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

Priority Water Quality Conditions Submittal (Permit Provision B.2)

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

The County of Orange, Orange County Flood Control District and 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

Publication Date: April 1, 2016

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

March 30, 2016

RE: South Orange County (San Juan Hydrologic Unit) Water Quality Improvement Plan: Priority Water Quality Conditions Submittal, Provision B.2

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March 28, 2016

City of Aliso Viejo Certification

for

South Orange County Water Quality Improvement Plan: Priority Water Quality Conditions Submittal

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Moy Yahya
Environmental Programs Manager

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DEPARTMENT OF PUBLIC WORKS

April 1, 2016

South Orange County (San Juan Hydrologic Unit) Water Quality Improvement Plan: Priority Water Quality Conditions Submittal, Provision B.2 – Certification Statement

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Brad Fowler
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City of Dana Point

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Sincerely,

David Shissler, P.E.
Director of Water Quality

3/29/16
Date

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CITY OF LAGUNA HILLS

March 30, 2016

To Whom It May Concern:

SUBJECT: South Orange County (San Juan Hydrologic Unit) Water Quality Improvement Plan: Priority Water Quality Conditions Submittal

I certify under penalty of law that this subject 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.

Sincerely,

Kenneth H. Rosenfield, P.E.
Director of Public Services

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March 28, 2016

RE: SOUTH ORANGE COUNTY (SAN JUAN HYDROLOGIC UNIT) WATER QUALITY IMPROVEMENT PLAN: PRIORITY WATER QUALITY CONDITIONS SUBMITTAL

I certify under penalty of law that this document and all attachments were prepared with my consultation 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.

Certified by:

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City Landscape Architect/Environmental Programs Manager

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Carol Moore
Councilmember

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City Manager

March 28, 2016

City of Laguna Woods Certification

for

South Orange County Water Quality Improvement Plan: Priority Water Quality Conditions Submittal

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Moy Yahya
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March 31, 2016

RE: South Orange County (San Juan Hydrologic Unit) Water Quality Improvement Plan: Priority Water Quality Conditions Submittal, Provision B.2

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.

Devin Slaven, CPSWQ, QSD/QSP
Environmental Manager
CITY OF LAKE FOREST

cc: Thomas Wheeler, P.E., Director of Public Works/City Engineer

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Council Member

March 28, 2016

Subject: South Orange County (San Juan Hydrologic Unit) Water Quality Improvement Plan: Priority Water Quality Conditions Submittal on Behalf of the City of Mission Viejo

To Whom It May Concern:

"I certify under penalty of law that the above subject 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."

Joe Ames

Joe Ames, P.E.
Assistant City Engineer

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March 31, 2016

Mr. Richard Boon, Chief
Orange County Stormwater Program
2301 N. Glassell Street
Orange, CA 92865

Subject: Submission of Provision B.2 to San Diego Regional Water Quality Control Board

Dear Mr. Boon,

Attached is the certification statement that authorizes the County of Orange, as the Principal Watershed Copermittee, to submit Provision B.2 on behalf of the City of Rancho Santa Magarita to the San Diego Regional Water Quality Control Board as required by Order No. R9-2013-0001, as amended by Order No. R9-2015-0001 and R9-2015-0100 (NPDES NO. CAS0109266).

The City appreciates and acknowledges the County of Orange's lead oversight of the preparation of Provision B.2 and the Water Quality Improvement Plan in accordance with the Shared Cost Budget between the County of Orange and permittees, including the City of Rancho Santa Margarita.

Sincerely,

E. (Max) Maximous, PE
Public Works Director/City Engineer

Enclosures:
1. Certification Statement

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City of San Clemente
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Tom Bonigut, Acting Public Works Director
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March 28, 2016

RE: South Orange County (San Juan Hydrologic Unit) Water Quality Improvement Plan: Priority Water Quality Conditions Submittal

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.

Certified by:

Tom Bonigut

Tom Bonigut, P.E.
Acting Public Works Director

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The City of San Juan Capistrano submits this statement of certification as an attachment to the NPDES Order No. R9-2015-0100 Provision B.2 (Priority Water Quality Conditions) report prepared in support of the San Juan Hydrologic Unit Water Quality Improvement Plan covering the area of south Orange County.

Statement of Certification

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.

Thom Coughran, Director
City of San Juan Capistrano

3/30/16
Date

Table of Contents

Table of Contents i
List of Appendices ii
List of Figures ii
List of Tables ii
Acronyms iii
1 Introduction 1-1
1.1 Purpose and Scope 1-1
1.2 Physical Setting 1-2
1.2.1 Geographic Context 1-2
1.2.2 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
2.2 Conditions Evaluation and Prioritization 2-6
2.2.1 Non-Priority Conditions 2-6
2.2.2 Priority Water Quality Conditions 2-8
2.2.3 Methodology for Selecting Highest Priority Water Quality Conditions 2-10
2.2.4 Data Adequacy and Gaps 2-19
2.3 Highest Priority Water Quality Conditions 2-19
2.3.1 Coastal Waters 2-19
2.3.2 Inland Waters 2-19
2.4 Potential Strategies 2-25
2.4.1 Potential Nonstructural BMPs 2-25
2.4.2 Potential Structural BMPs 2-28
2.5 References 2-34

List of Appendices

Appendix A: Map Exhibits

Appendix B: Inventory of Data Sources

Appendix C: Quantitative Data Sources and Associated Technical Documentation

Appendix D: Glossary of Key Terms

List of Figures

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

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

Figure 3: Relationship among Water Quality Conditions 2-6

Figure 4: Function-Based Framework for Stream Restoration 2-13

Figure 5: Variation of Inland Stream Temporal Conditions 2-14

Figure 6: Causal Linkages – Dry Weather Stream Functions 2-16

Figure 7: Causal Linkages – Wet Weather Stream Functions 2-17

Figure 8: Dry Weather HPWQC Condition Thread for Inland Streams 2-21

Figure 9: Wet Weather HPWQC Condition Thread for Inland Streams 2-22

List of Tables

Table 1: Non-Priority Water Quality Conditions 2-7

Table 2: Priority Water Quality Conditions 2-9

Table 3: HPWQC for the San Juan Hydrologic Unit 2-24

Table 4: Nexus of Potential Strategies to HPWQCs 2-32

Acronyms

BMP	Best Management Practice
CCME	Canadian Council of Ministers of the Environment
FIB	Fecal indicator bacteria
GIS	Geographic Information System
HPWQC	Highest Priority Water Quality Condition
IBI	Index of Biotic Integrity
LID	Low Impact Development
MS4	Municipal separate storm sewer system
NPDES	National Pollutant Discharge Elimination System
OCFCD	Orange County Flood Control District
OWTS	Onsite Wastewater Treatment System
PWQC	Priority Water Quality Conditions
ROWD	Report of Waste Discharge
RWQCB	Regional Water Quality Control Board
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load

1 INTRODUCTION

[Note to reviewer – this introduction is written in its ultimate tense and describes the overall scope of this Water Quality Improvement Plan. At this time, only Chapter 1 and 2 and associated appendices have been prepared, consistent with the submittal schedule for Permit provision B.2.]

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) 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 (Plan) for the San Juan Hydrologic Unit 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.

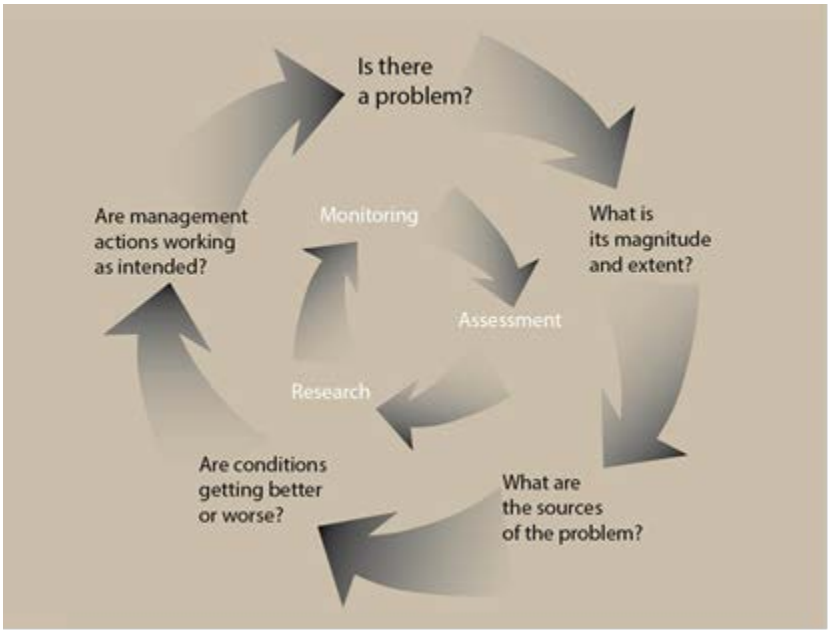
In order to further the Clean Water Act's primary objective to protect, preserve, enhance, and restore the water quality and designated beneficial uses of Orange County's creeks streams and coastal waters, the Plan applies a watershed-scale perspective combined with a focus on system value and function 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:

- 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) 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: Overview of Adaptive Assessment and Management Process



1.2 Physical Setting

1.2.1 Geographic Context

The Plan addresses direct MS4 discharges to the South Orange County coastline as well as MS4 discharges to the inland receiving waters within the San Juan Hydrologic Unit 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 stormdrain discharges and, in turn, these receiving waters.

Figure A-1 (Appendix A) shows the overall geographic extent and context of the San Juan Hydrologic Unit. This map shows the sub-watershed and catchment boundaries and major receiving waters. This figure also displays the approximate extent of catchments with MS4 infrastructure. To provide context for the current riparian system, Figure 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 figure displays data from different points in time with different antecedent conditions. Many of the stream reaches are ephemeral systems, and in these 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. Figure 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.

1.2.2 Urban Stream Syndrome

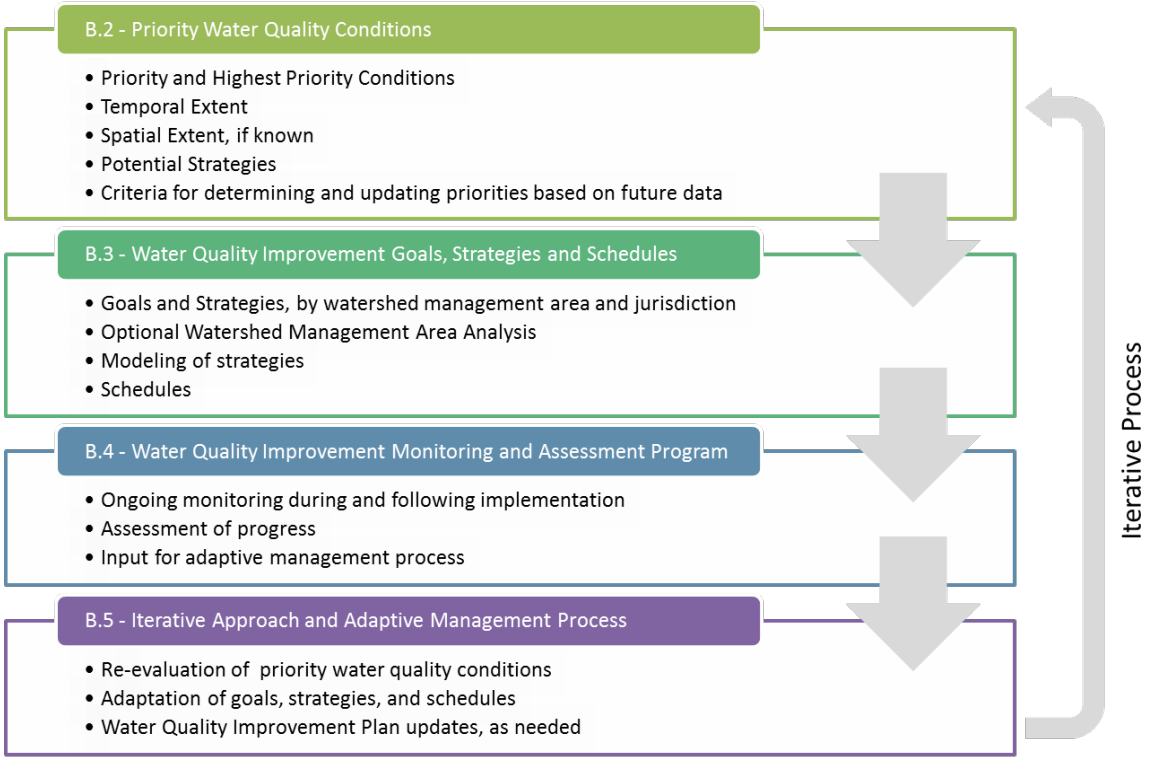
Many of the stream reaches in the San Juan Hydrologic Unit suffer from "urban stream syndrome" (Walsh et al., 2005a) to varying degrees as a result of past modifications to stream form (i.e., channelization), increases in hydrologic loading, primarily from increases in imperviousness, dry weather nuisance 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 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 Water Quality Improvement Plan (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 2.

Figure 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 and March 14, 2016 to provide input on the development of the B.2 section 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 chapter 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 chapter 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 chapter provide a means of tracking progress toward this goal.

The Permit requires that this Plan identify the water quality priorities associated with stormdrain 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 San Juan Hydrologic Unit as listed below and shown in Figure 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 San Juan Hydrologic Unit 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 stormdrain 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.

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 where either 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 it was 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., index of biological integrity, 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 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.

Stream segment scores 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 project.

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

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

These exhibits display CCME indices for fecal indicator bacteria (FIB), including fecal coliform, *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.

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

Eutrophication

- Figure 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

- Figure A-9 – Geomorphic Impact Related to Biology, independently showing:
  - Un-engineered 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.
  - Index of Biotic Integrity (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

- Figure 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. Maps include the following (Appendix A):

- Figure A-11 – Trash Abundance
- Figure A-12 – Invasive Plant Species
- Figure A-13 – Sensitive Resources
- Figure A-14 – NPDES Permitted Discharges
- Figure A-15 – Structural Stormwater Control Measures
- Figure A-16 – High Value Areas
- Figures A-17, 18 – Dry and 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 a definitive proof of causal relationships.

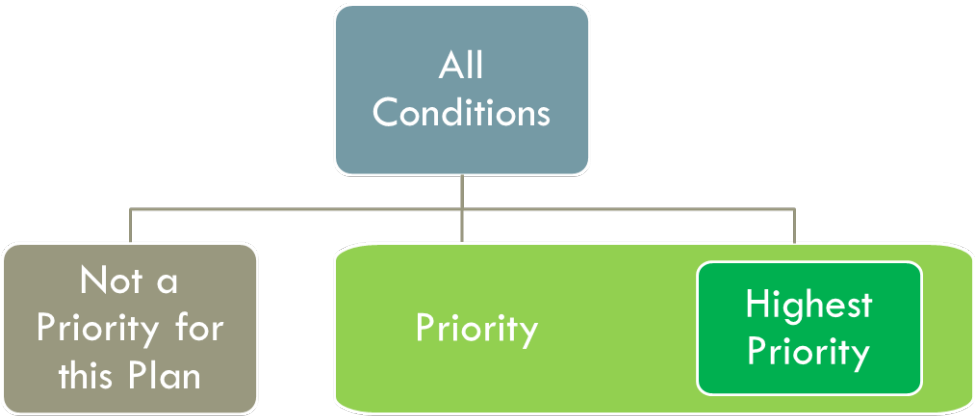
2.2 Conditions Evaluation and Prioritization

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 3 depicts the relationship between the levels of priority associated with water quality conditions.

Figure 3: 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 1.

Table 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 Figure 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 impairments near natural background levels.	Toxicity (wet and dry) Pesticides (dry) Indicator bacteria (dry) at coastal points, except at isolated beaches 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, stormdrain pipes, and similar non-accessible MS4 infrastructure
A specific beneficial use is not reasonably attainable (this results in non-priority for water quality	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, stormdrain pipes, and similar drainage features

Category of Non-Priority Condition	Temporal Applicability	Spatial Applicability	Tentative Extent of Non-Priority Designation
conditions that impact that use)			
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, the current non-priority condition designations listed in Table 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

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 and are listed in Table 3. A summary of PWQCs is shown in Table 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: 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, most locations where dry weather flows are present
		Wet	Localized inland, extent of individual parameters to be refined
	Eutrophication indicators (e.g., algal, dissolved oxygen, turbidity)	Dry	Inland, 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)
	Stream erosion impacts	Wet and Dry	See below; also grouped with nuisance category due to safety and aesthetic issues

Category	Condition/ Parameter	Temporal Extent	Geographic Extent[1] (to extent known)
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
	Index of biological integrity (IBI)	Dry	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	Index of biological integrity (IBI) or other bioassessment scores	Dry	Inland, where dry weather flows 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.

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 highest priority water quality condition(s) (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 and metals.

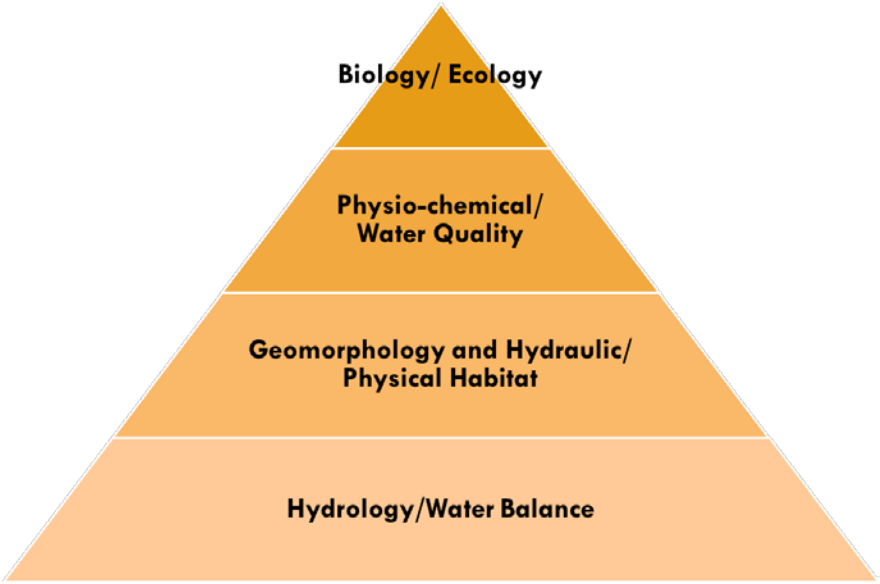
- **Linkage to intensity of beneficial use –** assessed based on known high recreational intensity (e.g., swimming beaches and surf locations) and sensitive areas (e.g., ASBS, MPAs).
- **Nexus to controllable MS4 discharges –** assessed based on outfall locations and mouth of stream relative to recreational 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 HPWQCs, which are discussed in Section 2.3.1.

2.2.3.2 Inland Waters

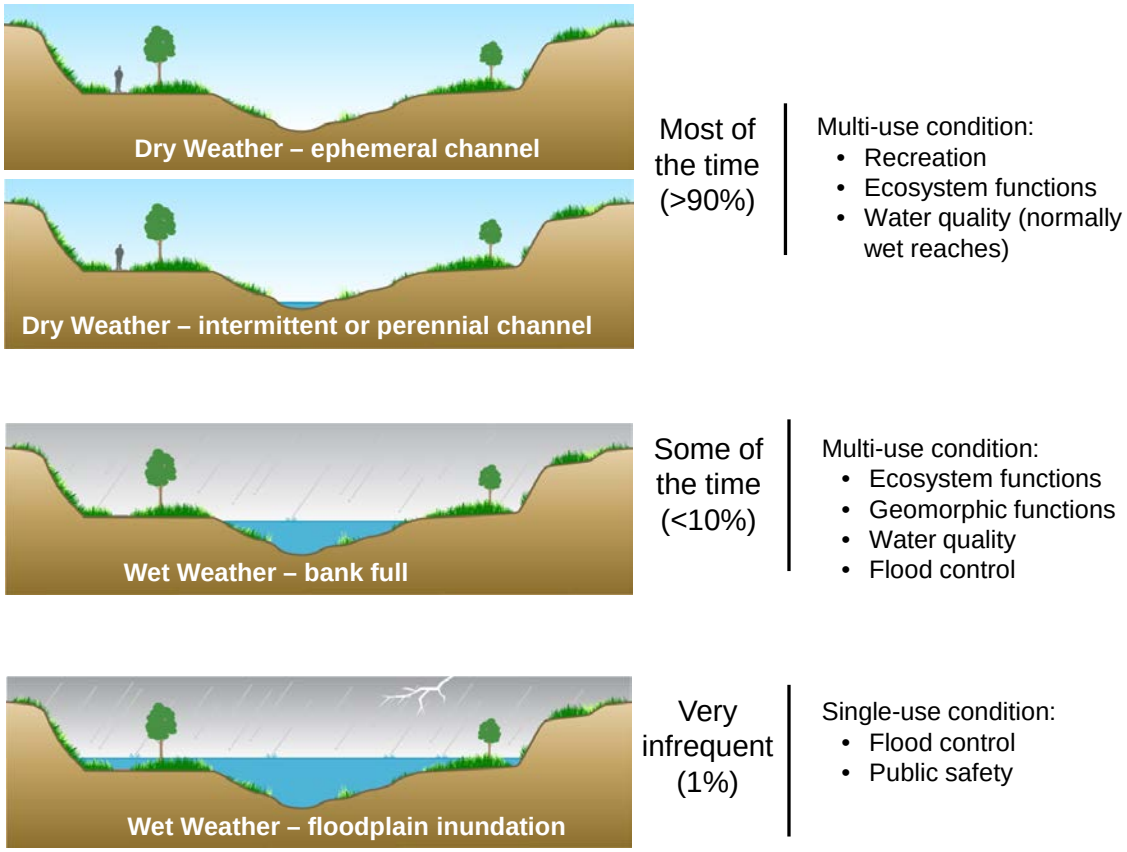
Establishment of the HPWQC for the inland waters involves evaluation of more complex interrelationships: inland waters experience a range of priority conditions related to flow, water quality, physical habitat, biological integrity, and geomorphology. Conditions are highly interrelated at a given reach and between upstream and downstream reaches, and it is common for two or more overlapping "urban stream syndrome" stressors (see Section 1.2.2) 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 beneficially 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 water stream systems, a useful conceptual model adapted from Harman (2014) considers a function-based framework for stream restoration as depicted in Figure 4. 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 4: 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 5.

Figure 5: Variation of Inland Stream Temporal Conditions



One premise of the framework described in Figure 4 is that efforts to improve riparian biological communities (pinnacle) 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 Figures 4 and 5 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 San Juan Hydrologic Unit 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 6. 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 7 uses a similar approach to introduce the conceptual relationships that are most dominant under wet weather conditions.

Figures 6 and 7 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 6: Causal Linkages – Dry Weather Stream Functions

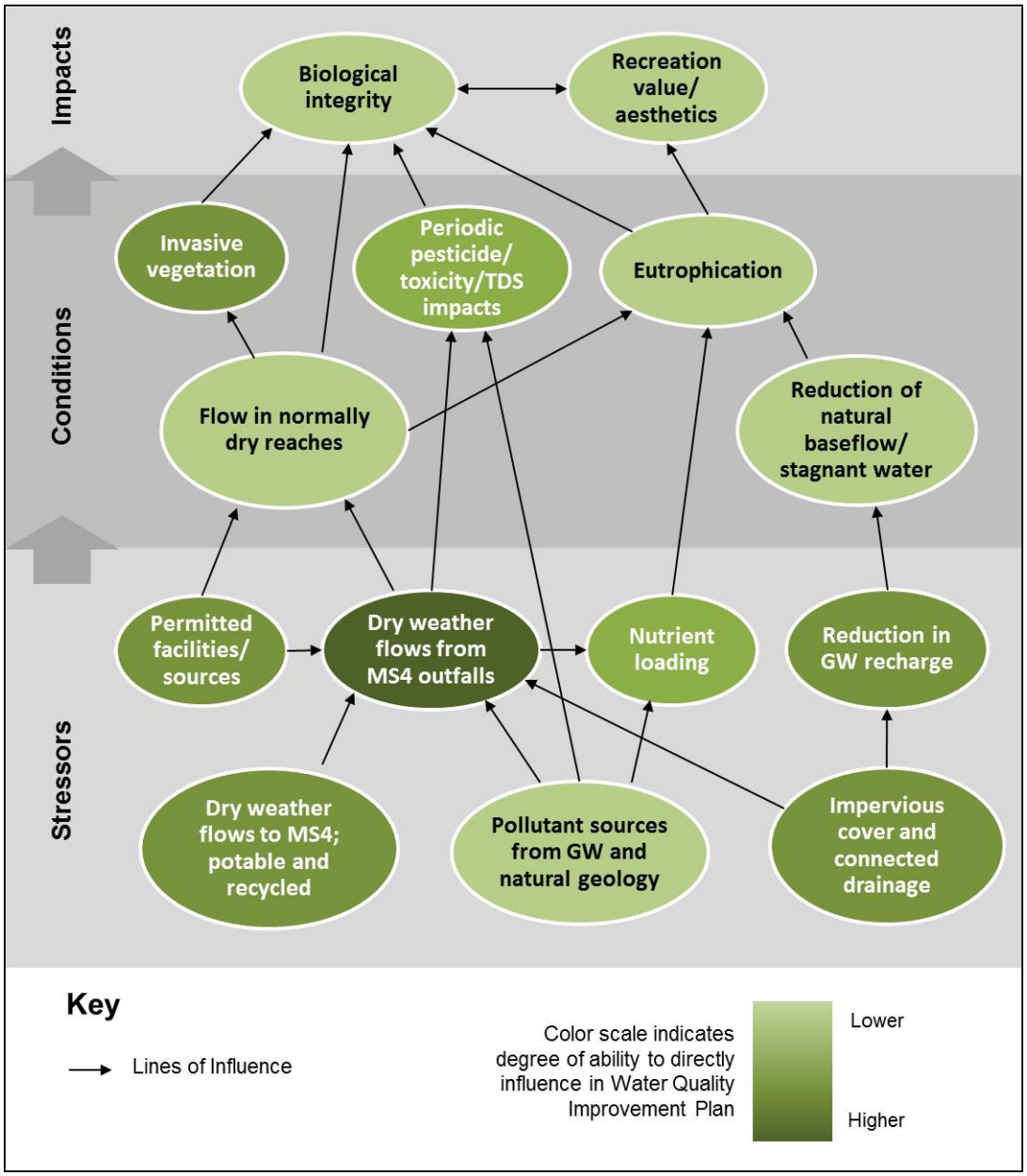
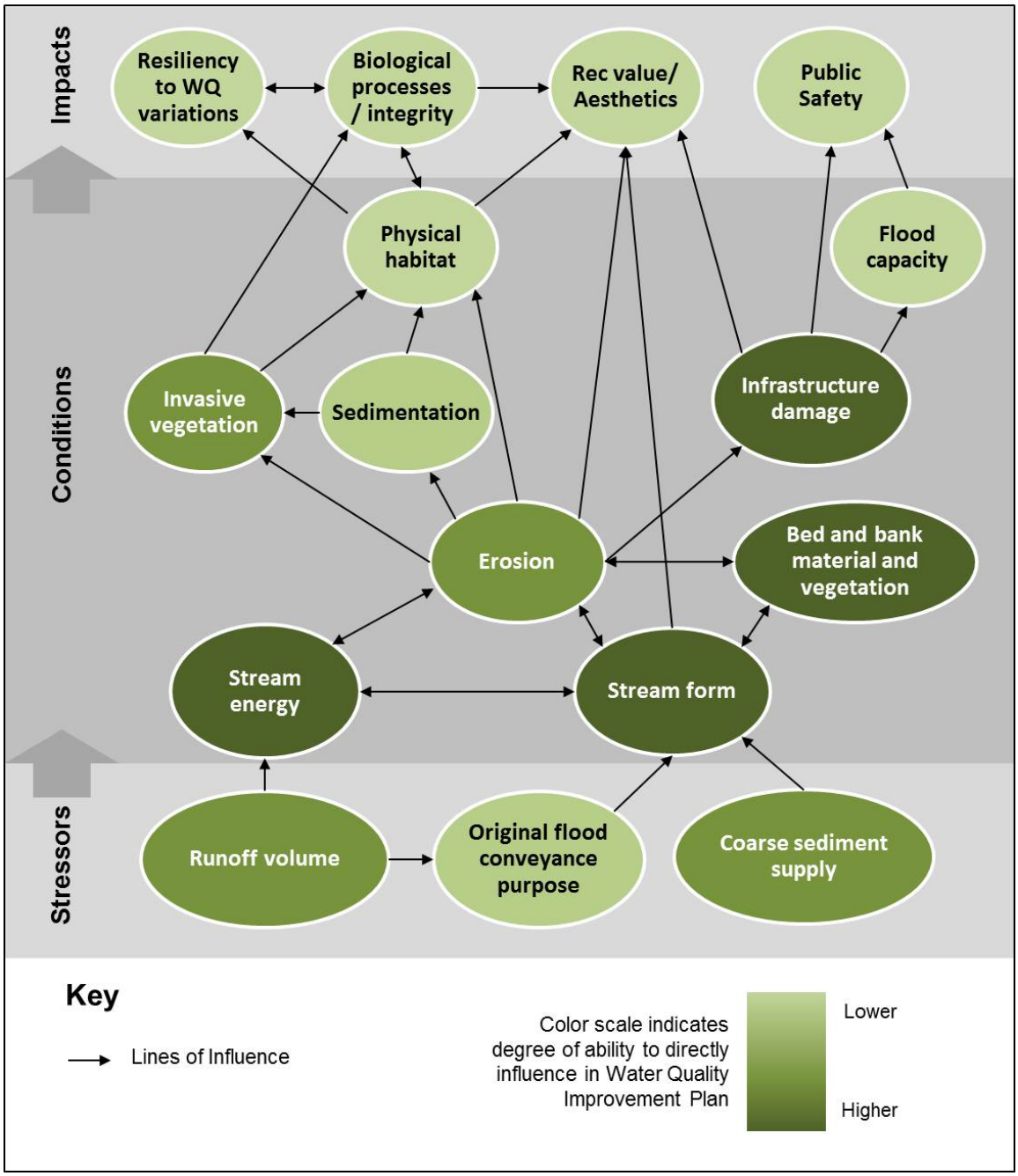


Figure 7: Causal Linkages – Wet Weather Stream Functions



In summary, the method for evaluating HPWQCs in inland waters 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 –** Evaluate based on functional groupings and most valued beneficial uses, including non- contact recreation, habitat/biology, flood conveyance, and water supply. Contact recreation is not considered to have a significant intensity of beneficial use.
- **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 6 and 7 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 6 and 7, 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 5.
- **Achievable improvements –** Evaluated primarily via causal linkages introduced in Figure 6 and 7. This was also assessed based on the conceptual temporal model introduced in Figure 5 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 4. Improvement in these factors is simpler to model.
- **Phasing as part of adaptive process –** This factor primarily via the hierarchy introduced in Figure 4 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.

2.2.4 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 San Juan Hydrologic Unit 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 (Chapter 3), while other data gaps may need to be filled as part of the implementation, monitoring, and adaptive management process (Chapter 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 Figures 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 HPQWC. 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 (Bacteria TMDL)* 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* establishes a high priority for addressing pathogenic human health risk in the early phases of Plan development and implementation.

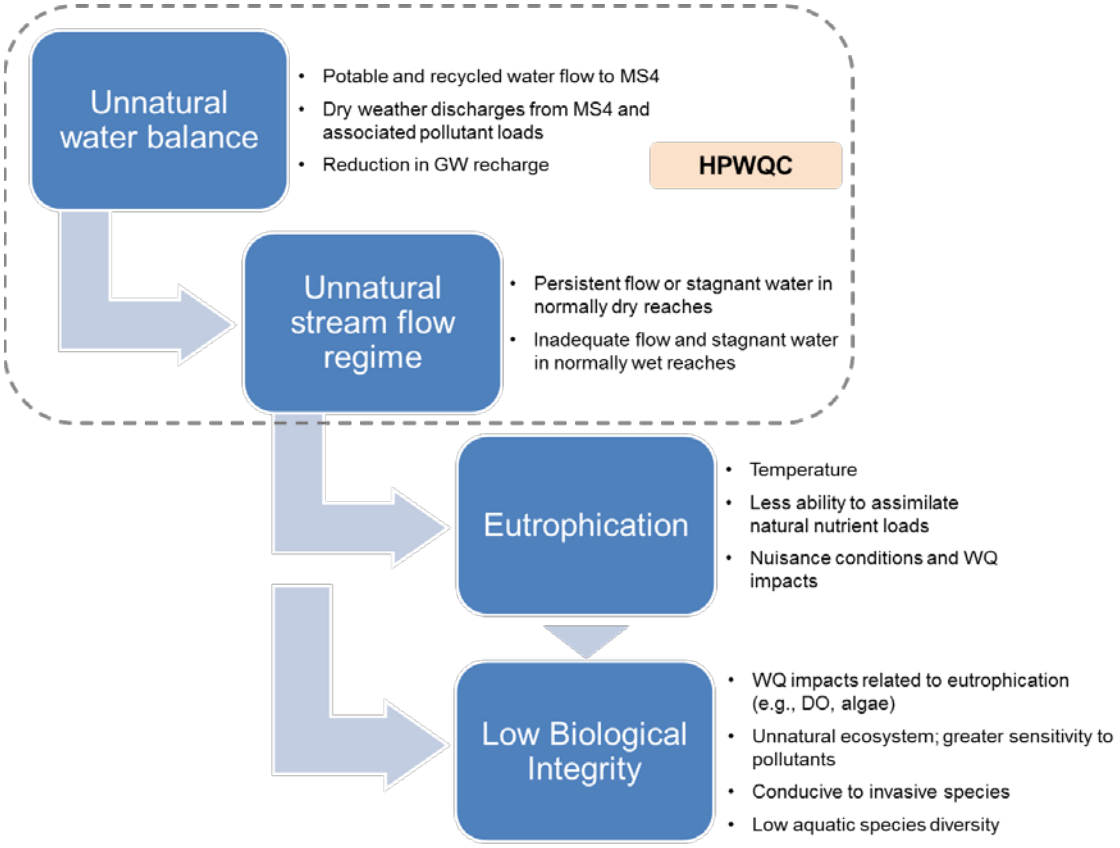
2.3.2 Inland Waters

Applying the criteria and framework established in section 2.2.3, and based on inspection of the causal linkages shown in Figure 6, priority conditions in dry weather including eutrophic conditions and low IBI scores have a common thread that can be traced as shown in Figure 8. In Figure 6, 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 8 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 HPQWCs. In this conceptual model, correcting unnatural water balance restores the base of the pyramid in Figure 4, 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.

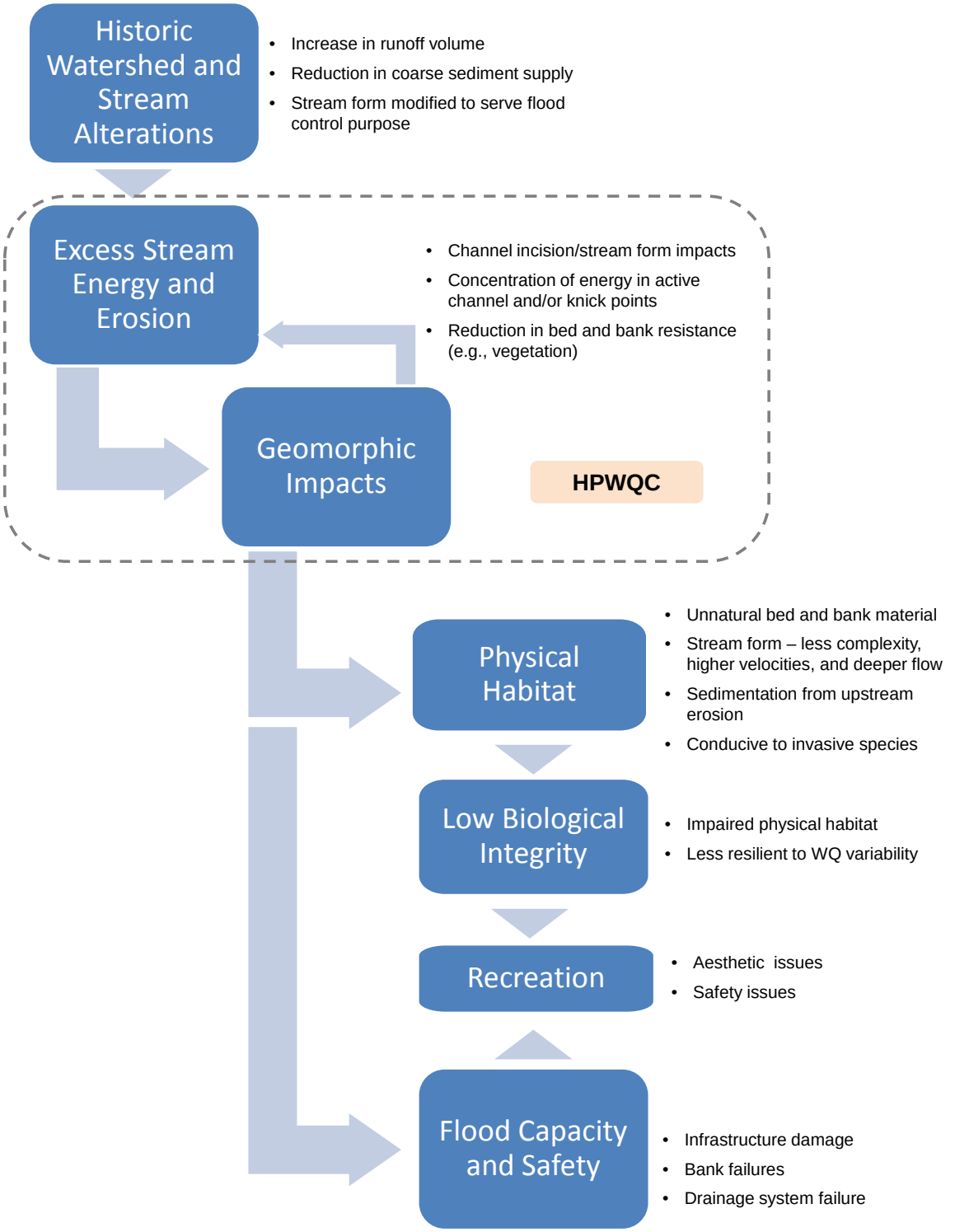
In addition, this condition was also elevated to a HPWQC because of: (1) nexus to integrated water management (i.e., water conservation, groundwater recharge), (2) nexus to recreational beneficial uses, (3) ability to quantitatively estimate improvements, (4) ability to achieve improvements through MS4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

Figure 8: Dry Weather HPWQC Condition Thread for Inland Streams



A similar rationale to identify the critical path in the causal relationships for wet weather conditions can be developed through interpretation of Figure 7. 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 largely arrest these impacts from propagating upward through the hierarchy if the compounding interrelationships between geomorphic impacts (i.e., stream energy, stream erosion, stream form, and bed and bank material/vegetation) can be countered. Based on this thread, Figure 9 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 9: Wet Weather HPWQC Condition Thread for Inland Streams



As depicted in Figure 9, 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 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 Figure 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.

Based on the criteria and rationale presented in the previous sections, Table 3 summarizes the HPWQC for the San Juan Hydrologic Unit. 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 HPWQC may change over time as more information becomes available about the watersheds and their response to improvements.

Table 3: HPWQC for the San Juan Hydrologic Unit

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 • 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
Channel Erosion/ Geomorphologic Impacts	Wet	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

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 stormdrain discharges and/or receiving waters within the watershed. The following section indicates these potential strategies that 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 (structural and nonstructural) other than those considered in this section may be considered in future efforts for implementation by the Permittees.

2.4.1 Potential Nonstructural BMPs

Nonstructural BMPs considered for inclusion in the Permittees' jurisdictional strategies to address the HPWQC include:

Identification and Control of Sewage Discharge to Participating Agency Stormdrain Systems

Identification and control of sewage discharge to the stormdrain system may include water quality monitoring for indicators of human sewage constituents, stormwater conveyance system inspections to identify locations with persistent dry weather flows, an illicit discharge detection and elimination hotline for citizens to report spills or suspicious discharges, or the use of cameras or continuous automated flowmeters in sewers and stormdrains to identify or measure infiltration and/or illicit connections. Finally, special studies such as dye tracing, canine source tracking, and/or microbial source tracking may be employed to answer specific, targeted questions. Additionally, an effective fats, oil and grease inspection program to reduce sanitary sewer overflows is recognized as an important nonstructural BMP.

If human sources are determined to be a significant source of pollutant loading within the watershed, accelerated repair or upgrade of sanitary sewer and stormdrain systems would encourage proactive mitigation of bacteria and nutrient pollution resulting from the sanitary sewer system and/or groundwater. To increase the effectiveness of illicit discharge detection and elimination, current programs could be expanded to include a tiered dry weather source investigation including: (1) visual surveys of stormdrain discharges to identify dry weather flow locations, (2) GIS-based prioritization where aging sewer laterals are above and near stormdrains that are observed to occasionally flow during dry weather, (3) video survey of the stormdrains to identify leaks from the top of the pipe and/or sewer dye tracing studies, and (4) fecal source tracking studies that use canine scent tracking and/or microbial source tracking, and (5) and when beyond the jurisdiction of the MS4s, coordinate with appropriate sewering agencies to inspect and/or repair sanitary system, as necessary.

Homelessness Waste Management Program

In areas of the watershed where homeless encampments are determined to be a significant pollutant source, efforts may include establishing ordinances that reduce encampments, enhancing efforts to reduce the number of homeless people in encampments, inhibiting access to certain locations, and enforcing new and existing laws to decrease the negative impact on water quality. Options to reduce water quality impacts of homeless 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. Homeless waste management programs have not only targeted pollutant reduction benefits, there is the potential for these programs to support larger socio- economic issues.

Onsite Wastewater Treatment Source Reduction

In 2012, the State Board adopted a State Policy for Water Quality Control for Siting, Design, and Operation and Management of Onsite Wastewater Treatment Systems (OWTS). The policy established a statewide, risk-based, five tiered approach for the management of OWTS installations and replacements and set a level of performance and protection expected from OWTS. OWTS fall into Tier 3 if they are located near (within 600 feet) an impaired water body or a water body addressed by a TMDL implementation plan. Currently, there are no Tier 3 OWTS identified in the watershed that would require an Advanced Protection Management Program including additional inspection, and possibly advanced treatment upgrades. However, an effective OWTS inspection program is recognized as an important nonstructural BMP, where appropriate.

Irrigation Runoff Reduction and Good Landscaping Practices

Effective methods to reduce irrigation runoff could include development of educational outreach, increased inspections, punitive measures for overwatering, tiered water rates, or distribution of smart irrigation controllers and/or other financial incentive programs that decrease watering volume. Irrigation runoff reduction programs can also be integrated with BMPs that encourage landscaping and smart gardening practices that reduce the load of fertilizers and chemicals that end up in stormwater, such as integrated pest management, reducing fertilizer and pesticide use, xeriscaping, and turf conversion. To facilitate the use of these natural approaches, ordinances, education and outreach, and financial incentives can be implemented. Based on studies, it is believed that increased irrigation runoff controls, such as inspection, enforcement, and incentives in commercial and residential land uses will generate pollutant load reductions. Water use programs may be under the authority of independent water agencies and therefore coordination among MS4s with these agencies is important.

Commercial, Industrial, and Residential Good Housekeeping

Requiring good housekeeping practices involves establishing and enforcing ordinances for commercial and industrial facilities, and residential areas. Programs that address wet weather load reductions may include increased inspection and enforcement of grease removal equipment for restaurants, monitoring trash enclosures for proper waste disposal, and cleaning of private catch basins and drain inlets. Dry weather controls can also include discouraging vehicle washing, appropriate pool draining, power washing and other wash down activities that produce nuisance flows to stormdrains.

Pet Waste Program

BMPs for pet waste pick-up and disposal could include both educational outreach and enforcement to encourage residents and pet owners to clean up after their pets. Examples include park signage, waste bag distribution stations, receptacles for pet waste, designated dog parks, strict ordinances to regulate pet waste clean-up, and educational outreach at pet stores, animal shelters, veterinary offices, and other sites frequented by pet owners. Pet waste management practices may also include BMPs relating to horseback riding activities.

Animal Facilities Management

An effective source control program could include an inventory and frequent inspection of horse ranches, livestock areas, kennels and other pet service areas. Community outreach tools would include education materials that stress manure and wash water management, directing drainage away from and/or around exposed stalls, horse health, and watershed awareness. These BMPs would address both commercial and private facilities.

Redevelopment and WQMP Implementation (Source Control, LID, Hydromodification)

The Permittees require advanced stormwater treatment through site design, source control, Low Impact Development (LID), and hydromodification control implementation for all development and redevelopment as part of their Model Water Quality Management Plan (WQMP), Technical Guidance Document (TGD), and Hydromodification Management Plan (HMP). These requirements applies to residential, commercial, industrial, educational, and transportation land uses. The land development planning program and associated manuals guide applicants through the design and submittal process to ensure the necessary stormwater features are being implemented. Project designs must show runoff being infiltrated or else treated by structural BMPs, such as bioretention facilities, planter boxes, filters, settling ponds, or constructed wetlands. LID implementation provides water quality benefits for multiple pollutants of concern through hydrologic source load mitigation and the removal of multiple pollutants. Additionally, where projects discharge to susceptible channels, the

project must manage peaks and durations of project runoff to approximate a fully pervious baseline condition.

Street and Median Sweeping

Street and median sweeping is a common practice for reducing street sediment and trash thereby reducing urban runoff pollutant loads from transportation land uses. High-efficiency street sweeping equipment, such as regenerative air sweepers or vacuum assisted sweepers can significantly increase the amount of sediment removed from roadways. The street and median sweeping within the watershed appears to be an effective program for managing the sediment transport of bacteria into the stormdrain system. Street sweeping BMPs provide water quality benefits for multiple pollutants of concern through transportation-related source load mitigation and the removal of multiple associated pollutants, as well as removal of gross debris and trash.

Stormdrain Cleaning

Cleaning sediment and trash from stormdrain inlets and conveyance systems can reduce pollutant loads of bacteria, nutrients, trash, metals, and sediments in receiving waters. Load reductions that can be gained by the cleaning of drain inlets and stormdrains will depend on the extent, timing and frequency of cleaning. As technology continues to advance, high efficiency stormdrain cleaning equipment allows for improved bacteria load reductions and therefore could be phased in to replace older equipment. Stormdrain cleaning BMPs provide water quality benefits for multiple pollutants of concern through composite source load mitigation and the removal of multiple associated pollutants of concern.

Special Studies and Site Specific Objectives

The Permittees may use the Water Quality Improvement Plan development process to identify areas where developing site-specific objectives, outcomes, or pollutant source identification may be appropriate. Strategies may include special studies such as epidemiologic study(ies), quantitative microbial risk assessment (QMRA), natural source evaluation/exclusion, site-specific criteria, toxicity identification evaluation, changes to beneficial uses/use attainability analysis/variance, high flow suspensions, evaluation of wildlife impacted areas, effectiveness testing of BMPs/pilot new and/or advanced technologies, fill data gaps, or other appropriate studies.

2.4.2 Potential Structural BMPs

Structural BMPs considered for inclusion in the Permittees' jurisdictional strategies to address the HPWQC include:

Watercourse Rehabilitation

Stream restoration/enhancement projects are designed to add or replace impacted habitat with habitat having similar functions of equal or greater ecological value, while making adjustments to stream form, if needed, to reduce risks of future impacts. These projects are expected to result in net pollutant load reduction through the following mechanisms: volume reductions; increased hydraulic residence time; increased settleable solids; increase in decay coefficient to account for plant assimilative capacity, reduction in erosion. These projects also potentially increase infiltration capacity (and associated benefits) and have the ability to improve benthic scores.

An important aspect of watercourse rehabilitation is to continue to accommodate flood 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., plunge pools, soft meanders, live stakes and other biotechnical streambank stabilization, riparian buffer, step-pools, etc.) in the active channel coupled with more engineered approaches.

Residential/Small-Scale Low Impact Development Incentive Program

This wet weather small-structural control is an incentive program that encourages residents and businesses to capture or redirect runoff from roofs using Low Impact Development principles to reduce flow to stormdrains. A comprehensive residential rain barrel and downspout retrofit program could include public education and outreach, as well as financial incentives. Examples of such incentives could include offering rain barrels at no or reduced cost, rebate programs for downspout retrofits, and financial assistance for conversion to sustainable landscapes.

Infiltration BMPs

Infiltration BMPs may include infiltration basins, trenches, and galleries, bioretention systems, dry wells, hybrid bioretention/dry wells, or permeable pavements. With the exception of permeable pavements, which are solely distributed, all of these may be centralized or distributed systems. These systems involve capture and filtration of stormwater into pervious soils. Distributed structural BMPs are treatment or volume mitigation BMPs implemented at the neighborhood, parcel or site scale. Distributed structural BMPs include green streets, rainwater harvesting, and other Low Impact Development type solutions.

Water Supply Augmentation

Projects that seek to augment water supply through infiltration of stormwater address multiple conditions. Capture of flows may include unnatural water balance/flow

regime in channels thereby mitigating the adverse impacts that include eutrophication and presence of invasive plant species.

Capture and Use, or Rainwater Harvesting

This refers to a type of distributed BMP that works by capturing stormwater runoff and storing it to maximize efficient use of the water. By reducing the amount of stormwater runoff that flows overland into a stormdrain system, loads of bacteria and other pollutants are reduced. Onsite use of the harvested water for non-potable domestic purposes conserves potable water and, where directed to unpaved surfaces, has potential to recharge groundwater in local aquifers.

Natural Treatment of Filtration

Biofiltration BMPs are vegetated facilities that utilize natural treatment systems to capture and treat stormwater runoff through a variety of physical and biological treatment processes. Runoff that passes through a biofiltration system is treated by the natural adsorption and filtration characteristics of the plants, soils, and microbes. Biofiltration BMPs include constructed wetlands, subsurface flow wetlands, biofiltration or bioinfiltration facilities with underdrains, planter boxes, and green streets.

Advanced Treatment and Proprietary Devices

Advanced treatment, such as low flow diversions to disinfection/treatment plants, and proprietary devices, such as prefabricated, modular infiltration galleries, are additional options for stormwater treatment for bacteria and other pollutants. There are many options for proprietary devices that would fit into, combine, or expand on the BMP types listed above.

In areas where the HPWQC is a challenging pollutant such as bacteria, advanced treatment BMPs provide water quality benefits for multiple pollutants of concern (not just PWQCs or the HPWQC) as a result of required pretreatment or the removal of flows from the flow stream.

Infrastructure Improvement and Ancillary/Source Control BMPs

This option could include retrofitting sewer lines and repairing stormdrains. Though these are structural BMPs, identification of locations for improvements would be performed as part of a nonstructural BMP, for instance illicit discharge detection and elimination programs or special bacteria source tracking studies.

Pretreatment BMPs

These systems may be used as part of a treatment train to enhance the performance of other structural BMPs. Examples of pretreatment BMP types include gross solids

removal (e.g., hydrodynamic devices, trash racks), biofiltration (e.g., vegetated filter strips, vegetated swales), and settling and storage (e.g., extended detention basins). Pretreated stormwater is then conveyed to an infiltration, biofiltration, or other structural BMP.

Pretreatment BMPs provide water quality benefits for multiple pollutants of concern as they remove pollutants necessary to condition water so that HPWQCs that are pollutants can be effectively treated.

Retrofits for Priority Conditions

Retrofitting projects in areas of existing development within the watershed can potentially be implemented to reduce stormwater conveyance system sources of pollutants or stressors identified under Provision B.2.d causing or contributing to the HPWQC identified under Provision B.2.c.

Catch Basin Retrofits

Examples include catch basin gates and in line baskets or filters. The debris gates are designed to remain closed during low flow conditions but open during high storm flows in order to prevent flooding. The gates keep debris out of the MS4 and within reach of street sweepers.

Nuisance Water Diversions

Dry weather diversions are also included in this category. Dry weather diversions eliminate all pollutants from the MS4 by eliminating all discharge to receiving water bodies under dry weather conditions. Flow is diverted to the sanitary sewer treatment plant where it is disinfected and can be recycled.

Table 4 presents a preliminary assessment of the linkages between the potential structural and nonstructural strategies to the HPWQCs.

Table 4: Nexus of Potential Strategies to HPWQCs

Strategy	Human Health Risk	Unnatural Water Balance/ Flow Regime	Channel Erosion/ Geomorphologic Impacts
Nonstructural Strategies			
Identification and Control of Sewage Discharge to Participating Agency Stormdrain Systems	2	1	0
Homelessness Waste Management Program	2	0	0
Onsite Wastewater Treatment Source Reduction	2	1	0
Irrigation Runoff Reduction and Good Landscaping Practices	1	2	0
Commercial, Industrial, and Residential Good Housekeeping	1	1	0
Pet Waste Program	2	0	0
Animal Facilities Management	2	1	0
Redevelopment and WQMP Implementation (Source Control, LID, Hydromodification)	2	1	1
Street and Median Sweeping	1	0	0
Stormdrain Cleaning	1	0	0
Special Studies and Site Specific Objectives	2	1	1
Structural Strategies			
Watercourse Rehabilitation	1	0	2
Residential/Small-Scale Low Impact Development Incentive Program	2	2	1
Infiltration BMPs	2	2	1
Water Supply Augmentation	1	2	0
Capture and Use, or Rainwater Harvesting	1	2	0
Natural Treatment or Filtration	2	0	1
Advanced Treatment and Proprietary Devices	2	0	0
Infrastructure Improvement and Ancillary/Source Control BMPs	1	1	0
Pretreatment BMPs	1	1	0

Retrofits for Priority Conditions	2	2	1
Nuisance Water Diversions	2	2	0
Catch Basin Retrofits	1	0	0

Key to Ranking

2: Direct and significant nexus to HPWQC

1: Partial nexus or partial contribution to HPWQC

0: No significant nexus to HPWQC

2.5 References

Canadian Council of Ministers of the Environment (CCME). 2001. Canadian water quality guidelines for the protection of aquatic life: CCME Water Quality Index 1.0, Technical Report. Canadian Council of Ministers of the Environment, Winnipeg.

Harman, W., R. Starr, M. Carter, K. Tweedy, M. Clemmons, K. Suggs, C. Miller. 2012. A Function-Based Framework for Stream Assessment and Restoration Projects. US Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Washington, DC EPA 843-K-12-006.

Maybeck, M and R. Helmer. 1992. Water Quality Assessments - A Guide to Use of Biota, Sediments and Water in Environmental Monitoring - Second Edition Edited by Deborah Chapman, 1992, 1996. Chapter 2. UNESCO/WHO/UNEP.

RWQCB. 2012. California Regional Water Quality Control Board, San Diego Region. A Framework for Monitoring and Assessment in the San Diego Region. November 2012.

SCCWRP. 2014. Southern California Coastal Water Research Project. Assessing Areas of Special Biological Significance Exposure to Stormwater Plumes Using a Surface Transport Model. March 2014.

Walsh CJ, Roy AH, Feminella JW, Cottingham PD, Groffman PM, Morgan RP II. 2005. The urban stream syndrome: Current knowledge and the search for a cure. Journal of the North American Benthological Society 24(3):706-723.