multi-jurisdictional strategies, or jurisdictional strategies and identifies implementation responsibility.

Table 3-7: Summary of Responsibility for Control Activities for Pathogen Health Risk HPWQC

Strategy	WMA or Jurisdictional Strategy?	Responsibility
JRMP program implementation	Jurisdictional	Each jurisdiction implements program; County leads program document updates
Human pathogen source control strategy	WMA	OC Stormwater Program

Strategy	WMA or Jurisdictional Strategy?	Responsibility
Redevelopment through permit-required LID implementation	Jurisdictional	OC Stormwater Program
Absorbent landscaping/Impervious Area dispersion incentive program	WMA	OC Stormwater Program
New development program	Jurisdictional	Each jurisdiction implements program; County leads program document updates
Dry weather flow retrofits/diversions within existing stormwater facilities	Jurisdictional/multi-jurisdictional	Based on jurisdiction owning or responsible for existing facility; jointly funded by jurisdictions within tributary area
New structural BMP implementation	Jurisdictional/multi-jurisdictional	Led by jurisdiction leading/owning projects; jointly funded by jurisdictions within tributary area

3.1.4.9 Optional Jurisdictional Strategies

Optional jurisdictional strategies include those that agencies may implement if necessary to achieve interim and final numeric goals. Implementation of the optional strategies will be contingent on circumstances supported by the need for the additional effort, the cost/benefit as compared to other options and strategies, and the availability of funding. Optional strategies that may be implemented are presented by jurisdiction in **Appendix D Tables**.

3.1.4.10 Optional Watershed Strategies

At the time of each update of the WQIP (not less than every five years), an assessment will be made regarding the degree of implementation of identified strategies versus the measured progress toward interim and final goals. If the percent of implementation is significantly higher than the percentage of the final goal achieved, optional strategies will be triggered. Additionally, data acquisition efforts and special studies and analyses described above may identify the need to initiate optional strategies or may identify new strategies. Primary optional strategies include:

More extensive application of structural controls: Locate additional sites for structural pollutant control BMPs, schedule implementation as determined to be necessary to achieve goals.

Site-specific objective: Perform pathogen sampling at the compliance monitoring locations and QMRA calculations to compute potential new site-specific objectives using bacteria indicator species consistent with the Basin Plan.

3.1.5 Summary

Adequacy of Goals and Schedule. The goals and associated schedule for the Pathogen Health Risk HPWQC were established to conform to the final numeric goals expressed as percent load reductions specified in the TMDL (i.e., Attachment E of the Permit).

Adequacy of Strategies - Wet Weather. The wet weather bacteria TMDL requires FIB load reductions from the baseline load by the final TMDL compliance date, April 4, 2031. Baseline loads for the SOC WMA were estimated using a watershed model as described in **Appendix F**. The benefits expected to result from implementation of the proposed non-structural and structural BMPs demonstrate that the load reduction targets for the watersheds will be achieved through implementation of this Plan. **Table 3-8** shows the summary of predicted wet weather load reductions from each BMP type proposed for implementation within the SOC WMA by 2031 as well as the estimated target load reduction (TLR) to meet the HPWQC final numeric goal. The table presents the average, low, and high ranges of estimated load reduction. Ranges reflect variability in baseline pollutant loading (e.g., land use event mean concentrations (EMCs)) as well as variability in BMP effectiveness and are represented by the 25th (low) and 75th percentile (high) prediction estimates. As indicated in the table the average of the range of load reductions achieved by 2031 for WY1993 are greater than the TLR. Based on these results, the suite of BMPs that are proposed in this Plan to be implemented as **primary strategies** are sufficient to achieve the TMDL requirements.

Quantification of BMP benefits for this Plan were assessed based on a number of parameters that have inherent uncertainties and natural variability. Parameters that carry significant uncertainty include storm precipitation, rainfall-runoff response, land uses, infrastructure conditions, EMC data, BMP design and efficiency, site-specific constraints, and cost data. While assessment of potential compliance incorporates a probabilistic assessment, it is recognized that as new data become available, these parameters may change. Furthermore, any translation of BMP performance (in terms of load reduction) to TMDL compliance metrics adds additional uncertainty to the analysis.

Table 3-8: Summary of Final Wet Weather Bacteria Load Reductions (Fecal Coliform) by BMP Type

BMP Category	Laguna Hills/San Joaquin HSAs		Aliso HSA		Dana Point HSA		Lower San Juan HSA		San Clemente HSA	
	10^{12} MPN/Year Average [Low-High]	Percentage of Average Municipal Load Average [Low-High]	10^{12} MPN/Year Average [Low-High]	Percentage of Average Municipal Load Average [Low-High]	10^{12} MPN/Year Average [Low-High]	Percentage of Average Municipal Load Average [Low-High]	10^{12} MPN/Year Average [Low-High]	Percentage of Average Municipal Load Average [Low-High]	10^{12} MPN/Year Average [Low-High]	Percentage of Average Municipal Load Average [Low-High]
Modeled Baseline Loads for WY 1993	1,115	100%	4,765	100%	1,543	100%	11,191	100%	2,553	100%
Final Target Load Reduction (from Table 3-1)	**580**	**52.07%**	**1,268**	**26.62%**	**229**	**14.86%**	**1,435**	**12.82%**	**628**	**24.58%**
Load Reductions										
Implemented BMPs (2001-2016)	22	2.0 % [1%-3%]	858	18.0 %	31	2.0 % [1%-3%]	1,119	10.0 %	51	2.0 % [1%-3%]
Programmatic Strategies (2016-2031)	268	24.0%	901	18.9%	342	22.2%	2,082	18.6%	531	20.8%
• *JRMP Programs*		*10%[b] [9.2%-11%]*		*10%[b] [9.2%-11%]*		*10%[b] [9.2%-11%]*		*10%[b] [9.2%-11%]*		*10%[b] [9.2%-11%]*
• *Redevelopment through Permit-Required LID Implementation*		*2.7% [2.2%-3.2%]*		*3.0% [2.3%-3.6%]*		*2.9% [2.3%-3.4%]*		*2.2% [1.8%-2.6%]*		*2.8% [2.2%-3.3%]*
• *Absorbent Landscaping/Impervious Area Dispersion Incentive Program*		*11.3% [1.6-21%]*		*5.9% [0.73%-11%]*		*9.3% [0.6%-18%]*		*6.4% [0.7%-12%]*		*8.0% [1.0%-14%]*
New Structural BMPs (2016-2031)	341	30.6% *[20%-46%]*	391	8.2% *[5%-12%]*	33	2.1% *[1%-3%]*	168	1.5% *[1%-2%]*	103	4.0% *[3%-6%]*
Total Load Reduction	**631**	**56.6%**	**2,149**	**45.1%**	**406**	**26.3%**	**3,368**	**30.1%**	**684**	**26.8%**

a. Range of water quality benefits represent the 25th and 75th percentile results. Range reflects variability in baseline pollutant loading (primarily driven by land use EMC's) as well as variability in BMP effectiveness.
b. HDR, 2014.
c. Fecal coliform is utilized as a surrogate for all FIB since there is an acceptable database of both land use stormwater concentrations and structural BMP performance for this constituent

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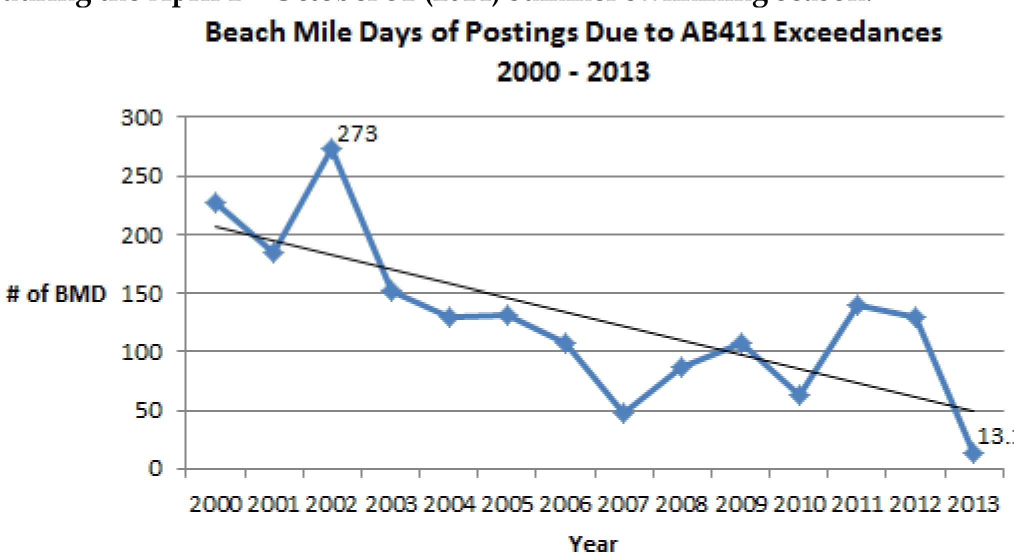
Adequacy of Strategies – Dry Weather

The implementation of this Plan is expected to achieve the numeric goals for dry weather FIB load reductions through a variety of mechanisms that are proposed as well as those that have already been implemented. Dry weather load reductions are anticipated through implementation of the programmatic strategies described in **Sections 3.1.4.2** and **3.1.4.3** where progress toward eliminating FIB and human-specific sources can be made. In addition, the strategies identified in **Section 0** seek to eliminate unnatural, unpermitted dry weather flows that will have commensurate reductions in FIB loading everywhere flow elimination is achieved. Specific and early commitments for eliminating or diverting dry weather flows from high priority outfalls are made in the Plan.

In addition to the anticipated load reductions from future strategy implementation, significant efforts have been made throughout the SOC WMA to address dry weather flows and the associated FIB loading. At least 40 flow diversion and dry weather treatment projects have been implemented along the SOC coastline to reduce the effects of dry weather discharges. As noted in the 2014 ROWD, long-term monitoring shows that exceedances of FIB regulatory standards have been decreasing steadily over time. Improved conditions during dry weather have been mirrored by a decrease over the past several years in beach closures due to contamination, as measured by Beach Mile Days. This metric is calculated by multiplying the length in days of each closure by the length (in miles) of beach affected and is a more accurate measure of the impact on beach users than the simple number of closures. This downward trend is depicted in **Figure 3-3**.

Figure 3-3: The total number of Beach Mile Days (the product of the length of beach posted times the length of beach posted) posted due to exceedances of standards during the April 1 – October 31 (2014) summer swimming season.



Both the 2014 ROWD, as indicated above, and the 2014-2015 City of Dana Point Baby Beach TMDL compliance progress report (see **Section 3.1.7.2**) indicate significant progress towards achieving the dry weather targets. As such, it is reasonable that the strategies identified, combined with refinements or additions to this Plan as part the iterative approach, will result in achievement of the interim and final goals.

Co-benefits Relevant to Aliso Creek Estuary Restoration. Assessments of the existing condition of the Aliso Creek Estuary note issues with bacteria and eutrophic conditions (e.g., nutrients, algae, depressed dissolved oxygen levels). Strategies proposed to address the Pathogen Health Risk HPWQC include non-structural/programmatic strategies expected to reduce human pathogens and indicator bacteria as well as pollutant loads of a wide range of pollutants, including nutrients. Additionally, as part of achieving the goals for this HPWQC, the Aliso Creek watershed is planning for a potential retrofit of 20% of the developed land area with structural treatment control measures that will also result in reductions in nutrients (total nitrogen and phosphorus) as quantified in **Appendix F**. The project description for the Aliso Creek Estuary Restoration Project is currently being developed and a more specific evaluation of the alignment of the Plan goals and strategies with this effort after the project description and description of target future conditions is completed and is available to evaluate.

Similar to this discussion, co-benefits of this HPWQC for other receiving waters are also expected.

3.1.6 Annual Milestones for Next Permit Cycle

Consistent with Provision B.3.c of the MS4 Permit, annual milestones are identified for this HPWQC in **Table 3-9**.

Table 3-9: Annual Milestones for Pathogen Health Risk HPWQC

Year[1]	Action
2018	• Initiate development of CHWSRS Work Plan.
2019	• Complete CHWSRS Work Plan (including Sampling & Analysis Plan, Quality Assurance Plan) for submission to SDRWQCB for review and approval (12 months from Plan effective date)
2020	• Complete at least 30 percent of the scope of dry weather source investigation activities identified in the CHWSRS Work Plan
2021	• Complete the full scope of dry weather source investigation activities identified

Year[1]	Action
	in the CHWSRS Work Plan; initiate abatement and verification efforts • Complete at least 25 percent of the scope of wet weather source investigation activities identified in the CHWSRS Work Plan
2022	• Complete at least 50 percent of the scope of wet weather source investigation activities identified in the CHWSRS Work Plan
2023	• Complete the full scope of wet weather source investigation activities identified in the CHWSRS Work Plan; initiate abatement and verification efforts • Prepare dry weather and wet weather source investigation summary report (interim report; will include proposed abatement efforts) • Update the WQIP to identify specific structural BMP sites, types, and conceptual designs necessary to address the deficiency in load reduction in each HSA.

1 – Milestones refer to the end of each year shown (December 31) except where noted. The status of attainment of these milestones will be reported in the following WQIP Annual Report, which is due by January 31 each year.

3.1.7 Other Compliance Determinations

3.1.7.1 Aliso Creek

Through implementation of the strategies to address Pathogen Health Risk outlined in this section and the TMDLs Monitoring Program indicated in **Section 4.1.4**, the Permittees will address the goals of the Aliso Creek 13225 Directive issued in 2001 and later incorporated in the prior MS4 Permit, Order R9-2009-0002. It should be noted, however, that upon acceptance the Pathogen Health Risk elements of this Plan make the Directive provisions duplicative. Upon WQIP approval, the Aliso Creek 13225 Directive is formally withdrawn. Based on the human waste source control monitoring described in **Section 3.1.4.3** and the TMDLs Monitoring Program indicated in **Section 4.1.4**, monitoring will continue to be conducted in Aliso Creek that is consistent with the intent of the directive.

3.1.7.2 Baby Beach TMDL

Compliance with the TMDL for Baby Beach in Dana Point Harbor (Resolution No. R9-2008-0027) is documented in annual progress reports from the City of Dana Point and County of Orange, the most recently documented in the FY2041-15 annual progress report. The compliance timelines for FIB in this watershed are in the past: 2009 for wet weather and 2014 for dry weather, except for wet weather *Enterococcus* that is September 15, 2019. As noted in the progress report, significant progress has been made including:

1) Dry weather final TMDL targets have been achieved in receiving waters for total coliform. No dry weather exceedances of the total coliform 30-day geometric mean target occurred during the 2014-15 reporting period.
2) Dry weather final TMDL targets have been achieved in receiving waters for fecal coliform. No dry weather exceedances of the fecal coliform 30-day geometric mean target occurred during the reporting period.
3) Exceedances of the *Enterococcus* numeric targets in receiving waters occurred for both the 30-day geometric mean and single sample maximum during dry weather. However, with the implementation of the dry weather diversion BMP, all run-off has been eliminated and the required load reduction for the MS4 during dry weather has been achieved.
4) Wet weather numeric targets for total coliform in receiving waters were generally met, with only one exceedance during the reporting period. There continues to be an overall declining trend in concentrations.
5) Wet weather numeric targets for fecal coliform in receiving waters were generally met, with only four exceedances during the reporting period. Exceedance rates have continuously declined from 32% in the baseline years to 13% in the progress years to 9.5% in the current reporting period.
6) Wet weather exceedance rates for *Enterococcus* in receiving waters were 50% below baseline years. Exceedance rates have declined from 55% in baseline years to 33% in the progress years to 27% in the current reporting period.

The Baby Beach TMDL Technical Report (SDRWQCB, 2008) found that less than 0.1% of dry weather loadings and less than 5% of wet weather loadings of indicator bacteria were attributed to urban runoff. The overwhelming majority was from natural/background sources. With a coordinated watershed-wide effort that includes monitoring, special studies, and load reduction BMPs, overall loadings of indicator bacteria have been reduced 50% to 90% during dry weather condition and 60-95% in wet weather conditions since the baseline years, significantly above and beyond the requirements of the TMDL.

3.2 Channel Erosion and Associated Geomorphic Impacts – Inland Receiving Waters

3.2.1 Overview

3.2.1.1 Introduction

Within the network of streams and creek systems in the SOC WMA, certain reaches have experienced adverse geomorphic impacts resulting from severe erosion, such that the underlying physical form of the stream has been altered. This condition influences the physical habitat (i.e., channel geometry, substrate, vegetation) and hydraulic flow regimes (i.e., velocity distributions, erosive energy) of a channel. Physical habitat and hydraulic conditions are elements of stream form and function near the foundation of the stream rehabilitation hierarchy described by Harman (2012). In other words, management efforts focused at this level of the pyramid are likely to be needed in some cases as a first step toward restoration of biological and recreational beneficial uses in these stream reaches. For these reasons, channel erosion and associated geomorphic impacts was identified as a HPWQCs in **Section 2**. The extent of this HPWQC applies to those reaches that are undergoing significant erosional impacts where the resulting impacts to channel form and function is an important limiting factor in restoration of beneficial uses.

3.2.1.2 Historical and Current Context

Prior to urbanization, farming, grazing other land use activities began to have hydromodification impacts on some streams in Southern California (SCCWRP, 2013) through changes in runoff hydrology (e.g., from changes in watershed vegetation and compaction), change in sediment transport (e.g., from road crossings), modification of channel form (e.g., channelization), and changes in riparian vegetation (e.g., vegetation removal, invasive species colonization). Early urbanization typically contributed to greater impacts to flow regime and sediment supply and often included further channelization or piping of streams to accommodate excess runoff volumes and peak flowrates, with a focus on the peak design storm (e.g., the 100-year event). With early MS4 Permit implementation, development was required to implement source control practices, water quality treatment BMPs, and in some cases peak flow control for storms occurring more frequently (e.g., the 2-year and 5-year storms). As the state of the scientific knowledge of hydromodification impacts has developed, modern MS4 Permits have enacted more stringent flow control and sediment management criteria intended to avoid new hydromodification impacts. Additionally, resource agencies have become less accepting of modifications of natural channels.

Much of the development in the WMA occurred at interim periods in this trajectory. This has resulted in a wide range of conditions and at various points in their response to pre-urban and urban disturbances. Today, stream channels in the WMA can be loosely classified into several categories:

1. Streams that have been fully channelized or piped, with a sole design basis for safely conveying the peak 100-year flowrate. These systems most often present no reasonable opportunity to restore riparian beneficial uses.
2. Streams that have been engineered to provide stability in up to a peak flood design flowrate (e.g., through grade controls structures; bank protection), but include soil and vegetation elements that continue to support some biological processes. Typically, the capacity of these systems is based on the required peak flood design flowrate. Introducing elements to slow water and create additional habitat is typically incompatible with maintaining this design basis. Therefore, these systems present limited opportunity to restore riparian beneficial uses.
3. Streams that have significant natural reaches (i.e., unarmored and unimproved), receiving runoff from areas that were developed prior to modern hydromodification control standards. These streams are often in various states of adjustment in response to urbanization. The degree to which systems are resilient to long term hydromodification impacts (i.e., can resist changes or can reestablish a new stable form after changes occur) is dependent on the degree of alteration of inputs and the local geology of the stream system. While hydraulic regimes and stream form may be modified, the establishment of a new stable form tends to result in reduction in active erosion and establishment of new mature vegetation.
4. Streams that have significant natural reaches (i.e., unarmored and unimproved) and receive runoff from areas solely developed to include modern hydromodification control standards. While adjustments may still occur in sensitive channels, it is expected that modern standards will be effective in avoiding most forms of hydromodification impacts. Monitoring described in **Section 4.1.2.1.1.3** is intended to evaluate the effectiveness of hydromodification controls and support adjustment of hydromodification control standards, if needed. However, where streams experienced erosion and incision prior to development, this may continue even with full modern hydromodification control of project discharges.
5. Streams that do not receive urban runoff and have not been improved. These systems may experience impacts associated with non-urban land uses, but are not the focus of this Plan.

In the rapid assessment of stream reaches conducted in **Section 2** the majority of reaches identified as experiencing hydromodification impacts were those in category 3 above.

The degree to which the channel has reestablished a new stable form is a key factor in the management actions appropriate for these reaches.

3.2.1.3 Focus of This Plan

This section focuses on identifying locations where (1) excess erosion and scour is actively occurring and is an important limiting factor in channel ecology, and (2) there are reasonable opportunities to implement rehabilitation projects designed to serve the full range of flow and temporal conditions (e.g., peak flows; geomorphically-significant flows; low flows). Feasible rehabilitation projects to abate excess erosion, implemented over a range of time, are anticipated to improve physical habitat and hydraulic regime (i.e., underlying tiers in the stream rehabilitation framework layer), facilitating the conditions for improvements in the associated biological communities (pinnacle of the Function-Based Framework for Stream Restoration).

This Plan places the highest priority on locations where streams remain unstable and have not reestablished a new stable form. Macro-scale erosion impacts were initially identified through a rapid screening assessment of the stream systems within the SOC WMA as depicted in **Exhibit A-9**. Further screening level investigations efforts have been conducted as part of preparing this Plan. However, given the episodic nature of channel erosion and limitations of aerial photography methods (e.g., tree cover, varying resolution), there remains uncertainty regarding the severity of current erosive impacts and the active effect they are having on channel form and physical habitat. Therefore, strategies described in this Plan will include conducting more detailed investigations of these reaches to determine the need for and feasibility of rehabilitation. Finally, this Plan includes advanced monitoring techniques based on LiDAR data for the entire urban stream network in the WMA to provide a more thorough assessment of existing conditions and allow earlier identification of future unstable conditions to allow less intensive interventions to be completed prior to the development of severe erosive impacts.

As a key element of this Plan, a "geomorphically-referenced" stream rehabilitation/ enhancement approach will be implemented that will aim to abate excess ongoing erosion while maintaining dynamic morphology of the active channel (rather than full stabilization) and provide conveyance for design flood flows. Where opportunity allows, these projects will also be designed to provide habitat improvement, water quality benefits, recreational (and associated safety) improvement, and utility protection. Successful rehabilitation projects that have been conducted within the WMA highlight the commitment of the respective agencies to restore stream systems that have been adversely impacted from developed watershed runoff. Examples include:

- Narco Channel Restoration at J04 – 800 LF

- Upper Sulphur Creek Restoration (from outfall at Rancho Niguel Park, to Crown Valley Park) – 13,200 LF
- Middle Sulphur Creek Ecosystem Restoration (within Crown Valley Park, to MNWD Treatment Plant) - 2,200 LF
- J03P01 Restoration (within Crown Valley Park) – 3,000 LF

A *draft Conceptual Geomorphically Referenced Basis of Design (GRBOD) Guideline* is included as part of this Plan (**Appendix I**) and will be finalized as an early milestone in Plan implementation. An important aspect of watercourse rehabilitation per this draft Guideline is to continue to accommodate flood conveyance purposes and mitigate geomorphic impacts, while providing a channel form that is conducive to riparian ecosystems. This can be conceptually achieved through use of "softer" approaches (e.g., buried grade control structures, soft meanders, live stakes and other biotechnical streambank stabilization, riparian buffer, step-pools, etc.) in the active channel coupled with more engineered approaches where needed. However, it must also be acknowledged that some reaches are constrained, such that it may only be feasible to abate erosion and maintain flood conveyance purposes. In this approach, a reduction in excessive downstream sedimentation and reduction of risks to property or recreational uses is still a desirable outcome of rehabilitation.

3.2.1.4 Role of Flow Control

In **Section 2**, wet weather hydrologic modification (e.g., wet weather runoff volume and peak flow increases) and sediment supply reduction were also examined as potential HPWQCs. While wet weather flow and sediment supply regimes have clearly been impacted by urbanization and are an underlying cause of past and active geomorphic impacts, this was not identified as a HPWQC for two primary reasons. First, where channel degradation has occurred, correcting hydrologic inputs is not adequate alone to rehabilitate stream form. For example, where channel incision has occurred, and the channel has been disconnected from the flood plain, the cumulative energy of streamflow tends to be more concentrated within the active channel such that predevelopment hydrologic inputs would incur a higher rate of sediment transport than predevelopment sediment transport. Additionally, room for natural meandering is limited by reduction in channel corridor width. Second, the reasonable level of improvement that can be expected for wet weather flow regimes is limited in most developed watersheds. While flow and volume management was not identified as a HPWQC, it will be considered and achieved in three primary ways: (1) in developing erosion management and rehabilitation plans for impacted reaches, the ability to achieve improved upland flow control will be considered, (2) flow control and volume reduction will be incidental outcomes from implementation of strategies identified for the Pathogen Health Risk HPWQC, and (3) new development and redevelopment projects will implement flow duration control and sediment management described in the South Orange County Hydromodification Management Plan (SOC HMP, 2015).

3.2.2 Goals and Schedules

The overall goal for this HPWQC is to abate excess erosion where these processes are determined to be an active and primary source of impairment to geomorphic form and function within an impaired reach. Abatement of excess erosion and scour through "geomorphically-referenced" approaches that maintain a more natural stream form (rather than full stabilization) is intended to provide the physical setting necessary for the channel to be revegetated with natural species and establish more natural bed and bank materials, which can support restoration of riparian and recreational beneficial uses and reduce downstream of water quality impacts caused by erosion and sedimentation. The specific numeric goals to demonstrate progress towards addressing channel erosion and associated geomorphic impacts within the SOC WMA stream systems are based on lineal measurements of channel lengths where excess erosion and scour will be abated using a geomorphically-referenced approach. These goals were established based on a reasonable assessment of the length of reach where this approach may be desirable and feasible.

3.2.2.1 Reach Prioritization Assessment to Support Numeric Goal Setting

As part of **Section 2**, a rapid aerial screening of approximately 170 lineal miles of inland receiving waters was conducted to identify reaches that appear to have experienced serious geomorphic impact associated with urbanization. This assessment was intended to support an initial estimate of the spatial extent of this HPWQC. However, this assessment did not consider a number of factors that influence the relative enhancement of beneficial uses that would be provided by a rehabilitation project or the likelihood that a rehabilitation project will be determined to be appropriate and feasible to implement. For example, the location of the reach within the watershed and the degree to which the reach has reestablished a stable channel form will determine the degree of beneficial use enhancement that could be obtained and whether rehabilitation efforts would, indeed, be appropriate.

As part of setting numeric goals for this HPWQC, an additional assessment was completed for the subset of potential priority reaches initially identified in **Section 2**. This assessment included a number of factors identified in the paragraphs below. The purpose of this assessment was to estimate the reasonable length of stream where rehabilitation is needed, appropriate and feasible.

Degree of recent instability. The degree of instability was assessed based on a series of historical aerial photographs from 1994 to present via Google Earth Pro. Observations of channel evolution (or lack thereof) was compared to reference reaches of similar watershed sizes located upstream of the influence of urbanization (in cases where urbanization occurred prior to 1994) or assessment of the channel form of the specific reach prior to the time of urbanization (in cases were urbanization occurred after 1994). In several cases, the geomorphic observations that were noted as indicators of instability in the previous assessment (for example, migration of active channel or sloughing of outer floodplain banks) were found to be consistent with natural or pre-urban channel form. In these cases, the reach was removed from consideration as a HPWQC reach.

Extent of impact. The same series of historical aerial photographs from 1994 to present were used to confirm or revise the extent of the upstream and downstream limits of the impact. This review resulted in increasing the length of impact of two reaches compared to the extents originally identified in **Section 2**.

Potential for enhancement of beneficial uses via rehabilitation. Various factors were considered in a preliminary assessment of the potential for enhancement of biological and recreational beneficial uses via rehabilitation projects, including:

- Relationship to infrastructure, particularly where erosion may be threatening infrastructure or public safety.
- Relationship to recreational features (parks, trails, schools, etc.) such that the actual recreational beneficial use associated with the reach is higher.
- Degree of current instability. Does the channel still appear to be actively eroding based on evaluation of response to recent wet winters – 2004/2005 and 2010/2011? Or does the channel appear to have evolved to a new stable form? What portion of the reach is currently experiencing elevated erosion?
- Degree of vegetative cover in wet and dry years. The extent of mature woody vegetative cover that resist erosion following wet years was used as an indicator for evaluating current degree of instability and active erosion. It was also used to evaluate whether there would be significant incidental impacts to habitat associated with a project.
- Potential impacts of excess erosion and sedimentation from the reach of interest on downstream resources or projects. For example, in-stream infiltration projects or estuary restoration.
- Opportunity to improve habitat connectivity via rehabilitation of a reach that lies between two reaches that are in better condition, including opportunities to provide fish passage (e.g., in San Juan and Trabuco Creeks).

Opportunity and constraints. Various factors were assessed to gauge the relative opportunity and constraints associated with completing an in-stream rehabilitation project, including:

- Flood design flows (100-year return interval), existing channel capacity, and degree of excess or deficiency in capacity, where known. This influences whether increases in channel roughness (from additional vegetation) and reduction in channel slope (as part of a rehabilitation approach) could be allowable.
- Right of way width and encroachments on the floodplain of the channel.
- Ownership the channel right of way and adjacent parcels.
- Existing hydraulic structures and infrastructure, which can improve stability by controlling grade (by design or otherwise) or can complicate rehabilitation efforts by creating areas of concentrate stream energy.
- Known existence or absence of prior design and feasibility efforts.
- Estimated degree of design and permitting complexity.

Based on these preliminary assessments, a qualitative rating of low, medium, or high was assigned for (1) potential enhancement of beneficial use, (2) opportunity for rehabilitation, and (3) constraints/complexity associated rehabilitation, and a summary of the basis for each rating was prepared. Based on these ratings, an overall "likelihood" rating between 0 and 100 percent was assigned to each reach. This rating presents an overall assessment of the probability that a rehabilitation project will be determined to be desirable, appropriate, and feasible for a given reach. If the need was determined to be low, then the reach was removed from consideration, and the likelihood of a rehabilitation project was set to zero. Where the need for rehabilitation was confirmed, then the opportunity and constraints were assessed to estimate the probability that a project could happen.

The reach length multiplied by the probability of rehabilitation was used as the basis for establishment of reasonable goals. **Table 3-10** provides a summary of the ratings prepared and various information about the reach that was used to support ratings. Associated map exhibits showing the locations of the candidate reaches appear in **Appendix H**. This assessment was based on limited data sources and is not intended to take the place of appropriate field investigation and engineering studies that are identified as strategies for implementing these goals.

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Table 3-10: Potential Reach Rehabilitation Information Summary

Reach ID	Watershed	Watershed Context	Potential Enhancement of Beneficial Uses	Opportunity	Constraints/ Complexity	Probability Estimate	Timeframe Rating	Assessment No(s).	Ownership	Reach Length (ft)	Est. Average Right-of-Way Width (ft)	Est. Slope (%)	OCFCD Reach No.	Design flow Q100 (cfs)	Existing flow (cfs)	Ex/Q100 flow rate ratio
ALC01	Aliso Creek	Aliso Creek upstream of El Toro Road and downstream of Portola Parkway	**Moderate.** Areas of bank failure and scour are clear Bank failure compromised bike path following 2011 Active channel vegetation does not readily reestablish Nexus to bikeway	**Moderate.** OCFCD ownership Excess capacity exists in most sections Some existing drop structures, however with long spacing	**Moderate.** Relatively narrow right of way No known study of this reach for restoration Major drainage deficiency at El Toro cross at downstream limit	40%	Mid to Long	104-531-22 104-541-04 104-541-06 104-531-20 104-531-19	Orange County Flood Control District	2,613	280	1.59	J01-45	5,585	13,812	2.47
ALC01a (added upstream of ALC01)	Aliso Creek							104-143-30 104-541-06 104-143-39 104-143-30 104-143-30	Orange County Flood Control District	3,300	TBD	~1.5%	J01-48	5,585	NP	NC
ALC02	Aliso Creek							104-531-22	Orange County Flood Control District	473	274	1.98	J01-44	5,585	6,248	1.12
ALC03	Aliso Creek	Aliso Creek downstream of Metrolink rail, adjacent to Los Alisos Blvd	**Moderate/Low.** Reach is semi-natural between two engineered sections Does not appear to exhibit major instability Heavily vegetated	**Moderate/low.** Public ownership Adjacent to golf course/open space	**Moderate.** Relatively narrow right of way Adjacent golf course	20%	Mid to long	No data 617-421-01 613-363-05	Private City of Lake Forest Orange County Flood Control District	1,228	182	0.64	J01-28	4,582	4,000	0.87
ALC04	Aliso Creek	Aliso Creek downstream of I-5	**High.** Severe erosion and bank failure in parts Bikeway and trail threatened by channel migration and bank failure	**Moderate.** Public ownership Has been identified by OCCR as potential projects	**Moderate** Adjacent infrastructure Relatively narrow right of way I-5 crossing creates concentrated energy	60%	Near to mid	620-461-21 620-461-19 620-461-20	County of Orange City of Laguna Hills	3,443	347	1.29	J01-19	4,582	5,000	1.09

Reach ID	Watershed	Watershed Context	Potential Enhancement of Beneficial Uses	Opportunity	Constraints/ Complexity	Probability Estimate	Timeframe Rating	Assessment No(s).	Ownership	Reach Length (ft)	Est. Average Right-of-Way Width (ft)	Est. Slope (%)	OCFCD Reach No.	Design flow Q100 (cfs)	Existing flow (cfs)	Ex/Q100 flow rate ratio
ALC05	Aliso Creek	Aliso Creek downstream of Moulton Parkway	**Moderate.** Some erosion and instability in portions; however strong revegetation Relationship to trail system	**Moderate** Public ownership	**Moderate** Somewhat narrow valley	40%	Mid to Long	623-011-50 623-011-51	County of Orange	1,895	375	0.61	J01-10	4,582	5,200	1.13
ALC06	Aliso Creek	Mid reach of Aliso Creek near the 73 toll road	**Moderate** Portions of reach have bank instabilities, but not as evident as downstream reaches Grade controlled at Pacific Park Drive crossing Relationship to trail system, parks, and middle school	**Moderate** Public ownership	**Moderate** Road crossings and culvert More constrained floodway Heavily vegetated Large streamflows	40%	Mid to Long	634-012-09 634-012-12 634-341-01 634-012-22	County of Orange	4,056	678	0.98	J01-10	7,400	5,982	0.81
								634-341-02 634-342-02	City of Aliso Viejo							
ALC07	Aliso Creek	Mid-lower reach of Aliso Creek within Aliso-Wood Canyon Park	**Moderate/High** Portions of reach have clear bank instabilities Need for mainstem Aliso Creek restoration has been long identified in planning efforts	**Moderate** Within predominantly open space areas Mostly County owned Reasonable floodplain width for restoration Preliminary feasibility analysis demonstrated viable technical options	**Moderate/High** Heavily vegetated Large streamflows Major permitting considerations Contingent on ACOE process	60%	Mid to Long	No data	Private	2,626	700	0.23	J01-2.3	6,500	6,438	0.99
								639-011-18	County of Orange							
ALC08	Aliso Creek							655-051-04	County of Orange	4,488	1,408	0.01	J01-2.2	10,800	NP	NC

Reach ID	Watershed	Watershed Context	Potential Enhancement of Beneficial Uses	Opportunity	Constraints/ Complexity	Probability Estimate	Timeframe Rating	Assessment No(s).	Ownership	Reach Length (ft)	Est. Average Right-of-Way Width (ft)	Est. Slope (%)	OCFCD Reach No.	Design flow Q100 (cfs)	Existing flow (cfs)	Ex/Q100 flow rate ratio
SCC01	San Clemente Coastal Streams	Two branches of Segunda Deshecha downstream of Avenida Talega	**Low/Moderate.** Limited signs of instability. Original indications appear to be part of natural channel form. Within golf course/No recreational use.	**Low.**	**High** Private ownership Limited signs of property/ infrastructure threat. Narrow corridor. Well vegetated.	Remove from priority	NA	708-032-06 701-161-01	Private	497	134	6.21	N/A	NP	NP	NC
SCC02	San Clemente Coastal Streams							708-032-06 701-161-01	Private	827	182	1.61	N/A	NP	NP	NC
SCC03	San Clemente Coastal Streams							708-032-04 708-032-06 701-161-01	Private	757	94	3.79	N/A	NP	NP	NC
SCC04	San Clemente Coastal Streams	Branch of Segunda Deshecha downstream of Calle Saluda	**Low/Moderate.** Limited signs of instability. Original indications appear to be part of natural channel form. No recreational use.	**Low.**	**High** Private ownership Limited signs of property/ infrastructure threat. Narrow corridor. Well vegetated.	Remove from priority	NA	701-332-14 701-332-10	Private	1,851	381	3.12	N/A	NP	NP	NC
SCC05	San Clemente Coastal Streams	Headwaters branch of Prima Deshecha parallel with Avenida Vista Hermosa	**Low/Moderate.** Limited signs of instability. Original indications appear to be part of natural channel form. No recreational use.	**Low.**	**High** Private ownership Limited signs of property/ infrastructure threat. Narrow corridor. Well vegetated.	Remove from priority	NA	679-161-06 679-161-21 679-161-23 679-161-16 679-281-04 679-281-05 679-161-13 679-281-09 679-161-24 679-161-22 679-161-17 679-281-06	Private	2,057	102	3.80	N/A	NP	NP	NC
SJC01	San Juan Creek	Headwaters of Trabuco Creek No significant urban impacts	**Low.** No significant urban impacts; change evolution	**Moderate.** Space and some public ownership.	**High.** Minimal opportunity for uplift given	Remove from priority	NA	842-061-01 842-051-13	Private Orange County Transport Authority	3,053	1,109	2.22	L02-20	14,400	6,800	0.47

Reach ID	Watershed	Watershed Context	Potential Enhancement of Beneficial Uses	Opportunity	Constraints/ Complexity	Probability Estimate	Timeframe Rating	Assessment No(s).	Ownership	Reach Length (ft)	Est. Average Right-of-Way Width (ft)	Est. Slope (%)	OCFCD Reach No.	Design flow Q100 (cfs)	Existing flow (cfs)	Ex/Q100 flow rate ratio
SJC02	San Juan Creek		appears to be natural.		good existing condition.			No data	Private	1,637	435	1.64	L02-20	14,400	6,800	0.47
SJC03	San Juan Creek	Tijeras Canyon near Antonio Parkway	**Moderate** Clear channel erosion Could improve connectivity with rehabilitation Does not appear to be encroaching on infrastructure Not a clear recreational asset	**Moderate** Mostly public ownership Moderate design flow for channel dimension	**Moderate** Has not been previously been studied for rehabilitation, per our knowledge	40%	Mid	125-087-12 125-087-11 125-087-09	County of Orange	843	437	1.96	L11-1.2	3,686	NP	NC
SJC04								787-151-01 125-087-12 125-087-11 125-087-09	Private County of Orange	1,280	629	1.56	L11-1.2	3,686	NP	NC
SJC04a (added)	San Juan Creek	Tijeras between SJC04 and headwaters	**Moderate** Clear channel erosion Significant sections without vegetative cover May be encroaching on development/ infrastructure Not a clear recreational asset	**Moderate** Moderate design flow for channel dimension Relatively steep slope	**Moderate** Very long section Ownership not known Has not been previously been studied for rehabilitation, per knowledge	40%	Mid to Long	125-036-19 806-051-38 125-036-20 125-087-36 125-087-03 125-087-02 814-281-10 814-281-09 125-102-01 125-036-24 814-281-08	County of Orange	10,500	TBD	2%	L11-1.3 to 1.7	2,335 to 3,686	NP	NC
SJC04b (added)	San Juan Creek	Tijeras between SJC04 and confluence with Trabuco Creek	**Moderate** Clear recent channel erosion Significant sections without vegetative cover May be encroaching on development/ infrastructure Not a clear recreational asset	**Moderate** Moderate design flow for channel dimension Relatively steep slope	**Moderate** Very long section Ownership appears private for much Has not been previously been studied for rehabilitation, per knowledge	20%	Mid to Long	787-141-04 787-151-01 125-097-20 125-097-09 125-097-03 125-097-33 125-097-34	Private County of Orange	6,800	TBD	2%	L11-1.1/1.2	3,749	NP	NC

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<tr><td>SJC05</td><td rowspan="4">San Juan Creek</td><td rowspan="4">Main stem Trabuco Creek; near mid watershed</td><td rowspan="4">Low
Channel evolution likely within natural variability
Does not appear to be a major impact to channel form</td><td rowspan="4">Moderate
Mostly county or water district ownership
Ample floodplain width</td><td rowspan="4">High
Large stream/ large design flow
Heavy vegetation</td><td rowspan="4">Remove from priority</td><td rowspan="4">NA</td><td>125-096-95
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<tr><td rowspan="3">SJC06</td><td>125-096-96</td><td>Private</td><td rowspan="3">2,768</td><td rowspan="3">697</td><td rowspan="3">1.42</td><td rowspan="3">L02-16</td><td rowspan="3">18,600</td><td rowspan="3">18,500</td><td rowspan="3">0.99</td></tr>
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125-096-62
125-096-64
125-096-15</td><td>County of Orange</td></tr>
<tr><td rowspan="3">SJC07</td><td rowspan="3">San Juan Creek</td><td rowspan="3">Side channel into Trabuco Creek from major storm drain outfall</td><td rowspan="3">Moderate
Likely sediment contributor
Could compromise infrastructure
Appears to have relationship to trail system
Limited uplift potential - Not mainstem; fed only by urban storm flows</td><td rowspan="3">Moderate
Clear issue
Partial public/water district ownership
Not mainstem; simpler permitting</td><td rowspan="3">Moderate
Partial private</td><td rowspan="3">40%</td><td rowspan="3">Mid</td><td>125-096-96
759-101-03</td><td>Private</td><td rowspan="3">1,870</td><td rowspan="3">115</td><td rowspan="3">4.04</td><td rowspan="3">N/A</td><td rowspan="3">NP</td><td rowspan="3">NP</td><td rowspan="3">NC</td></tr>
<tr><td>125-096-93</td><td>Santa Margarita Water District</td></tr>
<tr><td>125-096-95
125-096-52
125-096-15
125-096-53
125-096-14
125-096-08
125-096-62
125-096-64</td><td>County of Orange</td></tr>
</tbody>
</table>

Reach ID	Watershed	Watershed Context	Potential Enhancement of Beneficial Uses	Opportunity	Constraints/ Complexity	Probability Estimate	Timeframe Rating	Assessment No(s).	Ownership	Reach Length (ft)	Est. Average Right-of-Way Width (ft)	Est. Slope (%)	OCFCD Reach No.	Design flow Q100 (cfs)	Existing flow (cfs)	Ex/Q100 flow rate ratio
SJC08	San Juan Creek	Lower portion of Trabuco Creek; reach within golf course	**Moderate** Rehabilitation could expand flood plain and improve connectivity Form has been modified (more channelized) Open standing water Appears to have some form of grade control Does not appear to be unstable	**Low/moderate** Partial public ownership Golf course adjacent and was source of previous flood plain encroachment	**Moderate/high** Relatively high design flow Meaningful rehabilitation of channel form would require land acquisition and modification of golf course.	20%	Long	125-181-55 125-181-26 125-181-51 125-181-23 125-181-59 125-181-14 125-181-57 125-181-22 125-181-53 125-181-52	Private	2,216	183	0.03	L02-16	19,000	18,500	0.97
								125-181-30 125-181-58 125-181-32 125-181-54 125-181-50 125-181-56 125-181-49	County of Orange							
SJC09	San Juan Creek	Oso Creek between Gallivan Retarding Basin and Confluence with Trabuco Creek	**High** Major instability appears to be responsible for ongoing bank failures, physical habitat impact, and sediment loading Beginning to threaten OCTA infrastructure Sedimentation could complicate downstream recharge and steelhead recovery efforts	**Moderate** Relatively low peak design flow for watershed size (result of Gallivan Basin) Mostly adjacent to open space	**Very high** Mostly private ownership; have been approached by OCTA without success thus far	20%	Mid to long	637-082-71	Private	853	134	2.63	L03-1	6,600	17,931	2.72
								637-082-70	Orange County Flood Control District							
SJC10	San Juan Creek							637-082-15 637-082-14 121-050-23 121-070-57 121-070-67 637-082-71	Private	6,017	649	1.34	L03-1	6,600	17,931	2.72
								637-082-70	Orange County Flood Control District							
								121-050-16	City of San Juan Capistrano							

Reach ID	Watershed	Watershed Context	Potential Enhancement of Beneficial Uses	Opportunity	Constraints/ Complexity	Probability Estimate	Timeframe Rating	Assessment No(s).	Ownership	Reach Length	Est. Average Right-of-Way Width	Est. Slope	OCFCD Reach No.	Design flow Q100	Existing flow	Ex/Q100 flow rate ratio
										(ft)	(ft)	(%)		(cfs)	(cfs)	
SJC11	San Juan Creek	Trabuco Creek just upstream of confluence with Oso Creek near Metrolink crossing	**Moderate/high** Clear erosion impacts Sedimentation could complicate downstream recharge efforts Based on CP member comments, fish passage is desirable Standing water in scour pool below	**Moderate** Based on CP member comments, a 65% design has been completed for this reach, suggesting potential landowner cooperation	**Moderate** Private ownership Relatively high design flow and bridge constriction may require hardened approach for scour	40%	Mid	121-050-22 121-070-67	Private	775	127	1.81	L02-5	23,000	19,200	0.83
SJC12	San Juan Creek	Lateral to Oso Creek through Mission Viejo Country Club	**Low** Existing grade control appears to be mostly controlling erosion Limited opportunity for ecological connectivity	**Low** Very narrow right of way	**High** Mostly private ownership	Remove from priority	NA	784-521-37 784-521-35	Private	740	48	0.19	N/A	NP	NP	NC
								784-521-41	City of Mission Viejo							
SJC13	San Juan Creek	Wagon Wheel Creek	**High** Clear degradation from urban runoff Recreation/safety (within OC Park) Excess sedimentation into Gobernadora Basin	**High/Moderate** Phase I under construction Mostly OCCR ownership	**Moderate** Partially private	60%	Near to mid	125-102-07 755-011-14 755-022-02	Private	4,250	250	2.40	N/A	NP	NP	NC
								755-022-04 125-102-06	County of Orange							

NP- Not provided
NC – Not calculated

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3.2.2.2 Final Goals

Based on the assessment described in **Section 3.2.2.1** and **Appendix H**, this plan establishes a goal of rehabilitating **23,000 lineal feet** of streams using a geomorphically-referenced approach to abate excess erosion and scour while maintaining dynamic morphology of the active channel (rather than full stabilization) and provide conveyance for design flood flows. Additional benefits (e.g., vegetation rehabilitation, habitat rehabilitation, trails) will be incorporated into rehabilitation efforts on an opportunistic basis to realize the highest reasonable enhancement in beneficial uses associated with efforts to achieve these goals.

Two additional narrative goals are established:

- Any additional reaches beyond those identified in **Appendix H** that are identified to be experiencing excess erosion or scour that threatens biological or recreational beneficial uses will be added to the Plan at the earliest time that they are identified. Appropriate revisions to numeric goals will be established. Identification of additional reaches will be achieved through remote-sensing monitoring described in the strategy section or by other means. Thresholds of significance for channel erosion will be defined in **Section 4**.
- For reaches not currently impacted by urbanization, a goal of no net increase in extent of active erosion resulting from urban development is established. This will be assessed through remote-sensing monitoring described in the strategy section or by other means.

3.2.2.3 Interim Goals and Schedules

Schedules for achievement of interim and final goals were established with consideration for the various planning elements that are typical of rehabilitation projects, including:

- Securing funding
- Obtaining property or easements, where required and possible
- Inter- or Intra-agency cooperative agreements
- Resource agency permitting
- Environmental reviews (CEQA/NEPA)
- Design, bidding, and construction

Utilizing a recent stream rehabilitation project that is nearing the construction phase (Wagon Wheel Creek Project) as a representative example of the timeline over which these planning elements typically occur, it is assumed, for the purpose of establishing the goals for this HPWQC, that individual projects will take approximately 5-10 years to be realized if all of the planning elements described above can be put into effect in a relatively sequential fashion without large gaps of time between each element. A reasonable planning horizon timeline of approximately 20 years is considered in goal development to allow for implementation of a sufficient number of these projects, based on the rehabilitation strategy proposed in this Plan, such that assessment of the strategy's efficacy for realizing the intended outcomes of restoring habitat and the associated ecological functions can be made. This timeline is consistent with implementation timelines for strategies to address the other HPWQCs in this Plan, to be implemented over multiple Permit cycles. A planning horizon timeline significantly beyond a 20-year outlook is challenging, as changes in conditions over a multi-decadal period are difficult to foresee, and therefore does not consider the potential changes that may be identified as prudent based on the adaptive management actions that will be a part of this Plan. The numeric goals and schedules for abatement of excess channel erosion in the SOC WMA are presented in **Table 3-11**.

Table 3-11: Numeric Goals and Schedules for Channel Erosion HPWQC

Year	Length of Stream Reach Rehabilitated to Abate Excess Erosion using a Geomorphically-referenced Approach, Lineal Feet
2023	2,000
2028	6,000
2033	12,000
2037	18,000
2042	23,000 (final goal)

3.2.3 Strategies and Schedules

3.2.3.1 Overall Long-Term Strategic Vision

The long-term strategic vision for this Plan includes rehabilitation of geomorphically unstable channels within urbanized corridors and publicly owned rights-of-way using a multi-benefit rehabilitation approach, where feasible. This Plan proposes rehabilitation be conducted GRBoD where feasible. This design paradigm emphasizes a complete design approach that considers safe conveyance of flood flows (infrequent conveyance condition) while providing the ecological benefits of establishing a dynamically-stable channel reach to convey the geomorphically-significant flows (more frequent conveyance condition), while restoring or maintaining recreational uses. Potential design elements of rehabilitation include, but are not limited to:

- Grade control/drop structures to flatten slope
- Increase channel sinuosity
- Channel widening
- Elevating active channel to reconnect it to the floodplain
- Bed and bank reinforcement
- Partial flow diversion
- Hardened outer bank limits
- Removal of concrete/hardened infrastructure and replacement with reinforced vegetated bank infrastructure (i.e., ArmorFlex).
- Fully hardened sections, where needed (i.e., high energy, space constraints, etc.)
- Energy dissipation at transitions and outfalls
- Hardened crossings for access

These design principles are conceptually presented in the GRBoD Guidelines located in **Appendix I**. Each lineal foot of channel rehabilitated using these principles will be credited towards achievement of the goals indicated in the previous section. Actual project designs may vary in specific design elements and approaches depending on the specific purposes, opportunities, and constraints of the project, but shall reflect the intent, decision process, and fundamental qualities of the GRBoD approach.

3.2.3.2 Flow Control Strategy

In addition to evaluating reaches for rehabilitation using the GRBoD approach, an important additional element will be to evaluate upstream opportunities to implement flow control. Where opportunities present, either through new facilities or retrofit of existing facilities, implementing additional upstream flow control to mitigate downstream stream energy may be the key element to allowing rehabilitation to proceed in a less "hardened" manner, i.e., more closely aligned with the GRBoD approach. Opportunities for upstream flow control will be evaluated as part of the restoration alternatives and feasibility study discussed in the next section.

3.2.3.3 Specific Near-Term Strategies

A change in paradigm for urban stream management and rehabilitation is a major initiative that requires appropriate phasing of supporting efforts and extensive inter-department and inter-agency coordination. Additionally, each of the candidate reaches identified requires a multi-faceted design and permitting process that must consider site-specific factors to formulate potential project alternatives. It was not reasonable as part of the preparation of this plan to solidify the new framework for rehabilitation or investigate each identified reach in adequate detail to determine need and feasibility or develop a reliable cost estimate. Significant near-term effort (over the next 3 to 5 years) is required to establish the foundational elements of this plan and develop more specific project descriptions and phasing. These near-term efforts are described in this section.

Rehabilitation Alternatives and Feasibility Studies. For each of the candidate reaches identified in **Section 3.2.2** and **Appendix H**, an analysis of rehabilitation alternatives (including as assessment of whether the project will confer greater benefit than a do-nothing alternative), feasibility of these alternatives, and identification of a preferred alternative will be conducted. This analysis will include, as applicable:

- Detailed hydrologic characterization, including flood hydrology and continuous simulation hydrology
- Detailed hydraulic, geomorphic, and sediment transport characterization based on remote sensed and field data
- Evaluation of the potential ecological and recreational enhancement from rehabilitation
- Detailed assessment of constraints and opportunities, including review of topography, soils/geology, land ownership, utilities, habitat, and other factors
- Preliminary engineering evaluation of restoration potential and alternatives based on the methods and performance standards described in the GRBoD (**Appendix I**) and the Orange County Hydrology Manual, including a minimum of 3 alternatives per reach and evaluation of opportunities for improved upland flow control, where applicable
- Preliminary evaluation of permitting issues
- Alternatives analysis, results, and basis for recommended alternative presented in a consistent, transparent manner
- Preliminary cost estimates, schedule requirements, and identification of key contingencies
- Realistic assessment of funding sources and appropriate phasing relative to other reaches identified and analyses

Findings of the analysis for each candidate reach will be reported to the SDRWQCB as part of WQIP reporting requirements and findings and recommendations will be incorporated into periodic updates of the Plan. Analyses and reporting will be completed within five years of plan acceptance. A specific list of proposed projects and schedules will be included in the subsequent Plan update.

Programmatic Permitting Framework for Geomorphically-Referenced Basis of Design Projects. Implementation of multi-benefit restoration projects will require coordination with multiple permitting agencies, including CWA Section 401 permitting (SDRWQCB), CWA Section 404 permitting (Army Corps of Engineers), California Fish and Game Code, Section 1602 Streambed Alteration Agreement (California Department of Fish and Wildlife), and potentially Endangered Species Act consultation (National Marine Fisheries Service or United States Fish and Wildlife Services), the California Coastal

Commission, and other entities. A CEQA process is also required for these projects of this scale. In order to streamline project development and implementation, the Permittees will work with applicable agencies to explore a programmatic permitting framework for these types of projects. A Special Area Management Plan (SAMP) may be considered.

Finalize Conceptual GRBoD Guidelines. A draft of these Guidelines is included in **Appendix I**. This version is considered draft as it has not been fully vetted internally and has not been screened with resource agencies that may be responsible for permitting and design review. The Permittees will obtain input on these Guidelines as part of the *Permitting Framework* strategy described above. Based on input received, the Permittees will finalize these guidelines and submit them for review and input from the SDRWQCB.

LiDAR Data Acquisition and Analysis. The Permittees have obtained high-resolution LiDAR data for approximately 170 miles of stream and riparian corridor within the SOC WMA for the specific purpose of supporting rehabilitation projects, measuring changes over time, and allowing for earlier identification of future instabilities. LiDAR data will be analyzed to develop a high-resolution land surface model, hydraulic cross sections at 250-ft spacing, and land cover classifications relevant to hydraulic and geomorphic analyses (e.g., vegetation density, bare soil, standing water, and hardened surfaces. This dataset will be updated in the future at 5-year intervals or more frequently to support change analyses. The results of analyses of these data will be included in each update to the Plan, as appropriate.

Jurisdictional Implementation of Hydromodification Management Plan. As part of their jurisdictional programs, the Permittees will continue to implement the 2015 SOC HMP. From time to time, the HMP will be updated as part of an iterative process. This strategy will be ongoing. This strategy is expected to be the primary strategy for controlling new impacts to streams receiving runoff from new development, and will tend to result in improvement in hydrologic conditions in existing developed areas experiencing redevelopment.

Watershed Management Area Analysis Coarse Sediment Supply Analysis. As part of the Watershed Management Area Analysis (WMAA) included in this Plan (**Section 3.5**), the Permittees will bring forward the management guidance from the 2015 SOC HMP to mitigate impacts to coarse sediment supplies relative to land development.

Coordination with upland control proposed for Pathogen Health Risk and Water Balance HPWQCs. As part of near- to mid-term planning efforts for the Pathogen Health Risk and Water Balance HPWQCs, upland control projects will be identified. As part of an integrated strategy, opportunities for flow control within these projects will be evaluated and included where feasible and beneficial to downstream geomorphic conditions.

Rancho Mission Viejo Ranch Plan. The overall Runoff Management Plan (ROMP) for the RMV project was developed to mitigate and restore hydromodification impacts within the RMV project area. Through implementation of this Plan and associated tiered Plan development and approval process, geomorphic impacts are expected to be mitigated, and geomorphic conditions generally improved, as a result of development of the RMV project.

Hydromodification Management Plan Effectiveness Monitoring and Assessment. A stream monitoring program intended to evaluate the effectiveness of hydromodification control standards has been conducted in San Juan Creek, Chiquita Canyon, and Gobernadora Canyon in association with the RMV development. The scope and findings of this program were reported in the *Draft Integrated Effectiveness Assessment of Hydromodification Control Standards in South Orange County* (December 2017). In compliance with Provision B and D of the MS4 Permit, this Plan calls for the Copermittees to conduct additional monitoring and assessment activities to evaluate the effectiveness of hydromodification control standards (**Section 4.1.2.1.1.3**). This includes three additional years of monitoring (2019, 2020, and 2021) within Chiquita Canyon. These data will be used to inform whether adjustments to hydromodification control standards are warranted. A final report will be submitted to the Regional Board in January 2022.

Assessment of Stream Monitoring Data Submitted by RMV. This strategy involves annual assessment of stream monitoring program data submitted by RMV to the County of Orange pursuant to EIR 589 Mitigation Measure 4.5-8 to assess the need for changes to hydromodification control standards (e.g., low flow thresholds). It also involves annual reports. See **Section 4.2.2.2** for details of this strategy.

Aliso Creek Mainstem Ecosystem Restoration Project. This project has been led by the Army Corps of Engineers with involvement from the Orange County Stormwater Program. A draft Integrated Feasibility Report was released in September 2017, which was the latest step in the Army Corps planning process for this project. The County, with the support of local permittees and stakeholder groups, intends to pursue a locally-preferred alternative for this project, including elements and considerations that are generally consistent with the GRBoD described in this Plan. The scope of the project will likely include the HPWQC reaches identified as ALC07 and ALC08. This project will be coordinated with other potential future rehabilitation projects in the area including the Aliso Creek Estuary Rehabilitation Project.

Wagon Wheel Creek Restoration Project and Stormwater Management Project. This project will restore a section of Wagon Wheel Creek identified as HPWQC ID SJC013. The purposes of this project are to stabilize Wagon Wheel Creek for resource management purposes in order to protect the remaining oak and sycamore woodland and other riparian vegetation; to protect the Riley Wilderness Park and the recreational resources from flooding and to limit erosion hazards; and to ensure public safety within the Park. This project incorporates geomorphically-referenced elements that are generally consistent with those described in the GRBoD, including bioengineered grade control, riparian vegetation restoration, buried bank stabilization to protect key infrastructure, trail improvements, and stormwater detention. Bidding occurred in August 2016 and construction was completed in 2017. This project included prioritized rehabilitation work at 11 sites over approximately 10,000 lineal feet of stream channel (rehabilitation efforts cover a portion of this reach).

DeWitt Property Habitat Restoration Project. Laguna Canyon Creek is one of two remaining soft-bottomed creeks in the region. This project will restore sections that were damaged during flood events in 2010. A collaborative effort between the City of Laguna Beach, Laguna Canyon Foundation, and Laguna Greenbelt Inc. Laguna Canyon Creek has resulted in a $500,000 grant from the California Natural Resources Agency to conduct the project. The project will include removal of invasive species, creek area repair and planting native plant and tree species. The project will also include interpretive trail signs to educate visitors on the riparian habitat along the creek.

Coordination with Orange County Transportation Authority (OCTA) to Identify Impacted Reaches for Measure M2, Tier 2 Funding. The OC Stormwater Program will continue to coordinate with OCTA to identify and pursue projects to rehabilitate channels experiencing erosion. The Environmental Cleanup Program helps improve overall water quality in Orange County from transportation-generated pollution. The funds are designed to supplement, not supplant, existing transportation-related water quality programs.

OCTA through Measure M2 funding programs has contributed to the Wagon Wheel Creek Restoration Project (2016-2017 construction). Additionally, OCTA is in discussion with a private property owner to identify mitigation measures for an eroding reach of Oso Creek (identified as SJC10) downstream of Gallivan Basin based on potential threats to the MetroLink rail line.

Incorporation of the GRBoD design approach proposed in this Plan into OCTA-led or OCTA-funded projects will be facilitated by the continued participation of OC Stormwater Program personnel on the OCTA Environmental Cleanup Allocation Committee that is responsible for identifying future potential projects.

3.2.3.4 Mid- to Long-Term Strategies

At this time, the implementation of specific rehabilitation projects for additional HPWQC reaches is identified as a mid- to long-term strategy for those reaches that have not yet been studied in adequate detail to determine feasibility. The completion of the alternatives analyses and feasibility studies for these reaches (identified as a near-term strategy above) serves as the basis for identifying specific projects and establishing the implementation schedule for these projects. The funding sources and time requirements for each project will be defined in the respective alternatives analysis and feasibility report. In general, it is estimated that each project will take 5 to 10 years from inception to completion.

3.2.3.5 Optional Strategies and Schedule

Additional candidate reaches may be identified through LiDAR data analysis or other means. Rehabilitation efforts for these reaches are most appropriately categorized as optional strategies at this time. Triggers for identifying additional candidate reaches will be established in **Section 4**. Alternatives analysis, feasibility evaluation, project identification, and scheduling for these reaches will be performed within 3 years of identification of a new candidate reach.

3.2.3.6 Schedule Estimates

Table 3-12 summarizes the schedules for implementation of the strategies identified in this section. More specific discussion of scheduling and contingences is provided in the previous subsections.

Table 3-12: Summary of Schedule for Control Activities for Channel Erosion HPWQC

Strategy	Implementation Period Ending in:					
	2023	2028	2033	2038	2043	2048
Rehabilitation alternatives and feasibility studies and associated upland flow control opportunity evaluation	Completed for HPWQC reaches by 2021	As needed as new reaches are added				
Programmatic permitting framework for GRBoD Projects	Initiated in 2018; Completed by 2021	As needed				
Finalize Conceptual GRBoD Guidelines	Completed by 2020	Update as needed based on adaptive process				
LiDAR data acquisition and analysis	Acquisition completed; analysis completed by2018	Obtain and reanalyze at 5-year interval or more frequently				
Coordination with upland controls proposed for Pathogen Health Risk and Unnatural Water Balance HPWQCs	Ongoing; opportunistic					
Aliso Creek Mainstem Ecosystem Restoration Project	Develop locally-preferred alternative (effort is underway)	To be determined.				
Jurisdictional implementation of HMP via new development/ redevelopment program	Program updates were completed in 2017	Ongoing program implementation and refinements to guidance, criteria, and inspections				
Watershed Management Area Analysis Coarse Sediment Supply Guidance	Completed as part of this Plan	Refresh periodically, as needed				
RMV Ranch Plan	Ongoing implementation					
Hydromodification Control Effectiveness Monitoring and Assessment	Monitoring in 2019, 2020, and 2021; assessment and final report with 2022 WQIP Annual Report.					

Strategy	Implementation Period Ending in:					
	2023	2028	2033	2038	2043	2048
Hydromodification Control Effectiveness Assessment based on RMV Stream Monitoring Program Data	Annually until RMV project is complete.					
Wagon Wheel Creek Restoration Project and Stormwater Management Project	Completed in 2017.					
GRBoD rehabilitation projects	Ongoing implementation beginning in approximately 2022					

This schedule represents an aggressive commitment to a range of new efforts and capital investments. **Table 3-13** summarizes estimated time requirements for these strategies.

Table 3-13: Summary of Time Requirements for Channel Erosion HPWQC

Strategy	Explanation of Time Requirements
Restoration alternatives and feasibility studies	3 years to collect data, conduct analysis, develop recommendations and provide time for comments and coordination
Programmatic permitting framework for GRBoD projects	2 to 3 years required to facilitate inter-agency process
Finalize Conceptual GRBoD Guidelines	1 to 2 years to consult resource agencies and integrate channel design process with existing flood control design requirements
LiDAR data acquisition and analysis	Initial analysis was completed in 2017. Subsequent updates and interpretation require 4 to 8 months from time of data acquisition.
Coordination with upland controls proposed for Pathogen Health Risk and Water Balance HPWQCs	Contingent on project identification as part of other tracks
Aliso Creek Mainstem Ecosystem Restoration Project	Timing is contingent on development of an acceptable locally-preferred alternative.
Jurisdictional implementation of HMP via new development/ redevelopment program	Ongoing
Hydromodification Control Effectiveness Monitoring and Assessment	3 years of additional monitoring are specified.
Annual Hydromodification Control Assessment Based on Stream Monitoring Data Reported by RMV	Ongoing
Watershed Management Area Analysis Coarse Sediment Supply Analysis	Completed as part of Plan submittal
RMV Ranch Plan	In place and ongoing

Strategy	Explanation of Time Requirements
Wagon Wheel Creek Restoration Project and Stormwater Management Project	Completed in 2017.
Rehabilitation Projects	5 to 10 years per project once specific projects are identified and determined to be feasible 2 to 3 projects concurrent Est. 30 year phased implementation

3.2.3.7 Responsibility for Strategy Implementation

Table 3-14 identifies implementation responsibility for WMA strategies, multi-jurisdictional strategies, or jurisdictional strategies and identifies implementation responsibility.

Table 3-14: Summary of Responsibility for Control Activities for Channel Erosion HPWQC

Strategy	WMA or Jurisdictional Strategy?	Responsibility
Restoration alternatives and feasibility studies	WMA	OC Stormwater Program
Finalize Conceptual GRBoD Guidelines	WMA	OC Stormwater Program
Programmatic permitting framework for GRBoD Projects	WMA	OC Stormwater Program
LiDAR data acquisition and analysis	WMA	OC Stormwater Program
Coordination with upland controls proposed for Pathogen Health Risk and Water Balance HPWQCs	WMA	OC Stormwater Program
Aliso Creek Mainstem Ecosystem Restoration Project	WMA	Aliso Creek agencies
Jurisdictional implementation of HMP via new development/ redevelopment program	Jurisdictional	Each jurisdiction implements program; County leads program document updates

Strategy	WMA or Jurisdictional Strategy?	Responsibility
Hydromodification Control Monitoring and Effectiveness Assessment	WMA	OC Stormwater Program
Annual Hydromodification Control Assessment Based on Stream Monitoring Data Reported by RMV	WMA	OC Stormwater Program
Watershed Management Area Analysis Coarse Sediment Supply Analysis	WMA	OC Stormwater Program
RMV Ranch Plan	Jurisdictional	County jurisdiction
Wagon Wheel Creek Restoration Project and Stormwater Management Project	Jurisdictional	OC Community Resources
Rehabilitation Projects	Jurisdictional/multi-jurisdictional	Led by jurisdiction leading/owning projects; jointly funded by jurisdictions within tributary area

3.2.4 Summary

Adequacy of Goals and Schedules.

The goals described in **Section 3.2.2** are directly related to the HPWQC identified. These goals are specific, measurable, and have interim goals at five-year intervals.

The expected outcomes of achieving these goals are directly related to restoring beneficial uses of inland receiving waters, including:

- Restoration of habitat and associated ecological functions that are allowed to regenerate within a dynamically-stable channel section, or
- Improvements in downstream water quality realized through reductions in discharges of sediment-bound pollutants precluded by stable channel section.

Adequacy Strategies Schedules.

A long-term strategy for achieving these goals is described, however at this time it is not possible to foresee precisely how this strategy will be implemented in terms of spatial application of specific design measures. The short-term strategies identified have well-defined outcomes and milestones that are intended to lead toward more precise definition of the long-term strategy. These short-term strategies represent an aggressive commitment to developing the foundation of a new program and paradigm for stream rehabilitation. The proposed approach for phasing strategies is consistent with the iterative approach described in this Plan.

Based on the long-term strategic vision, short-term strategies, optional strategies and clear milestones to trigger these strategies, it is reasonable to expect that this Plan will result in attainment of goals that will result in significant improvement of beneficial uses in receiving waters.

Co-benefits Relevant to Aliso Creek Estuary Restoration.

Assessments of the existing condition of the Aliso Creek Estuary have noted issues associated with sedimentation from upstream stream erosion. The strategies outlined in this section for reducing channel erosion and rehabilitating eroding reaches are anticipated to result in reduction of sediment to the Aliso Creek Estuary and phosphorus contained in deposited sediment. Rehabilitated upstream reaches may also have the effect of improving water quality, such as reduced temperature and reduced nutrients. Finally, potential design concepts for the Estuary include reconfiguring the channel upstream of the Estuary to reduce inflow velocity and scour potential. Such an approach would be consistent with the geomorphically-referenced rehabilitation strategies identified to address this HPWQC.

3.2.5 Annual Milestones for Next Permit Term

Consistent with Provision B.3.c of the MS4 Permit, annual milestones are identified for this HPWQC in **Table 3-15**.

Table 3-15: Annual Milestones for Channel Erosion HPWQC

Year[1]	Milestone
2018	• Develop an HMP-specific QAPP for ongoing hydromodification control effectiveness monitoring and submit for Regional Board review (60 days from Plan effective date) • Revise *Integrated Effectiveness Assessment of Hydromodification Control Standards* (based on 2017 draft) and submit for Regional Board review. • Annually assess and report on stream monitoring data submitted to the County by RMV.
2019	• Conduct hydromodification effectiveness monitoring • Annually assess and report on stream monitoring data submitted to the County by RMV.
2020	• Finalize GRBoD Guidelines based on input from resource/permitting agencies. • Annually assess and report on stream monitoring data submitted to the County by RMV.
2021	• Obtain LiDAR data for 2021 condition • Complete rehabilitation alternatives and feasibility studies for the candidate reaches identified in **Appendix H** • Annually assess and report on stream monitoring data submitted to the County by RMV.
2022	• Complete LiDAR stream channel change analysis for 2016-2021 and identify new candidate reaches resulting from this analysis • Annually assess and report on stream monitoring data submitted to the County by RMV.
2023	• Update WQIP to incorporate specific projects identified as part of rehabilitation alternatives and feasibility studies • Annually assess and report on stream monitoring data submitted to the County by RMV.

1 – Milestones refer to the end of each year shown (December 31) unless otherwise stated. The status of attainment of these milestones will be reported in the following WQIP Annual Report, which is due by January 31 each year.

3.3 Unnatural Water Balance and Flow Regime – Inland Receiving Waters

3.3.1 Overview

The SOC WMA includes more than 170 miles of significant **inland receiving water** stream reaches that receive runoff from developed land. Within this network, there are approximately 250 storm major drain outfalls (defined as outfalls greater than or equal to 36 inches) to inland receiving waters, and a similar number of minor outfalls (smaller than 36 inches) that have been inventoried. While certain outfalls and reaches have been studied in detail, the collection of consistent system-wide data regarding dry weather flow presence, magnitudes, connectivity to receiving waters has been initiated more recently and does not yet provide full coverage of the network. Initial observations indicate that approximately half of major outfalls discharge some amount of dry weather flow, and a portion of these outfalls appear to have consistent connectivity to an inland receiving water. Dry weather flows from the MS4 contribute to the in-stream flow in receiving waters to varying degrees. Some outfalls essentially form the headwaters of a stream reach while others contribute a small fraction of flow in the stream. Some of the flow at outfalls and streams is from natural sources (groundwater seepage that would occur regardless of MS4 infrastructure); however imported or recycled water is a major component of the current urban water balance and is known to contribute to unnatural quantity and timing of flows in many stream systems.

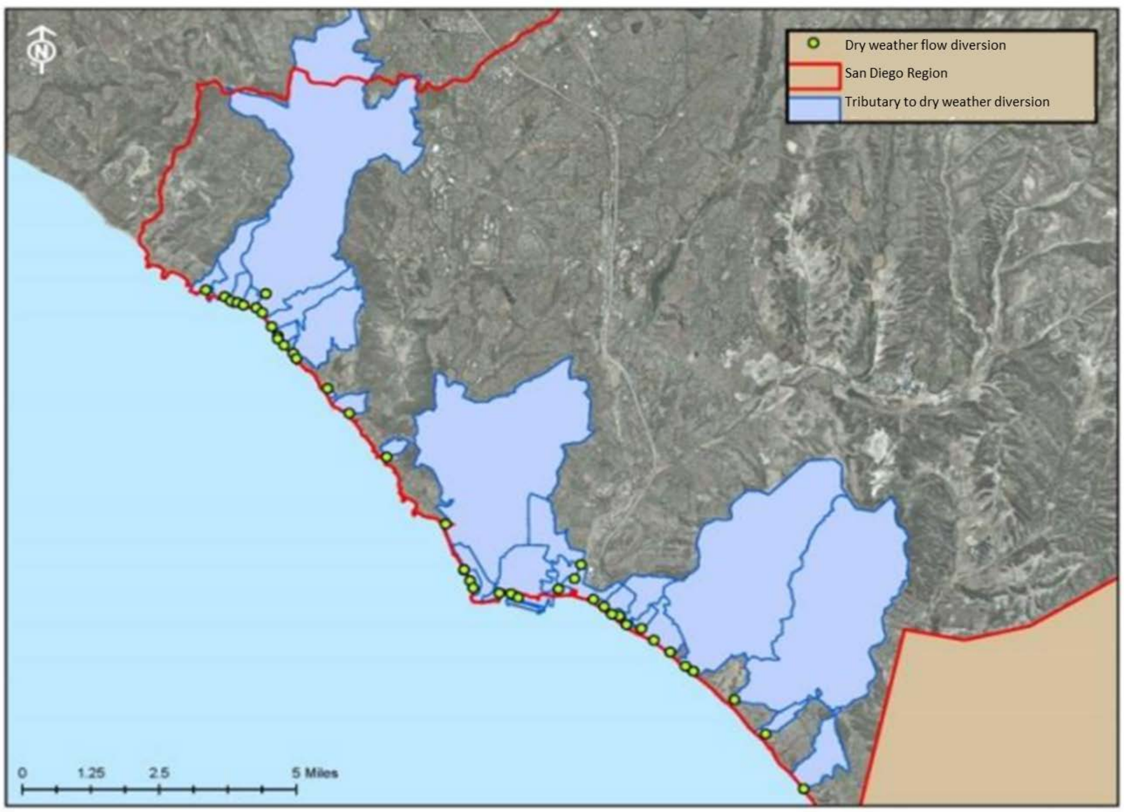
Flow regime is one of the foundations of the function-based hierarchy for stream assessment and restoration projects (Harman et al, 2012). Disruption in the natural flow regime of a stream system is considered one of the key stressors associated with “urban stream syndrome” (Walsh et al, 2005). Stream ecosystems that are subject to unnatural inputs tend to be vulnerable to changes in the quality or quantity of these inputs over time. In moderate to high stress urban streams, perennialization of urban streams is associated with lower biological integrity (Mazor et al, 2012). This study also documented a higher rate of perennial streams in urban areas than reference conditions. In streams that are naturally perennial, unnatural dry weather inputs from MS4 can have unnatural chemistry associated with source water (e.g., dissolved solids in imported water) and can carry pollutants from urban land uses (e.g., nutrients, pesticides, pathogens).

Based on evaluation of spatial data relationship in the SOC WMA (see **Section 2**), there appears to be a correlation between dry weather MS4 discharges to stream channels, flows in these channels, and impairments to water quality and beneficial uses. This is also supported by narrative observations as part of the County’s Transitional Monitoring Program. As described in **Section 2**, unnatural water balance and flow regime has been defined as a HPWQC for **inland water bodies during dry weather conditions.**

3.3.1.1 Highlights of Progress to Date

The SOC Permittees have studied and implemented various projects to manage dry weather flows in recent years, including source control and education projects, LID planning requirements, BMP retrofits, outfall treatment systems, and outfalls diversions to sanitary sewers (which can lead to a form of water reuse/recycling). In coastal areas, dry weather flow capture and diversion or treatment systems have been implemented extensively, covering the majority of areas draining directly to the coast (**Figure 3-4**). This approach has not been extensively implemented for discharges to inland receiving waters; however, some treatment systems and diversion systems are in place.

Figure 3-4: Tributary Area to Implemented Diversion and/or Treatment Systems in South Orange County



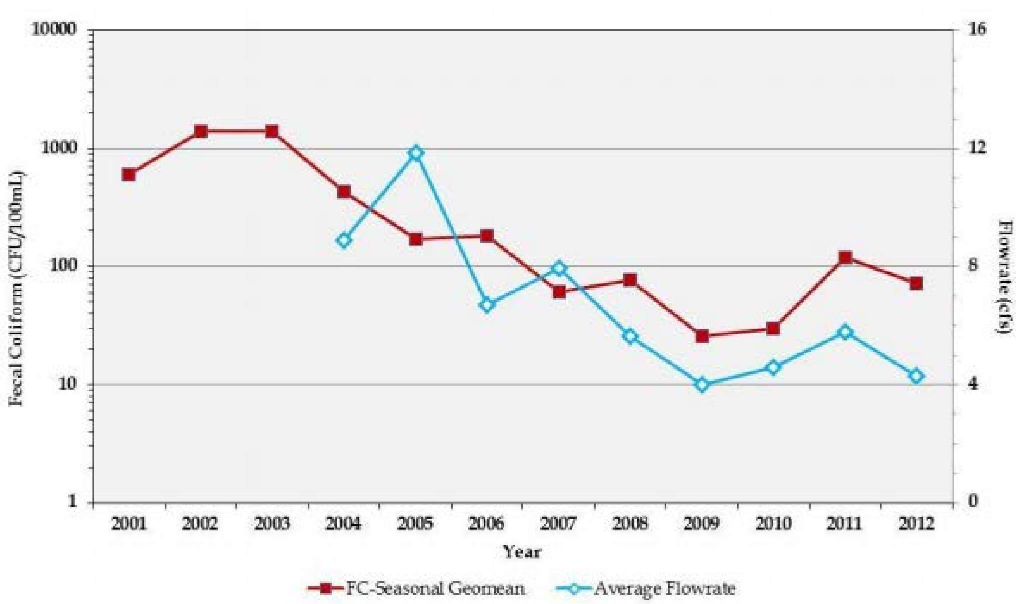
(Source: 2013 Report of Waste Discharge, State of the Environment Report)

The Permittees have implemented a number of studies and outreach initiatives related to irritation overspray reduction and water conservation, such as the SmarTimer Edgescape Evaluation Project (SEEP) completed in 2008 and the current *Overwatering is Out* initiative. Based on the SEEP study, a reduction in dry weather flows of 40 percent was estimated as a result for areas that implemented irrigation controllers, improved irrigation systems, pervious edge-scaping, and turf conversion to drought tolerant plants. In total, dry weather BMPs implemented to date in Aliso Creek and San Juan

Creek were estimated to address 57 percent and 58 percent of dry weather FIB load in these watersheds, respectively, in part from dry weather runoff volume reduction.

Consistent with expectations, dry weather flow rates in inland receiving waters appear to be declining, likely in part due to dry weather flow control efforts (e.g., outdoor water conservation) and in part due to extended drought conditions. As an indicator of urban contributions to dry weather flows, **Figure 3-5** plots the fecal coliform seasonal geometric mean (geomean) in Aliso Creek in comparison to the average flowrate. This provides anecdotal evidence that reduction of dry weather urban runoff (a primary source of indicator bacteria) may be declining at a rate that exceeds the decline in natural baseflows.

Figure 3-5: The Fecal Coliform Seasonal Geomean in the Aliso Creek Watershed Plotted in Comparison to the Average Dry Weather Flow Rate in the Creek.



Source: 2014 State of the Environment Report.

3.3.1.2 Introduction to Plan

This section focuses specifically on identifying and eliminating unnatural and unpermitted, non-exempted dry weather flows from the MS4 into **inland receiving waters**, with priority for the locations where unnatural dry weather flow inputs arising from an unnatural urban water balance are exacerbating in-stream water quality conditions and contributing to unnatural in-stream regimes. There are five primary strategies included in this plan:

1. Focused data collection efforts of various types intended to fill data gaps, support prioritization of approaches, track progress toward goals, track progress toward attainment of beneficial uses, and support adaptive management.
2. Special studies and analyses intended to result in more precise and definitive implementation of strategies that are appropriate and effective for the specific receiving water.
3. Source control, incentives, and educational measures to promote water conservation and reduction of unnatural flows into the MS4.
4. Structural BMP retrofit strategies to divert and capture water at high priority outfalls, where appropriate.
5. Optional structural BMP retrofit strategies where it is determined that source control and educational strategies have reached their limit of effectiveness and conditions remain as a high priority.

As part of near-term implementation of this Plan, necessary attention is dedicated to defining what is "natural" and "unnatural" relative to discharges from MS4 outfalls and in-stream conditions. Some types of unnatural conditions are clear (for example, irrigation excess forming the sole flow in a stream that would otherwise be ephemeral) and will be the primary focus of initial efforts. However, where groundwater tables are higher and/or riparian systems are more altered, available datasets do not support a clear and definitive distinction of the degree to which "unnatural" flows contribute to existing impairments or the extent to which it is appropriate to remove these flows from specific systems. For example, where habitat has been established based on these flows and/or there are efforts to restore habitat or introduce desirable species, maintaining flows may be desirable, even if of unnatural origin. Additionally, not all unnatural flows are controllable via source controls in the urban landscape. Some discharges such as permitted discharges, and groundwater seepage into storm drain pipes will occur.

While this Plan takes a comprehensive watershed-based approach to the unnatural flow regime in receiving waters, this Plan also acknowledges the limits to the authority of MS4 Permittees. For the reasons above, it should be noted that the ultimate target for this Plan is not total elimination of flow from outfalls or in the receiving streams, as some flow inputs are of natural origin or are exempted/permitted and it is expected that some streams will remain perennial after elimination of targeted unnatural dry weather discharges from the MS4.

Section 3.3.2 describes interim and final goals and schedules. **Section 3.3.3** describes strategies and schedules and describes an outfall prioritization approach, based on available data that has been applied to determine appropriate strategies for each outfall. A summary of the plan is provided in **Section 3.3.4**. Annual milestones for the next Permit term are described in **Section 3.3.5.**

Integration of Plan with Other Efforts

This Plan includes specific, measurable, and reasonably-simple goals focused on unnatural flow contributions to and from the MS4. Strategies are focused on MS4 permittee actions for achieving these goals and explained in that context. However, this Plan is not intended to be implemented in isolation. It is the intent that the goals and strategies described in this Plan will be interpreted and implemented in the overall watershed and water management context, including:

- This Plan is intended to be synergistic with South Orange County Watershed Management Area Integrated Regional Watershed Management Plan (SOC IRWMP) and efforts prioritized in that plan such as water conservation, water harvesting and recycling. As such, the plan for this HPWQC is built around a hierarchy of water conservation first, recycling of water second, and treatment and discharge third. The strategies described include participation in projects being led by others IRWM partners.
- While restoring a more natural flow regime is a foundational element of stream rehabilitation, it is not always possible or desirable. Implementation of this Plan must consider the negative effects that flow reduction or elimination may have on in-stream habitat and how this relates to habitat rehabilitation goals. This may introduce necessary complexity and require site-specific studies in some cases, which are envisioned in the strategies described.
- Wet weather management of stormwater, particularly LID-type approaches that rely on infiltration, have a potential long-term nexus to dry weather flow management. For example, increases in base flows resulting from infiltration/groundwater recharge could improve conditions in cases where base flow augmentation is desirable, or could complicate efforts related to returning reaches to ephemeral conditions. This nexus may need to be considered in some locations and could prompt the need for region-specific strategies for overall water balance.
- It is expected that implementation of strategies will accrue benefits beyond those described in this section, including reduction of pathogen sources (discussed in **Section 3.1**), and reduction of loads of PWQCs (discussed in **Section 0**) while also augmenting the potential reuse of water.

3.3.2 Goals and Schedules

3.3.2.1 Final Goals

The final numeric goal for this HPWQC is to effectively eliminate unnatural dry weather flows from MS4 outfalls to inland receiving waters. This goal applies to all MS4 outfalls, subject to the definitions and exceptions stated below.

For the purpose of this Plan, the following terms are defined:

- Dry weather is defined as any time that is not within a wet weather period. A wet weather period is defined as days with 0.2 inches of precipitation or greater and the subsequent three-day period.
- An inland receiving water is defined as any inland stream segment included in the Basin Plan (see named receiving waters in **Exhibit A-1**) that reasonably has the potential to support biological beneficial use(s). For the purpose of this HPWQC, a concrete or riprap channel, pipe segment, or similar, does not reasonably support biologically-related beneficial use(s) and in many cases is part of the MS4.
- An unnatural dry weather flow from the MS4 is defined as any unpermitted and /or non-exempted discharge from a MS4 outfall with hydrologic connectivity to a receiving water that occurs during dry weather and is not primary of groundwater origin.
- Connectivity to a receiving water is defined as a condition under which water from a MS4 outfall has a defined and normal overland flow path to the receiving water. Water that pools and infiltrates or evaporates near the outfall, in a location outside of the active channel of the receiving stream, is not considered to be connected to the receiving water.
- Effectively eliminate means that the condition will not exist on a normal basis or form a chronic condition. Discharges that occur infrequently, as a result of unanticipated or abnormal conditions and do not cause a chronic issue are still considered to be effectively eliminated.

The final and interim goals identified in this section do not apply to discharges/outfalls that can be classified in one of the exception categories below. These exception categories have similarities to exemption categories in the MS4 Permit, but have been developed specifically for this Plan to allow site- and reach-specific approaches for restoration of beneficial uses.

- Category 1 Exception: Negligible impact to flow regime or water quality (all criteria must be met)
  - The outfall discharges to a reach that is demonstrated to be naturally perennial under normal conditions (such as from natural groundwater sources), such that removal of all MS4 discharges would not restore the stream to a non-perennial condition, <u>and</u>
  - The flow rate of dry weather flow from the MS4 is relatively small relative to the in-stream flow or is relatively stable such that allowing the discharge to continue would not lead to significant unnatural variability of in-stream flowrates that threaten water quality, <u>and</u>

    - The water quality of the dry weather flow from the MS4 does not exceed applicable receiving water quality objectives, is determined to be from a natural source (e.g., groundwater seepage), and/or there is no connectivity to receiving waters
    - It is the intent of this exception category to be applied to outfalls discharging to stream reaches where in-stream flows are relatively large compared to the dry weather flow from the outfall, the contribution of dry weather flow provides a net positive input to the stream, and/or the flow is determined to be of a natural source (e.g., groundwater seepage). Removal of the volume of flow from MS4 outfalls could potentially negatively affect in-stream flowrates. However, water quality issues posed by continuing to allow MS4 outfalls to discharge must be considered and addressed.
- Category 2 Exception: Discharge to permitted to in-stream stormwater capture projects (all criteria must be met)
    - The outfall discharges to a stream reach that serves as a water supply augmentation project (e.g., infiltration into the stream bed), and
    - The water supply augmentation project has received appropriate permits for this use of the stream reach, including approval to accept dry weather discharges from the MS4.
    - The intent of this exception category is to allow the Permittees to participate in and support related SOC IRWMP efforts and avoid redundant or conflicting actions.
- Category 3 Exception: Discharge is desirable for habitat restoration or species recovery projects
    - The outfall provides water to a reach that is being managed for habitat restoration and/or anadromous fish population conservation and recovery projects (e.g., green sturgeon, salmon and steelhead listed under the federal Endangered Species Act (ESA))
    - Water quality is determined to be appropriate (or is treated to be appropriate) to support the relevant beneficial uses.
- Category 4 Exception: Discharge is permitted or an exempted discharge not causing or contributing to impairment.

These exception categories are intended to support the development of watershed and reach-specific approaches to result in restoration or preservation of beneficial uses and/or align with integrated water management objectives. Other exception categories may be identified in future updates of this Plan that have similar purposes.

3.3.2.2 Interim Goals

Interim goals associated with this HPWQC are expressed based on the quantity of unnatural dry weather flow from the MS4 to inland receiving waters (as cubic feet per second, or as a percentage reduction).

This Plan gave careful consideration to establishing an appropriate baseline for establishing future-looking goals. As introduced in **Section 3.3.1**, significant progress has been made toward the reduction of dry weather flows and dry weather pollutant loads. Education and incentive programs are currently active and structural treatment or diversion systems are in operation. These actions represent meaningful progress toward plan implementation. Additionally, the current period of monitoring data represents the effects of extreme drought conditions and conservation mandates, therefore sets a baseline that will present challenges for further improvements.

However, the ultimate goal is elimination (or justified exception) of unnatural dry weather flows from the MS4 to receiving waters, which applies regardless of baseline conditions. For the specific purpose of establishing interim targets, the baseline rates of unnatural dry weather flows have been established based on data collected between 2010 and 2016 and will be refined in the next plan update based on evaluation of available information obtained between 2010 and 2020. This decade-long evaluation period is intended to allow the effect of longer-term climatic cycles to be reflected in estimates of baseline dry weather discharges. It will also allow a reasonable future period (from present to 2020) for data gaps to be filled to better characterize the total magnitude and extent of dry weather discharges. A description of the strategy for filling these data gaps and establishing reliable baseline estimates is included in **Section 3.3.3.2**.

Table 3-16 summarizes interim goals for this HPWQC. Interim goals are based on aggregate improvement within the SOC WMA as a whole. **Section 3.3.3.3** (*Outfall Prioritization*) identifies considerations for phasing of strategies. Implementation of strategies may not necessarily result in uniform application across HSAs and jurisdictions under interim conditions.

Table 3-16: Interim Goals of Water Balance/Unnatural Flow Regime HPWQC

Year[3]	Reduction in Magnitude of Unnatural Dry Weather Flow from MS4 to Inland Receiving Water, % of 2015 baseline discharge [1, 2]
2023	10%
2028	25%
2033	50%
2038	70%
2043	90%
2047	100%

1 – The 2015 baseline is used specifically for interim goal setting (see discussion in text); while progress has been made prior to this date, these goals are established as future milestones measured from 2015 baseline. The 2015 baseline may be updated in the next Plan revision based on additional data collected through 2020 to support filling of data gaps and averaging over a longer period.
2 – Dry weather flow lows from outfalls that are classified into one of the exception categories described above shall be tabulated as a reduction in total flow WMA flow magnitude.
3 – Milestones refer to the end of each year shown (December 31). The status of attainment of these milestones will be reported in the following WQIP Annual Report, which is due by January 31 each year.

In addition to these interim goals, the estimated aerial extent of unnatural flow regime in receiving waters (as lineal feet of stream) will be used to evaluate changes in the extent of perennialized reaches resulting from interim goal attainment. It is expected that re-evaluation at regular intervals will show reduction in the extent of perennialized reaches, subject to other influences associated with natural climatic variability. The ultimate target for this metric is not total elimination, as it is expected that some streams will remain perennial after elimination of targeted unnatural dry weather discharges from the MS4. However, with various inputs to these systems, it is not possible to define the extent of naturally-perennial versus unnaturally-perennial reaches at this time.

3.3.3 Strategies and Schedules

3.3.3.1 Introduction

This Plan includes a suite of strategies that are intended to serve complementary roles in meeting the goals within this Plan and making progress toward restoration of beneficial uses of inland receiving waters during dry weather. By necessity, additional data collection and analyses efforts are needed to support more precise identification of goals. These efforts are primarily short-term, with specific time limits and objectives. Strategies have been assembled based on a number of underlying considerations:

- Dry weather flow management is an integrated water management issue. The strategies defined in the Plan have been developed in this context and leave flexibility for participation in projects identified as part of SOC IRWMP efforts. The underlying priority in this Plan is to "start at the source" wherever feasible, conserving water and keeping water out of storm drain pipes, rather than skipping to end-of-pipe solutions.
- This approach has shown promise. There has been a general declining trend in dry weather discharge volumes through the recent drought. This is believed to be a result of effective conservation measures, such as water conservation incentives from water agencies and the County's "Overwatering is Out" campaign. Continuation of these efforts is likely to result in further improvements and more permanent behavior change and consequential changes to the landscape.
- However, there are limits to the effectiveness of source control. Forecasts of effectiveness are uncertain and are unlikely to reach 100 percent. Additionally, not all unnatural flows are controllable via source controls in the urban landscape. Some discharges such as permitted discharges, and groundwater seepage into storm drain pipes may persist.
- Given this, structural strategies for dry weather flow reduction (e.g., diversions to sanitary sewer, retrofits within existing stormwater facilities) should be prioritized in some cases, particularly where connectivity to receiving waters remains and the nexus to in-stream issues is most serious. However, these solutions are not always feasible, can be expensive, and are not universally appropriate. Excessive application of these measures would have the effect of unnecessarily detracting from investment in other HPWQCs and unnecessarily increasing the operational costs borne by the Permittees.
- Site-specific information is critical to determine the need for structural controls, select appropriate structural measures and develop reliable cost estimates and implementation schedules. Given the large number of outfalls and receiving waters, this site-specific analyses and development of precise plans of action included as strategies to be completed within the initial term of this Plan.
- Beyond the specific strategies defined in this Plan, there are opportunities for dry weather flow management to be considered as part of other strategies that may be implemented by the Permittees based on other HPWQCs. These opportunities have been identified.

As part of implementing strategies to meet the defined, potential negative outcomes could result and must be considered in selection and phasing of strategies:

- There is potential for interim conditions to occur in some reaches during which dry weather flow inputs have been reduced but not eliminated, such that conditions associated with water stagnation may temporarily worsen until flow is completely eliminated.
- Transition from perennial reaches to non-perennial may be accompanied by a natural transition in riparian ecosystems. It is possible that temporary depressions in biological indices or compromised recreation value may result.
- In some cases, elimination of dry weather flows could have a long term detrimental effect. The allowance for exceptions and site-specific approaches within this Plan is intended to help avoid these issues.

Consistent with these considerations, this Plan defines a suite of non-structural and structure source controls, structural outfall controls, opportunistic approaches, and optional strategies to be selected and triggered based on outfall prioritization and adaptive management.

3.3.3.2 Data Collection Activities

Data collection efforts will be continued and expanded to improve understanding of conditions. Data collection will serve as a basis for establishing and refining goals and determining appropriate strategies for addressing dry weather flows from MS4 outfalls. The following specific data collection efforts will be completed. *[Note: This section has not been updated from the original Plan submittal in April 2017. The April 2017 Plan was based on data available as of September 2016. Data collection efforts have continued since that date and will be summarized in future Annual Reports.]*

Expanded transitional monitoring observations: The Permittees' transitional monitoring program has been underway since 2015. This program involves monitoring at MS4 outfalls to inland receiving waters. This has resulted in 2 to 3 site visits to most major outfalls, including visual observation of flow presence and estimations of flow magnitudes, among other observations. Based on observations from this program, approximately 120 major outfalls have been identified as having consistent flow. This program was expanded in Spring/Summer 2016 to include assessments of connectivity of flow to receiving waters, the upstream and downstream conditions in the receiving water, and the relative contribution of the outfall discharge to in-stream flowrates. These expanded observations have been partly completed for major outfalls (58 out of 120 sites with estimated flow as of the date of this report). Between 2017 and 2020, the Permittees will complete these expanded observations for all major outfalls, except where safety or permission issues prevent access. Additionally, this program will be extended to known minor outfalls where access can be achieved. The data collected thus far have been used as part of prioritization of outfalls discussed in **Section 3.3.3.3** and **Appendix J**. Future collected data will be incorporated into updated prioritization efforts.

Detailed flow monitoring at priority outfalls: Beginning in Spring/Summer 2016, the Permittees began detailed dry weather flow monitoring studies at high priority outfalls. Flow monitoring at 5-minute intervals is typically conducted for approximately 2 week periods. The purpose of this monitoring is to obtain a better estimate of average flow magnitude and flow patterns, including diurnal fluctuations and other variability observed in the flow pattern. Data collected to date (more than 52 stations at time of publication) has been used for prioritization of outfalls as described in **Section 3.3.3.3** and **Attachment J**. Between 2017 and 2020, this program will continue, and will include monitoring of all priority outfalls, except where access or safety issues prevent monitoring or flows are found to be too low to measure. For the purpose of this Plan, priority outfalls for flow monitoring include outfalls where transitional monitoring observations have identified consistent flow with connectivity to the receiving water and average flowrates are greater than approximately 0.02 cfs (10 gallons per minute [gpm]). This threshold is estimated to represent approximately 60 percent of the major outfalls that are estimated to have flow and accounts for approximately 95 percent of the total estimated dry weather discharge from the group of 120 major outfalls that are estimated to have some flow. If minor outfalls are identified in expanded transitional monitoring activities that exceed this threshold, they will also be monitored.

High-resolution imagery analysis: The Permittees have obtained high-resolution multi-spectral aerial imagery in 2016. This imagery is intended to support visual inspection of presence of water in combination with other monitoring and assessment methods. Future imagery will be obtained at a similar time of year at each interval (typically late spring). The purpose of this data acquisition and periodic analysis effort is to better define the spatial extent of perennial reaches, identify connectivity from outfalls to inland receiving waters, identify outfalls that have not been previously prioritized that require additional investigation, and evaluate changes in conditions over time in response to implemented strategies and/or climatic variation. Imagery obtained from drones will also be considered to complement aerial imagery.

3.3.3.3 Special Investigations and Analyses

A number of special investigations analysis will be conducted to characterize potential sources and prioritize actions. These activities are described below.

Permitted discharge inventory: The Permittees will utilize available information and request specific information from the SDRWQCB to prepare an inventory of permitted dischargers in the WMA and compile available and relevant information about types, magnitudes, frequency, and timing of discharges to the MS4 or directly to an inland receiving water. The SDRWQCB issues WDID, NOAs, WDRs, etc. for many discharges through a variety of programs, including:

> Conditional Waiver NOIs:
> www.waterboards.ca.gov/sandiego/water_issues/programs/waivers/waivers_w.shtml
>
> NPDES Permits and WDRs.
> State Water Resource Control Board (State Board) Order No. 2006-0003-DWQ, *Statewide General Waste Discharge Requirements for Sanitary Sewer Systems*, http://www.waterboards.ca.gov/sandiego/water_issues/programs/sso/index.shtml
>
> NPDES Permits:
> http://www.waterboards.ca.gov/sandiego/water_issues/programs/regulatory/index.shtml
>
> WDRs:
> http://www.waterboards.ca.gov/sandiego/publications_forms/general_orders.shtml
>
> Recycled Water and Septic Systems:
> http://www.waterboards.ca.gov/sandiego/water_issues/programs/ground_water_basin/recycled_subsurface/recycledwater_subsurfacedisposal_programs.shtml

The purpose of this inventory is to characterize the contribution of these sources to flows at MS4 outfalls and inland receiving waters and identify strategies within the Permittees' authority to address these discharges. Requests for data will be provided to the SDRWQCB within 3 months of Plan acceptance. This inventory will be reviewed compiled and completed within six months of receiving data from SDRWQCB.

Water impoundment inventory: The Permittees will utilize available information to prepare an inventory of water impoundments in the WMA and compile available and relevant information about types, magnitudes, frequency, and timing of discharges to the MS4 or directly to an inland receiving water. Facilities such as lakes may have periodic discharges. The purpose of this inventory is to characterize the potential contribution of these sources to flows at MS4 outfalls and inland receiving waters and identify strategies within the Permittees' authority to address these discharges. This inventory will be completed within one year of plan acceptance.

Evaluation of Baseline and Reference In-stream Flow Conditions. There is significant complexity associated with characterizing current flow regimes in each relevant reach within the WMA, as well as data gaps associated with this effort. In addition, there is uncertainty and complexity associated with estimating reference condition (i.e., the conditions expected to result if urban inputs were removed). While desktop methods have been applied to fill gaps, site-specific validation is necessary to support appropriate management actions. These evaluations could not be reasonably completed for the more than 150 lineal miles of stream reaches within the WMA in the period allowed for initial plan development. As part of the initial three-year period of this Plan, monitoring and evaluation will be completed to:

- Define current in-stream flow regimes and associated habitat that dependent on these regimes
- Identity habitat restoration and/or species recover programs that relate to in-stream flow regimes in specific reaches
- Estimate reference conditions that would be expected to occur with full removal of urban discharges.

Results and methods will be reported and documented, and incorporated into future plan updates and outfall prioritization (described below).

Outfall prioritization: Based on monitoring data obtained as discussed above, and other available datasets, a transparent and consistent framework for prioritization of outfalls has been developed. The initial version of this framework and results is provided in **Appendix J**. This framework considers the following factors in determining the priority of outfalls for different control approaches. Specifically, this framework has been applied to identify outfalls where construction of structural outfall controls (e.g., diversion to sanitary, infiltration, as discussed in **Section 3.3.3.5**) would be most appropriate and would have the largest benefit for in-stream beneficial uses. Structural outfall controls are considered to be the most appropriate solution, if feasible, in cases where:

- Flow magnitudes are relatively high, indicating widespread sources and/or elevated contributions from sources
- There is higher connectivity to the receiving water and larger contribution to in-stream flow, indicating that impacts are more significant and benefits of flow elimination would be more significant
- There is lower diurnal fluctuation compared to other sites, indicating more groundwater seepage into pipes or permitted discharges, which may not be affected by most source controls
- The tributary area is large, suggesting a diverse range of sources that would be challenging to fully eliminate with source controls

While not yet considered in this framework, future prioritization efforts will also consider:

- Spatial phasing considerations, such as implement clusters of solutions for a given water body in a similar timeframe to limit the duration of interim conditions where flow is still present but has been reduced.
- Other projects proposed, such as upland control projects in the tributary area or in-stream restoration or capture projects downstream that may change the priority of the project.
- Estimated natural flow regime (understanding may be improved through additional data collection). In cases where the natural flow regime is perennial, then the priority may be changed to pollutant control rather than water balance management.

This prioritization framework will be maintained, updated, and/or refined for the life of this Plan as additional data become available and strategies are implemented. The purpose of this framework is intended to identify appropriate controls strategies on an outfall-by-outfall basis and prioritize program expenditures based on estimated costs and benefits.

Outfall capture feasibility studies: In addition to the data collection activities described above and utilized for outfall prioritization, it is necessary for detailed site-specific information to be compiled and evaluated to verify the feasibility of outfall capture strategies. This must be completed prior to definitive phasing and scheduling of specific projects. While significant efforts have been invested in general outfall characterization and prioritization, it was not reasonable to complete feasibility studies for each outfall as part of the initial development of this Plan. Within the two years following acceptance of the plan, at least 20 feasibility studies will be completed for the highest priority subset of outfalls. This is anticipated to result in identification of an adequate number of feasible outfall control projects to meet anticipated implementation schedules described in **Section 3.3.3.5**. Additional feasibility studies will be conducted in each permit term, based on updated prioritization, to meet the schedule for outfall capture projects described in **Section 3.3.3.5**. Outfall capture feasibility studies will include, as applicable:

- Flow characterization via monitoring
- Groundwater exfiltration
- Water quality characterization
- Assessment of sources of flows (e.g., groundwater flow into storm drains, permitted discharges)
- Ability to obtain easements for access and power
- Evaluation of control approach and associated infrastructure requirements
- Soil and groundwater conditions (if proposing infiltration)
- Pipe alignment for diversion systems

- Estimated cost and schedule requirements
- Estimated lifecycle operating costs
- Potential negative effects on in-stream conditions and/or conflicts with in-stream restoration or species recover projects
- Other anticipated control activities that may be conflicting or overlapping (for example, if a regional treatment system is proposed upstream or downstream, this could have the effect of eliminating the need for a dry weather-specific outfall capture project)

Negative result of a feasibility study does not reduce the goals contained in this plan, however it may prompt updates to strategies and schedules, including triggering optional strategies if it appears outfall capture projects are not feasible at this level currently anticipated.

3.3.3.4 Upland Source Control Strategies

Upland source controls strategies include facilities or programs intended to reduce the quantity of dry weather flow present at MS4 outfalls.

New development/redevelopment program: The Permittees will update their new development/ redevelopment planning program to include specific criteria and controls for elimination of dry weather flows leaving project sites, except where otherwise approved by an NPDES permit. In general, the incorporation of LID features is expected to minimize or eliminate dry weather flows from priority new development and redevelopment projects. Additionally, structural irrigation controls such as smart timers, soil moisture sensors will be required for new development and redevelopment. Drought tolerant landscaping will be evaluated as a source control. Site inspection guidelines will be updated to include inspection for dry weather flows. As program documents are updated in subsequent permit terms, technical guidance will be reviewed in light of inspection results and continually improved.

RMV Ranch Plan: The overall ROMP for the RMV project was developed with consideration of water balance issues, including avoidance of excess infiltration and/or surface discharge of dry weather flows. Through implementation of the ROMP and subsequent documents and associated tiered plan development and approval processes, water balance issues are expected to be mitigated as a result of development of the RMV project.

Dry weather flow reduction elements in wet weather retrofit BMPs: BMP retrofits implemented for control of wet weather flows (e.g., control of indicator bacteria, other benefits) can often be designed to reduce or provide treatment of dry weather flows. As wet weather retrofit projects are planned and designed, dry weather flow management will be a key design goal and included in the projects, as applicable and feasible.

Examples include shallow infiltration sumps (where soils allow), or subsurface flow wetland gravel beds (for treatment where soils have low permeability). This is an opportunistic strategy that does not have a definitive schedule or estimated degree of implementation.

Dry weather flow retrofits within existing stormwater facilities: This strategy would include retrofit activities within existing facilities so that they provide new or enhanced functions for reducing or treating dry weather flows. Examples are similar to those discussed above and could be achieved via minor modifications to outlet structures or minor internal earthwork. As part of outfall feasibility evaluations, the presence of existing stormwater facilities and the ability to retrofit these facilities to control dry weather flows will be considered. Therefore, the schedule will be contingent on the schedules for outfall feasibility studies and implementation of outfall control strategies.

Incentives for low water-use landscaping and/or irrigation source controls: The "Overwatering is Out" initiative by the OC Stormwater Program (www.overwateringisout.org) helps raise awareness of issues, provide tips to residents and businesses, and connect residents with rebates such as the OC WaterSmart Program (Municipal Water District of OC), the SoCalWaterSmart Rainbarrel Rebate Program (Municipal Water District of SoCal), and the Turf Removal Program (Municipal Water District of OC). As part of this Plan, the Permittees will continue this initiative and adapt or expand it to continue to promote water conservation and reduction of excess irrigation. At each update of this Plan, opportunities for new initiatives regarding water conservation and dry weather runoff management will be evaluated.

3.3.3.5 Outfall Control Strategies

Outfall control strategies include facilities or projects constructed at or near a MS4 outfall to eliminate or treat all dry weather flows from the outfall. The outfall prioritization process described in **Section 3.3.3.3** and **Appendix J** will be applied to identify high priority outfalls where structural control measures are appropriate. Categories of structural controls include:

- *Dry weather diversion to sanitary sewer (water harvesting) at high priority outfalls:* Diversion systems involve structural retrofits within the MS4 or near the outfall, typically including a pump station to divert water to a nearby sanitary sewer main. These systems can be designed to achieve full elimination of discharge during dry weather conditions. A pre-treatment system, such as a trash capture system, may be needed.
- *Dry weather infiltration improvements at high priority outfalls:* This strategy would include construction of infiltration facilities at outfalls to receive dry weather flows and eliminate discharges to the receiving water. This strategy would only

be applicable where soils are adequate for infiltration and groundwater quality and geotechnical considerations are addressed. Wet weather flows would be diverted around these systems, unless adequate space is available to treat wet weather flows. A pre-treatment system, such as a settling basin or hydrodynamic separator may be needed.

- *Treatment systems at high priority outfalls:* Where the in-stream flow regime is determined to be naturally perennial, it may be appropriate to continue to allow dry weather discharges subject to the criteria in Exception Category 1 (above). As part of this approach, it may be necessary to provide treatment to improve the quality of discharges in order to meet applicable water quality objectives. Treatment systems at outfalls are a broad category that could include passive treatment, such as subsurface wetlands, or active treatment, such as filtration and disinfection systems. Treatment technologies should be selected to address appropriate pollutants of concern in order to meet criteria for Exception Category 1. Pre-treatment may also be needed, such as trash screens or hydrodynamic separators.
- *San Juan Creek in-stream water augmentation project:* The San Juan Basin Authority is proposing improvements to San Juan Creek to augment the local groundwater basin. Improvements may include inflatable rubber dams below Interstate 5 and/or live-bed recharge of treated water between Interstate 5 and Ortega Highway. To the extent dry weather flows are determined to be acceptable inflows to these systems, participation in this project can serve as an alternative to other structural controls for the outfalls that drain directly to these reaches. At this time, plans for San Juan Creek are preliminary and are outside of the control of the Permittees. However, the Permittees will coordinate with this project. It may be appropriate for some Permittees to financially participate in and benefit (water quality and water supply benefits) from this project.
- *Aliso Creek Water Reclamation Facility.* The Aliso Creek Water Reclamation Facility (ACWRF), operated by the South Coast Water District, became operational in 2014. This facility includes a diversion from Aliso Creek located 1.5 miles from the stream mouth with the capability to divert and treat up to 0.8 million gallons per day (1.25 cfs) of dry weather flows from the creek to be blended with recycled wastewater. It is located at the Coastal Treatment Plant in Aliso Canyon. Some of the Permittees were partners in this project.

Structural controls will be implemented as part of a phased approached based on relative priority, availability of funding, and feasibility of the projects. The outcome of outfall feasibility studies described in **Section 3.3.3.3** will be used to determine the projects to be implemented in each 5-year term of this Plan.

Table 3-17 summarizes anticipated implementation of structural control strategies for each 5-year term based on information available as of the date of plan preparation. Based on initial prioritization described in **Appendix J**, the 35 highest priority outfalls represent approximately 75 percent of the total WMA flow magnitude. Based on the scoring approach used, these highest priority outfalls are weighted the most significant. Of this group of highest priority outfalls, half are estimated to make a "major contribution" to in-stream flows (defined as making up at least 50 percent of streamflow), and an additional 30 percent of this group is estimated to have a "significant contribution" to in-stream flows (defined as making up at least 10%but less than 50% of streamflow). This group of high priority outfalls includes approximately 75% of all outfalls that have been determined to have a major contribution to in-stream flows based on assessments to date. Remaining outfalls will be addressed by upland source controls (**Section 3.3.3.4**) or other measures determined to be appropriate through the studies and analyses described in **Section 3.3.3.3**. This implementation schedule is subject to change based on additional data obtained and analyses conducted in the future, and may be augmented by optional strategies if determined to be necessary based on measured progress toward goals. If source controls are found to be effective, then the number of outfalls with structural outfall controls may be reduced. This would be considered a favorable outcome for water conservation while not reducing the attainment of goals.

Table 3-17: Anticipated Phasing of Outfall Control Strategies for Unnatural Water Balance HPWQC

Year[2]	Cumulative Number of Outfalls with New Structural Outfall Controls Implemented	Estimated Reduction in Total WMA Dry Weather Flow Resulting from Cumulative Implementation of Outfall Controls[1]
2021	2	5%
2025	10	12%
2030	20	25%
2035	26	33%
2040	32	42%
2045	35	50%

1 - Reduction is estimated based on average estimated flow magnitudes for high priority outfalls as a fraction of total estimated flow magnitude for the approximately 120 outfalls currently understood to have dry weather flows. The actual flow magnitude addressed in each permit term will depend on the actual outfalls implemented in each permit term. The total magnitude flow with connectivity to receiving waters may be refined as additional data are obtained about flow magnitudes and outfall connectivity. While the highest 35 outfalls are estimated to represent 75 percent of flow, an estimate of 50 percent is attributed to outfall capture to account for uncertainty in the outfalls that will be appropriate and feasible to capture.

2 – Milestones refer to the end of each year shown (December 31). The status of attainment of these milestones will be reported in the following WQIP Annual Report, which is due by January 31 each year.

3.3.3.6 In-stream Strategies for Water Quality Improvement in Dry Weather Conditions

The plan for this HPWQC includes short- to medium-term management actions that are specifically intended to manage inputs to receiving waters. Outside of these actions, rehabilitation activities for inland receiving waters may be implemented. These efforts can be complementary to the efforts in this Plan to eliminate unnatural discharges. As these projects are implemented, elements can be included to support water quality issues in dry weather:

- Design of drop structures to avoid pools of stagnant water
- Remove of non-critical structures that are resulting in pools of stagnant water
- Provide low-flow channel of appropriate dimensions for dry weather flows and which can provide shading, as appropriate
- Consider gravel-bed augmentation in some sections to improve hyporheic flow and associated pollutant removal and temperature reduction.

Permittees proposing in-stream rehabilitation projects should consider these elements, as applicable and feasible. Note that these elements are not directly related to this HPWQC and are not intended to imply specific commitments as part of this Plan. The schedule for this strategy is therefore not defined in this Plan and will be implemented on an opportunistic basis.

3.3.3.7 Optional Strategies

At the time of each update of the WQIP (not less than every five years), and assessment will be made regarding the degree of implementation of identified strategies versus the measured progress toward interim and final goals. If the percent of implementation is significantly higher than the percentage of the final goal achieved, optional strategies will be triggered. Additionally, data acquisition efforts and special studies and analyses described above may identify the need to initiate optional strategies or may identify new strategies. Primary optional strategies include:

More extensive application of structural outfall controls: Additional sites from the prioritization framework will be investigated and scheduled for structural outfall controls, as determined to be necessary to achieve goals.

Pipe lining: If additional investigation reveals that unnatural dry weather flows at an outfall are resulting primarily from storm drain pipe leakage and causing water quality impairments, then a storm drain pipe lining project may be initiated in targeted areas.

3.3.3.8 Schedule and Cost Estimate Implementation of Strategies

Table 3-18 summarizes the schedule for implementation of the strategies identified in this section. More specific discussion of scheduling and contingences is provided in the previous subsections.

Table 3-18: Summary of Schedule for Control Activities for Unnatural Water Balance HPWQC

Strategy	Implementation Period Ending in:					
	2023	2028	2033	2038	2043	2048
Expanded transitional monitoring observations	Completed by 2020	As needed				
Detailed flow monitoring at priority outfalls	Completed by 2020	As needed				
High-resolution imagery analysis	Imagery obtained in 2016	Obtain and reanalyze at 5-year interval or more frequently				
Permitted discharge inventory	Completed by 2019	Refresh periodically to identify new facilities				
Water impoundment inventory	Completed by 2019	Refresh periodically to identify new facilities				
Flow regime characterization	Completed by 2021	Update periodically, as needed				
Outfall prioritization	Initial prioritization completed; update in 2021 based on additional data through 2020	Update periodically, not less than every 5 years				
Outfall capture feasibility studies (cumulative number scheduled to be completed is shown)	20 studies completed by 2020	40 studies completed cumulatively by 2025	Additional studies, as needed to verify enough feasible projects to meet implementation targets			
New development/ redevelopment program	Program updates were completed in 2017	Ongoing program implementation and refinements to guidance, criteria, and inspections				
RMV Ranch Plan	Ongoing implementation					

Strategy	Implementation Period Ending in:					
	2023	2028	2033	2038	2043	2048
Dry weather flow reduction elements in wet weather retrofit BMPs	Opportunistic, subject to schedule for wet weather retrofits determined for other HPWQCs or other project drivers					
Dry weather flow retrofits within existing stormwater facilities	Identify as part of outfall feasibility studies; implement as identified and determined to be appropriate					
Incentives for low water use landscaping and/or irrigation source controls	Ongoing “Overwatering is Out” initiative and subsequent versions, modifications, or expansions of similar programs					
Outfall control strategies	See anticipated schedule in Table 3-17.					

This schedule represents an aggressive commitment to a range of new efforts and capital investments. **Table 3-19** summarizes the time requirements for these strategies. The necessity of additional data collection is the primary constraint on short-term activities. The primary new capital expenditure is associated with outfall controls. The overall plan represents a commitment to upwards of $30 million in capital investment, addition of 4 to 6 FTE and $1.5 million per year in new operational costs. To minimize short term staffing impacts and account for project lead times, this program will be phased over 20 to 30 years. Current source of budget for these projects is not identified, and project timing and phasing will be contingent on securing adequate budget.

Table 3-19: Summary of Time Requirements for Unnatural Water Balance HPWQC

Strategy	Time Requirements
Expanded transitional monitoring observations	1 to 2 years to visit all major and minor outfalls to collect new information
Detailed flow monitoring at priority outfalls	1 to 2 years required to complete monitoring and data analysis from priority outfalls
High-resolution imagery analysis	Imagery will be obtained and available for analysis every 5 years.
Permitted discharge inventory	6 months to 1 year
Water impoundment inventory	6 months to 1 year
Flow regime characterization	2 years new monitoring, 1 year analysis and reporting
Outfall prioritization	Initial prioritization completed; update contingent on completing initial data acquisition efforts; then periodic updates
Outfall capture feasibility studies	2 years to complete first set of 20 outfalls, including appropriate data acquisition and coordination with applicable agencies
New development/ redevelopment program	In place and ongoing
RMV Ranch Plan	In place and ongoing
Dry weather flow reduction elements in wet weather retrofit BMPs	Dependent on other HPWQC efforts
Incentives for low water use landscaping and/or irrigation source controls	In place and ongoing

Strategy	Time Requirements
Outfall control strategies	2 to 5 years to develop, permit, and construct project depending on complexity

3.3.3.9 Time Requirements for Optional Strategies

Feasibility and project scoping investigations for optional strategies will be completed within 1 year of identifying the need for optional controls. Strategies needed to meet interim targets will be implemented within five years of identification of feasible projects, as funding allows.

3.3.3.10 Responsibility for Strategy Implementation

Table 3-20 categorizes strategies as WMA strategies, multi-jurisdictional strategies, or jurisdictional strategies and identifies implementation responsibility.

Table 3-20: Summary of Responsibility for Strategy Implementation Unnatural Water Balance HPWQC

Strategy	WMA or Jurisdictional Strategy?	Responsibility
Expanded transitional monitoring observations	WMA	OC Stormwater Program
Detailed flow monitoring at priority outfalls	WMA	OC Stormwater Program
High-resolution imagery analysis	WMA	OC Stormwater Program
Permitted discharge inventory	Jurisdictional	SDRWQCB to provide data upon request for all permitted sites (NPDES, WDRs, NOAs, NOIs, etc.) Each jurisdiction responsible to review and compile inventory of facilities within jurisdiction
Water impoundment inventory	Jurisdictional	Each jurisdiction responsible to compile inventory of facilities within jurisdiction
Flow regime characterization	WMA	OC Stormwater Program

Strategy	WMA or Jurisdictional Strategy?	Responsibility
Outfall prioritization	WMA	OC Stormwater Program
Outfall capture feasibility studies	WMA	OC Stormwater Program
New development/ redevelopment program	Jurisdictional	Each jurisdiction implements program; County leads program document updates
RMV Ranch Plan	Jurisdictional	County jurisdiction
Dry weather flow reduction elements in wet weather retrofit BMPs	Jurisdictional/multi-jurisdictional	Led by jurisdiction leading/owning projects; jointly funded by jurisdictions within tributary area
Dry weather flow retrofits within existing stormwater facilities	Jurisdictional/multi-jurisdictional	Based on jurisdiction owning or responsible for existing facility; jointly funded by jurisdictions within tributary area
Incentives for low water use landscaping and/or irrigation source controls	WMA	OC Stormwater Program
Outfall control strategies	Jurisdictional/multi-jurisdictional	Led by jurisdiction owning outfall; jointly funded by jurisdictions within tributary area

3.3.4 Summary

Adequacy of Goals. The goals described in **Section 3.3.2** are directly related to this HPWQC. These goals are specific, measurable, and have interim goals at 5-year intervals.

The expected outcomes of achieving these goals are directly related to restoring beneficial uses of inland receiving waters (i.e., stream, creeks and coastal estuaries), including:

- Restore non-perennial hydrologic conditions in reaches that have become perennialized through urbanization, providing a setting for more natural, higher quality, and more resilient ecological systems
- Reduce MS4-related dry weather pollutant loads contributing to in-stream water quality issues
- Support SOC IRWM efforts to reduce water consumption and capture dry weather flows for water supply augmentation; this provides a multiple benefit of reducing potable water demand
- Reduce hydrologic conditions conducive to invasive species, stagnation, vector, and other nuisance issues that affect water quality and recreational value
- Reduce number of concurrent stressors, which is expected to support and improve the efficiency of ongoing monitoring and assessment by allowing more precise identification of additional improvements that may be needed to restore beneficial uses, if any

With careful selection and implementation of strategies to achieve these goals, it is quite reasonable to expect that attainment of goals will result in a significant improvement of beneficial uses in receiving waters.

Adequacy of Strategies. Given the spatial scope of this Plan and the data gaps that exist, it is essential that data collection and more focused planning efforts be included as primary near-term activities. Prioritization of these efforts is not intended to unnecessarily extend the duration of Plan implementation. Rather these efforts are intended to result in a more appropriate and effective plan of action for future efforts that maximize benefit and avoid/minimize negative outcomes. Funds will also be used more efficiently due to effective planning.

The suite of controls that will be implemented is based on a hierarchy of source controls before "end of pipe" control. However, the plan acknowledges the limitations of source control approaches and includes a rigorous, transparent decision framework and anticipated implementation schedule for engineered solutions to complement these approaches. Finally, optional approaches are identified to provide a contingency plan in the event that engineered solutions are not feasible or are not effective to the extent anticipated. As currently anticipated, approximately half of the total dry weather flow magnitude in the WMA will be addressed with structural measures (representing approximately one-quarter of the major outfalls) and the other half will be addressed with source control efforts. This distribution may be change as part of the iterative process.

Responsibility for initial activities has been documented in **Table 3-20**. Future activities, involving capital projects, have not been precisely identified and therefore responsibilities cannot be defined at this point. Specific projects and associated jurisdictional responsibility will be defined in subsequent updates of this Plan.

Based on the progress already noted toward the goals, the current programs in place, and the proposed decision framework and specific commitments identified in this Plan, it is reasonable that the strategies identified, combined with refinements or additions to this Plan as part the iterative approach, will result in achievement of the interim and final goals.

Adequacy of Schedules. Key efforts are already underway and progress to date appears to be substantial. Based on the discussion presented in **Section 3.3.3.8**, the proposed schedules of goals and strategies represent a reasonable assessment of the time required to implement this Plan.

Co-benefits Relevant to Aliso Creek Estuary Restoration. Assessments of the existing condition of the Aliso Creek Estuary have noted eutrophic conditions (e.g., depressed dissolved oxygen levels) and concerns about frequency of breaching of the estuary. The strategies outlined in this section for dry weather flow reduction are anticipated to result in reductions of loading of nutrients (nitrogen and phosphorus) to Aliso Creek and the Aliso Creek estuary. This is expected to have a direct effect on eutrophication issues. Additionally, reduction in the dry weather flowrate in Aliso Creek may reduce the frequency of breaching of the sand berm at the beach. As additional information becomes available about the project description for the Aliso Creek Estuary Restoration project, further consideration of this project can be incorporated into the WQIP.

3.3.5 Annual Milestones for Next Permit Term

Consistent with Provision B.3.c of the MS4 Permit, annual milestones are identified for this HPWQC in **Table 3-21.**

Table 3-21: Annual Milestones for Unnatural Water Balance HPWQC

Year[1]	Milestone
2018	• Conduct ongoing outfall monitoring and update outfall prioritization as part of Annual Report.
2019	• Complete inventory of permitted facilities and water impoundments
2020	• Complete expanded outfall monitoring, detailed flow monitoring • Complete assessment of flow regime in each major receiving water • Update outfall prioritization
2021	• Complete first 20 outfall capture feasibility studies • Establish baseline quantification of Unnatural Dry Weather Flow from MS4 to Inland Receiving Water based on review of data from 2010 to 2020.
2022	• Analyze high resolution multi-spectral aerial imagery obtained in 2021
2023	• Update WQIP to include specific outfall control projects • Document achievement of 2023 interim goal of 10 percent reduction in flow magnitude

1 – Milestones refer to the end of each year shown (December 31). The status of attainment of these milestones will be reported in the following WQIP Annual Report, which is due by January 31 each year.

3.4 Prohibitions and Limitations Compliance Option

As allowed per Provision B.3.c (Prohibitions and Limitations Compliance Option), the Permittees [3] intend to rely on implementation of the WQIP to demonstrate compliance with the requirements of Provisions A.1.a, A.1.c, A.1.d, A.2, and A.3.b.

Table 3-22 summarizes the HPWQCs and PWQCs and associated Basin Plan parameters enrolled in the Provision B.3.c compliance option, including temporal extent and spatial extent. The technical basis for these designations is summarized in **Section 3.4.1** through **3.4.4**.

Table 3-22: Summary of HPWQCs and PWQCs and Associated Basin Plan Parameters Enrolled in B.3.c Compliance Option

HPWQC or PWQC Enrolled in B.3.c Compliance Option	Specific Basin Plan Parameter(s) Enrolled in B.3.c Compliance Option	Temporal Extent	Spatial Extent [A, B]
Highest Priority Water Quality Conditions (HPWQCs)			
Pathogen Health Risk/Bacteria	Enterococcus, E. coli Fecal coliform Total coliform	Dry and Wet Weather Conditions	Ocean Waters; Inland Surface Waters, Coastal Estuaries and Lagoons
Channel Erosion/ Geomorphic Impacts	Not a Basin Plan parameter. Strategies confer benefits related to sediment and bioassessment PWQCs (below).	Dry and Wet Weather Conditions	Inland Surface Waters, Coastal Estuaries and Lagoons
Unnatural Water Balance and Flow Regime	Not a Basin Plan parameter. Strategies confer benefits related to nutrients, eutrophication, and bioassessment PWQCs (below).	Dry Weather Condition	Inland Surface Waters, Coastal Estuaries and Lagoons
Priority Water Quality Conditions (PWQCs)			
Nutrients	Total Phosphorus Nitrogen	Dry Weather Condition	Inland Surface Waters, Coastal Estuaries and Lagoons

3 By agreement dated February 10, 2015, pursuant to Water Code section 13228, Phase I MS4 discharges within the City of Lake Forest located within the San Diego Water Board Region will be regulated by the Santa Ana Water Board upon the effective date of the Santa Ana Water Board's reissuance of NPDES Permit. No. CAS618030 (Santa Ana MS4 Permit). Thereafter, the City of Lake Forest will no longer be considered a Copermittee regulated under the San Diego MS4 Permit. Upon the reissuance of the Santa Ana MS4 Permit, the City of Lake Forest will still be required to actively participate in the development and implementation of this WQIP for the Aliso Creek watershed in accordance with the February 10, 2015 agreement. The City of Lake Forest's obligation to actively participate in the development and implementation of this WQIP does not require continued participation in the portions of the WQIP included solely to implement Provision B.3.c (Prohibitions and Limitations Compliance Option).

HPWQC or PWQC Enrolled in B.3.c Compliance Option	Specific Basin Plan Parameter(s) Enrolled in B.3.c Compliance Option	Temporal Extent	Spatial Extent [A, B]
Eutrophication	Dissolved Oxygen Turbidity Nephelometric Turbidity Units (NTU)	Dry Weather Condition	Inland Surface Waters, Coastal Estuaries and Lagoons
Sediment	Turbidity (NTU) Total Suspended Solids (TSS)	Wet Weather Condition	Inland Surface Waters, Coastal Estuaries and Lagoons
Biological Integrity (IBI, CSCI, or equivalent)	Not a Basin Plan parameter.	Dry and Wet Weather Conditions	Inland Surface Waters, Coastal Estuaries and Lagoons

A - Inland surface waters refers to the receiving waters identified in Figure A-1, including reaches identified as being within MS4 catchments and reaches downstream of MS4 catchments. This is also intended to include coastal estuary systems/lagoons at the mouth of Aliso Creek and San Juan Creek.
B - Ocean waters refer to the Pacific Ocean Shoreline segments identified in Table 6.0 of Attachment E of the MS4 Permit and Baby Beach within Dana Point Harbor.

3.4.1 General Approach for B.3.c Compliance

This Plan is based on an underlying framework of:

- A comprehensive evaluation of water quality conditions and interrelationships,
- Identification of highest priorities based on a restoration hierarchy, and
- Regular adaptive management, expected to result in Plan evolution over time.

This framework differs from a pollutant-by-pollutant tabulation. As part of this framework, a set of three HPWQCs have been establish, with associated goals, strategies and annual milestones that seek to effect improvements that are at more fundamental levels of the restoration hierarchy. These HPWQCs were selected as part of **Section 2** because of their direct linkages to a range of other water quality pollutants, stressors and conditions, and their potential to address some of the root causes of impairments to beneficial uses.

For each HPWQC track, an analysis, with clearly stated assumptions, was undertaken to provide reasonable assurance that the implementation of strategies will achieve final numeric goals, as summarized in **Section 3.1.5, 3.2.4, and 3.3.4**. These analyses took different forms, depending on the nature of the HPWQC and are presented in the Plan with clearly stated and explained assumptions. These HPWQC tracks, combined with regular adaptive management, are ultimately intended to "result in chemical, physical, and biological conditions protective of the beneficial uses of the receiving waters."

Implementation of strategies to attain HPWQC goals are expected to confer direct benefits for a range of individual constituents that are not specifically named as part of a HPWQC goals. Through these direct linkages, the goals, schedules, and annual milestones established for the HPWQC tracks satisfy the criteria of Provision B.3.c for several PWQCs. Provision B.3.c does not mandate that separate goals, schedules, and milestones be established for each WQ condition. A set of goals and milestones can address more than one issue. **Table 3-23** contains a list of constituents, not identified as HPWQCs, that the Permittees seek to be included as part of the Provision B.3.c Prohibitions and Limitations Compliance Option. **Table 3-23** describes how the goals and strategies identified for HPWQC relate to the PWQCs and identifies the goals, schedules, and milestones established by the Plan that have a linkage to each PWQC.

It is expected that other HPWQCs may be identified as part of subsequent Plan updates via the monitoring, assessment, and adaptive management process. If it is determined that the goals and strategies associated with the current HPWQCs are not resulting in a commensurate degree of progress to address a PWQC, then it is envisioned that the PWQC would be elevated to a separate HPWQC with associated goals, strategies, schedules, and milestones.

3.4.2 Highest Priority Water Quality Conditions

Provision B.3.c criteria are met for the three HPWQCs per the plans described in **Section 3.1** through **Section 0**, including:

- Establishment of numeric goals and schedules
- Identification of strategies and schedules, including optional strategies and triggers
- Demonstration that strategies are reasonably expected to result in achievement of goals within the scheduled developed
- Establishment of annual milestones for the next five annual reporting periods

The basis for establishment of these HPWQCs is explained in **Section 2**. A discussion of the adequacy of goals, strategies, and schedules are described in **Section 3.1.5, 3.2.4, and 3.3.4**. Annual milestones are provided in **Section 3.1.6, 3.2.5,** and **3.3.5** of this Plan.

3.4.3 Priority Water Quality Conditions

Table 3-23 lists the other PWQCs that are being optionally enrolled in B.3.c provision per the allowance stated in Provision B.3.c.(1)(a)(v) and the spatial extent to which these PWQCs apply. The PWQCs listed in this table include the PWQCs from **Section 2** for which a HPWQC plan has not already been directly developed.

While HPWQC plans were not directly developed to target the PWQCs identified in **Table 3-23**, the strategies identified to meet the goals established for the three HPWQCs will have direct linkages to these PWQCs. **Table 3-23** identifies the goals interim and final goals that pertain to each PWQC.

In some cases, stormwater treatment projects that are identified as a strategy for control of indicator bacteria are identified as having co-benefits for other constituents. Should subsequent updates of this Plan propose to reduce the number of stormwater treatment projects needed for control of indicator bacteria, an evaluation of PWQCs shall also be conducted to determine if a lower degree of implementation of stormwater treatment projects would be acceptable.

In summary, the HPWQCs identified in Chapter 3.1 through 3.3 and the subset of PWQCs identified in **Table 3-23** satisfy the criteria to qualify for enrollment in Provision B.3.c, including:

- Indicator bacteria and pathogen health risk
- Unnatural water balance/dry weather flow (Note: It is recognized that B.3.c does not serve to demonstrate compliance with Permit Provision A.1.b.)
- Channel erosion and associated geomorphic impacts
- Nutrients (nitrogen and phosphorus species) and eutrophication indicators (e.g., algal growth, dissolved oxygen)
- Index of biological integrity (IBI) or other bioassessment scores
- Turbidity

For these conditions, the option provided by Provision B.3.c is being used as the mechanism to demonstrate compliance with the requirements of Provisions A.1.a, A.1.c, A.1.d, A.2, and A.3.b.

Table 3-23: Summary of Final and Interim Goals and Annual Milestones Relating to PWQCs

PWQC	Primary Temporal Scope of Condition	Geographic Scope (to extent known)	Primary Beneficial Uses Potentially Impacted by PWQC	Discussion of Underlying Approach for Restoration of Beneficial Uses	Goals Intended to Result in Chemical, Physical, and Biological Conditions Protective of the Beneficial Uses that are Impacted by the PWQC	Strategies for Goal Attainment that Relate to Restoration of Beneficial Uses	Annual Milestones for Implementation of Strategies
Nutrients (N, P) and eutrophication indicators (e.g., algal growth, dissolved oxygen)	Dry Weather	Inland water bodies where dry weather flows or standing water are present	Biological – WARM, WILD, COLD, SPWN Recreation – REC2 (aesthetic issues)	Goals and strategies for elimination or treatment of unnatural dry weather discharges from MS4 outfalls per the plan described in **Section 3.3** will result in: • Reduction in loading of nutrients and oxygen demanding substances originating from irrigation overspray and other urban sources • Reduction in the extent of unnatural perennial reaches where stagnation can exacerbate eutrophication-related issues • Return of systems to more natural flow regime, enabling more reliable assessment of additional nutrient reductions, if any, needed to manage eutrophication. Source control strategies described in **Section 3.1** for controlling indicator bacteria and human pathogens include pet waste management; absorbent landscaping/ disconnection, street sweeping, trash management; identification and abatement of sewer cross connections and leakage entering the MS4, and other standard JRMP elements. These are expected to result in a load and concentration reductions of nutrients and oxygen demanding substances. Structural treatment strategies described in **Section 3.1** for controlling indicator bacteria and human pathogens, are expected to result in reduction of volume (and associated loads) and treatment of nutrients and oxygen demanding substances. Rehabilitation approaches to reduce scour pools and improve vegetative cover are expected to reduce the extent of disturbed stream channels that are conducive to eutrophication.	Effectively eliminate unnatural dry weather flows from MS4 outfalls to inland receiving waters. (See Section 3.3.2 for final and interim goals and schedules) Rehabilitate **23,000 lineal feet** of streams using a geomorphically-referenced approach (See Section 3.2.2 for final and interim goals and schedules)	Section 3.1 – Pathogen Health Risk The following strategies are expected to have demonstrable benefits for nutrient load reductions in dry and wet weather 3.1.4.1 – Implemented BMPs 3.1.4.2 – Programmatic Strategies 3.1.4.3 – Human Pathogen Source Control – elimination of sewage or other source of human waste also reduces nutrient sources 3.1.4.6 – New Structural Treatment Strategies Section 3.2 – Channel Erosion The long term framework for prioritized rehabilitation projects is expected to: • Improve physical conditions that promote stagnation and eutrophication • Reduce nutrient loading from sediment sources • Reduce prevalence of invasive species Section 3.3 – Unnatural Water Balance and Flow Regime The following strategies contribute to reduction in unnatural wetted extent of streams and reduction of MS4 nutrient loads to reaches remaining wet 3.3.3.4 – Upland Source Control Strategies 3.3.3.5 – Outfall Control Strategies 3.3.3.6 – In-stream Strategies	The milestones associated with the HPWQCs also serve as milestones for restoring the beneficial uses impacted by the PWQC. For brevity, the milestones are not repeated here. See Table 3-9 in Section 3.1.6 See Table 3-15 in Section 3.2.5 See Table 3-21 in Section 3.3.5

PWQC	Primary Temporal Scope of Condition	Geographic Scope (to extent known)	Primary Beneficial Uses Potentially Impacted by PWQC	Discussion of Underlying Approach for Restoration of Beneficial Uses	Goals Intended to Result in Chemical, Physical, and Biological Conditions Protective of the Beneficial Uses that are Impacted by the PWQC	Strategies for Goal Attainment that Relate to Restoration of Beneficial Uses	Annual Milestones for Implementation of Strategies
Turbidity	Wet	Inland, limited (limited to Prima and Segunda Deshecha Creeks)	Biological – WARM, WILD, COLD, SPWN Recreation – REC2 (possible aesthetic issues at beach outfall; limited or no recreational opportunities adjacent to Prima and Segunda Deshecha Creeks)	Identification and abatement of major channel erosion issues per the plan described in **Section 3.2** is expected to reduce turbidity. Note, this PWQC is based on a 303(d) listing based on monitoring data obtained while there was significant active construction and prior to modern criteria for construction stormwater management and industrial site stormwater management. More stringent criteria for construction stormwater management and industrial site stormwater management are also expected to address turbidity in these watersheds.	Rehabilitate **23,000 lineal feet** of streams using a geomorphically-referenced approach (See Section 3.2.2 for final and interim goals and schedules)	Section 3.2 – Channel Erosion The long term framework and commitments for prioritized rehabilitation projects is expected to reduce channel erosion and scour, thereby reducing sources of turbidity.	The milestones associated with the Channel Erosion HPWQC also serve as milestones for restoring the beneficial uses impacted by the turbidity. See Table 3-15 in Section 3.2.5
IBI or other bioassessment scores (note "IBI" is used to refer to the IBI index another potential biological assessment scores)	Dry and Wet[1]	Inland, where channel type supports biological functions	Biological – WARM, WILD, COLD, SPWN	Eutrophication is a key limiting factor in biological integrity, therefore the co-benefits of HPWQCs to address eutrophication (identified above) are also anticipated to be effective for improvement of biological integrity. Rehabilitation of major active erosion issues per the plan described in **Section 3.2** combined with elimination of unnatural dry weather discharges and associated pollutant loads from MS4 outfalls per the plan described in **Section 3.3** are expected to reduce underlying physical habitat stressors that are linked to depressed biological integrity.	Rehabilitate **23,000 lineal feet** of streams using a geomorphically-referenced approach (See Section 3.2.2 for final and interim goals and schedules) Effectively eliminate unnatural dry weather flows from MS4 outfalls to inland receiving waters. (See Section 3.3.2 for final and interim goals and schedules)	All strategies intended to address unnatural eutrophication are expected to address impairments to IBI. Additionally, certain strategies relate directly to improvements in IBI, as follows: Section 3.2 – Channel Erosion The long term framework and commitments for prioritized rehabilitation projects is expected to: • Improve physical conditions to support biological beneficial uses • Reduce prevalence of invasive species Section 3.3 – Unnatural Water Balance and Flow Regime The following strategies contribute to reduction in unnatural wetted extent of streams and reduction of MS4 dry weather pollutant loads which are believed to be underlying stressors to biological beneficial uses 3.3.3.4 – Upland Source Control Strategies 3.3.3.5 – Outfall Control Strategies 3.3.3.6 – In-stream Strategies	The milestones associated with the HPWQCs also serve as milestones for restoring the beneficial uses impacted by the PWQC. For brevity, the milestones are not repeated here. See Table 3-15 in Section 3.2.5 See Table 3-21 in Section 3.3.5

PWQC	Primary Temporal Scope of Condition	Geographic Scope (to extent known)	Primary Beneficial Uses Potentially Impacted by PWQC	Discussion of Underlying Approach for Restoration of Beneficial Uses	Goals Intended to Result in Chemical, Physical, and Biological Conditions Protective of the Beneficial Uses that are Impacted by the PWQC	Strategies for Goal Attainment that Relate to Restoration of Beneficial Uses	Annual Milestones for Implementation of Strategies

1 – While stream integrity sampling is conducted during dry weather, stream integrity is affected by both dry and wet weather processes. Therefore, this PWQC noted as applying to both wet and dry weather temporal extent. However, this designation is not intended to indicate the need for wet weather stream integrity monitoring.

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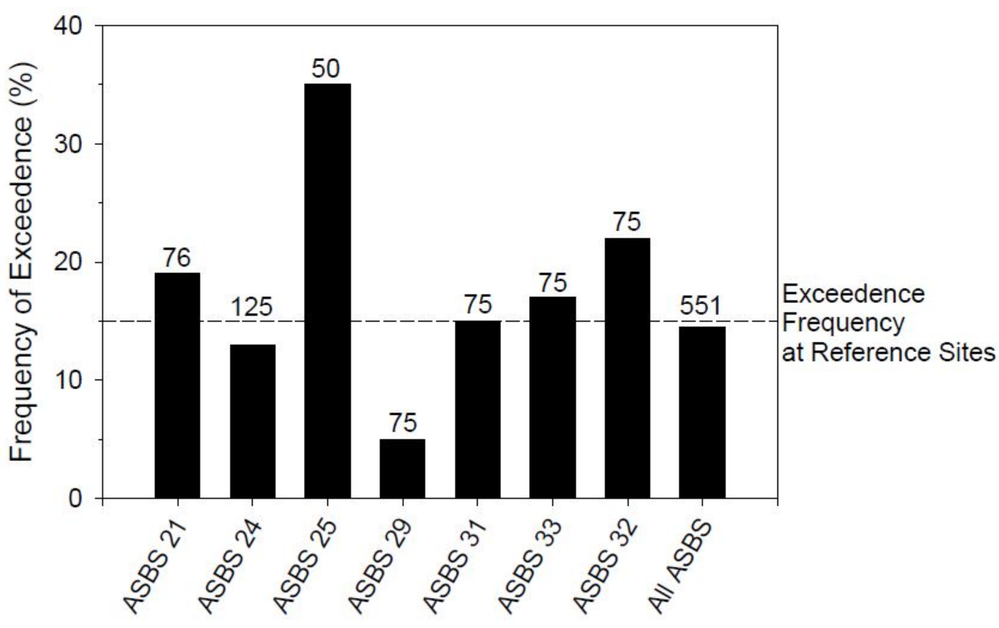
3.4.3.1 Areas of Special Biological Significance

3.4.3.1.1 Heisler Park ASBS

The Heisler Park Area of Special Biological Significance is located within the Laguna Coastal Streams Watershed approximately bounded between the Boat Canyon and Laguna Canyon stream outfalls. The assessment of this ASBS includes the results of the following two studies:

1. Southern California Bight 2008 Regional Monitoring Program: II. Areas of Special Biological Significance (Schiff, K.C. *et al.*, 2011) - This study concluded that the frequency of exceedances for wet weather sampling for a typical suite of stormwater parameters was only slightly higher than at reference sites as depicted in the **Figure 3-6** (Heisler ASBS No.33). The study noted that near-shore seawater concentrations measured at reference drainage sites influenced by stormwater inputs were generally low overall with many parameters very close to, or less than, method detection limits (i.e., DDTs, PCBs, PAHs), but that the reference data set used to derive natural water quality was limited.

Figure 3-6 Frequency of reference site based threshold exceedances for all parameters during all storm events at each Area of Special Biological Significance (ASBS) in southern California. Number above bar is total sample size.



2. Final Report - Assessing Areas of Special Biological Significance Exposure to Stormwater Plumes Using a Surface Transport Model Assessing Areas of Special Biological Significance (SCCWRP, 2014) – This study conducted modeling

exercises to assess the potential of plumes from large, neighboring watersheds to negatively impact ASBS water quality. The study concluded that the Heisler Park ASBS had the least extent and smallest magnitude of exposure probability where there was virtually no (<1%) probability of plume exposure. This conclusion was caveated by noting that the probability of exposure from the Laguna Canyon Creek could not be determined.

Noting these conclusions, this Plan will address compliance with Attachment B to State Water Board Resolution 2012-0012, as amended by State Water Board Resolution No. 2012-0013 for Special Protections for Areas of Special Biological Significance through the strategies, goals and schedules noted in **Sections 3.1 and 3.3**. Specifically, **Section 3.1** indicates that in addition to non-structural and jurisdictional strategy implementation, that potentially as much as 85% of the developed area of the Laguna Coastal Watershed will require new structural pollutant controls to meet the Pathogen Health Risk Goals.

It is also noted that significant measures to address discharges to the ASBS have already been implemented as indicated in the City of Laguna Beach - Heisler Park Area of Special Biological Significance Compliance Plan (2014). The following structural control requirements indicated in the compliance plan have been constructed and are in operation.

- Heisler Park nuisance water diversion units
- Restrooms/lift station rebuild inside and adjacent to the Heisler Park ASBS
- LID Site Design BMPs at Heisler Park
- SmarTimer, irrigation and landscaping at Heisler Park
- Bluff erosion control and drainage improvements

Additional best management practices will be investigated and implemented if future monitoring indicates water quality problems within the Heisler Park ASBS.

<u>*3.4.3.1.2 Irvine Coast ASBS*</u>

A small portion of the Irvine Coast ASBS protrudes into the SOC WMA within the Laguna Coastal Streams Watershed, specifically proximate to the outlet of Moro Canyon. This Plan does not specifically address this ASBS because there were no direct MS4 discharge locations noted within the Irvine ASBS coastline.

<u>3.4.4 Protection of Beneficial Uses</u>

The principal beneficial uses addressed by this Plan include:

- REC-1 (San Juan Creek; Pacific Ocean only)
- REC-2

- WARM
- WILD
- COLD (San Juan Creek only)
- SPWN (Trabuco Creek only)

This list is based on the beneficial use present in urbanized portions of the SOC WMA (areas potentially impacted by urban runoff) that are associated with pollutants found on the 303(d) list or for which a TMDL is in place. Other beneficial uses with limited nexus to urban runoff based on spatial proximity and pollutants of concern include:

- AGR
- IND (San Juan Creek only)
- RARE (San Mateo Creek only)
- BIOL or SPWN in natural reaches outside of urbanized areas
- Various other beneficial uses applicable to coastal waters

HPWQCs have been identified in **Section 2** and plans for these HPWQCs have been developed in **Section 3** based on protection of those beneficial uses that have a nexus to urban runoff. As described in **Section 2**, the HPWQCs addressed in this Plan are focused on underlying water quality conditions and are specifically intended to be implemented in a phased and adaptive approach, where underlying processes and conditions are improved as the first phase. This framework has been formulated in response to the challenges presented by "urban stream syndrome" and the associated uncertainty in future conditions necessary to restore and protect beneficial uses. Within this framework, ultimate protection of beneficial uses will be achieved through (1) implementation of the strategies to address HPWQCs identified in this Plan, (2) monitoring and assessment, (3) adaptation of priority conditions, goals and/or strategies as needed, and (4) ongoing implementation of strategies to identify any new HPWQCs identified through this process. The execution of the detailed plans for HPWQCs described in **Section 3.1 through Section 0**, combined with monitoring, assessment, and adaptive management is expected to result in chemical, physical, and biological conditions protective of the beneficial uses of the applicable receiving waters.

Table 3-24 summarizes the conformance of this WQIP with the criteria in Provision B.3.c.

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Table 3-24: Summary of Conformance to Provision B.3.c

Permit Provision	Summary of Conformance
c. PROHIBITIONS AND LIMITATIONS COMPLIANCE OPTION	
Each Permittee [4] has the option to utilize the implementation of the WQIP to demonstrate compliance with the requirements of Provisions A.1.a, A.1.c, A.1.d, A.2, and A.3.b within a Watershed Management Area subject to the following conditions:	This option has been elected.
(1) A Permittee is eligible to be deemed in compliance with Provisions A.1.a, A.1.c, A.1.d, A.2, and A.3.b within a Watershed Management Area when the WQIP for a Watershed Management Area incorporates the following:	This provision is acknowledged
(a) Numeric goals, water quality improvement strategies, and schedules developed pursuant to Provisions B.3.a and B.3.b that include the following:	Numeric goals, water quality improvement strategies, and schedules have been defined for the three HPWQCs based on the criteria in Provisions B.3.a and B.3.b
(i) Interim and final WQBELs established by the TMDLs in Attachment E to this Order applicable to the Permittee's jurisdiction within the Watershed Management Area; AND	Goals for Pathogen Health Risk were established based on the Indicator Bacteria TMDL
(ii) Interim and final numeric goals for any ASBS subject to the provisions of Attachment B to State Water Board Resolution No. 2012-0012 (included as Attachment A to this Order) applicable to the Permittee's jurisdiction within the Watershed Management Area; AND	This WQIP considered ASBS water quality and determined that the strategies for HPWQCs, in combination with the Heisler Park ASBS Compliance Plan, are adequate to protect ASBS water quality. The City of Laguna Beach - Heisler Park Area of Special Biological Significance Compliance Plan (2014) remains in effect.
(iii) Interim and final numeric goals applicable to the Permittee's MS4 discharges within the Watershed Management Area expressed as numeric concentration-based or load-based goals for all pollutants and conditions listed on the Clean Water Act Section 303(d) List of Water Quality Impaired Segments8 for the receiving waters in the Watershed Management Area that do not have a TMDL incorporated into Attachment E to this Order; AND/OR	This option not elected.
(iv) Interim and final numeric goals for pollutants and conditions identified as receiving water priorities in the WQIP that will result in chemical, physical, and biological conditions protective of the beneficial uses of the receiving waters impacted by the Permittee's MS4 discharges within the Watershed Management Area; AND	This option elected for Channel Erosion and Unnatural Water Balance HPWQCs and the PWQCs identified in Table 3-22 that have a linkage to these HPWQCs.
(v) The Permittee has the option to include interim and final numeric goals applicable to the Permittee's MS4 discharges and/or receiving waters within the Watershed Management Area for any pollutants or conditions in addition to those described in Provisions B.3.c.(1)(a)(i)-(iv); AND	PWQCs identified in Table 3-22 have been enrolled in this option. Table 3-22 explains why the interim and final numeric goals for HPWQC address these PWQCs.
(vi) Schedules for achieving each final numeric goal that reflect a realistic assessment of the shortest practicable time needed for achievement; AND	**Sections 3.1, 3.2,** and **3.3** present the basis for development of schedules for goals.
(vii) For each final numeric goal developed pursuant to Provisions B.3.a and B.3.c.(1)(a)(i)-(v), annual milestones and the dates for their achievement must be included within each of the next five (5) WQIP Annual Report reporting periods, or until the final numeric goal is achieved. Annual milestones and the dates for their achievement for the 5 WQIP Annual Report reporting periods of the next permit term, or until the final numeric goal is achieved, must be provided as part of the Report of Waste Discharge required pursuant to Provision F.5.	**Sections 3.1.6, 3.2.5,** and **3.3.5** present annual milestones for each HPWQC for the next 5 annual reporting periods. Table 3-22 explains how these milestones also have linkages to the PWQCs listed in Table 3-22
(b) An analysis that meets all of the following conditions:	

4 See footnote on Page 3-96.

Permit Provision	Summary of Conformance
(i) The analysis, with clearly stated assumptions included in the analysis, must quantitatively demonstrate that the implementation of the water quality improvement strategies required under Provision B.3.b will achieve the final numeric goals within the schedules developed pursuant to Provisions B.3.a and B.3.c.(1)(a).	This analysis has been conducted and documented for each HPWQC. This analysis takes different forms, as applicable to the nature of the condition.
(ii) The development of the analysis must include a public participation process which allows the public to review and provide comments on the analysis methodology utilized and the assumptions included in the analysis. Public comments and responses must be included as part of the analysis documentation included in the WQIP.	Documentation of analyses are included in Section 3, which has a public comment period.
(iii) The analysis may be performed by an individual Permittee or jointly by two or more Permittees choosing to utilize this compliance option for their jurisdictions within the Watershed Management Area.	This compliance option is elected by all Permittees in the WMA.
(iv) The analysis must be updated as part of the iterative approach and adaptive management process required under Provisions B.5.a-b.	This requirement is acknowledged
(c) Specific monitoring and assessments required pursuant to Provision B.4.a that will be performed by the Permittee capable of 1) demonstrating whether the implementation of the water quality improvement strategies is making progress toward achieving the numeric goals in accordance with the established schedules developed pursuant to Provisions B.3.a and B.3.c.(1)(a), and 2) determining whether interim and final numeric goals have been achieved. The specific monitoring and assessments must be updated as part of the iterative approach and adaptive management process required under Provision B.5.c.	This requirement is acknowledged and will be described in Section 4
(d) Documentation showing that the numeric goals, schedules, and annual milestones proposed pursuant to Provision B.3.c.(1)(a), the analysis performed pursuant to Provision B.3.c.(1)(b), and the specific monitoring and assessments proposed pursuant to Provision B.3.c.(1)(c) have been reviewed by the Water Quality Improvement Consultation Panel (see Provision F.1.a.(1)(b)). Updates must be reviewed by the Water Quality Improvement Consultation Panel for any recommendations.	This requirement is acknowledged
(2) Each Permittee that voluntarily completes the requirements of Provision B.3.c.(1) is deemed in compliance with Provisions A.1.a, A.1.c, A.1.d, A.2, and A.3.b for the pollutants and conditions for which numeric goals are developed when the WQIP, incorporating the requirements of Provision B.3.c.(1), is accepted by the San Diego Water Board pursuant to Provision F.1.b or F.2.c.	This requirement is acknowledged

3.5 Watershed Management Area Analysis

3.5.1 Introduction

The Permit (Provision B.3.b.(4)), through inclusion of the WMAA, provides an optional pathway for Permittees to develop an integrated approach for their land development stormwater planning programs by promoting evaluation of multiple strategies for water quality improvement and development of watershed-scale solutions for improving overall water quality in the watershed. The WMAA primarily applies to land development projects. In contrast, the WQIP applies primarily to existing development. Through the combination of these two elements, there may be potential for regional projects with watershed-scale benefits to be used in part to satisfy requirements for land development projects and in part to make progress towards WQIP goals.

The current Permit provides an option for Permittees to allow Priority Development Projects to satisfy stormwater control requirements on a regional- or watershed-based scale rather than onsite. The Permit indicates the first step in developing such a program and approach is "…identification of existing opportunities and constraints in order to prioritize areas of greater concern, areas of restoration potential, infrastructure constraints, and pathways for potential cumulative effects." This is a primary purpose of the WMAA. Therefore, performance of the WMAA is a first requisite step to allow for Priority Development Projects subject to post-construction pollutant control requirements to participate in offsite alternative compliance projects that yield greater overall water quality benefit to the watershed. These alternative compliance projects would be implemented in lieu of meeting full onsite pollutant retention and hydromodification management control requirements as is required for all Priority Development Projects.

As indicated, performance of the WMAA is the initial requirement to an Alternative Compliance program. Alternative Compliance program development as well as identifying qualifying alternative compliance (offsite) projects is subject to SDRWQCB approval (per Provision E of the Permit) and is not included in the B.3 submittal. To this end, preparation of the optional WMAA does not complete the development of an Alternative Compliance Program, but allows Permittees to pursue development of such a program. The WMAA is comprised of the following three components as indicated in the Permit:

1. Perform analysis and develop Geographic Information System (GIS) layers (maps) by gathering information pertaining to the physical characteristics of the WMA (referred to herein as WMA Characterization). This includes, for example, identifying hydrologic and infiltration features of the watersheds, land uses, stormwater conveyance and management facility locations that affect the

watershed hydrology.

2. Using the WMA Characterization results, compile a list of candidate projects that could potentially be used as alternative compliance options for Priority Development Projects. Such projects may include, for example, opportunities for stream or riparian area rehabilitation, opportunities for retrofitting existing infrastructure to incorporate stormwater retention or treatment, or opportunities for regional BMPs, among others. Prior to implementing these candidate projects the Permittees must demonstrate that implementing such a candidate project would provide greater overall benefit to the watershed than requiring implementation of the onsite structural BMPs.

3. Additionally, using the WMA Characterization maps, identify areas within the watershed management area where it is appropriate to allow for exemptions from hydromodification management requirements that are in addition to those already allowed by the Permit for Priority Development Projects. The Permittees shall identify such cases on a watershed basis and include them in the WMAA with supporting rationale to support claims for exemptions.

The following sections describe each of these components as they apply to the SOC WMA.

3.5.2 Watershed Characterization

A directly applicable data set to satisfy the WMAA watershed characterization requirements has already been developed as part of the region's cooperative program to develop the Model Water Quality Management Plan (WQMP). The WQMP provides guidance to development project proponents with addressing post-construction urban runoff and stormwater pollution from new development and significant redevelopment projects that qualify as Priority Projects. A variety of geodata sets pertinent to the WMAA data requirements are available for viewing and download through the OC Environmental Resources Data Portal (https://ocenvironmentaldata.giscloud.com/). Specifically applicable to the WMAA are the Watershed Infiltration & Hydromodification Management Plan (WIHMP) data sets that are provided to evaluate opportunities for implementation of LID, identification of hydromodification conditions of concern (HCOC), and watershed planning. In addition to the mapping exhibits referenced in **Section 2** of the Plan, the following WIHMP mapping exhibits, specific to each of the five SOC HSAs, are provided in this Plan supplementing the GIS data that can be accessed from the web address indicated above:

- Watershed Extent
- Elevation Data
- Watershed Slope

- County Drainage Facilities
- Sub-basin and Facility Watershed Delineation
- Land Use
- Existing Imperviousness
- Existing Curve Number Analysis
- Precipitation – 85th Percentile
- Infiltration Constraints – Overall Constraints
- Infiltration Constraints – USGS D Soils (Low Permeability)
- Infiltration Constraints – Landslides
- Infiltration Constraints – Physiographic Features
- Erodibility (RUSLE)
- Feasible structural BMP siting locations

These mapping exhibits are presented in **Appendix K.1**.

Provision B.3.b.(4)(a) of the Order specifies that the WMAA must include GIS layers (i.e., maps) as an output; and to the extent it is available, 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 if they are perennial or ephemeral;
- Current and anticipated future land uses;
- Potential coarse sediment yield areas; and
- Location of existing flood control structures and channel structures, such as stream armoring, constrictions, grade control structures, and hydromodification or flood management basins.

Table 3-25 explains how these requirements were addressed in this WMAA.

Table 3-25: Datasets and Data Availability Relative to Core WMAA Provisions

Information Identified in Provision B.3.b.(4)(a), to the extent available	Summary of Data Provided in WQIP/WMAA
A description of dominant hydrologic processes, such as areas where infiltration or overland flow likely dominates;	• Appendix K.1, Figures 6.6, 7.6, 8.6, 9.6, and 10.6 show degrees of existing imperviousness which is indicative of the prevalence of overland flow versus infiltration or ET. • Appendix K.1, Figures 6.7, 7.7, 8.7, 9.7, and 10.7 show curve numbers, which are indicative of the prevalence of overland flow versus infiltration or ET. • Appendix K.1, Figures 6.4, 7.4, 8.4, 9.4, and 10.4 show available subbasin delineations, County, and local drainage systems. This provides indication of where the watersheds are storm-sewered versus where flow is more likely to be overland. • Appendix K.1, Figures 6.9, 7.9, 8.9, 9.9, and 10.9 indicate infiltration constraints. Areas with fewer constraints that are not impervious may be dominated by infiltration or ET of stormwater runoff. In general, ET is a more dominant process than infiltration in most areas of Southern California.
A description of existing streams in the watershed, including bed material and composition, and if they are perennial or ephemeral;	• Information on stream channel type is presented in Appendix K.1, Figure 6.3, 7.3, 8.3, 9.3, and 10.3. • Additional information about stream channel type is shown in Appendix A, Figures A-3 and A-9. • Beyond characterizing channels as engineered, engineered earthen, or natural watercourse, WMA-wide GIS datasets of bed material and composition are not available. This information is anticipated to be obtained through evaluation of high-resolution LiDAR data obtained for stream channels and through reach-level efforts to evaluate rehabilitation feasibility and develop conceptual rehabilitation designs. • Appendix A, Figure A-2 shows observations of dry weather flow conditions at outfalls and in-stream observation points. This provides available information about perennial vs ephemeral streams. There are significant data gaps in current understanding of flow regime. This is discussed in Section 2 and 3 of the WQIP. Specific milestones have been established to obtain information to fill these gaps.

Information Identified in Provision B.3.b.(4)(a), to the extent available	Summary of Data Provided in WQIP/WMAA
Current and anticipated future land uses;	• Land uses are depicted in Appendix K.1, Figures 6.5, 7.5, 8.5, 9.5, and 10.5. • Future land uses are not available. • Zoning information is available at http://landrecords.ocpublicworks.com/ocsl/ (link provided rather than static map to ensure that updates are reflected).
Potential coarse sediment yield areas; and	• See Section 3.5.4.1 below and exhibits in Appendix K.4.
Location of existing flood control structures and channel structures, such as stream armoring, constrictions, grade control structures, and hydromodification or flood management basins.	• Information on stream channel type is presented in Appendix K.1, Figures 6.3, 7.3, 8.3, 9.3, and 10.3. Additional information about stream channel type is shown in Appendix A, Figures A-3 and A-9. • These exhibits indicate the location of channels, and stream armoring. Generally, the category "engineered earthen" is associated with the presence of grade control structures. Specific structures, constrictions, individual grade control structures, etc. are not available in a format that could be mapped for this effort. Much of this information will be obtained through evaluation of high-resolution LiDAR data obtained for stream channels and through reach-level efforts to evaluate rehabilitation feasibility and develop conceptual rehabilitation designs. • GIS information on existing major water quality, flood control, and/or hydromodification control basins are identified in Appendix K.1, Figures 6.11, 7.11, 8.11, 9.11, and 10.11. The location of existing stormwater control measures are identified in Appendix A, Figure A-15.

3.5.3 Alternative Compliance Candidate Projects

The Permit requires that results from the watershed characterization noted in the previous section be used to evaluate and list candidate projects that could potentially be used as alternative compliance options for Priority Development Projects should an agency or jurisdiction opt to develop an alternative compliance program. Permittees must first conclude that implementing such a candidate project would provide greater overall benefit to the watershed than requiring implementation of structural BMPs onsite prior to implementing these candidate projects as alternative compliance projects.

It is anticipated that there will be a significant period of time to fully consider opting to develop an Alternative Compliance (AC) program and, if elected, develop the program. Over this period, should development of an AC program move forward, a more extensive effort to identify and list candidate projects will occur and will be submitted as part of annual WQIP updates in accordance with Provision F. In the interim period, as part of this submittal, the stream rehabilitation projects identified in **Section 3.2** of the Plan will serve as the initial list of candidate projects for potential alternative compliance projects. As noted, these and any other potential project must first demonstrate that the project will have greater overall water quality benefit for the WMA than fully complying with the onsite performance requirements for priority projects, in accordance with Provision E.3.c.(3).

3.5.4 Hydromodification Management Requirements for Coarse Sediment

Provision E.3.c.(2) describes the hydromodification management requirements for projects which includes the requirement for such projects to avoid critical coarse sediment yield, or implement measures that allow critical coarse sediment to be discharged to receiving waters, such that there is no net impact to the receiving water. The function and importance of coarse sediment is described in the following passage from SCCWRP Technical Report 667 titled "Hydromodification Assessment and Management in California":

"Coarse sediment functions to naturally armor the stream bed and reduce the erosive forces associated with high flows. Absence of coarse sediment often results in erosion of in-channel substrate during high flows. In addition, coarse sediment contributes to formation of in-channel habitats necessary to support native flora and fauna."

Coarse sediment management requirements have been developed as part of the accepted 2015 SOC HMP. Specifically, Section 4 of the HMP indicates the sediment supply management measures that are applicable to all priority development projects. This section excerpt is provided in **Appendix K.2**. To facilitate identification of potential coarse sediment areas that require management in conformance with the SOC HMP, a map was developed as described in the following section.

3.5.4.1 Potential Coarse Sediment

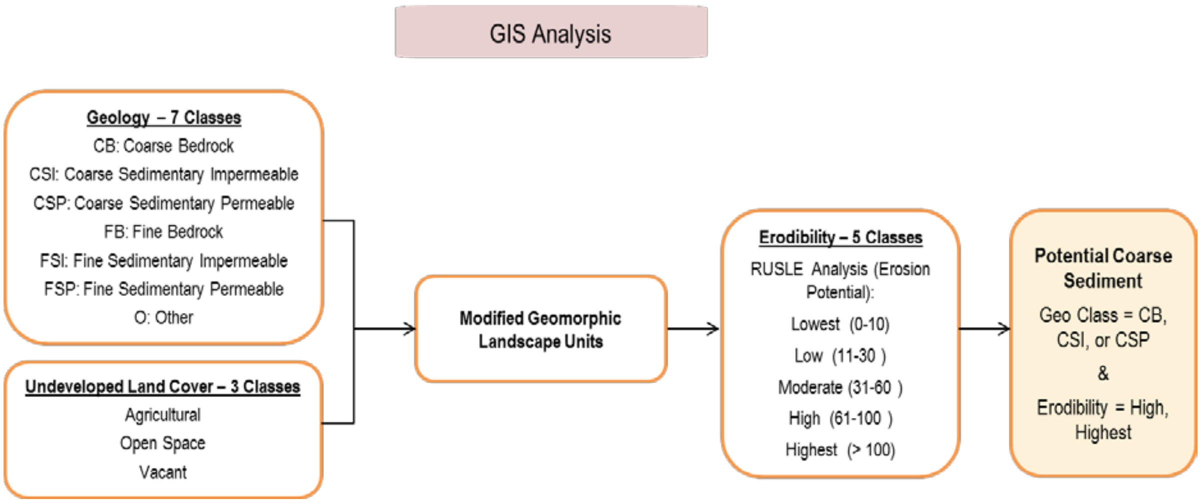
As part of the requirements outlined for the WMAA, a map of potential coarse sediment was developed to assist with identifying where projects potentially have to consider management of existing coarse sediment supplies that may be considered a critical supply area to downstream receiving waters (i.e., natural streams and creeks). The map was developed using regionally available GIS data and data developed as part of the WIHMP data described in **Section 3.5.2**. Coarse grain-producing geology units were identified consistent with the San Diego Regional Watershed Management Area Analysis (SDRWMAA, 2014) for the SOC WMAs. The data sets utilized for development of this map are indicated in **Table 3-26**.

Table 3-26: Datasets Used to Identify Potential Coarse Sediment Areas

Dataset	Source	Year	Description
Land Cover	County of Orange GIS	2013	Undeveloped land uses: Agriculture, Open Space, Vacant
Geology	USGS	2006	Geologic Map of the San Bernardino and Santa Ana 30' x 60' quadrangles, California
	California Geological Survey	2005	Geologic Map of the Oceanside 30' x 60' Quadrangle, California
Erodibility	County of Orange	2013	WIHMP data set: Erodibility (RUSLE) – High and Highest categories only

Analysis Approach - The methodology used to identify coarse sediment yield areas is partially based on the Geomorphic Landscape Unit (GLU) methodology presented in the SCCWRP Technical Report 605 titled "Hydromodification Screening Tools: GIS-Based Catchment Analyses of Potential Changes in Runoff and Sediment Discharge" (SCCWRP, 2010). Geomorphic Landscape Units characterize the magnitude of sediment production from areas through three factors judged to exert the greatest influence on the variability on sediment-production rates: geology types, hillslope gradient, and land cover. The GLU approach provides a useful, rapid framework to identify sediment-delivery attributes of the watershed. The process to integrate these factors into GLUs is indicated in **Figure 3-7**.

Figure 3-7: GIS Methodology to Identify Potential Coarse Sediment



The following steps mirroring the flowchart in **Figure 3-7** were used to identify potential coarse sediment areas in the SOC WMA.

1. **Integrate data sets used to determine GLU:** Categories for geology and land cover were defined based on readily available GIS datasets. The different combinations of these categories make up distinct GLUs.
   a. **Land Use Classes**: Undeveloped land areas were identified from the County of Orange land use dataset to determine where potential coarse sediment supplies may be located. Undeveloped land use categories included vacant, open space, and agriculture. An exhibit showing the undeveloped land use categories in the SOC WMA is presented in **Attachment K.4, Figure 1**.
   b. **Geologic Classes**: Based on methodology described in the SDRWMAA, individual geologic map units were grouped into classes to distinguish coarse from fine sediment producing geology as follows: Coarse Bedrock (CB), Coarse Sedimentary Impermeable (CSI), Coarse Sedimentary Permeable (CSP), Fine Bedrock (FB), Fine Sedimentary Impermeable (FSI), Fine Sedimentary Permeable (FSP), and Other (O). An exhibit showing the geology groupings in the SOC WMA is presented in **Attachment K.4, Figure 2**. A corresponding table of geology grouping assignments is presented in **Attachment K.4** following **Figure 2**.
2. **Define Pertinent Geologic Classes**: the geologic classes (**Attachment K.4, Figure 2**) considered in this study to have the potential to generate coarse sediment are Coarse Bedrock (CB), Coarse Sedimentary Impermeable (CSI), and Coarse Sedimentary Permeable (CSP).
3. **Define Relative Erosion Potential**: Erodibility datasets developed through the WIHMP process indicate the potential for sediment to be eroded and therefore

potentially delivered to the downstream receiving water (i.e., stream or creek). Through RUSLE analysis, a relative scale of erosion potential was developed in the WIHMP dataset: Lowest (0-10), Low (11-30), Moderate (31-60), High (61-100), Highest (> 100). An exhibit showing the erodibility within the SOC WMA is presented in **Attachment K.4, Figure 3.**

4. **Relate GLU to Erodibility to Identify Potential Coarse Sediment Areas**: The final step to identify potential coarse sediment was to intersect the three (3) coarse geology classes with the high and highest erodibility classes. An exhibit showing the resulting potential coarse sediment areas in the SOC WMA is presented in **Attachment K.4, Figure 4**. Individual exhibits for each of the six (6) subwatersheds showing potential coarse sediment areas are provided in **Attachment K.4, Figures 5 through 10**.

The resulting GIS layers indicating potential coarse sediment areas will be made available on the OC Environmental Resources Data Portal.

3.5.4.1.1 *Potential Coarse Sediment Map Limitations*

The resulting GIS layers as depicted in **Attachment K.4, Figures 4 through 10** were developed using regional datasets and provide a useful, rapid framework to perform screening-level analysis that is appropriate for watershed-scale planning studies. The methodology used to identify potential coarse sediment yield areas does not account for instream sediment supply and sediment production from mass failures like landslides which are difficult to estimate on a regional scale without performing extensive field investigation. This data set also does not account for potential existing impediments that may hinder delivery of coarse sediment to receiving waters or downstream locations within the watershed as this was beyond the scope of a regional study. Where more precise estimates are required for a particular site or subarea it is recommended that this analysis be augmented with site-specific analysis. It is also recognized that this regional data set is a function of the inherent data resolution and therefore may not conform to all site conditions, or does not reflect changes to particular areas that have occurred since the underlying data was developed. As such, the potential critical coarse sediment yield areas should be verified in the field according to the procedures outlined in the SOC HMP.

3.5.5 Hydromodification Management Exemptions

Hydromodification, which is caused by both altered stormwater flow and altered sediment flow regimes, is largely responsible for degradation of creeks, streams, and associated habitats in Orange County. The purpose of the hydromodification management requirements in the Permit is to maintain or restore more natural hydrologic flow regimes to prevent accelerated, unnatural erosion in downstream receiving waters.

In some cases, priority development projects may be exempt from hydromodification management requirements if the project site discharges runoff to receiving waters that are not susceptible to erosion (e.g., a lake, bay, or the Pacific Ocean) either directly or via hardened systems including concrete-lined channels or existing underground storm drain systems.

Provision E.3.c.(2) of the Permit also provided interim exemptions for project discharges directly to:

1. An **engineered channel** conveyance system with a capacity to convey peak flows generated by the 10-year storm event all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean; and
2. **Large river** reaches with a drainage area larger than 100 square miles and a 100-year flow capacity in excess of 20,000 cubic feet per second, provided that properly sized energy dissipation is included at all Priority Development Project discharge points.

The Permit allows these interim exemptions to become permanent if acceptable analysis, data, and rationale for supporting the exemption can be provided. Major SOC WMA engineered conveyance systems and river reaches meeting the definitions of the categorical interim exemptions indicated above, as initially presented in the 2015 HMP, are indicated in the **Table 3-27**.

Table 3-27: Summary of Reaches Evaluated for Permanent Exemption

Reach	Limits
Sleepy Hollow Storm Drain	Pacific Ocean to Park Avenue
Bluebird Storm Drain	Pacific Ocean to Glenneyre Street
Salt Creek	Pacific Ocean to 300 ft north of PCH
Prima Deshecha Canada	Pacific Ocean to Portico del Norte and Diamante
North Creek	Pacific Ocean to Dana Harbor Drive
Cascadita Canyon Storm Channel	Prima Deshecha Canada Channel to Via Cascadita
Segunda Deshecha Canada	Pacific Ocean to Calle Frontera
Marquita Storm Channel	Pacific Ocean to Encino Lane
Trafalgar Storm Drain	Pacific Ocean to South Ola Vista
Trabuco Creek	Confluence with San Juan Creek to Avenida De La Vista
San Juan Creek	Pacific Ocean to Casper Park Road

These river and channel reaches were reevaluated as part of the Plan to determine if proposing a permanent exemption from hydromodification requirements is appropriate. All of the systems indicated above are recommended for permanent exemption either because they are fully hardened system all the way to the ultimate receiving water, i.e., the Pacific Ocean, or the conveyance channel is not likely susceptible to hydromodification impacts. A summary of the analysis approach appears in the following section supported by the specific analyses provided in **Appendix K.3**.

3.5.5.1 Fully Hardened Systems

The following systems from **Table 3-27,** for the specific extents noted in the table, were confirmed as fully-hardened/-engineered (i.e., pipe or concrete channels) and therefore are granted exemption from hydromodification control requirements:

- Sleepy Hollow Storm Drain
- Bluebird Storm Drain
- Salt Creek Channel
- Prima Deshecha Canada Channel

- Cascadita Canyon Storm Channel
- Marquita Storm Channel

3.5.5.2 Non-fully Hardened Systems

The following systems from **Table 3-27**, for the specific extents noted in the table, were confirmed as partially-hardened/engineered through field and desktop-screening efforts.

- North Creek
- Segunda Desheca Canada
- Trafalgar Storm Drain (outfall only)
- Trabuco Creek

These systems were evaluated to determine the appropriateness of establishing permanent exemptions for these specific reaches. The evaluation included a field screening component and a GIS-based imperviousness assessment to support exemption recommendations. It was determined through field screening efforts that the current flow regimes in these systems are not resulting in significant active downcutting. In addition, the GIS-based exercise to evaluate potential changes in imperviousness in the contributing watersheds found that the cumulative future buildout would have a negligible effect on flow regime with or without the exemption. As such, the results of these evaluations support making exemptions from hydromodification requirements for direct discharges to these systems permanent. The details of the field screening, GIS analysis, and reach location figures are presented in **Appendix K.3**.

3.5.5.3 Large River Reach

San Juan Creek meets the Permit definition of a large river reach and was therefore evaluated to determine if granting a permanent exemption from hydromodification management controls for development projects discharging directly to the river is appropriate. The extents of the evaluation were from the outfall at the Pacific Ocean to Casper Park Road above the RMV development. A preponderance of the remaining developable land within the San Juan Creek watershed is within the RMV. To address the impacts of the development, RMV evaluated San Juan Creek as part of the approved Runoff Management Plan with the following conclusions regarding the system:

- Watershed/sub-watershed-based hydrologic and fluvial geomorphologic studies and planning principles used to develop the RMV Ranch Plan established the mainstem of San Juan Creek is not susceptible to hydromodification impacts from direct discharges from the planned RMV Ranch Plan development
- San Juan Creek is observed to have very similar channel form going back to 1930-40's

- San Juan Creek is an inherently dynamic system better able to modulate effects of slight downstream erosion

These conclusions, bolstered by the absence of severe downcutting observed through historical aerial photography of San Juan Creek, support making an exemption from hydromodification requirements for this reach of San Juan Creek permanent.

3.5.5.4 Recommendations

All of the systems indicated above are recommended for permanent exemption based on the discussions above and the supporting evaluations and rationale presented in **Appendix K**.

4 MONITORING AND ASSESSMENT PROGRAM

This Monitoring and Assessment Program (MAP) describes the strategies and methods that the Permittees will use to monitor and assess progress toward the numeric goals and schedules presented in **Section 3** of this Plan. This MAP also describes the approach the Permittees will use to monitor the conditions of receiving waters and discharges from the MS4 under wet and dry weather conditions. This MAP adheres to the prescriptive monitoring and assessment requirements of Permit Provision B, "Water Quality Improvement Plans,' Provision D, "Monitoring and Assessment Program Requirements," and Attachment E, "Specific Provisions for Total Maximum Daily Loads Applicable to Order No. R9-2013-0001, as amended by Order Nos. R9-2015-0001 and R9-2015-0100." The specific field and laboratory methods and protocols, and measurement quality objectives will be included within the *South Orange County Monitoring and Assessment Program Quality Assurance Program Plan*, which is currently being in developed.

Monitoring and assessment will be performed in the six subwatersheds of the SOC WMA as listed below and as depicted in **Appendix L**:

- Laguna Coastal Streams Watershed
- Aliso Creek Watershed
- Dana Point Coastal Streams Watershed
- San Juan Creek Watershed
- San Clemente Coastal Streams Watershed
- San Mateo Creek Watershed

The *Monitoring Program* includes five major elements:

(1) The *High Priority Water Quality Condition Monitoring Program* will monitor the effectiveness of strategies, and progress towards goals and schedules associated with the HPWQCs, summarized in **Section 3** of this Plan.

(2) The *Receiving Water Monitoring Program* is intended to measure the long-term health of the watersheds.

(3) The *MS4 Outfall Monitoring Program* will monitor the discharges from the MS4 outfalls in order to assess the effectiveness of the Permittee's LIPs at prohibiting

non-stormwater discharges into the MS4 and reducing pollutants in stormwater discharges.

(4) *TMDL Monitoring Program* will monitor progress toward achieving compliance with interim and final numeric targets specified in the Bacteria TMDLs.

(5) *Special Studies* will address pollutant and/or stressor data gaps and/or develop information necessary to more effectively address the pollutants and/or stressors that cause or contribute to the HPWQCs presented in **Section 2** of this Plan.

An overview of planned monitoring activities for the SOC WMA is provided as **Table 4-1**.

The *Assessment Program* includes both annual assessments and an integrated assessment. Annually, the Permittees will evaluate data collected as part of the aforementioned monitoring programs and special studies and information collected during the implementation of the LIPs in order to assess the progress of water quality improvement strategies. At the end of the Permit term, an integrated assessment will be performed by the Permittees. The integrated assessment will combine all previously performed assessments along with regional monitoring results and studies so that WQIP effectiveness and modifications can be considered.

Figure 4-1 depicts the conceptual organization and relationship of the SOC MAP.

MAP updates are anticipated for a variety of reasons including, but not limited to new priority water quality conditions and HPWQCs, anticipated changes to water quality objectives, and new monitoring and assessments methods and tools. MAP updates will be completed pursuant to Permit Provision F.2 requirements.

Table 4-1: Summary of WQIP Monitoring Programs

Monitoring Programs			Monitoring Elements	Permit Year				
				2016	2017	2018	2019	2020
HPWQC: Pathogen Health Risk	Human Waste Investigation	Dry/ Wet	Human waste investigations and verification sampling				●[1]	●[1]
	Structural BMP Performance	Dry/ Wet	Pre-installation sampling					●[2]
			Post-installation effectiveness sampling					●[2]
HPWQC: Channel Erosion/ Geomorphic Impacts	Stream Restoration Evaluation	Dry	Pre-restoration geomorphic, bioassessment, and CRAM characterization.				●[3]	
			Post-restoration geomorphic, bioassessment, and CRAM characterization.				●[3]	
	LiDAR Aerial Survey	Dry	Land surface model, hydraulic cross-sections at 250-ft spacing, and land cover classifications.	●				●[4]
HPWQC: Unnatural Water Balance/Flow Regime	Expanded Outfall Observations	Dry	Complete the expanded outfall observations for all Major and Minor outfalls with persistent flow.			●	●	●
	Detailed Flow Monitoring	Dry	Flow monitoring at all Priority outfalls, including Minor outfalls deemed a Priority			●	●	●
	High-resolution Imagery	Dry	Aerial imagery and analysis for approximately 170 miles of stream and riparian corridors.			●		●[4]
Receiving Water	Long-term Receiving Water	Dry	Field observations (i.e., location, flow or pooled water details, station condition, trash)			●	●	●
			Field measurements (i.e., pH, temperature, specific conductivity, dissolved oxygen, and turbidity)			●	●	●

Monitoring Programs			Monitoring Elements	Permit Year				
				2016	2017	2018	2019	2020
			Analytical monitoring (i.e., nutrients, metals, pesticides, indicator bacteria, and other required parameters)			●	●	●
			Toxicity monitoring (i.e., marine, estuarine, and freshwater chronic toxicity testing)			●	●	●
			Bioassessment (i.e., Benthic Macroinvertibrates [BMI] taxonomy, algae taxonomy, physical habitat characteristics)				●	
			Hydromodification Effectiveness Evaluation (i.e., channel conditions, bioassessment, and CRAM)				●[7]	●[7]
			Permittee Assessment and Reporting of Data from Rancho Mission Viejo Stream Monitoring Program			●	●	●
			Hydromodification at Long Term Mass Emission (LTME) Stations (i.e., channel conditions, discharge points, habitat integrity, evidence and estimate of erosion and habitat impacts)				●	
		Wet	Field observations (i.e., location, flow details, station condition, trash)			●	●	●
			Field measurements (i.e., pH, temperature, specific conductivity, dissolved oxygen, and turbidity)			●	●	●
			Analytical monitoring (i.e., nutrients, metals, pesticides, indicator bacteria, and other required parameters)			●	●	●

<table>
<tr><th colspan="3" rowspan="2">Monitoring Programs</th><th colspan="2" rowspan="2">Monitoring Elements</th><th colspan="5">Permit Year</th></tr>
<tr><th>2016</th><th>2017</th><th>2018</th><th>2019</th><th>2020</th></tr>
<tr><td rowspan="7"></td><td></td><td></td><td colspan="2">Toxicity Monitoring (i.e., marine, estuarine, and freshwater chronic toxicity testing)</td><td></td><td></td><td>•</td><td>•</td><td>•</td></tr>
<tr><td rowspan="3">Regional Monitoring</td><td>Dry</td><td>SMC Regional Monitoring</td><td>Regional Stream Bioassessment Monitoring Program</td><td colspan="5">•</td></tr>
<tr><td>Dry/ Wet</td><td>SC Bight Regional Monitoring (2013 and 2018 Program)</td><td>’13 Program Assessments: Contaminant Impacts; Nutrients; Trash/Debris; Shoreline Microbiology; MPA/Rocky Reef</td><td colspan="2">•</td><td colspan="3">•</td></tr>
<tr><td>Dry</td><td>Unified Beach Monitoring Program</td><td>Weekly samples collected at 67 stations on SOC beaches</td><td colspan="5">•</td></tr>
<tr><td>Sediment Quality</td><td>Dry</td><td colspan="2">Chemistry, toxicity, benthic infauna monitoring</td><td></td><td></td><td></td><td colspan="2">•[5]</td></tr>
<tr><td rowspan="2">ASBS</td><td>Wet</td><td colspan="2">Core discharge and receiving water sampling; trash[6]</td><td></td><td></td><td>•</td><td>•</td><td>•</td></tr>
<tr><td>Wet</td><td colspan="2">Bioaccumulation sampling and benthic macroinvertebrate surveys[6]</td><td colspan="2">•</td><td colspan="3">•</td></tr>
<tr><td rowspan="2">MS4 Outfall</td><td colspan="2" rowspan="2">Dry Weather</td><td colspan="2">Field observations (i.e., location, flow or pooled water details, station condition, trash, illicit discharges)</td><td></td><td></td><td>•</td><td>•</td><td>•</td></tr>
<tr><td colspan="2">Field measurements (i.e., pH, temperature, specific conductivity, dissolved oxygen, and turbidity)</td><td></td><td></td><td>•</td><td>•</td><td>•</td></tr>
</table>

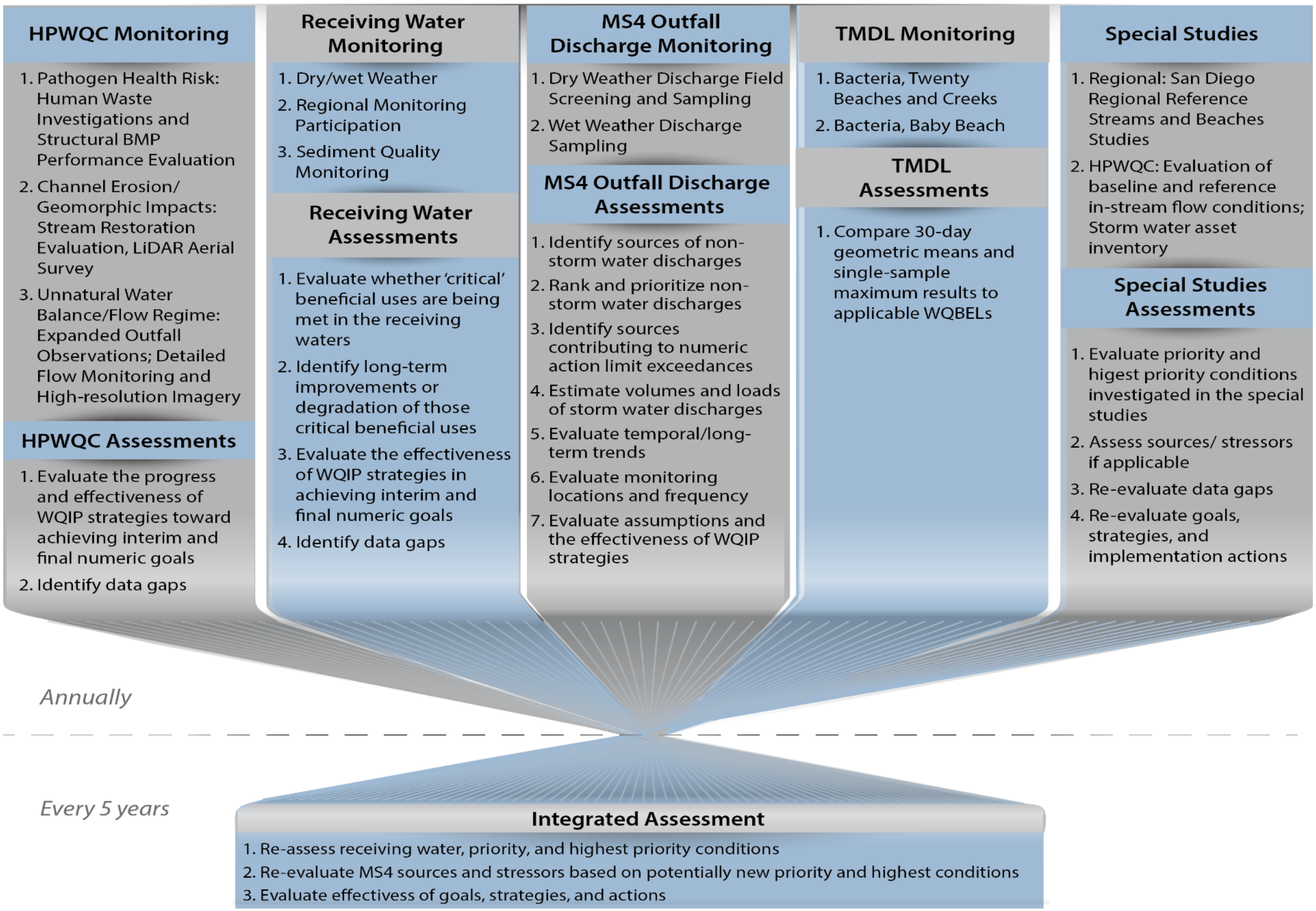
Monitoring Programs			Monitoring Elements	Permit Year				
				2016	2017	2018	2019	2020
			Analytical monitoring (i.e., nutrients, metals, pesticides, indicator bacteria, and other required parameters)			●	●	●
			Toxicity Monitoring			●	●	●
	Wet Weather		Field observations (i.e., location, flow details, station condition, trash, illicit discharges)			●	●	●
	Wet Weather		Field Measurements (i.e., pH, temperature, specific conductivity, dissolved oxygen, and turbidity)			●	●	●
	Wet Weather		Analytical Monitoring (i.e., conventional, nutrients, metals, and indicator bacteria)			●	●	●
	Wet Weather		Toxicity Monitoring			●	●	●
TMDLs	Bacteria, Twenty Beaches and Creeks	Dry	Beach and creeks/creek mouths sampling			●	●	●
TMDLs	Bacteria, Twenty Beaches and Creeks	Wet	Beach and creeks/creek mouths sampling			●	●	●
TMDLs	Bacteria, Baby Beach	Dry/ Wet	Beach sampling for indicator bacteria			●	●	●
Special Studies	Regional	Dry/ Wet	San Diego Regional Reference Streams and Beaches Studies				●	
Special Studies	HPWQC	Dry/ Wet	Evaluation of Baseline and Reference In-stream Flow Conditions				●	
Special Studies	HPWQC	Dry	Stormwater Asset Inventory				●	

Notes:
1 Pathogen health risk human waste investigation monitoring will be performed upon preparation of the *Human Waste Investigation and Abatement Work Plan*, which is to be prepared by the year 2019 (12 months from Plan effective date).
2 Structural BMP effectiveness monitoring will be performed as necessary.
3 Pre-restoration water quality, hydrologic, geomorphic, and biologic monitoring will be initiated upon selection of a targeted stream reach for restoration.
4 Aerial surveys for high-resolution LiDAR and imagery will be performed every 5-years; the next survey is in 2021.
5 The County and City of Dana Point Permittees will participate in the anticipated 2018 Regional Harbor Monitoring Program.

6 The City of Laguna Beach performs core discharge and receiving water monitoring. The City participates in the Southern California Bight Regional Monitoring Program, which included the collection of bioaccumulation samples and a benthic macroinvertebrate surveys.

7 Stream monitoring for hydromodification control effectiveness has been conducted as part of the RMV Stream Monitoring Plan and Habitat Conservation Plan, which will continue. Beginning in 2019 (and extending for 3 years), additional focused monitoring will be performed to assess the effectiveness of hydromodification control standards in Chiquita Canyon.

Figure 4-1: Conceptual Organization of Monitoring and Assessment Program



4.1 WQIP Monitoring Program

4.1.1 High Priority Water Quality Condition Monitoring

This section summarizes the planned monitoring intended to assess progress toward achieving goals related to the HPWQCs. Monitoring defined in the following sections addresses both near- and long-term strategies and goals presented in **Section 3**.

4.1.1.1 Pathogen Health Risk

Section 2 of this Plan describes pathogen health risk in coastal waters as a HPWQC due to the coastal beach and surf zone being high-value recreational areas in both dry and wet weather, and MS4 outfalls generally contributing bacteria loading in both dry and wet weather. Additionally, the adoption of the Bacteria TMDLs further emphasizes FIB loading as a high priority. **Section 3** of this Plan describes the goals, strategies, and schedules for reducing pathogen health risk to coastal waters. This section of the Plan summarizes monitoring designed to assess the effectiveness of strategies and progress towards achieving goals related to reducing pathogen health risk in coastal waters.

4.1.1.1.1 Summary of Goals and Strategies

The goals for the Pathogen Health Risk HPWQC presented in **Section 3** were established to conform to the interim and final numeric goals of the Twenty Beaches and Creeks TMDL, expressed as FIB percent load reductions. These interim and final goals are presented in **Table 3-1** (*Pathogen Health Risk Numeric Goals – Wet Weather*) and **Table 3-2** (*Pathogen Health Risk Numeric Goals – Dry Weather*) of **Section 3**. To achieve these goals, **Section 3** prioritizes targeted non-structural BMPs for early implementation, with emphasis on those that most directly address risks to human health. More specifically, the Permittees will implement a Comprehensive Human Waste Source Reduction Strategy (i.e., microbial source tracking) to aggressively and comprehensively investigate and eliminate human waste sources in the watersheds. The emphasis on human waste reflects the fact that these sources are a higher risk to the public and more controllable than anthropogenic and non-anthropogenic sources of FIB. Through implementation of the Human Waste Source Reduction Strategy and the TMDLs monitoring summarized in **Section 4.1.4**, the Permittees will address the goals of the Aliso Creek 13225 Directive issued in 2001 and later incorporated in the prior MS4 Permit, Order R9-2009-0002. As part of a separate strategy, structural treatment BMPs to address general stormwater runoff are planned. For more specifics regarding potential structural BMPs, including their timing, refer to **Section 3.1.4.6**, New Structural Treatment Strategies.

Individual Permittee LIPs will continue to implement, track, and report the status of traditional source control BMPs such as, but not limited to, eliminating cross-connections, trash clean-ups, pet waste management, MS4 cleaning, and education and outreach. However, Section 3 includes a Comprehensive Human Waste Source Reduction Strategy that is expected to result in significant long-term pathogen reduction during both dry and wet weather (Refer to **Figure 3-2**, Steps for Comprehensive Human Waste Source Reduction Strategy, within **Section 3**). Specifically, the Permittees will implement pathogen-focused MST, according to the California Microbial Source Identification Manual and recent SCCWRP findings and recommendations, to focus abatement efforts. Details pertaining to MST sampling and investigations throughout the MS4 will be described in a Human Waste Investigation and Abatement Work Plan. This work plan will be developed in 2018 through 2019 (12 months from WQIP acceptance).

The overall effectiveness of these strategies will be monitored according to the TMDLs Monitoring Program described in **Section 4.1.4** of this MAP. These programs include sampling and analysis specifically intended to address the Permittees' progress towards achieving compliance with the water quality-based effluent limitations (WQBELs) associated with applicable TMDLs. Additional monitoring, which is described in the following subsections, will be performed by Permittees to verify the progress and effectiveness of the Comprehensive Human Waste Source Reduction Strategy and structural BMPs.

4.1.1.1.2 Comprehensive Human Waste Source Reduction Strategy

Upon its development, the Comprehensive Human Waste Source Reduction Strategy Work Plan will be integrated into this MAP. This work plan will address sampling and analytical methods, spatial and temporal scale of the MST, decision criteria, and assessment methodology. An integral component of this work plan will be verification of dry and wet weather human waste abatement activities, as depicted in **Figure 3-2**, *Steps for Comprehensive Human Waste Source Reduction Strategy*. Dry and wet weather verification sampling will directly inform Permittees about the progress of the MSTs and the efficacy of the work plan and non-structural abatement strategies.

4.1.1.1.3 Structural BMP Performance Assessments

If persistent human marker detections have been eliminated, but FIB exceedances continue, then either structural treatment BMPs will be installed where feasible or an alternative compliance approach will be identified. Assessing the effectiveness of structural BMPs generally involves measuring inlet/outlet volume and water quality to assess load reduction. Efficiency assessments of new structural treatment strategies, if necessary, will be developed according to the *Urban Stormwater BMP Performance Monitoring Manual* (Geosyntec Consultants and Wright Water Engineers, Inc., 2009).

New structural BMP strategies could include infrastructure improvements, retrofits, stream restoration projects, and diversion to alternate locations to treat, infiltrate, or harvest and reuse runoff. In all cases, performance and efficiency assessments will include Before-After/Control-Impact studies in which monitoring would occur prior to the installation of a BMP. Pre-installation assessment results would be compared to post-installation monitoring assessment results. In addition, long-term monitoring and performance function testing would be completed to verify the BMP is working correctly and assess relative BMP performances.

4.1.1.2 Channel Erosion and Associated Geomorphic Impacts – Inland Receiving Waters

Section 2 of this Plan describes channel erosion and associated geomorphic impacts of inland receiving waters as a HPWQC since this is an important limiting factor in the restoration of beneficial uses. These adverse geomorphic conditions affect the physical form of the stream, which in turn causes changes in the physical habitat (i.e., channel geometry, substrate, vegetation, etc.) and hydraulic flow regimes (i.e., velocity distributions, erosive energy, etc.) of a channel. **Section 3** of this Plan describes the goals, strategies, and schedules for correcting channel erosion and associated geomorphic impacts within inland waterbodies, which will ultimately benefit and reduce sedimentation within coastal waterbodies. This section summarizes monitoring designed to assess the effectiveness of strategies and progress towards achieving goals related to correcting channel erosion and associated geomorphic impacts within inland waterbodies.

4.1.1.2.1 Summary of Goals and Strategies

Stream rehabilitation projects are expected to abate excess erosion and, implemented over a range of time, are anticipated to improve physical habitat and hydraulic regime, facilitating the conditions for improvements in the associated biological communities. Therefore, the Permittees will address this HPWQC by restoring stream reaches that remain unstable and have not reestablished a new, stable form where (1) excess erosion and scour is actively occurring and is an important limiting factor in channel ecology and (2) reasonable opportunities exist for implementing rehabilitation projects designed to serve the full range of flow and temporal conditions (i.e., peak flows; geomorphically-significant flows; low flows). The Permittees will use a geomorphically-referenced approach to abate channel erosion and associated geomorphic impacts within inland receiving waters of the SOC WMA. As noted in **Section 3.2.2.2**, the final numeric goal is to restore 23,000 lineal feet of stream reach by 2042 (schedule based on a five to ten-year per restoration project timeframe).

In order to assess the effectiveness of future stream restoration projects and reductions in channel erosion, more detailed investigation of applicable stream reaches, prior to and after restoration, will be needed. A basic framework for assessing the effectiveness of stream restoration projects will include the following monitoring:

- Geomorphic characterization;
- High-resolution LiDAR analysis; and
- Targeted bioassessment and California Rapid Assessment Method (CRAM).

Each assessment method is described in more detail in the subsections that follow. Given the geospatial variability of individual projects, including site-specific objectives and constraints, the Permittees will prepare a project-specific monitoring plan that defines a quantitative function-based assessment of the streambed habitat downstream of restoration reaches prior to restoration project initiation. This plan will specify in greater detail the specific monitoring locations and methods to be used.

4.1.1.2.2 Geomorphic Characterization

The objectives of the geomorphic monitoring are to evaluate the stability of restored stream reaches over time. Representative monitoring stations will be established within the restoration reach. Typical station locations may include but are not limited to riffles, pools, and meander bends.

If available, a reference site will be identified at the initiation of the monitoring program and will be used to assess program success. The reference site would ideally be located in a high quality habitat area with general geomorphic conditions (valley slope, drainage area, underlying substrate, etc.) similar to those found within the restoration area.

At the monitoring stations and within the reference reach the following parameters will be collected at regular intervals over a specified period to be defined at the time of developing restoration plans and project permitting: longitudinal profile, channel cross-section, bed material particle size distribution, size and extent of channel features (pools, riffles, and runs), and photographs. Changes in bed elevation, channel width, and bed material will be analyzed for indicators of overall stability and trends in channel cross-sectional area and sediment being transported or deposited on the stream bed and on bartops (i.e., instream depositional or erosional features).

The specific details of the geomorphic characterization will be dependent on the type of restoration project.

4.1.1.2.3 High-Resolution LiDAR Analysis

High-resolution LiDAR data has been obtained for approximately 170 miles of stream and riparian corridor within the SOC WMA for the specific purpose of supporting rehabilitation projects, measuring changes over time, and allowing for earlier identification of future instability within inland receiving waters. This data will be updated every five-years to assess changes in channel condition over time. The data will be used to develop a land surface model, hydraulic cross-sections at 250-ft spacing, and land cover classifications relevant to hydraulic and geomorphic analyses (i.e., vegetation density, bare soil, standing water, and hardened surfaces).

4.1.1.2.4 Targeted Bioassessment and CRAM

The project-specific monitoring plans will include both targeted bioassessment and CRAM monitoring protocols so the overall ecological health of downstream reaches can be quantitatively measured over time. *Pre-restoration* and *Post-restoration* monitoring will be conducted during spring over a specified period to be defined at the time of developing restoration plans and project permitting. Collection of BMIs will be conducted according to Surface Water Ambient Monitoring Program (SWAMP) protocols. Bioassessment data obtained downstream of restoration projects will be paired with environmental data obtained via standard GIS protocols, so that a California Stream Condition Index (CSCI) score can be calculated. An IBI score for algae will also be calculated upon completion of method development. Permittees will evaluate existing and new indices for their ability to accurately describe receiving water conditions, and will modify/update the indices it uses accordingly.

4.1.1.3 Unnatural Water Balance and Flow Regime – Inland Receiving Waters

Section 2 of this Plan describes unnatural water balance and flow regime within inland water bodies during dry weather conditions as a HPWQC. Correcting unnatural water balance and flow regime is foundational to the application of the function-based hierarchy for stream assessment and restoration projects described by Harman *et al*. (2012). A practical example of this relationship within the SOC WMA is the effect of seasonal (wet and dry weather) flows on the frequency and duration of the open/closed condition of the Aliso Creek mouth, which in turn greatly influences water quality conditions behind the intermittent sand berms of the estuary.

Section 3 of this Plan describes the goals, strategies, and schedules for correcting unnatural water balance and flow regime within inland waterbodies during dry weather. This section summarizes monitoring designed to assess the effectiveness of strategies and progress towards achieving goals related to correcting unnatural water balance and flow regime.

4.1.1.3.1 Summary of Goals and Strategies

The final numeric goal for this HPWQC is to effectively eliminate unnatural dry weather flows from MS4 outfalls to inland receiving waters, giving priority to locations where unnatural dry weather flow inputs arising from an unnatural urban water balance are exacerbating in-stream water quality conditions and contributing to unnatural in-stream regimes. In **Section 3**, **Table 3-16**: Interim Goals of Water Balance/Unnatural Flow Regime HPWQC summarizes interim goals for this HPWQC, which are based on aggregate improvement within the SOC WMA as a whole.

The five primary strategies the Permittees will use to achieve these goals, some of which incorporate monitoring tasks to refine goals, strategies, and schedules:

1. Focused data collection efforts intended to fill data gaps, support prioritization of approaches, and support adaptive management.
2. Special studies intended to result in more precise and definitive strategies that are appropriate for the specific receiving water.
3. Source control, incentives, and educational measures to promote water conservation and reduction of unnatural flows into the MS4.
4. Structural BMP retrofit strategies to divert and capture water at high priority outfalls, where appropriate.
5. Optional structural BMP retrofit strategies where it is determined that source control and educational strategies have reached their limit of effectiveness and conditions remain a high priority.

Given these strategies, the Permittees will implement the following monitoring, much of which is integral to the purpose and ultimate success of individual strategies:

- Expanded outfall observations;
- Detailed flow monitoring at priority outfalls; and
- High-resolution multispectral aerial imagery.

4.1.1.3.2 Expanded Outfall Observations

Section 3 of this Plan establishes a framework for prioritizing MS4 outfalls for future construction of outfall retrofits which divert and/or capture dry weather flows. The purpose of this framework is intended to identify appropriate control strategies on an outfall-by-outfall basis and prioritize program expenditures based on estimated costs and benefits. This framework is applied in-part using outfall discharge field screening data collected as part of the Permittees' Transitional Monitoring Program (TMP).

The TMP included outfall discharge field screening at 315 major outfalls (≥ 36 inches in diameter) for parameters specified in Table D-5 of Permit Provision D. Additionally, since dry weather flows may consist of natural sources, such as groundwater seepage, water quality monitoring to assess the presence of anthropogenic indicators in dry weather flows may be conducted. Field measurements for further assessment of source, such as fluoride, ammonia, conductivity, and hardness, may be included during future outfall observations.

Based on observations from this program, there are approximately 120 major outfalls that have been identified as having persistent flow. To enhance the prioritization of outfalls for future construction of outfall retrofits, the transitional outfall field screening was expanded during development of **Section 3** to include 1) connectivity of flow to receiving waters; 2) instream conditions upstream and downstream of the outfall; and 3) relative contribution of the outfall discharge to in-stream flowrates. As of September 2016, these expanded observations had been completed for 58 of the 120 major outfalls.

Between 2018 and 2020, the Permittees will complete the expanded outfall observations for all major outfalls, except where safety or private ownership prevents access or entry. Additionally, through the findings of other monitoring programs and through implementation of individual LIPs, the Permittees will extend the expanded outfall observations to smaller outfalls, as necessary. **Appendix M** summarizes the specific outfall observations that will be evaluated during future observations.

4.1.1.3.3 Detailed Flow Monitoring at Priority Outfalls

As noted, **Section 3** establishes a framework for prioritizing outfalls for future construction of outfall retrofits which divert and/or capture dry weather flows. In addition to the outfall observations described in **Section 4.1.1.3.2** of this MAP, detailed dry weather flow monitoring at outfalls will be used to support the prioritization of outfalls. The purpose of this monitoring is to obtain a better estimate of average flow magnitude and flow patterns, including diurnal fluctuations and other variability observed in the flow pattern, as well as to inform outfall capture feasibility studies. As of September 2016, detailed flow monitoring had been conducted at 42 outfalls.

Between 2018 and 2020, detailed flow monitoring will be completed at all priority outfalls, except where access or safety issues prevent monitoring or flows are found to be too low to measure. For the purpose of this monitoring task, "priority" outfalls for include those where outfall observations have identified consistent flow with connectivity to the receiving water and average flow rates are estimated to be greater than approximately 0.02 cubic feet per second (CFS) (10 gallons per minute [gpm]). If minor outfalls – identified during the outfall observations summarized in **Section 4.1.3.1.1** – exceed the 0.02 cfs (10 gpm) threshold, they too will be monitored. Detailed flow monitoring will be performed such that flow is recorded at approximately five-minute intervals for a two-week period.

4.1.1.3.4 High-resolution Multispectral Aerial Imagery

In 2016, the Permittees obtained high-resolution multispectral aerial imagery for approximately 170 miles of stream and riparian corridors within the SOC WMA. This imagery can be visually reviewed to identify areas of standing water, well-watered vegetation, wet soil and other covers (i.e., impervious, non-watered vegetation, dry soil, etc.). The Permittees will update this dataset at five-year intervals or more frequently to support change analyses. Future imagery will be obtained at a similar time of year at each interval (typically late spring), with similar interpretation methods applied in order to detect changes over time. Changes observed over time can be used to help inform the outfall prioritization process, better define the spatial extent of perennial reaches, identify connectivity from outfalls to inland receiving waters, and evaluate changes in conditions over time in response to implemented strategies and/or climatic variation. The results of analyses of these data will be included in each update to the Plan, as appropriate.

4.1.2 Receiving Water Monitoring Program

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, are enhanced. Additionally, the receiving water monitoring component helps inform the Permittees of any linkage between the health of the receiving waters and the quality of the discharges from the MS4 outfalls.

Pursuant to Provision D.1 and Attachment E of the Permit, the receiving water monitoring program includes the following components:

- Long-Term Receiving Water Monitoring: includes a broad set of monitoring activities designed to characterize receiving water quality during wet and dry weather over an extended, multi-year timeframe.
- Regional Monitoring Participation: includes continued participation in regional monitoring programs that are applicable to the Permittees, including the *Southern California Bight Regional Monitoring Program*, the *Stormwater Monitoring Coalition Regional Monitoring Program,* and the *Unified Beach Water Quality Monitoring and Assessment Program*.
- Sediment Quality Monitoring: includes monitoring of sediments from receiving waters, including Dana Point Harbor.
- TMDL Monitoring: includes monitoring for indicator bacteria according to the Baby Beach TMDL and the Twenty Beaches and Creeks TMDL.

These monitoring components are designed to answer one or more of 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 improving or degrading? Long-Term Receiving Water Monitoring

Long-term receiving water monitoring is intended to track over time the overall health of the receiving waters for dry and wet weather conditions as described in the following sections. Long-term receiving water monitoring data will help to answer the following questions:

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

4.1.2.1.1 Dry Weather Receiving Water Monitoring

Dry weather receiving water monitoring will consist of field observations and measurements, grab and composite sample collection for laboratory analysis (chemistry and toxicity), bioassessment monitoring, and hydromodification monitoring (i.e., of wet weather impacts).

4.1.2.1.1.1 Field Observations, Measurements, and Sampling

The Permittees will perform field observations, measurements, and sampling at seven historical LTME (six historical stations and one new station located on Salt Creek within the Dana Point Coastal Streams Watershed). The monitoring site selection criteria included the following:

- Suitability of the site drainage area to monitor area-wide contributions of stormwater pollutant loading;
- Suitability of the site's hydrological characteristics to enable practical measurement of flow and collection of representative stormwater samples;
- Maintenance of long-term data collection at appropriate existing monitoring stations;
- Safety from traffic and other hazards;
- Suitability for efficient operation of automatic sampling equipment; and
- Access for safely retrieving samples and maintaining equipment during storm conditions.

Field observations, measurements, and sampling will be performed at LTME sampling stations during a minimum of three monitoring events over the course of the Permit term:

- Event 1: During the dry season, May 1 through September 30;
- Event 2: During a dry weather period in the wet season (October 1 through April 30) after the first wet weather event of the season, with an antecedent dry period of at least 72 hours following a storm event producing measurable rainfall of greater than 0.1 inch; and
- Event 3: An additional dry weather event (May 1 through September 30).

Dry weather receiving water field observations will be recorded during all monitoring events, and if conditions allow, the Permittees will record field measurements and collect samples. If receiving water conditions prevent the Permittees form performing field measurements and collecting samples, then the Permittees will wait for conditions to change (i.e., flow to resume) and will return to applicable monitoring stations accordingly.

Dry weather receiving water sampling will be conducted with two automatic samplers that are programmed to collect time/flow-weighted composite samples. One automatic sampler will be used for water chemistry samples, and the other will be used for aqueous toxicity samples. The automatic samplers consist of programmable pumps (peristaltic) that transport water from the channel to a collection reservoir in the sampler base. Composite sample will be analyzed for parameters specified in the Permit. Grab samples will also be collected for FIB at the time of sampler servicing.

The Permittees will also employ the use of a Temporary Watershed Assessment Stations (TWAS) in order to monitor water quality in impaired waterbody segments which don't already have a LTME station, or where an existing LTME station is not adequately sited to address a specific impairment. For example, a TWAS will be sited within Oso Creek, Moro Canyon (in conjunction with California Department of Parks and Recreation), and English Canyon, and samples collected that target pollutants associated with known impairments (i.e., chloride, sulfates, total dissolved solids, selenium, toxicity). At a minimum, a TWAS will monitored during dry weather according to the same frequency as an LTME station, with regular assessment of the data collected to determine additional monitoring needs.

Additional details of this monitoring, including sampling locations and frequencies, can be found in **Appendix M**. The specific methods, protocols, and data quality objectives will be included within the *South Orange County Monitoring and Assessment Program Quality Assurance Program Plan*, and may change over time due to site-specific conditions and advances in methodology and technology. LTME sampling stations are also depicted in **Appendix L**.

4.1.2.1.1.2 Bioassessment Monitoring

The Permittees will perform bioassessment monitoring at the seven monitoring stations depicted in the Map Exhibits included as **Appendix L**. These stations will be monitored a minimum of one time during the Permit term. Individual station locations were selected based on a variety of factors including accessibility and feasibility (i.e., wadeable) of sampling. The Permittees will collect the following bioassessment samples and measurements at each station:

- Benthic macroinvertebrate samples pursuant to the "Reachwide Benthos (Multihabitat) Procedure" in the most current SWAMP *Bioassessment Standard Operating Procedures* (SOPs), and amendments, as applicable;
- The "Full" suite of physical habitat characterization measurements according to the most current SWAMP Bioassessment SOP, and as summarized in the SWAMP *Stream Habitat Characterization Form – Full Version*; and
- Freshwater algae samples according to the SWAMP Standard Operating Procedures for Collecting Algae Samples, analyzed for algal taxonomic composition (diatoms and soft algae) and algal biomass.

The Permittees will use bioassessment sample results, measurements, and appropriate water chemistry data to calculate a CSCI score. The Permittees will also calculate an algal IBI score, upon development of an approved IBI method.

Historically, the Southern California Index of Biotic Integrity (SoCal IBI) was used as the scoring metric, and was based on data from the southern California region, from southern Monterey County to the Mexican border. However, the CSCI was created using a more robust dataset of reference sites from a wide variety of streams across multiple climate zones throughout California. The CSCI is a new statewide biological scoring tool that translates complex data about BMIs found living in a stream into an overall measure of stream health. The CSCI was finalized in 2015 and represents the latest generation of biological indicators for assessing stream health in California. The CSCI combines two separate types of indices, each of which provides unique information about the biological condition at a stream: a multi-metric index that measures ecological structure and function, and an observed-to-expected index that measures taxonomic completeness. Unlike previous multi-metric or observed-to-expected indices that were applicable only on a regional basis or under-represented large portions of the state (e.g., SoCal IBI), the CSCI was built with a statewide dataset that represents the broad range of environmental conditions across California. The CSCI provides consistency and accuracy in the interpretation of biological data collected by both statewide and regional monitoring programs and will be the basis of the new statewide Biological Integrity Plan.

Additional details of this monitoring, including sampling locations and frequencies, can be found in **Appendix M**. The specific methods, protocols, and data quality objectives will be included within the *South Orange County Monitoring and Assessment Program Quality Assurance Program Plan* and may change over time due to site-specific conditions and advances in methodology and technology.

Additional bioassessment monitoring will be performed as part of other monitoring programs described in this MAP. Specifically, the Hydromodification Monitoring described in the following section, and Channel Erosion and Associated Geomorphic

Impacts monitoring described in **Section 4.1.1.2.4**, include bioassessment monitoring in order to fulfill the objectives of those monitoring programs.

4.1.2.1.1.3 Hydromodification Control Effectiveness Monitoring

Hydromodification control effectiveness monitoring will be performed in the SOC WMA in order to assess the effectiveness of the South Orange County Hydromodification Management Plan (SOC HMP). This will take two forms: (1) permittee monitoring, assessment, and reporting, and (2) permittee assessment and reporting of data from stream monitoring conducted as part of the RMV stream monitoring program. These are described in the following headings.

South Orange County Hydromodification Management Plan Effectiveness Monitoring

The SOC HMP (County of Orange, 2015) defines hydromodification control criteria for Priority Development Projects (i.e., development that creates new impervious surface, or redevelopment that adds or replaces 5,000 or more square feet of impervious area) in the SOC WMA. The criteria specified in the SOC HMP requires that post-project runoff flow rates and durations for the PDP do not exceed pre-development, naturally occurring, runoff flow rates and durations more than 10% of the time, from 10% of the 2-year runoff event up to the 10-year runoff event.

In compliance with Provision B and D of the MS4 Permit, the Permittees will complete three (3) years of HMP effectiveness monitoring associated with development of the RMV Ranch Plan development. The monitoring will be conducted at three (3) locations in areas exclusively in Chiquita Canyon Creek that receives discharge from development subject to hydromodification flow control standards. The purpose of this monitoring shall be to further evaluate the HMP framework questions 1 through 4 identified in section 1.3 of the *Draft Integrated Effectiveness Assessment of Hydromodification Control Standards in South Orange County* (December 2017). Specifically:

- The monitoring locations shall be located at the Rancho Mission Viejo development project downstream of areas exclusively in development that has installed an outfall for an HMP mitigation facility. The three (3) monitoring locations shall be in Chiquita Canyon Creek.
- Monitoring at each of these locations shall consist of:
    - CRAM in conjunction with bioassessment;
    - Geomorphic characterization; and
    - Cross section surveys.

The specific monitoring locations, methods and agreements on access to private lands will be detailed in an *HMP-Specific Quality Assurance Project Plan*. The specific methods, protocols, and data quality objectives included within the *HMP-Specific Quality Assurance Program Plan* may change over time due to site-specific conditions and advances in methodology and technology.

Assessment and reporting of hydromodification control effectiveness monitoring is described in **Section 4.2.2.2**.

<u>RMV Ranch Plan Stream Monitoring Program and Habitat Conservation Plan</u>

The RMV Ranch Plan located in the SOC WMA was designed pursuant to the SOC HMP criteria. The ROMP (Pacific Advanced Civil Engineering, Inc. [PACE], 2013) was partially developed to mitigate and restore hydromodification impacts within the RMV project area. Through implementation of the ROMP and associated tiered plan development and approval process, hydromodification is expected to be mitigated, and geomorphic conditions generally improved, as a result of development of the RMV project.

The ROMP specifies hydromodification monitoring which is intended to provide data that can be used to evaluate the effectiveness of proposed mitigation measures and inform an adaptive management process. The hydromodification monitoring program, which has been on-going since 2006, includes annual stream channel surveys and geomorphic assessments, annual BMP inspection and performance monitoring, and annual hydrologic monitoring (PACE, 2013). Additional cross-sections have been added in Gobernadora and Chiquita Canyons (4 stations in both), as well as in San Juan Creek (3 stations), to assist in monitoring the expansion of the RMV development program for the Planning Area 2 development area. As of 2017, there were a total of 16 monumented cross-section locations (PACE, 2016).

In addition to the hydromodification monitoring specified in the ROMP, CRAM surveys are also being performed in Chiquita Canyon pursuant to the *Southern Subregion Habitat Conservation Plan, San Juan Creek and Western San Mateo Creek Watershed Special Area Management Plan* and *The Ranch Plan Master Streambed Alteration Agreement*. There are three survey stations in Chiquita Canyon, all of which have been monitored in 2013 and 2016.

Additional details of these monitoring programs and integrated findings to date were reported to the Regional Board in the *Draft Integrated Effectiveness Assessment of Hydromodification Control Standards in South Orange County* (December 2017).

Programs associated with the RMV Ranch Plan are ongoing. Mitigation Measure 4.5-8 of California EIR No. 589 specifies the frequency and duration of activities associated with the Stream Monitoring Program and specifies annual reporting of results to the County of Orange.

As described in **Section 4.2.2.2**, the permittees will conduct an annual assessment, based on stream monitoring data submitted by RMV pursuant to Mitigation Measure 4.5-8. The objectives and details of this assessment and reporting are explained in **Section 4.2.2.2.**

4.1.2.1.1.4 Hydromodification Monitoring at LTME Stations

In addition to the SOC HMP effectiveness monitoring, and pursuant to Permit Provision D.1.c.(6), the Permittees will conduct dry weather receiving water hydromodification observations and measurements at or proximal to all LTME stations once during the Permit term. The general observations and measurements to be collected will include:

- Channel conditions, including:
  - Channel dimensions,
  - Hydrologic and geomorphic conditions, and
  - Presence and condition of vegetation and habitat;
- Location of discharge points;
- Habitat integrity;
- Photo documentation of existing erosion and habitat impacts, with location (i.e., latitude and longitude coordinates) where photos were taken;
- Measurement or estimate of dimensions of any existing channel bed or bank eroded areas, including length, width, and depth of any incisions; and
- Known or suspected cause(s) of existing downstream erosion or habitat impact, including flow, soil, slope, and vegetation conditions, as well as upstream land uses and contributing new and existing development.

Prior to performing these observations and measurements, the Permittees will coordinate and collaborate with SCCWRP and the Southern California Stormwater Monitoring Coalition (SMC) to define applicable domains of analysis (i.e., natural receiving waters without a hydromodification exemption) for each LTME station that accounts for local and regional objectives. This coordination will also be used to define the most pertinent assessment protocols and tools which reflect Southern California stream conditions.

4.1.2.1.2 Wet Weather Receiving Water Monitoring

The Permittees will conduct wet weather receiving water monitoring at the LTME stations presented in **Appendix L**. Wet weather receiving water sampling will consist of field observations and measurements, and grab and composite sample collection for laboratory analysis. Wet weather sampling will be performed during a storm event producing measurable rainfall of greater than 0.1 inch—the Permittees trigger monitoring upon receiving 0.25 inches of rainfall or greater—and when there is measurable flow at the LTME station. In order to obtain samples representative of the targeted storm event, wet weather sampling will only be performed following a dry period of at least 72 hours.

Field observations, measurements, and sampling will be conducted at LTME stations during a minimum of three storm events (i.e., greater than 0.1 inch of precipitation), during the wet season (October 1 to April 30), over the course of the Permit term:

- Event 1: The first storm of the season;
- Event 2: A storm occurring after February 1; and
- Event 3: An additional storm event.

Similar to the dry weather receiving water monitoring, wet weather receiving water monitoring will rely on the use of automatic samplers to collect time-/flow-weighted composite samples. These samplers will be initiated when the water level in the channel rises above a triggering device (level actuator or flow meter) connected to the respective sampler. When possible, a single triggering device will be used to trigger both samplers simultaneously. Time-/flow-weighted composite sampling will also be supported by the County's precipitation and stream gaging network which consists of recording and/or transmitting Automated Local Evaluation in Real Time (ALERT) gauges. The ALERT precipitation gauges are tipping bucket type with data loggers. Data are recorded and transmitted in digital format. The sensitivity of the ALERT transmitting gauges is 1 mm (0.04 inches) of accumulated rainfall. The recording non-transmitting gauges have a sensitivity of 0.01 inch of rainfall.

For water chemistry samples (and the toxicity sampler during the first storm) the frequency of collection during the first hour of a storm will be set at 1 sample per 12 minutes. After the sixth sample is collected at the one-hour mark, the collection frequency will be decreased to one sample every 2 hours. The first flush of the first storm of the year will be modified slightly to collect additional volume for additional chemistry analyses (1 sample per 7 minutes). The first six samples collected during the first hour of each storm will be composited and represent the "first flush". Using water level hydrographs from the ALERT system as a guide or by evaluating the specific conductance of the samples in each bottle, the remaining bi-hourly storm samples representing the storm peak and recession will be composited into a single sample. Storms spanning multiple days will be split into two or more composite samples.

Wet weather composite samples will be analyzed for the parameters specified in the Permit. Grab samples will also be collected for FIB at the time of sampler servicing.

Similar to the Dry Weather Receiving Water Monitoring described in **Section 4.1.2.1.1**, the Permittees will use a TWAS in order to monitor water quality in impaired waterbody segments which don't already have a LTME station, or where an existing LTME station isn't adequately sited to address a specific impairment. Samples will be collected at a TWAS for pollutants specifically associated with known impairments (i.e., chloride, sulfates, total dissolved solids, selenium, toxicity). At a minimum, a TWAS will monitored during wet weather according to the same frequency as an LTME station, with regular assessment of the data collected to determine additional monitoring needs.

Additional details of this monitoring, including sampling locations and frequencies, can be found in **Appendix M**. The specific methods, protocols, and data quality objectives will be included within the *South Orange County Monitoring and Assessment Program Quality Assurance Program Plan*, and may change over time due to site-specific conditions and advances in methodology and technology.

4.1.2.2 Other Receiving Water Monitoring

4.1.2.2.1 Regional Monitoring

The Permittees will continue to participate in regional studies/programs including the SMC Regional Monitoring Program, the Southern California Bight Regional Monitoring Program, and the Unified Beach Water Quality Monitoring and Assessment Program. Data obtained from these programs assist with:

- Determining whether receiving water conditions are protective of beneficial uses;
- Identifying the extent and magnitude of current receiving water problems;
- Identifying potential future receiving water problems; and
- Determining TMDL progress and the effectiveness of current TMDL measures.

Details on the regional programs South Orange County has participated in may be found below.

4.1.2.2.1.1 SMC Regional Monitoring Program

Founded in 2001, regulated municipalities, the Regional Water Quality Control Boards, and SCCWRP partnered to form the SMC. The goals of the SMC are to develop information to help further understand stormwater mechanics and impacts in southern California watersheds, and effectively improve decision making related to stormwater management (SMC, 2016).

The SMC has completed a variety of projects including studies concerning barriers to low impact development BMPs and how to better standardize stormwater data across the region. Twenty-one projects were identified in the 2014 Research Agenda for implementation over the next five-year term (SMC, 2014). One of the larger projects related to South Orange County is the *Regional Freshwater Stream Bioassessment Monitoring Program*.

The *Regional Freshwater Stream Bioassessment Monitoring Program* completed its first term of monitoring from 2009-2013. During this period, the Program assessed:

- Biologic conditions of streams in the region;
- Stressors associated with poor stream condition; and
- Changes in stream conditions over time.

Conditions were assessed using BMIs, diatoms, soft algae, and riparian conditions as biological indicators. Results of the initial five-year survey helped to develop new statewide benthic invertebrate scoring tools and contribute to the southern California algae IBI. A second five-year term was approved for implementation from 2015-2019. During this term, the SMC will discontinue any monitoring of stressors deemed low-priority during the last monitoring term, continue monitoring of high priority stressors (with the inclusion of sediment toxicity and bioanalytical screens), expand the survey to include both perennial and non-perennial streams, and revisit sites from previous surveys to further analyze changes in stream conditions (SMC, 2016). The specific methods, protocols, and data quality objectives may change over time due to site-specific conditions and advances in methodology and technology.

4.1.2.2.1.2 Southern California Bight Regional Monitoring

The *Southern California Bight Regional Monitoring Program* aims to improve the efficacy of existing monitoring programs and improve capacity for regional assessments intended to address the ecological condition of the Southern California Bight. Working with a variety of Southern California agencies, including SOC Permittees, SCCWRP initiated a series of monitoring efforts throughout the Southern California Bight in 1994, 1998, 2003, 2008, and 2013. The 2013 program (Bight '13), which was completed in 2017, was designed to address the following questions or problems (SCCWRP, 2016):

- Contaminant Impact Assessment will evaluate:
  - Direct impacts of sediment contaminants;
  - Trends in extent and magnitude of impacts from sediment contaminants; and
  - Indirect risk of sediment contaminants to seabirds.
- Nutrients Assessment will:
  - Determine frequency, spatial extent, and seasonality of algal blooms;

  - Determine spatial patterns and seasonality of pH and aragonite saturation; and
  - Determine the effect of anthropogenic nutrient inputs on ecological processes and rates driving biological productivity.
- Trash and Debris Assessment will address the amount, type and distribution of trash and debris across major habitats of the Southern California Bight and link that data to sources on land.
- Shoreline Microbiology will assess reliability of the rapid qPCR test method and the percentage of beach discharges with significant human fecal pollution.

Upon completion of the Bight '13, the Permittees will continue to participate in the development and implementation of specific elements of future Bight monitoring programs (i.e., Bight '18).

Additional details of this monitoring, including sampling locations and frequencies, can be found in **Appendix M**. The specific methods, protocols, and data quality objectives may change over time due to site-specific conditions and advances in methodology and technology.

4.1.2.2.1.3 Unified Beach Water Quality Monitoring and Assessment Program

In 2015 the *Unified Beach Water Quality Monitoring and Assessment Program* was initiated after its approval by the SDRWQCB (SDRWQCB 2014). The aim of this program is to efficiently monitor water quality at beaches throughout south Orange County pursuant to the requirements of the California Ocean Plan and AB 411, as well as to evaluate their status relative to the water contact recreation (REC-1) beneficial use standard.

Sixty-seven stations, covering beaches between Crystal Cove State Park and San Clemente, are monitored by this program. All sampling stations are either along the open coast or within Dana Point Harbor. Samples are collected once per week, year round, at all locations, either in the surf zone for fixed locations or where discharge from outlets reaches the ocean. Monitoring responsibilities are distributed between the South Orange County Wastewater Authority, Orange County Health Care Agency, and Orange County Public Works.

Results from the continuous monitoring are used to track beach health over time, as well as guide public notifications on the health of local beaches. Analytical data indicating an exceedance of REC-1 standards, AB 411 standards, or California Ocean Plan standards result in a public notice and possible closure of the beach in question. An exceedance will also result in follow-up sampling which is intended to verify/validate the original results and further protect beach goers from waterborne diseases.

Additional details of this monitoring, including sampling locations and frequencies, can be found in **Appendix M**. The specific locations, methods, protocols, and data quality objectives may change over time due to site-specific conditions and advances in methodology and technology.

4.1.2.2.2 *Sediment Monitoring*

Pursuant to Permit Provision D.1.e(2), the Permittees will perform sediment quality monitoring within Dana Point Harbor to assess compliance with the State Water Board's *Water Quality Control Plan for Enclosed Bays and Estuaries of California – Part I Sediment Quality* (Sediment Control Plan) (SWRCB, 2009). Sediment Control Plan Section VII.D requires NPDES Phase I stormwater dischargers such as the SOC WMA Permittees to conduct monitoring at least twice per Permit term, unless monitoring stations are shown to consistently be "unimpacted." Section VII.E of the Sediment Control Plan provides general guidelines for conducting sediment monitoring and refers to the specific monitoring parameters and assessments that are required per Section V of the Sediment Control Plan. To address these requirements, the Permittees will continue to participate in the *Regional Harbor Monitoring Program* (RHMP). Additionally, the Permittees will perform one sediment monitoring event, separate from the RHMP, during permit term.

The RHMP was developed by the Port of San Diego, the City of San Diego, the City of Oceanside, and the County of Orange, in response to a July 24, 2003 request by SDRWQCB under Section 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 RHMP was designed to assess sediment and receiving water quality using the procedures of the Sediment Control Plan, including a multiple lines of evidence (MLOE) approach.

Dana Point Harbor was last sampled by the RHMP in 2013. The 2013 RHMP *Final Work Plan* and *Quality Assurance Program Plan* (AMEC, 2013) are incorporated by reference within this MAP. These documents describe the monitoring, including a map of the stations, the participating agencies, and a schedule for implementation. A total of four sites, listed in **Table 4-2** , were sampled for water quality, sediment quality, and toxicity.

Table 4-2: Dana Point Harbor Regional Harbor Monitoring Program Sampling Stations

Station ID	Latitude	Longitude	Final Integrated SQO Score
B13-8259	33.45894	-117.697734	Likely Impacted
B13-8263	33.460713	-117.705564	Unimpacted
B13-8265	33.460921	-117.702298	Unimpacted

B13-8267	33.461948	-117.702047	Possibly Impacted

The *Final Regional Harbor Monitoring Program 2013 Report* (2016) summarized sediment data and the sediment quality of monitoring stations within Dana Point Harbor. It included an assessment using Sediment Quality Objectives (SQO) as described in the Sediment Control Plan, as well as an updated methodology (Bay et al., 2013) to derive *Integrated SQO Scores*. The 2013 scores for each monitoring station in Dana Point Harbor are summarized in **Table 4-2**.

The next cycle of monitoring associated with the RHMP is anticipated to occur as part of Bight '18, within the Permittees next permit term (2018-2023). The 2018 RHMP work plan and quality assurance program plan development was initiated in early 2018, and monitoring will be performed in 2018-19. The Permittees will participate in this monitoring cycle as before, which will satisfy one of two sampling events required by the Sediment Control Plan. A second required sampling event will be satisfied by conducting follow-up sampling at the same Dana Point Harbor monitoring stations sampled during the 2018 RHMP.

Sediment monitoring led by the Permittees (i.e., separate from the RHMP) will employ the same methods described in the 2018 RHMP work plan and quality assurance program plan. The Permittee led sediment monitoring will include (1) sediment chemistry, (2) toxicity, and (3) benthic community.

4.1.2.2.3 Area of Special Biological Significance Monitoring

The California Ocean Plan identifies 14 Areas of Special Biological Significance in Southern California. Discharging "waste" of any kind into an ASBS, including stormwater, is strictly prohibited by the California Ocean Plan. One of the 14 identified ASBS in Southern California, Heisler Park ASBS, is located within the boundaries of the SOC WMA. Heisler Park was designated as an ASBS in 1974.

The City of Laguna Beach was notified by the State Water Board in October of 2004 to either cease the discharge of stormwater and non-point source waste into Heisler Park ASBS or request an exception to the California Ocean Plan. The City formally requested an exception in December of 2004 to allow the continued discharge of stormwater into the ASBS. The *General Exception to the California Ocean Plan for Areas of Special Biological Significance Waste Discharge Prohibition for Stormwater and Nonpoint Source Discharges, with Special Protections* (the General Exception) was adopted by the SWRCB on March 20, 2012 and the City was notified on March 20, 2012 of inclusion in the General Exception. The General Exception allows for the continued discharge of stormwater into the Heisler Park ASBS as long as "natural water quality" is maintained. The General Exception requires that an ASBS Compliance Plan be developed and implemented, and that discharge and receiving water monitoring be conducted.

To satisfy the monitoring requirements of the General Exception, the City of Laguna Beach participates in the Southern California Bight Regional Monitoring Program managed by SCCWRP, as well as self-performing some monitoring. More specifically, the City of Laguna Beach coordinates and collects stormwater runoff and receiving water samples during wet weather at one outfall and receiving water station. SCCWRP collects bioaccumulation samples and also performs benthic invertebrate surveys according to General Exception monitoring requirements. To determine whether or not "natural water quality" is being maintained within the Heisler Park ASBS, the City of Laguna Beach compares receiving water sampling results to a series of reference-based thresholds developed by SCCWRP.

Additional details of this monitoring, including sampling locations and frequencies, can be found in **Appendix M**. The specific methods, protocols, and data quality objectives can be found within the *South Orange County Monitoring and Assessment Program Quality Assurance Program Plan*, and may change over time due to site-specific conditions and advances in methodology and technology. Sampling locations are also depicted in **Appendix L**.

4.1.3 MS4 Outfall Monitoring Program

Permittees will implement wet and dry weather outfall monitoring in order to assess the effectiveness of individual LIPs toward effectively prohibiting non-stormwater discharges into the MS4 and reducing pollutants in stormwater discharges from their MS4s. It will also be used to answer a primary question: Do non-stormwater or stormwater discharges from the MS4 contribute to receiving water quality problems?

Pursuant to Permit Provision D.2.a.(1), *MS4 Outfall Discharge Monitoring Station Inventory*, the Permittees developed an inventory of major outfalls that discharge directly to receiving waters. **Table 4-3** summarizes the number of major outfalls by Permittee to be monitored according to dry and wet weather protocols described in the following subsections. The number and location of outfalls monitored is subject to change on the basis of new information, updates to the Permittees' MS4 outfall inventories, changes in transient or persistent flow classifications, and/or updates to the Plan.

Table 4-3. Summary of Permittee's Major MS4 Outfalls To Be Monitored

Permittee	Total Major Outfalls	Dry Weather		Wet Weather Discharge Sampling[3]
		Field Screening[1]	Discharge Sampling[2]	
Aliso Viejo	23	18	6	1
Dana Point	22	18	2	1
Laguna Beach	26	21	2	1

Laguna Hills	2	2	-	-
Laguna Niguel	40	32	6	3
Laguna Woods	3	2	3	1
Lake Forest [4]	16	13	5	1
Mission Viejo	30	24	5	1
Rancho Santa Margarita	31	25	5	1
San Clemente	21	17	6	1
San Juan Capistrano	30	24	5	1
Orange County	34	27	6	2
	278	222	51	14

Notes: 1 For Permittees with less than 125 major MS4 outfalls in the SOC WMA, at least 80 percent of the outfalls must be visually inspected two times per year during dry weather conditions.
2 For Permittees with less than 5 major outfalls in the SOC WMA, all its major outfalls with persistent flow must be sampled.
3 At least one MS4 outfall per Permittee, which discharges within the SOC WMA, must be sampled during wet weather conditions.
4 See footnote on page 3-96

4.1.3.1 Dry Weather MS4 Outfall Discharge Monitoring

The Permittees will conduct dry weather MS4 outfall discharge monitoring throughout the SOC WMA in order to:

- Identify non-stormwater and illicit discharges to the MS4;
- Prioritize the dry weather MS4 discharges that will be investigated and eliminated pursuant to Permit Provision E.2.d; and
- Inform the prioritization of outfall retrofits and feasibility of planned outfall capture strategies associated with the unnatural water balance and flow regime HPWQC.

Dry weather outfall discharge monitoring will consist of field screening, and where persistent flows are identified, field screening will be followed by dry weather sampling.

4.1.3.1.1 Field Screening

The intent of outfall screening is to identify and eliminate sources of persistent non-stormwater discharges. Persistent flow is defined in the Permit "as the presence of flowing, pooled, or ponded water more than 72 hours after a measurable 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.

Pursuant to Permit Provision D.2.a.(2), field screening will be conducted at 80 percent of the major outfalls in the SOC WMA (see **Table 4-3**). Field screening will be performed two times per year during dry weather conditions with an antecedent dry period of at least 72 hours with less than 0.1 inch of rainfall. The observation parameters summarized in **Appendix M** will be recorded for each outfall. Field observations will be used along with information available in prior reports, inspections, and monitoring to determine whether any observed flowing, pooled, or ponded waters are likely to be transient or persistent flow. Additionally, jurisdictional illicit connection and/or illicit discharge (IC/ID) programs will be implemented based on observations.

4.1.3.1.2 Non-stormwater Persistent Flow MS4 Outfall Discharge Sampling

The primary purpose of dry weather MS4 outfall discharge sampling is to identify major outfalls with persistent dry weather flows that are impacting receiving water quality, so they may be prioritized and eliminated through targeted programmatic actions and source investigations. In order to accomplish this goal, the Permittees will use field screening information, including an outfalls discharge status (i.e., persistent, transient, and no-flow), to prioritize major outfalls for sampling. The Permittees within the SOC WMA will use the prioritization of outfalls for future retrofits to select the five highest priority outfalls for dry weather MS4 outfall discharge sampling.

Sampling will be performed semi-annually at the highest priority outfall monitoring stations presented in **Appendix M**. Sampling will include field observations consistent with the parameters presented in **Appendix M**. When measurable flow is present, field measurements will be recorded and grab or composite samples will be collected for the analytes presented in **Appendix M**. Ultimately, monitoring will be adaptive to receiving water conditions.

In order to determine which persistent non-stormwater discharges impact receiving water quality, dry weather MS4 outfall discharge sampling results will be compared to the applicable non-stormwater action levels (NALs) included within Permit Provision C.1.a. The results of these comparisons will help to further assess the effectiveness of water quality improvement strategies, as well as inform the prioritization of outfalls for future retrofits.

Dry weather MS4 outfall discharge sampling will be performed at the selected highest priority outfalls until one of the following occurs:

1. Non-stormwater discharges have been effectively eliminated for three consecutive dry weather monitoring events;
2. The source(s) of the persistent flows have been identified as a category of non-stormwater discharges that do not require a NPDES Permit and the associated constituents in the discharge do not exceed the NALs;
3. Constituents in the persistent flow do not exceed NALs; or
4. The source(s) of the persistent flows has been identified as a non-stormwater discharge authorized by a separate NPDES Permit.

If one of the aforementioned criteria is met or the threat to water quality has been reduced by the Permittees, the major outfalls will be reprioritized and a new group of five highest priority outfalls will be selected for dry weather MS4 outfall discharge sampling. Highest priority outfall monitoring stations that have been removed from the inventory of outfalls will be replaced with the next highest prioritized outfall. Any removal or reprioritization of the highest priority outfalls will be documented within the WQIP Annual Report.

Additional details of this monitoring, including sampling locations and frequencies, can be found in **Appendix M**. The specific methods, protocols, and data quality objectives can be found within the *South Orange County Monitoring and Assessment Program Quality Assurance Program Plan*, and may change over time due to site-specific conditions and advances in methodology and technology. Sampling locations are also depicted in **Appendix L**.

4.1.3.2 Wet Weather MS4 Outfall Discharge Monitoring

The Permittees will conduct wet weather MS4 outfall discharge monitoring throughout the SOC WMA in order to:

- Identify pollutants in stormwater discharges from the MS4s;
- Guide pollutant source identification efforts;
- Determine the effectiveness of water quality improvement strategies associated with the pathogen health risk HPWQC; and
- Determine compliance with the WQBELs associated with applicable TMDLs.

Pursuant to Permit Provision D.2.c, 14 outfalls were selected for wet weather MS4 outfall discharge monitoring. These 14 outfalls represent stormwater discharges for each Permittee, as well as residential, commercial, industrial, and mixed-use land uses. Appendix M summarizes the location of the 14 outfall monitoring stations and the Map Exhibits included as **Appendix L** depict their locations.

Wet weather MS4 outfall discharge monitoring will be performed during a minimum of one storm event, annually. Wet weather outfall discharge monitoring will consist of field observations, field monitoring, and collection of both grab and time-/flow-weighted composite samples. **Appendix M** summarizes the specific monitoring requirements at each outfall. Ultimately, monitoring will be adaptive to receiving water conditions.

Wet weather MS4 outfall discharge sampling results will be compared to the applicable stormwater action levels (SALs) included within Permit Provision C.2.a. The results of these comparisons will help to further assess the effectiveness of water quality improvement strategies, as well as inform the development and prioritization of water quality improvement strategies.

Additional details of this monitoring, including sampling locations and frequencies, can be found in **Appendix M**. The specific methods, protocols, and data quality objectives can be found within the *South Orange County Monitoring and Assessment Program Quality Assurance Program Plan*, and may change over time due to site-specific conditions and advances in methodology and technology. Sampling locations are also depicted in **Appendix L**.

4.1.4 TMDLs Monitoring Program

TMDLs monitoring will be performed during dry and wet weather pursuant to the Twenty Beaches and Creeks TMDL and the Baby Beach TMDL monitoring requirements summarized in Attachment E of the Permit. Based on the 2002 303(d) list, the Twenty Beaches and Creeks TMDL (SDRWQC 2010) includes 30 segments or areas where TMDL compliance requirements are applicable. A summary of the segments or areas which the TMDL applies to is summarized in **Appendix M**. Although various segments/areas identified in the Twenty Beaches and Creeks TMDL have been omitted or delisted from more current 303(d) lists, the Permittees will continue to monitor and assess progress at achieving TMDL compliance requirements according to the 30 segments/areas listed in the Twenty Beaches and Creeks TMDL.

The monitoring will be used by applicable Permittees to track progress toward achieving compliance with interim and final numeric targets, and will help to answer the following questions:

1. Are the numeric targets for bacteria indicators, as described in Attachment E of the Permit, being adhered to at compliance monitoring stations?
2. Are bacteria levels improving or getting worse at the compliance monitoring stations?

TMDLs monitoring is summarized below. Additional details of this monitoring, including sampling locations and frequencies, can be found in **Appendix M**. The specific methods, protocols, and data quality objectives will be included within the *South Orange County Monitoring and Assessment Program Quality Assurance Program Plan*, and may change over time due to site-specific conditions, advances in methodology and technology, and anticipated updates to the 2014 Region 9 Basin Plan. TMDLs sampling locations are also depicted in **Appendix L**.

4.1.4.1 Beach Sampling

Beach samples will be collected and analyzed for total coliform, fecal coliform, and *Enterococcus*. During the dry season, samples will be collected weekly on dry weather days[5] by way of the *Unified Beach Water Quality Monitoring Program* (SDRWQCB 2014). Wet weather sampling will target storms with greater than 0.1 inch of precipitation and will be performed at least once within 24 hours of the end of a storm event. A maximum of six storm events will be collected during the wet season (October 1 through April 30). To help capture seasonal variation throughout the wet season, an effort will be made to sample storms at the start (October-November), in the middle (December-February), and towards the end of the wet season (March-April). Sampling will be subject to whether enough storms of 0.1 inches or greater occur in any given year.

4.1.4.1.1 Alternative Monitoring Procedures for Delisted Beach Segments

Although the delisted beach segments currently meet water quality standards, monitoring will verify that the delisted segments continue to meet the TMDL standards, so weekly samples will be collected during both dry and wet seasons through the *Unified Beach Water Quality Monitoring Program.* Wet weather samples will be collected at least once within 72 hours after the end of a 0.1 inch storm event. As part of the adaptive management, additional follow up monitoring and investigation will be performed in response to water quality standards exceedances. Should any waterbody indicate persistently occurring exceedances of applicable water quality standards, monitoring will be performed according to the aforementioned beach monitoring procedures during the following reporting year.

4.1.4.2 Creeks and Creek Mouths

Creek and creek mouth samples will be collected and analyzed for fecal coliform and *Enterococcus*. Dry weather creek sampling will be performed at the LTME stations according to the Dry Weather Receiving Water Monitoring Program, described in Section 4.1.2.1.1. Creek mouths will be monitored at least monthly during dry weather. In addition, watershed assessment stations located upstream of the mouth for the two creeks in the TMDLs will be monitored monthly during dry weather. Wet weather monitoring will be conducted during a maximum of six storm events during the wet season (October 1 through April 30). Wet weather sampling will target storms with greater than 0.1 inch of precipitation and will be performed within the first 24 hours of the end of a storm event.

4.1.5 Special Studies

The Permittees will implement special studies to address pollutant and/or stressor data gaps and/or develop information necessary to more effectively address the pollutants

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5 After an antecedent dry period of 72 hours with less than 0.2 inch of rainfall

and/or stressors that cause or contribute to HPWQCs. One regional special study and two special studies specific to the SOC WMA will be implemented.

4.1.5.1 San Diego Regional Reference Streams and Beaches Studies

The Twenty Beaches and Creeks TMDL was developed using land-use based modeling and limited data. Prior studies on indicator bacteria concentrations in reference beaches and streams have suggested that current TMDL numeric targets do not adequately account for the natural and largely uncontrollable sources of bacteria generated in watersheds. In addition, studies on stream nutrients and metals concentrations have also shown that exceedances of numeric targets may be wet weather-driven or geology-driven, as with metals concentrations in many South Orange County coastal watersheds. A regional reference study was completed to gather the data necessary to derive reasonable and accurate numeric targets for bacteria, nutrients, and metals.

The San Diego Regional Streams Reference Study primarily aimed to ascertain the naturally occurring levels of bacteria, nutrients, and metals in minimally-disturbed watersheds in the San Diego Region (SCCWRP, 2015). The study investigated conditions during both wet and dry weather and evaluated the seasonal variance of WQO exceedance frequencies for FIB. Furthermore, the study analyzed the effects of hydrologic, geomorphologic, and biotic and abiotic factors on the frequency of WQO exceedance. The results of this study will serve as a reference for the development of practical compliance goals for the concentrations of pollutants in regional streams.

FIB levels were largely found to be under the WQOs with the exception of *Enterococcus*. The study found that FIB concentrations were significantly correlated with temperature, nutrients, and organic carbon, all of which peaked during the summer dry weather, coincident with the end of stream flow. This relationship may suggest that increasing temperature and decomposition of organic matter are contributing factors to high levels of FIB. Geology and watershed size did not appear to have an effect on bacteria levels during dry weather. Due to low sample size during wet weather, the findings for wet weather factors were limited, however a general correlation was observed between higher bacteria concentrations and storms with increased size, lower number of antecedent storm days, and storms occurring late in the year. The results of this study were found to be comparable to studies previously conducted in 2007 and 2008 and thus can be used with confidence for reference when developing target levels for regulated pollutants.

The San Diego Regional Beaches Reference Study seeks to accomplish the same goals listed above: to identify the background levels of FIB at beaches with minimal human impact and to use the results as a reference in order to create appropriate numeric targets. The study took place during wet and dry weather in order to assess the frequency of WQO exceedance for FIB and how it varies between seasons. Additionally, the study examined the effects of conditions such as water temperature, salinity, number of antecedent dry days, and the presence or absence of an estuary. The study was performed at two sites, San Onofre Creek and Deer Creek.

The study found that the frequency of WQO exceedances for FIB were very low at the beaches of both sites during dry weather. FIB concentrations at both sites were found to be much higher in the estuary or freshwater mixing zone compared to the beaches. This suggests that had there been more tidal exchange at the mouth of the estuary, the exceedance frequencies may have been higher. The estuary at San Onofre Creek had higher WQO exceedance frequencies than the mixing zone at Deer Creek and the difference is attributed to the large amount of organic matter common in estuaries that can foster microbial growth as well as the presence of water birds that excrete FIB. Water temperature, salinity, and antecedent dry days were not found to have a significant effect on FIB concentrations. Due to the drought only one storm was sampled for the study and, as human-associated fecal material was found to be present in the sample, could not be used as reference for "natural background" wet weather exceedance frequencies.

During the Permit term, the Permittees will further evaluate the findings of each study and consider their potential implications to the Plan. The Permittees will prepare and submit to the SDRWQCB a report documenting planned adjustments to the Plan based on the findings of each study.

4.1.5.2 Evaluation of Baseline and Reference In-stream Flow Conditions

Flow regime is one of the foundations of the function-based hierarchy for stream assessment and restoration projects described by Harman *et al*. (2012). Disruption in the natural flow regime of a stream system is considered one of the key stressors associated with "urban stream syndrome" described by Walsh, *et al*. (2005). Stream ecosystems that are subject to unnatural inputs tend to be vulnerable to changes in the quality or quantity of these inputs over time. In moderate to high stress urban streams, perennialization of urban streams is associated with lower biological integrity (Mazor *et al*., 2012). For these reasons, the Permittees identified unnatural water balance and flow regime (inland receiving waters) as a HPWQC.

A great deal of study has been performed in Southern California by the USGS, SCCWRP and others to help explore the relationship between flow and stream ecology. This research was used to identify a suite of flow metrics that can be used to predict changes in benthic macroinvertebrate community condition within the region. A related study developed GIS screening methods to characterize the flow status (perennial-intermittent-ephemeral) of stream reaches and identified benthic macroinvertebrate traits that relate to the ability of a particular species to persist in streams with non-perennial flow (City of San Diego and Tetra Tech, 2015). Ultimately, these flow–ecology relationships and the associated hydrologic/biological tools can help inform management decisions, such as determining diversion volumes for irrigation or water re-use, or identifying the flow characteristics required for successful stream restoration. A recent example of these study efforts is documented within SCCWRP Technical Report 948, *Application of Regional Flow-ecology to Inform Management Decision in the San Diego River Watershed* (2016). This report demonstrates how regionally derived flow–ecology relationships can be implemented at a watershed scale to inform management decisions.

To aid with more precise and definitive implementation of dry weather discharge control strategies for individual receiving waters and/or stream reaches within the SOC WMA, the Permittees will implement a special study to assess the degree of hydrologic alteration within waterbodies across the SOC WMA. This study will build on the findings presented in these studies, and enhance the tools and datasets previously developed by the USGS and SCCWRP. For example, the Permittees will apply HSPF, or other watershed model, to allow simulation of a greater range of flow management scenarios than currently available. Additionally, the Permittees will update and apply a more detailed hydrologic model (Loading Simulation Program C [LSPC]), to provide a more accurate simulation of local stream flow conditions and to support the evaluation of various flow management scenarios. This information will also allow the Permittees to examine whether data gaps exist that prevent a complete and accurate assessment of hydrologic alteration. This study will apply the enhanced and updated tools to examine a range of potential management strategies aimed at eliminating unnatural dry weather flows and improving in-stream flow regime. Communication with and participation of regional stakeholders will be critical to further refining the study scope and objectives, and identifying potential management strategies for analysis.

The primary questions the special study will attempt to answer include:

1. What are the expected reference conditions of streams within the SOC WMA assuming complete elimination of urban discharges?
2. What are the specific instream flow requirements necessary to meet ecological benchmarks?
3. Where is additional stream/reach data needed to close gaps related to the degree of hydrologic alteration?
4. Where are there biologically healthy sites (e.g., CSCI scores > 0.79) that are also hydrologically unaltered sites, so they may be prioritized for protection?
5. Where are there biologically healthy sites (e.g., CSCI scores > 0.79) that are hydrologically altered, so they can be prioritized for monitoring?
6. Where are there biologically degraded sites that are hydrologically altered, so they should be prioritized flow management (such as increased stormwater detention or groundwater infiltration),

7. Where are there biologically degraded sites that are hydrologically unaltered, so they can be prioritized for separate stressor evaluations?

To answer these questions, the special study will consist of four primary phases:

1. Work Plan – Based on stakeholder input, develop a work plan defining the specific study goals and methods.
2. Modeling – Estimate current and historic flows at ungauged streams based on available coarse-scale flow modeling data and outputs from the **Section 4.1.5.2** pollutant loading study (advanced LSPC watershed modeling). Reconcile any significant discrepancies with the suite of flow ecology metrics proposed by SCCWRP and make improvements to the metrics as needed.
3. Model Calibration – Collect field data to close any hydraulic and hydrologic data gaps identified during the modeling phase.
4. Reporting – prepare a report summarizing all findings.

The special study work plan will be developed in 2017-18, with modeling and data collection performed in 2018 and 2019, and reporting completed in 2019.

4.1.5.3 Stormwater Quality Asset Inventory and Pollutant Loading Estimates

Long-term stormwater program asset tracking, effectiveness assessments, and periodic updates are important to the Plan's adaptive management process discussed in **Section 5**, Iterative Process and Adaptive Management. Development of standardized data collection methods, asset information, and pollutant load estimates will be used together with measurements of in-stream conditions to 1) assess the effectiveness of implemented strategies/BMPs; 2) identify problematic catchments that can be prioritized for future BMPs/strategies; and 3) assess progress as a result of reducing runoff and pollutant loading over time. This information will allow the Permittees to better target limited resources and streamline efforts across jurisdictions and programs.

The Permittees will inventory all stormwater assets (e.g. outfalls, pipes, channels, BMPs), further delineate MS4 drainage areas using high resolution data (e.g., LiDAR), and characterize existing structural BMPs and relevant non-structural BMPs that reduce urban runoff and pollutant loads using consistent methods within one or more high priority watersheds. Existing datasets will be leveraged and important data gaps identified to determine if additional data collection is needed to support the technical approach and special study goals. This asset information, combined with MS4 outfall and receiving water data, will be used to develop pollutant loading and hydrology modeling estimates at various spatial scales (e.g., watershed, jurisdictional, catch basin). This information will be used for two purposes: 1) refine the WQIP strategies to better target priority areas and strategically optimize the placement and scale of BMP opportunities; and 2) provide a quantification system to document and track progress as a result of reducing stormwater loading to receiving waters. The asset database will also provide the foundation for future coordinated master planning efforts designed to identify synergies across various programs and achieve multiple objectives (e.g., development of asset management performance indicators, identification of drainage and flood control needs, development of capital improvement plan schedules, identification of water reuse opportunities).

Existing datasets and the watershed modeling that will be performed to support the **Section 4.1.5.2** In-Stream Flow Conditions special study will be leveraged to provide accurate baseline hydrologic and pollutant loading estimates. The modeling framework will include a BMP modeling component, which will allow the Permittees to optimize and characterize the multiple benefits of specific BMP opportunities. The modeling framework will also allow for the incorporation of key non-structural BMPs, such as street sweeping programs, to help refine the WQIP strategies. A standardized set of water quality and BMP performance outputs will be generated (maps, tables, and other visualization tools) to communicate existing BMP effectiveness, identify priority areas for additional investments, and further refine future BMP needs. Graphical outputs will be used to quantify progress over time, support MS4 permit compliance and WQIP annual reporting needs, and facilitate communication among the Permittees and other stakeholders.

The special study will consist of four primary tasks:

1. Work Plan – Based on stakeholder input, develop a work plan defining the specific study goals and methods. Identify one or more priority watershed areas.
2. Data Inventory/Data Collection – Assess current stormwater asset data and identify data collection priorities. Develop standardized asset inventory and data collection methods. Complete data collection efforts.
3. Watershed and BMP Modeling – Estimate baseline flow and pollutant loads based on the watershed modeling discussed in **Section 4.1.5.2**. Estimate the runoff and load reduction benefits of existing BMPs and identify priority areas for future water quality improvements. Conduct modeling analyses to further refine future BMP needs.
4. Reporting – Prepare a report summarizing all findings.

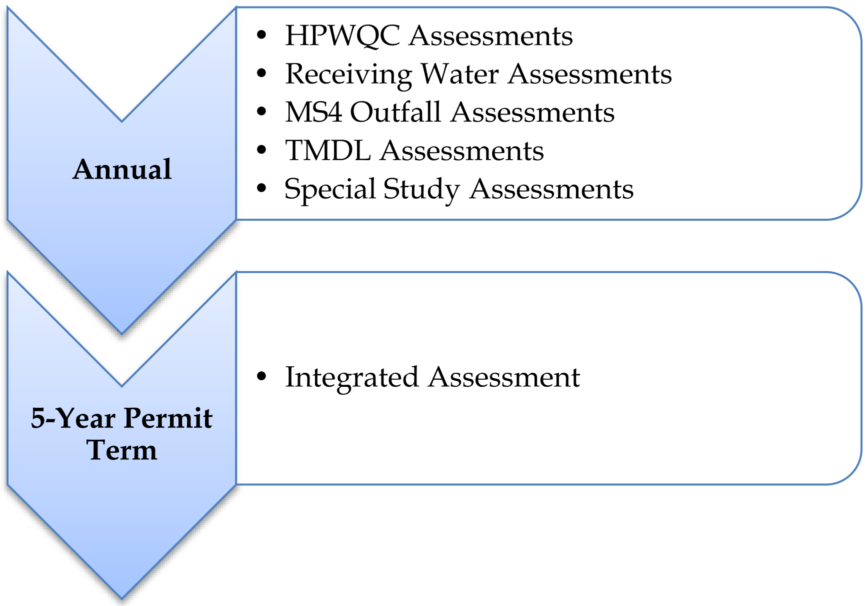
The special study work plan will be developed in 2017-18, with modeling and data collection performed in 2018 and 2019, and reporting completed in 2019.

4.2 WQIP Assessment Program

The Permittees will regularly assess its progress toward achieving the Plan goals and schedules, including addressing the HPWQCs. This will be accomplished by evaluating monitoring data, as well as information collected by individual Permittees via their LIPs. Six primary assessments and their associated timeframes are summarized in **Figure 4-2**.

Based on the findings of the assessments summarized in **Figure 4-2**, the Plan MAP will be regularly updated. Updates are likely to close data gaps, refine monitoring methods, revise monitoring locations and frequency of sampling, and incorporate new or enhanced predictive tools. Ultimately, all MAP updates will be determined based on opportunities for Permittees to better assess its progress toward achieving the Plan goals and schedules. Although updates are anticipated, the MAP will at a minimum adhere to Permit Provision D requirements.

Figure 4-2: Annual and 5-Year Permit Term Assessments



4.2.1 High Priority Water Quality Condition Assessments

The Permittees will annually assess and report within the WQIP Annual Report the progress and effectiveness of strategies implemented to address HPWQCs. **Table 4-4** summarizes the specific assessments that will be performed for each HPWQC.

Table 4-4. Summary of HPWQC Assessments

Monitoring Programs		Assessment
HPWQC: Pathogen Health Risk	Human Waste Investigation	Determine if investigations successfully identified and abated pathogen sources.
	Structural BMP Performance Evaluation	Determine whether structural BMPs reduced the discharge of pathogens to receiving waters.
HPWQC: Channel Erosion/ Geomorphic Impacts	Stream Restoration Evaluation	Evaluate the geomorphic stability of restored stream reaches relative to baseline conditions.
		Evaluate whether IBI and CRAM scores improve relative to baseline conditions.
	LiDAR Aerial Survey	Determine whether there are significant changes to stream stability over time.
HPWQC: Unnatural Water Balance/Flow Regime	Expanded Outfall Observations	Evaluate the connectivity of dry weather flow discharges to receiving waters; reprioritize outfalls accordingly.
	Detailed Flow Monitoring	Evaluate the magnitude and extent of dry weather flow discharges; reprioritize outfalls accordingly.

Monitoring Programs		Assessment
	High-resolution Imagery	Determine whether there are significant changes to cover conditions (e.g., water, vegetation, soil, etc.) within stream reaches over time.

HPWQC assessments will also be supplemented by the receiving water, MS4 outfall, TMDL, and special study assessments described in this section.

4.2.2 Receiving Water Assessments

The Permittees will annually assess and report within the WQIP Annual Report both the dry and wet weather conditions of the receiving waters (coastal waters; enclosed bays, harbors, and estuaries; and streams) in the SOC WMA. Receiving water assessments will include consolidating and processing physical, chemical, and biological data collected during the reporting period, and using this data to summarize the status and trends of receiving water quality conditions. Pursuant to Permit Provision D, the receiving water assessment will:

1. Assess whether the conditions of the receiving waters are meeting the numeric goals established in **Section 3** of this Plan.
2. Identify the most critical beneficial uses that must be protected to ensure the overall health of the receiving water.
3. Evaluate whether those critical beneficial uses are being protected.
4. Identify short-term and/or long-term improvements or degradation of those critical beneficial uses.
5. Consider whether the strategies established in **Section 3** of this Plan (i.e., *Comprehensive Human Waste Source Reduction Strategy,* stream restoration, and elimination of dry weather flows) contribute toward progress in achieving the interim and final numeric goals of the Plan.
6. Identify gaps in the monitoring data needed to assess the provisions above.

The approach for evaluating receiving water monitoring data includes comparisons to various benchmarks, including as appropriate:

- Basin Plan Objectives for Inland Waters and Enclosed Bays;
- California Ocean Plan;
- California Toxics Rule (CTR) criteria for toxics and priority pollutants;
- Shoreline recreational water contact objectives established by Assembly Bill 411 (AB411);
- Water Quality Control Policy thresholds for aquatic and sediment toxicity;
- US Environmental Protection Agency aquatic life benchmarks;
- The ; and

- Reference stream thresholds from the SMC's Regional Watershed Monitoring Program.

The aforementioned objectives will also be partially accomplished by building upon efforts completed during development of the 2014 *Report of Waste Discharge San Diego Region State of the Environment.* Specifically, the SOC Permittees will continue to use a frequency-based index developed by the Canadian Council of Ministers of the Environment to score (i.e., from 0 to 100) the frequency and magnitude of inland receiving water standard exceedances. These scores will be tracked and compared over time. This index, which is an effective means of communicating water quality results, accounts for the number of indicators within each category (i.e., bacteria, metals) that exceed standards for a given year, the percentage of individual samples that exceed standards, and the average magnitude of any such exceedances (CCME, 2001).

In addition to the CCME Index, the Permittees will combine the bioassessment data it collects within inland receiving waters to apply the CSCI. The CSCI translates complex data about individual BMIs living in a stream into a measure of overall stream health. Also, the City of San Diego and Tetra Tech (in collaboration with the SDRWQCB and others) are currently developing novel causal assessment approaches and tools that could potentially be applied regionally to help streamline causal assessments in the future.

If chronic toxicity is detected in receiving waters, the Permittees will address the need for conducting a Toxicity Identification Evaluation (TIE) / Toxicity Reduction Evaluation (TRE). If a TIE/TRE is deemed necessary by the Permittees, then a plan for implementing the TIE/TRE will be noted in the assessment. A TIE/TRE work plan would be prepared and ultimately be incorporated in this WQIP.

4.2.2.1 Sediment Monitoring Assessments

The Permittees will use the results of the 2018 RHMP and Permittee-led sediment monitoring to assess the degree of potential impact at each site. The Permittees will conduct the assessment using the California SQO MLOE approach, and will ultimately categorize/score the sites as "unimpacted," "likely unimpacted," "possibly impacted," "likely impacted," or "clearly impacted.

Upon completing this initial scoring, the Permittees will aggregate the 2013 RHMP Final Integrated SQO Scores presented in Table 2, and the station scores for the 2018 RHMP and Permittee-led sediment monitoring. Where the scores indicate a station is "possibly impacted," "likely impacted," or "clearly impacted," the Permittees will use the methods described in Section VII of the Sediment Control Plan to characterize pollutant-related impacts.

The first phase of the stressor/source identification (SSID) investigation will use existing data to determine whether the integrated scores indicate potential impacts due to toxic pollutants (i.e., freshwater-related contaminant sources from the MS4), or non-toxic pollutants (i.e., physical habitat, freshwater inundation, legacy contaminants, or other potential factors). If the first phase of the SSID investigation determines the impact or impairment of monitoring station is not likely to be caused or contributed to by MS4 discharges, no additional follow-up will be needed.

If it is determined the impact or impairment of sites is likely to be caused or contributed to by MS4 discharges, an additional follow-up investigation may be needed. In this circumstance, the Permittees will discuss with the SDRWQCB whether/where any additional SSID studies should be undertaken, and to identify scope of future studies. Prior to additional SSID investigation, a site-specific Sediment Assessment Work Plan would be prepared that would outline specific steps and methodologies to be taken.

As information becomes available the WQIP Annual Report will include a Sediment Monitoring Report. The Sediment Monitoring Report will summarize the results of sediment monitoring and the aforementioned assessments. It will also include a sample location map and a statement certifying that the monitoring data and results have been uploaded into the California Environmental Data Exchange Network.

4.2.2.2 HMP Effectiveness Monitoring

The Permittees will report on the findings of HMP Effectiveness Monitoring described in Section 4.1.2.1.1.3. Reporting of HMP effectiveness monitoring will consist of:

1. The Permittees will update the *Draft Integrated Effectiveness Assessment of Hydromodification Control Standards in South Orange County* (December 2017) (IEA). The revised IEA will be submitted concurrently with the January 2019 WQIP Annual Plan Report as a separate submittal. The IEA currently focuses on data in the San Juan Creek as the primary basis for answering the framework questions. The IEA will be revised to focus on the selected monitoring locations in Chiquita Canyon Creek. Baseline data for the selected monitoring locations and the reference stream will be summarized with appropriate data sets and maps to complete the submittal. In addition, the relevant outfall, development design, and development phase information and maps will also be included in the updated IEA.
2. The Permittees will submit an *HMP-specific Quality Assurance Project Plan* (QAPP) within 60 days of the date of Plan acceptance and approval that specifies the locations, frequencies, and methods associated with hydromodification effectiveness monitoring. The QAPP will describe the HMP effectiveness monitoring for the selected (3) three HMP monitoring locations in Chiquita Canyon described above. The QAPP will identify the monitoring locations, methods, timing, agreements on

access to private lands, and other elements necessary to detail these monitoring efforts.

3. The Permittees will annually submit HMP Effectiveness Assessment monitoring data obtained at these three stations. Data will be submitted concurrently with Plan Annual Reports (January 2020 and 2021). The HMP Effectiveness Assessment monitoring data will be submitted as a separate document.
4. The Permittees will submit a Final HMP Effectiveness Assessment Monitoring Report concurrently with the Plan Annual Report (January 2022). The Final Report will be submitted as a separate document. The Final HMP Effectiveness Assessment Report will include responses to the Framework Questions 1 through 4 in the Draft 2017 EIA. These responses will be based on the monitoring data collected through 2021.
5. In addition to the reporting described above, the Permittees will submit the Rancho Mission Viejo monitoring data and reports required by the CEQA Mitigation Measure 4.5-8 (EIR No. 589) for creek systems impacted by the Rancho Mission Viejo development project for PAs 2 through 5. These data and reports will be submitted annually, on an ongoing basis. The data and reports will be submitted with a technical summary prepared by the Permittees that includes a description of the status of development within Rancho Mission Viejo, including a map of PAs 2 through 5, constructed outfall locations, percent impervious area draining to the outfalls, and any creek restoration recommendations due to hydromodification impacts from development.
6. Based on the hydromodification monitoring data and recommendations conducted by RMV to mitigate impacts to stream systems from development, the Permittees will:
    a. Submit annually a summary describing any updates to the low flow design criteria as part of the Plan Annual Report for any year in which stream monitoring data are submitted by RMV to the County of Orange per CEQA Mitigation Measure 4.5-8; and
    b. Update the Technical Guidance Document (TGD) with revised low flow design criteria (if updates are determined necessary). If updates are made, the updated TGD will be submitted to the San Diego Water Board for review with the next Plan Annual Report.

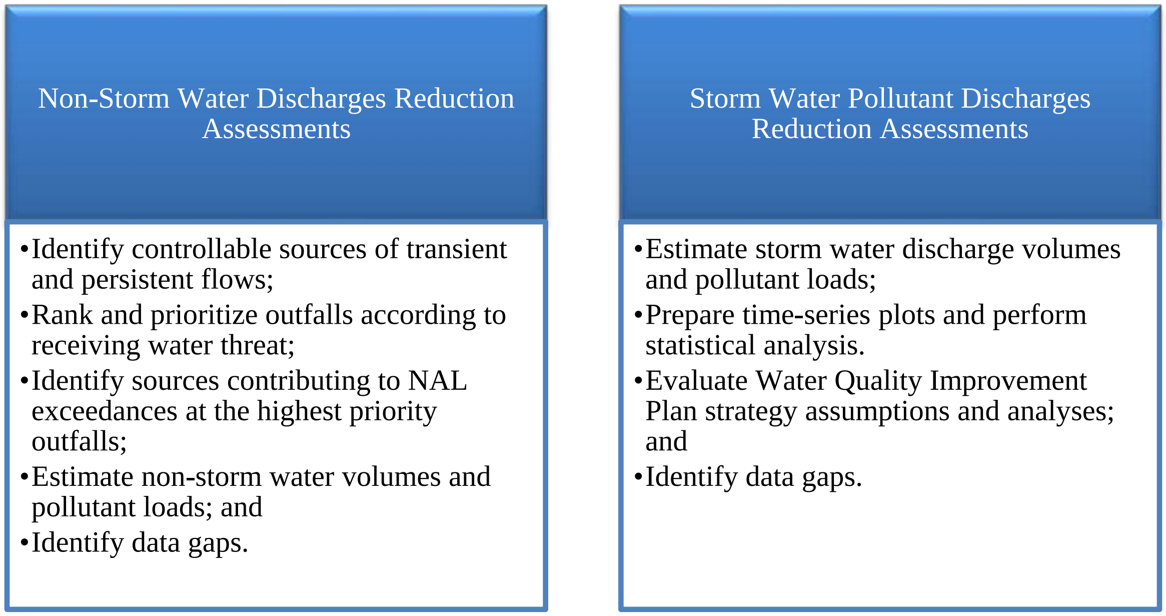
Note: It is not the Permittees' intent to independently evaluate updates to low flow criteria annually as part of bullet (6). The intent of bullet (6) is if updates to low flow criteria are identified by RMV as part of monitoring in fulfillment of CEQA Mitigation Measure 4.5-8, then these updates will also be applied to the TGD if updates are determined to be necessary.

Annual assessment and reporting per bullet 5 and 6 will continue until the RMV project is complete. Note in some years, Mitigation Measure 4.5-8 may not require submittal of stream monitoring data to the County of Orange. This does not change to annual frequency of the permittees' assessment and reporting per bullet 5 and 6.

4.2.3 MS4 Outfall Discharge Assessments

The Permittees will annually assess the effectiveness of the LIPs toward effectively prohibiting non-stormwater discharges into the MS4 and reducing pollutants in stormwater discharges from the MS4s. The MS4 outfall discharge assessments will be based on both dry and wet weather monitoring data collected pursuant to Permit Provision D, as well as the results of individual jurisdictional illicit discharge detection and elimination programs implemented pursuant to Permit Provision E.2. **Figure 4-3** depicts the primary components of both the *Non-Stormwater Discharges Reduction Assessments* and the *Stormwater Pollutant Discharges Reduction Assessments*.

Figure 4-3: Primary Components of the Annual Dry and Weather MS4 Outfall Assessments



The following sections describe in more detail the primary components and approaches the Permittees will use for accomplishing these two separate assessments.

4.2.3.1 Non-Stormwater Discharges Reduction Assessments

The Permittees will complete Non-stormwater Discharge Reduction Assessments using the results of dry weather MS4 outfall discharge Field Screening and Non-stormwater Persistent Flow MS4 Outfall Discharge Sampling summarized in **Sections 4.1.3.1.1** and **4.1.3.1.2**, respectively. The following sections summarize the approach to completing the Non-stormwater Discharge Reduction Assessments.

4.2.3.1.1 Identify Controllable Sources of Transient and Persistent Flows

Using 1) dry weather MS4 outfall discharge Field Screening data, 2) information compiled from individual JRMP Annual Reports, and 3) data obtained via strategies associated with the unnatural water balance and flow regime HPWQC, the Permittees will:

- Identify the known and suspected controllable sources (i.e., facilities, areas, land uses, and pollutant-generating activities) of transient and persistent flows within the SOC WMA;
- Identify sources of transient and persistent flows within the SOC WMA that have been reduced or eliminated; and

- Identify modifications of the field screening monitoring locations and frequencies for the MS4 outfalls in the Permittees' inventory necessary to identify and eliminate sources of persistent flow non-stormwater discharges.

The specific activities performed by individual LIPs that will assist with the aforementioned reporting include facility inspections, and response to stormwater hotline calls and public complaints. The unnatural water balance and flow regime HPWQC strategies that will assist with this reporting include an inventory of permitted discharges and water impoundments.

4.2.3.1.2 *Rank and Prioritize Outfalls According to Receiving Water Threat*

The Permittees will use dry weather MS4 outfall discharge monitoring data, including results of NAL comparisons, to refine the outfall prioritization strategy associated with the unnatural water balance and flow regime HPWQC. More specifically, major outfalls prioritized for retrofit will be ranked according to potential threat to receiving water quality.

4.2.3.1.3 *Identify Sources Contributing to NAL Exceedances at the Highest Priority Outfalls*

The Permittees will identify both known and suspected sources of discharge that may cause or contribute to NAL exceedances at the highest priority major MS4 outfalls within the SOC WMA. This reporting will be particularly important for those highest priority major outfalls where outfall control strategies associated with the unnatural water balance and flow regime HPWQC are deemed infeasible; thereby, triggering optional strategies associated with the unnatural water balance and flow regime HPWQC, including source investigations.

4.2.3.1.4 *Estimate Non-stormwater Volumes and Pollutant Loads*

The Permittees will use data from *Non-stormwater Persistent Flow MS4 Outfall Discharge Sampling* to estimate the non-stormwater 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 estimated volumes and pollutant loads will be derived by calculation or a model, and will include:

- The annual non-stormwater volumes and pollutant loads collectively discharged from major MS4 outfalls to receiving waters within the SOC WMA, with an estimate of the percent contribution from each known source for each MS4 outfall; and
- The annual volumes and pollutant loads for sources of non-stormwater not subject to the legal authority of LIPs that are discharged from the Permittees' major outfalls to downstream receiving waters.

<u>*4.2.3.1.5 Identify Data Gaps*</u>

The Permittees will determine whether or not data gaps must be filled in order to effectively complete the aforementioned annual *Non-Stormwater Discharges Reduction Assessments*. If data gaps are identified, the Permittees will update the Plan's MAP accordingly.

4.2.3.2 Stormwater Pollutant Discharges Reduction Assessments

The Permittees will complete Stormwater Pollutant Discharge Reduction Assessments using the results of Wet Weather MS4 Outfall Discharge Monitoring summarized in **Section 4.1.3.2**. The following sections summarize the approach to completing the Stormwater Pollutant Discharge Reduction Assessments.

<u>*4.2.3.2.1 Estimate Stormwater Discharge Volumes and Pollutant Loads*</u>

The Permittees will analyze data from *Wet Weather MS4 Outfall Discharge Monitoring*, and use a watershed model or other method to calculate or estimate the following:

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

<u>*4.2.3.2.2 Prepare Time-Series Plots and Perform Statistical Analysis*</u>

The Permittees will evaluate all the data collected as part of the *Wet Weather MS4 Outfall Discharge Monitoring* activities, including an update of existing time-series plots with new data for each long-term monitoring constituent. Parametric and non-parametric statistical methods will be applied accordingly.

<u>*4.2.3.2.3 Evaluate WQIP Strategy Assumptions and Analyses*</u>

The Permittees will revisit the Plan strategy assumptions and analyses based upon *Wet Weather MS4 Outfall Discharge Monitoring* results and a comparison of the results to SALs. Where new data conflicts with prior assumptions, the Permittees will reevaluate and update the analyses associated with Plan strategies and adjust the strategies accordingly. Adjustments to the Plan strategy will be captured within future Plan updates.

4.2.3.2.4 Identify Data Gaps

The Permittees will determine whether or not there are data gaps that must be filled in order to effectively complete the aforementioned annual *Stormwater Pollutant Discharge Reduction Assessments.* If data gaps are identified the Permittees will update the Plan Monitoring and Assessment Program accordingly.

4.2.4 TMDL Assessments

Annually, the Permittees will analyze both dry and wet weather monitoring data it collects in order to continue assessing whether the interim and final WQBELs, defined within Attachment E of the Permit, are being achieved. The following sections describe the specific assessment approaches that will be used for the Baby Beach TMDL and the Twenty Beaches and Creeks TMDL. The specified assessment approaches are likely to change in the future based upon anticipated updates to the Region 9 Basin Plan including, at a minimum, revising the recreational water quality standards.

4.2.4.1 Baby Beach TMDL

Due to the close proximity of Baby Beach monitoring sites, monitoring data from all four sites (BDP12, BDP13, BDP14, and BDP15) will be aggregated to determine compliance with the receiving water limitations expressed as bacteria densities. 30-day geometric means will be calculated when there are at least five samples collected. Dry and wet weather exceedance frequencies will be calculated by comparing dry weather 30-day geometric means and single-sample maximum results, and wet weather single-sample maximum results to applicable WQBELs, respectively. Effort will be made to correlate any elevated bacteria levels with known or suspected sewage spills from wastewater collection systems and treatment plants or boats.

4.2.4.2 Twenty Beaches and Creeks TMDL

The primary method responsible Permittees will use to determine compliance with the interim and final WQBELs at the beach and creek/creek mouth segments and areas, as defined within Attachment E of the Permit, will be calculating dry and wet weather exceedance frequencies relative to receiving water limitations expressed as bacteria densities. The following is a summary of the specific exceedance frequency calculations that will be used by the responsible Permittees:

1. Dry weather exceedance frequencies:
    a. For each *Water Body* or *Segment or Area* identified within Attachment E of the Permit, 30-day geometric means will be calculated when there are at least five samples collected.

   b. The *dry weather 30-day geometric mean exceedance frequency* will be calculated by dividing the number of geometric means that exceed the geometric mean receiving water limitations in Attachment E of the Permit, by the total number of geometric means calculated from samples collected during the dry season.
2. Wet weather exceedance frequencies:
   a. The *single sample maximum exceedance frequency* will be calculated by dividing the number of wet weather days that exceed the single sample maximum receiving water limitations defined in Attachment E of the Permit, by the total number of wet weather days during the rainy seasons.
   b. The *wet weather 30-day geometric mean exceedance frequency* will be calculated by dividing the number of geometric means that exceed the geometric mean receiving water limitations in Attachment E of the Permit, by the total number of geometric means calculated from samples collected during the wet season. The data collected for dry weather will be used in addition to the data collected for wet weather to calculate the wet weather 30-day geometric means.
   c. If only one sample is collected for a storm event, the bacteria density for every wet weather day associated with that storm event will be assumed to be equal to the results from the one sample collected;
   d. If more than one sample is collected for a storm event, but not on a daily basis, the bacteria density for all wet weather days of the storm event not sampled will be assumed to be equal to the highest bacteria density result reported from the samples collected;
   e. If there are any storm events not sampled, the bacteria density for every wet weather day of those storm events will be assumed to be equal to the average of the highest bacteria densities reported from each storm event sampled.

The responsible Permittees may also determine compliance by comparing wet and dry weather MS4 outfall discharge results to the concentration or load based effluent limitations specified in Attachment E of the Permit.

4.2.5 Special Studies Assessments

The Permittees will use the results and findings from the special studies described in **Section 4.1.5** to:

- Better characterize the receiving water conditions of the SOC WMA;
- Better understand the sources of pollutants and/or stressors within streams of the SOC WMA; and

- Better target efforts to reduce the discharge of pollutants from the MS4 outfalls to receiving waters.

The results of the special studies assessment will be documented within the WQIP Annual Report and may warrant modifications of or updates to the Plan, including priority water quality conditions; water quality improvement strategies, goals, and schedules; and monitoring and assessment methods.

4.2.6 Integrated Assessments

The Plan will be updated iteratively so it is more effective toward achieving compliance with discharge prohibitions and receiving water limitations specified in the Permit. To guide this iterative approach, the Permittees will complete an integrated assessment at the time of preparing the Report of Waste Discharge (at the end of the Permit term), which will compile and distill monitoring data and information collected during the implementation of individual LIPs. The results of the integrated assessments will be critical to the Permittees' ability to effectively identify Plan updates, including update or refinement of priority water quality conditions and adaptation of associated water quality improvement strategies, goals, and schedules.

Integrated assessments will use the findings of HPWQC, receiving water, MS4 outfall discharge, TMDL, and special study assessments described in **Sections 4.2.1** through **4.2.5**, as well as the assessments completed as part of the TMP, to re-evaluate the primary components of the Plan. Specifically, the Permittees will:

1. Re-evaluate SOC WMA Priority Water Quality Conditions according to the methodology presented in **Section 2** of this Plan;
2. Evaluate progress towards achieving Plan goals and schedules, including chosen compliance pathways, presented in **Section 3** of this Plan; and
3. Evaluate the effectiveness of Plan strategies presented in **Section 3** of this Plan.

Figure 4-4 presents in more detail the individual components and approach of the integrated assessment described above. Water quality improvement strategies will also be evaluated in the WQIP Annual Reports based on available monitoring and LIP data.

Figure 4-4: Summary of Integrated Assessment

Evaluate SOC WMA Priority Water Quality Conditions

- Re-evaluate the receiving water conditions according to the methodology in Section 2.
- Re-evaluate the impacts of MS4 discharges on receiving waters according to the methodology in Section 2.
- Re-evaluate MS4 sources and stressors based on potentially new priority and highest priority conditions according to the methodology in Section 2.
- Re-evaluate the beneficial uses in receiving waters that must be protected pursuant to findings of the *Receiving Water Assessment*.

Evaluate WQIP Goals and Schedules

- Evaluate progress toward achieving interim and final numeric goals and schedules for protecting impacted beneficial uses in receiving waters.

Evaluate the Effectiveness of WQIP Strategies

- Identify the non-storm water and storm water pollutant loads of the MS4 outfalls pursuant to findings of the *MS4 Outfall Discharge Assessment*.
- Identify pollutant load reductions, or other water quality improvement strategies, that are necessary to attain the interim and final numeric goals.
- Identify pollutant load reductions, or other water quality improvement strategies, that are necessary to demonstrate that non-storm water and storm water discharges are not causing or contributing to exceedances of receiving water limitations.
- Evaluate the progress of the WQIP strategies toward achieving the interim and final numeric goals identified in the WQIP for protecting beneficial uses in the receiving waters.

Re-evaluate the Monitoring and Assessment Program

- Identify data gaps determined the receiving water, MS4 Outfall, and special study assessments.
- Identify MAP improvements based on results of special studies.
- Identify MAP updates according to revised prioritiy water quality conditions, and WQIP strategies, goals and schedules.

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5 ITERATIVE APPROACH AND ADAPTIVE MANAGEMENT PROCESS

5.1 Background

Provision B.5. of the Permit requires the Permittees to periodically reevaluate the priority water quality conditions, water quality improvement goals, strategies, and schedules, and the MAP to provide recommendations for modifying those elements to improve the effectiveness of the WQIP (SDRWQCB 2015). This Section builds on information provided in earlier sections of the WQIP and aims to demonstrate the iterative approach that the Permittees will use to ensure the WQIP is updated, as needed, to support the specified goals.

In addition to adhering to the Permit requirements, the iterative approach and adaptive management process described herein extends the three key themes identified in the Orange County Stormwater Program's Report of Waste Discharge (ROWD, 2014) on the State of the Environment in the San Diego Region:

- Focus on priority areas and constituents rather than trying to monitor all constituents, potential issues, and locations
- Increase the integration of data from a wider range of sources
- Continue to evolve from a strictly discharge-specific approach to a risk-based prioritization approach

Provision A.4 of the Permit essentially requires that Permittees implement additional BMPs until MS4 discharges no longer cause or contribute to a violation of water quality standards. The Permit requires that an iterative approach and adaptive management process be used to determine which additional BMPs are necessary to achieve this goal.

The Permit also provides for an iterative process that must be followed to meet this goal and thereby maintain compliance. This process involves ongoing assessments of programs and water quality improvement strategies and requires necessary modifications in a timely fashion. There are two components integral to this process – the evaluation of new information, and updates necessary based upon this information.

The Permit specifies two circumstances under which the Plan <u>must</u> be updated (**Figure 5-1**). The Permit states that if exceedances of water quality standards persist in receiving waters, and the Permittees or Regional Board determine that the exceedances are new and being caused by the MS4, and are not addressed by the existing Plan, then the Permittees must use an iterative approach to update the Plan. The Permit also requires that the Plan be updated to address newly approved TMDLs with WLAs applicable to the Permittees.

Figure 5-1. Mandatory WQIP Update Triggers

Ultimately, the Plan must be updated as necessary to ultimately achieve compliance with discharge prohibitions and receiving water limitations. The Permit states that the iterative approach required by Provision A.4 does "not have to be repeated for continuing or recurring exceedances of the same water quality standard(s) following implementation of scheduled actions unless directed to do otherwise by the San Diego Water Board." If an exceedance is in the process of being addressed by the existing WQIP, then the Permittees must implement the WQIP as it was approved and provide updates "as necessary" (SDRWQCB 2015).

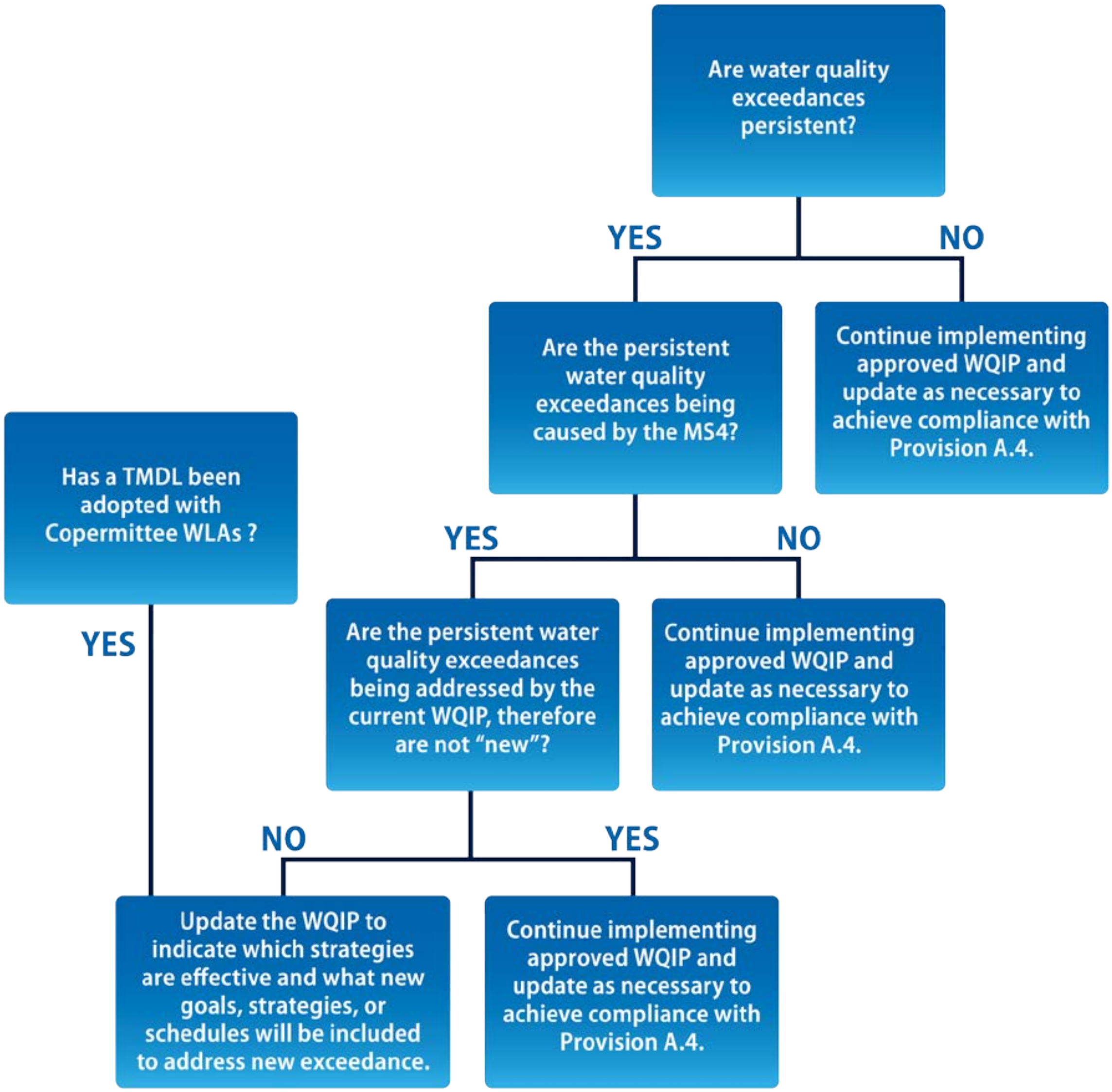
Attachment F to the Permit contains a fact sheet/technical report that summarizes the principal facts and the significant factual, legal, methodological, and policy questions that the San Diego Water Board considered when preparing the Order and its amendments. This fact sheet/technical report states "The Water Quality Improvement Plan is expected to be a dynamic document that will evolve over time. The Water Quality Improvement Plan is also expected to be a long-term plan that focuses the Permittees' efforts and resources on a limited set of priority water quality conditions, with the ultimate goal of protecting all the beneficial uses of the receiving waters within the Watershed Management Area from impacts that may be caused or contributed by MS4 discharges. Therefore, as Permittees collect data, implement their JRMPs, and review results from MAPs, the WQIP must be continually reviewed and updated until compliance with discharge prohibitions and receiving water limitations (i.e. Provisions A.1.a, A.1.c, and A.2.a.) is achieved" (SDRWQCB 2015). The MS4 permit essentially requires the Permittees implement the BMPs necessary to ultimately protect receiving water beneficial uses. The Plan's adaptive management process is the mechanism for ensuring the BMPs implemented accomplish this goal (**Figure 5-2**).

Figure 5-2. Adaptive Management/Stream Condition Relationship

Simply put, the Permit requires that the Permittees continually assess water quality exceedances and evaluate new information; however, this information will result in updates to the WQIP only as required in the Permit and as necessary to achieve compliance with discharge prohibitions and receiving water limitations. Any and all new information obtained by the Permittees will be evaluated and considered within the context of all other known information and data available at that time.

The only exception to the iterative approach and adaptive management process allowance is for receiving waters subject to approved TMDLs. Where compliance dates for a TMDL have passed, compliance with the WQBELs incorporated into the Permit established by a TMDL is required (**Figure 5-3**).

Figure 5-3. Adaptive Management Process Flow



5.2 Approach

Provision B.5 summarizes the requirements of the iterative approach, including three program components which must be reevaluated by the Permittees when new information becomes available, and the WQIP adapted, as necessary: (1) Priority Water Quality Conditions, (2) Goals, strategies, and schedules, and (3) the MAP. The Permittees acknowledge that these three components are inexorably linked to each other; therefore, the review and update of one component will likely require the review and update of others. Accordingly, the Permittees will use data collected via the MAP (Provisions D.1 – D.3), findings from program assessments (Provision D.4.a – c), and information collected during implementation of the JRMPs (Provision E), to conduct annual and integrated assessments of the effectiveness of and identify necessary modifications to the Plan (**Figure 4-2**) (SDRWQCB 2015).

If Plan modifications are required or deemed necessary, the Plan will be updated pursuant to Permit Provision F.2.C (SDRWQCB 2015) and will:

- Indicate which strategies are effective and will continue to be implemented,
- Identify any new strategies that will be implemented to reduce or eliminate the pollutants or conditions which are causing the exceedance, and
- Identify any updates to the schedule or MAP which are necessary to accommodate these strategy changes.

Potential WQIP Update Trigger

Per the criteria for non-priority conditions established in Section 2, if monitoring data obtained during the permit term indicates that a previously conforming stream reach or coastal waterbody is experiencing ongoing exceedances for metals and no longer conforms with water quality objectives, the Permittees will use that data to reevaluate priority water quality conditions. As another example, if data obtained as a part of a special study, map, or the public input process indicates that the MS4 is a source of TDS (during dry weather), phosphorus (during dry weather), or selenium (during wet or dry weather), the Permittees will reevaluate the priority water quality conditions.

The following sections describe the Permittees' iterative process for adapting the Plan[6] to address previously described circumstances that may require an update of the Plan.

5.2.1 Priority Water Quality Conditions

This Plan identifies three HPWQCs based on a holistic review of available watershed data:

- Pathogen Health Risk at Beaches;
- Channel Erosion and Associated Geomorphic Impacts for Inland Waters; and
- Unnatural Water Balance/Flow Regime in Inland Waters.

Other PWQCs were also identified.

6 As the Permittees are implementing the Prohibitions and Limitations Compliance Option (Provision B.3.c) for the HPWQCs, new information will also trigger an evaluation of the numeric goals, water quality improvement strategies, schedules, or annual milestones (Provision B.3.c.(1)) as well as the analysis required under Provision B.3.c.(2). These updates will be submitted with the ROWD.

The Permittees will evaluate HPWQCs/PWQCs as needed during the Permit term to ensure consideration of all available data. These evaluations will be done to determine whether changes to the HPWQCs/PWQCs are appropriate when, or if, assessments indicate that the conditions can be eliminated from the current list. As part of the iterative process, the WQIP HPWQCs/PWQCs and numeric goals for the SOC WMA will be reevaluated to determine whether water quality improvement outcomes have been achieved in MS4 discharges and/or receiving waters by:

- Re-evaluating the receiving water conditions (Provision B.2.a);
- Re-evaluating the impacts on receiving waters from MS4 discharges (Provision B.2.b);
- Re-evaluating the identification of MS4 sources of pollutants and/or stressors (Provision B.2.d);
- Identifying the beneficial uses of the receiving waters that are protected (Provision D.4.a); and then
- Evaluating the progress toward achieving the interim and final numeric goals for protecting impacted beneficial uses in the receiving waters.

Potential WQIP Update Trigger

The Permittees have proposed conducting a special study to assess the degree of hydrologic alteration within waterbodies across the SOC WMA. If the modeling indicates that there are additional biologically degraded sites that are hydrologically altered, the Permittees will use this new information to update the WQIP strategies to include prioritized flow management projects designed to eliminate unnatural dry weather flows and improve the in-stream flow regime.

In addition to this progress assessment, the following will be considered new information and evaluated when applying the iterative process:

- Information regarding the spatial and temporal accuracy of monitoring data collected to inform prioritization of water quality conditions and implementation strategies to address the HPWQCs;
- Information and data from sources other than the jurisdictional runoff management programs within the SOC WMA that informs the effectiveness of the actions implemented by the Permittees;
- San Diego Water Board recommendations; and
- Recommendations for modifications solicited through a public participation process.

For example, per the criteria for Non-Priority Conditions established in **Section 2**, if monitoring data obtained during the Permit term indicates that a previously conforming stream reach or coastal waterbody is experiencing ongoing exceedances for metals and no longer conforms with water quality objectives, the Permittees will use that data to reevaluate priority water quality conditions.

Any proposed updates to the PWQCs and numeric goals – and associated modifications to the schedules – will be reported either in the WQIP annual report or, at a minimum, in the ROWD. It is also important to note that if a TMDL Basin Plan Amendment is approved during the Permit term which includes WLAs assigned to the Permittees, the Permittees will initiate an update of the WQIP within six months to incorporate the TMDL provisions.

5.2.2 Adaptation of Goals, Strategies, and Schedules

Section 3 of this Plan describes water quality improvement goals for each of the HPWQCs and describes the strategies and schedules for achieving these goals. **Section 3** has been divided into planning "tracks" based on each HPWQC. Each planning track describes overall goals, specific numeric goals, strategies, and schedules to meet the requirements of the Permit. Beyond the HPWQC planning tracks, **Section 3** also describes how the Plan addresses the other priority water quality conditions. This Plan demonstrates that within each track the implementation of the strategies, as described, will reasonably achieve the goals through the use of this iterative approach and adaptive management process.

All Plan goals, strategies and schedules will be reevaluated any time significant new information becomes available. This evaluation should result in more effective and efficient controls to address the HPWQCs. The primary factor in making this determination will be whether or not progress is being made toward achieving interim and final numeric goals in receiving waters and discharges for the HPWQCs (**Section 2**) and whether this progress is adequate to meet the overarching goals of the Plan, as follows:

- Manage health risk associated with contact water recreation in coastal waters to an acceptable level;
- Maintain the existing high quality of water present at many swimming beaches; and
- Restore or maintain recreational and biological beneficial uses of inland receiving waters to the extent reasonably achievable.

As significant new information becomes available the premise of the Plan's framework—namely the function-based framework for restoration presented in **Section 2** and depicted in **Figure 2-3** will also be evaluated. More specifically, the Permittees will consider whether adequate strategies exist spatially and temporally to enhance/restore the foundational layers of the function-based framework for restoration (i.e., hydrology, water balance, geomorphology, and hydraulic/physical habitat). Emphasis on improvements closer to the base of this hierarchy is likely to have the most far-reaching positive effects and/or reduce the degree of compensation needed to affect improvements at higher levels.

When new data becomes available that is relevant to any of these determinations, the Permittees will:

- Recalculate or re-estimate non-stormwater and stormwater pollutant loads from the MS4 outfalls (Provisions D.4.b)
- Identify the non-stormwater and stormwater pollutant load reductions, or other improvements to receiving water or water quality conditions, that are necessary to attain the interim and final numeric goals identified in the Plan for protecting beneficial uses in the receiving waters;
- Identify the non-stormwater and stormwater pollutant load reductions, or other improvements to the quality of MS4 discharges, that are necessary to demonstrate that non-stormwater and stormwater discharges from their MS4s are not causing or contributing to exceedances of receiving water limitations;
- Evaluate the progress of the existing strategies to achieve these numeric goals.

A variety of new information will trigger a reevaluation of goals, strategies, and schedules. Each could indicate a change in conditions that would require updates to the Plan to ensure maximum efficiency and effectiveness over time. The new condition triggers include:

- Modifications to the priority water quality conditions (Provision B.5.a);
- Progress made toward achieving outcomes according to established schedules;
- New policies or regulations are enacted that may affect identified numeric goals;
- Reductions of non-stormwater discharges to and from each Permittee's MS4 are measured or demonstrated;
- Reductions of pollutants in stormwater discharges from each Permittee's MS4 to the MEP are measured or demonstrated;
- New information is developed when impacts from MS4 discharges or sources of pollutants (Provisions B.2.b and B.2.d) have been re-evaluated;
- Efficiency is demonstrated in implementing the Plan;
- San Diego Water Board makes recommendations for updates; and
- Recommendations for Plan modifications are received through a public participation process.

Examples of new information could be water quality data collected after initial Plan development, special study results, revised 303(d) Listings, or Basin Plan amendments related to water quality conditions.

Modifications to strategies may include the removal or addition of strategies from the suite of strategies implemented, modifications to the implementation methods of existing strategies, or the initiation of identified optional strategies. For example, data acquired through the MAP, assessments, or public participation could indicate a need to develop subwatershed goals, strategies, and, schedules in addition to those developed for the WMA.

These updated goals, strategies, and schedules could be developed to be jurisdiction-specific, as appropriate.

Potential WQIP Update Trigger

The Permittees also will use the information generated during the Non-Stormwater and Stormwater Pollutant Discharges Reduction Assessments to determine whether JRMP strategies are achieving CWA requirements to effectively prohibit non-stormwater discharges into storm sewers and reduce discharge of pollutants to the MEP. If the Permittees determine that these requirements are not being met, then modifications to the JRMP will be proposed in the Annual Report or as a part of the ROWD.

Any proposed updates to the priority water quality conditions and numeric goals, and associated modifications to the schedules, will be reported either in the WQIP annual report or, at a minimum, in the ROWD.

In addition, the Permittees also will use the information generated during the Non-Stormwater and Stormwater Pollutant Discharges Reduction Assessments to determine whether LIP strategies are achieving CWA requirements to effectively prohibit non-stormwater discharges into storm sewers and reduce discharge of pollutants to the MEP. If the Permittees determine that these requirements are not being met, then modifications to the LIP will be proposed in the Annual Report or as a part of the ROWD.

Potential WQIP Update Trigger

Data acquired through the MAP, assessments, or public participation could indicate a need to develop subwatershed goals, strategies, and, schedules in addition to those developed for the WMA. The six subwatersheds of the San Juan Hydrologic Unit are listed below and depicted in Appendix A:

- Laguna Coastal Streams Watershed
- Aliso Creek Watershed
- Dana Point Coastal Streams Watershed
- San Juan Creek Watershed
- San Clemente Coastal Streams Watershed
- San Mateo Creek Watershed

5.2.3 Monitoring and Assessment Program

The MAP will likely need to be updated whenever a strategy, goal, or schedule is revised. Similar to the goals, strategies, and schedules, the MAP will also be reevaluated whenever new information becomes available. At a minimum, any data gaps identified during required receiving water and MS4 outfall discharge assessments and results of any special studies will be considered to determine if MAP updates are required. However, any modifications also will be consistent with Provisions D.1, D.2, and D.3 of the Permit (SDRWQCB 2015). Any proposed updates to the MAP will be reported either in the WQIP annual report or, at a minimum, in the ROWD.

5.3 Stakeholder Involvement

Stakeholders will be continuously involved in the adaptive management process. Stakeholder information and feedback will be received through three pathways during the permit term: 1) as potential sources of new information which could trigger a Plan update; 2) as part of the WQIP Consultation Panel annually reviewing proposed Plan updates; and 3) through the review of annual reports and Plan updates which will be available through the Regional Clearinghouse.

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