Arias

County of San Diego

SAN DIEGO REGIONAL
WATER QUALITY
CONTROL BOARD

2014 DEC 17 PM 1 54

SARAH E. AGHASSI
DEPUTY CHIEF ADMINISTRATIVE OFFICER

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December 17, 2014

Mr. David W. Gibson, Executive Officer
California Regional Water Quality Control Board
San Diego Region
2375 Northside Drive, Suite 100
San Diego, CA 92108-2700

COUNTY OF SAN DIEGO, PERMIT R9-2013-0001, PIN 255223 – INTERIM DELIVERABLE IN RESPONSE TO PROVISION B.3 WATER QUALITY IMPROVEMENT GOALS, STRATEGIES AND SCHEDULES FOR THE WATER QUALITY IMPROVEMENT PLAN FOR THE SAN DIEGO RIVER WATERSHED MANAGEMENT AREA

Dear Mr. Gibson:

On behalf of the Participating Agencies (PAs) in the San Diego River Watershed Management Area, the County of San Diego is pleased to submit the attached document in accordance with requirements set forth in Provision F.1.a. (3)(c) of Order R9-2013-0001, the National Pollution Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds within the San Diego Region, NPDES No. CAS0109266 (Permit).

In order to facilitate regulatory review, a "crosswalk" table is provided following the Executive Summary to indicate where specific permit provisions are addressed in the document. Section 3 follows the framework of Permit Provision B.3, Water Quality Improvement Goals, Strategies, and Schedules:

- Section 3.1. Introduction
- Section 3.2. Water Quality Improvement Goals and Schedules
- Section 3.3. Water Quality Improvement Strategies
- Section 3.4. Permit Compliance
- Section 3.5 Optional Watershed Management Area Analysis
- Section 3.6 References

We want to thank your staff for their willingness to provide feedback and we look forward to continued interaction with your staff on developing the Water Quality Improvement Plan for the San Diego River Watershed Management Area.

If you have any questions or comments, please contact LUEG Program Manager, Todd Snyder at (858) 694-3672 or Todd.Snyder@sdcounty.ca.gov, or Jo Ann Weber at (858) 495-5317 or JoAnn.Weber@sdcounty.ca.gov.

Sincerely,

Sarah Aghassi

SARAH E. AGHASSI, Deputy Chief Administrative Officer
Land Use and Environment Group

Attachments: San Diego River Water Quality Improvement Plan Provision B.3

Cc: Jaime Campos, City of El Cajon Permit No. R9-2013-0001: PIN 222391
Joe Kuhn, City of La Mesa Permit No. R9-2013-0001: PIN 235927
Clement Brown, City of San Diego Permit No. R9-2013-0001: PIN 255222
Cecilia Tipton, City of Santee Permit No. R9-2013-0001: PIN 255749
Roya Yazdanifard, California Department of Transportation Permit No. R9-2013-0001: PIN 212814

County of San Diego

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Royya Yazdanifard, California Department of Transportation Permit No. R9-2013-0001: PIN 212814

City Manager

San Diego River Watershed Management Area, Water Quality Improvement Plan
Provision B.3 Chapter

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."

Signature　　　　　　　　　　Date 12/3/14

Douglas Williford, City Manager　　　　　　(619) 441-1780
Printed Name, Title　　　　　　Phone Number

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CITY OF
LA MESA
JEWEL of the HILLS

PUBLIC WORKS DEPARTMENT

December 3, 2014

SAN DIEGO RIVER WATERSHED MANAGEMENT AREA, WATER QUALITY IMPROVEMENT PLAN PROVISION B.3 CHAPTER, 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.

Name ____________________ Date 12/11/14

8130 ALLISON AVENUE • LA MESA, CA 91942 • TEL: 619.667.1166 FAX: 619.667.1380

STATEMENT OF CERTIFICATION

DRAFT SAN DIEGO RIVER WATERSHED MANAGEMENT AREA, WATER QUALITY IMPROVEMENT PLAN – INTRODUCTION, PROVISION B.2 CHAPTER AND PROVISION B.3 CHAPTER

I certify, under penalty of law, that this Water Quality Improvement Plan submittal 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 known violations.

12/11/14
Date

DREW KLEIS
Deputy Director
Transportation & Storm Water Department

Transportation & Storm Water Department
9370 Chesapeake Drive, Suite 100, MS 1900 • San Diego, CA 92123
Hotline (619) 235-1000 Fax (858) 541-4350

CITY OF SANTEE

SAN DIEGO RIVER WATERSHED MANAGEMENT AREA, WATER QUALITY IMPROVEMENT PLAN PROVISION B.3 CHAPTER, 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.

Pedro Orso-Delgado
PRINT NAME

Acting City Manager
TITLE

SIGNATURE

11/26/14
DATE

10601 Magnolia Avenue • Santee, California 92071 • (619) 258-4100 • www.cityofsanteeca.gov

County of San Diego

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SAN DIEGO RIVER WATERSHED MANAGEMENT AREA, WATER QUALITY IMPROVEMENT PLAN PROVISION B.3 CHAPTER, STATEMENT OF CERTIFICATION

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Sarah Aghassi

SARAH E. AGHASSI
Deputy Chief Administrative Officer
Land Use and Environment Group
County of San Diego

12/17/14
Date

DEPARTMENT OF TRANSPORTATION
DISTRICT 11
4050 TAYLOR STREET, M.S. 242
SAN DIEGO, CA 92110
PHONE (619) 688-0100
FAX (619) 688-4237
TTY 711
www.dot.ca.gov

Serious drought.
Help save water!

December 2, 2014

STATEMENT OF CERTIFICATION

SAN DIEGO RIVER WATERSHED MANAGEMENT AREA, WATER QUALITY IMPROVEMENT PLAN PROVISION B.3 CHAPTER, 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.

BRUCE L. APRIL
Deputy District Director, Environmental

12/4/14
Date

Enclosure

SAN DIEGO RIVER
WATERSHED MANAGEMENT AREA
WATER QUALITY IMPROVEMENT PLAN
PROVISION B.3 CHAPTER

Submitted by

City of El Cajon
City of La Mesa
City of San Diego
City of Santee
County of San Diego
Caltrans

Prepared by

Geosyntec consultants

Larry Walker Associates

December 17, 2014

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ACRONYMS

AEF	Allowed Exceedance Frequencies
CPI	Catchment Prioritization Index
EMC	Event Mean Concentrations
FC	Fecal Coliform
HMP	Hydromodification Management Plan
HPWQC	Highest Priority Water Quality Condition
IDDE	Illicit Discharge Detection and Elimination
JRMP	Jurisdictional Runoff Management Programs
LID	Low Impact Development
LSPC	Loading Simulation Program in C++
PWQC	Priority Water Quality Conditions
ROW	Rights of Ways
ROWD	Report Of Waste Discharge
SBPAT	Structural BMP Prioritization Analysis Tool
SCCWRP	Southern California Coastal Water Research Project
SDR	San Diego River
SSF	Subsurface Flow
SUSMP	Standard Urban Storm water Management Plan
SUSTAIN	System for Urban Stormwater Treatment and Analysis INtegration
SWRCB	State Water Resources Control Board
TLR	Target Load Reductions
TMDL	Total Maximum Daily Load
UTC	Urban Tree Canopy
WMAA	Watershed Management Area Analysis
WQIP	Water Quality Improvement Plan

EXECUTIVE SUMMARY

WATER QUALITY IMPROVEMENT GOALS, STRATEGIES, AND SCHEDULES (SECTION 3)

The SDR Participating Agencies must develop specific water quality improvement goals and strategies to address the water quality conditions identified for the San Diego River Watershed (SDR), as defined in the Provision B.2 Chapter of the Water Quality Improvement Plan (WQIP).

The goals include interim and final numeric (i.e., quantifiable) goals for the highest priority water quality condition (HPWQC), fecal indicator bacteria (bacteria), for wet weather and dry weather in the San Diego River Watershed. The Bacteria TMDL requires Participating Agencies to reduce bacteria levels during both dry weather and wet weather conditions within a 10- and 20-year compliance timeline, respectively. The goals within the WQIP were selected to demonstrate progress towards compliance with the Bacteria TMDL, and the strategies are the actions to be taken to obtain compliance. Multi-benefit strategies have been prioritized to achieve goals for bacteria as well as other pollutants, and will thereby address both the HPWQC and other priority water quality conditions (PWQCs) in the San Diego River Watershed. The approach to achieving WQIP goals, and the corresponding WQIP section, is shown in **Figure ES-1.**

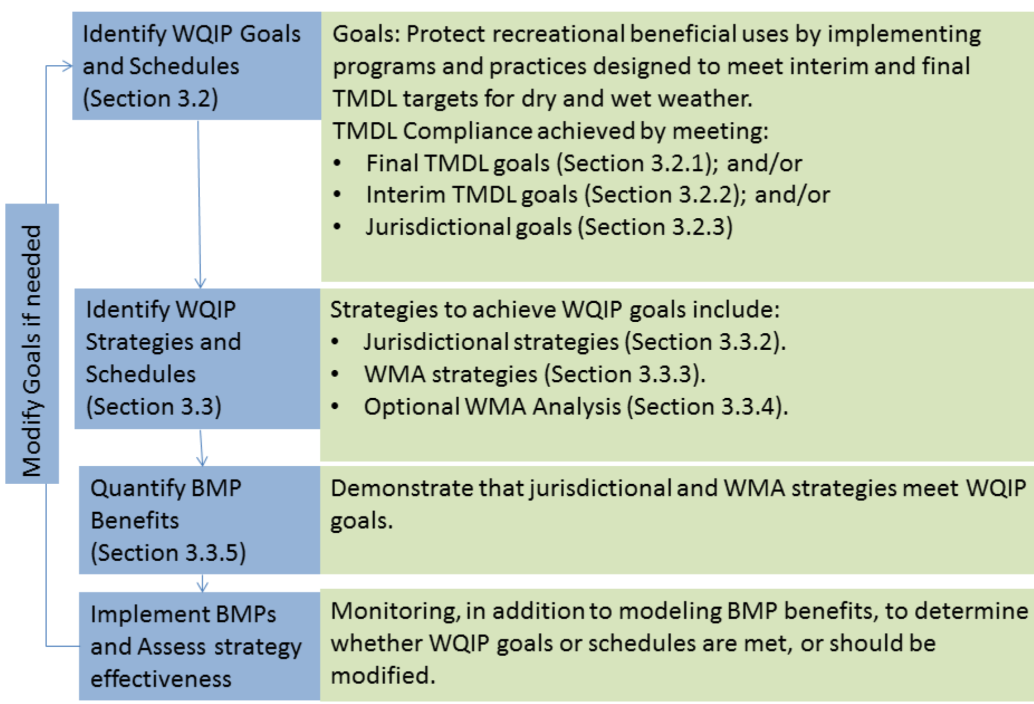

Figure ES-1. Approach for Achieving WQIP Goals

WATER QUALITY IMPROVEMENT GOALS AND SCHEDULES (SECTION 3.2)

The jurisdictional interim and final goals are based on the compliance options for the Bacteria TMDL from Attachment E of the Permit. The goals are presented for dry and wet weather conditions as follows:

- Interim goals include:
  - Jurisdictional specific goals based on Current Permit terms (through 2018)
  - Jurisdictional specific goals for each 5 year Permit Term following WQIP acceptance based on the Bacteria TMDL schedules to demonstrate progress toward meeting the final goals.
- Final goals include compliance options based on final TMDL compliance requirements.

Since the permit allows multiple pathways to be followed to achieve compliance (i.e. demonstration of progress toward all compliance pathways is not required), the numeric goals are independent of each other. The timelines and relationships between the goals are shown in **Figure ES-2.**

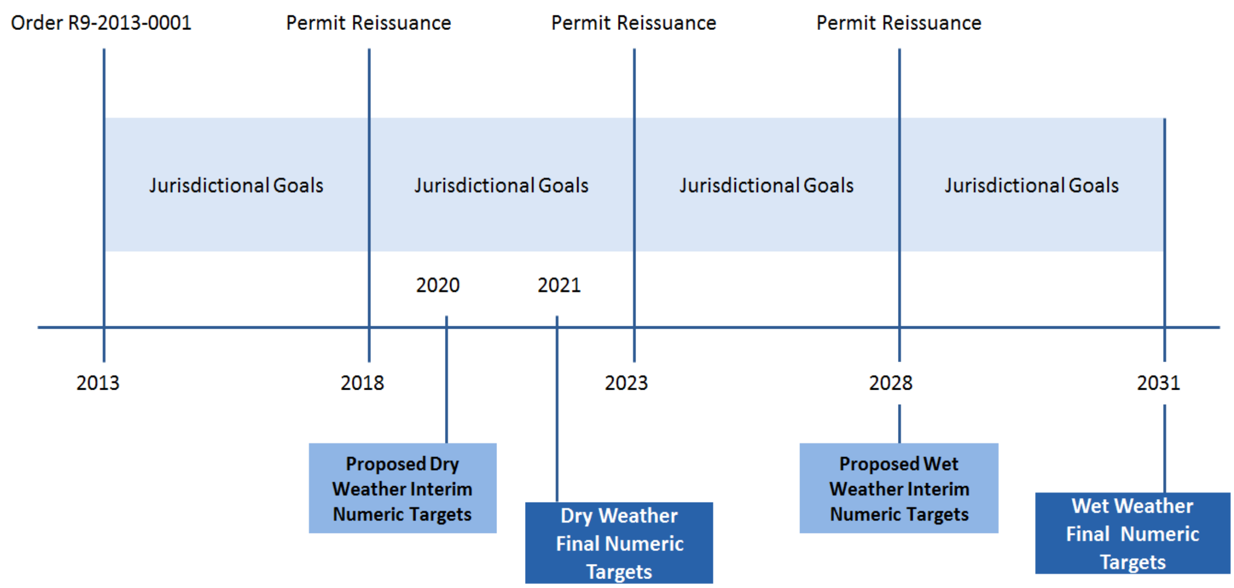

Figure ES-2. Timelines and Relationships Between Bacteria TMDL Numeric Targets[1]

[1]Per the Permit, Participating Agencies may propose alternative TMDL interim milestones which differ from those presented in above in Figure 3.

WATER QUALITY IMPROVEMENT STRATEGIES (SECTION 3.3)

Each jurisdiction has developed its own strategies that will be implemented to work toward its goals. The Participating Agencies also developed optional jurisdictional and watershed strategies that, if needed, would be implemented through coordination amongst the Participating Agencies. The strategies are generally broad in nature and include suites of programmatic (a.k.a. non-structural) and structural BMPs that are expected to improve conditions within the watershed. The

Strategies were selected for consideration using the following criteria:

- BMP effectiveness, particularly for bacteria reduction, with consideration for the priority water quality conditions;

- Provision of multiple benefits, including but not limited to habitat, recreation, economic, and water resources benefits; and

- The degree to which the strategy is sustainable, implementable, and cost-effective.

In order to assess the ability of the proposed strategies to achieve WQIP numeric goals, load reductions expected to result from the implementation of these strategies were estimated for dry and wet weather.

PERMIT COMPLIANCE (SECTION 3.4)

To provide a reasonable assurance, quantitative wet weather load reduction modeling was performed for the structural BMPs to demonstrate that the load reduction target for the SDR watershed management area can be achieved through implementation of this WQIP. The predicted wet weather load reduction is greater than the estimated target load reduction, indicating that WQIP implementation is expected to meet the HPWQC final numeric goal. For dry weather, an analytical spreadsheet approach was used to demonstrate reasonable assurance that compliance will be reached through implementation of this WQIP. Per the requirements of Attachment E in the Permit, the structural BMPs proposed in the CLRP were included in this plan.

OPTIONAL WATERSHED MANAGEMENT AREA ANALYSIS (SECTION 3.5)

The Permit provides an innovative pathway for Participating Agencies to provide offsite alternative compliance options to their land development programs by performing watershed-specific analyses characterizing each watershed. The Watershed Management Area Analysis (WMAA), as denoted in the Permit, is an optional task intended to characterize important processes and characteristics of each watershed through creation of GIS layers that may be used for the following purposes:

1) To identify candidate projects that could potentially be used as offsite alternative compliance options in lieu of satisfying full onsite retention, biofiltration, and hydromodification runoff requirements.

2) To identify and/or prioritize areas where it is appropriate to allow certain exemptions from onsite hydromodification management BMPs.

Understanding that development of a WMAA is on a watershed-by-watershed basis could be time and funding intensive, the Participating Agencies elected to perform the watershed characterization and hydromodification management exemption mapping on a regional scale under a separate but concurrent effort to development of the WQIPs, and presented it in Appendix F.

DOCUMENT CROSSWALK

As part of the WQIP Development, the Participating Agencies have collaboratively crafted this document "crosswalk" to provide permit provision references to the corresponding WQIP document section, including the WQIP page number reference. This crosswalk is intended to ease the review process.

Permit Provision		Corresponding WQIP Document Section		Page No.
B.3	Water Quality Improvement Goals, Strategies and Schedules	3.	Water Quality Improvement Goals, Strategies and Schedules	1
B.3.a	Water Quality Improvement Goals and Schedules	3.2	Water Quality Improvement Goals and Schedules	5
B.3.a.(1)	Numeric Goals	3.2.2 3.2.3	Jurisdictional Interim Goals Jurisdictional Final Goals	7 8
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B.3.b.(1)	Jurisdictional Strategies	3.3.3	Jurisdictional Strategies	13
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3 Water Quality Improvement Goals, Strategies, and Schedules

3.1 Introduction

WQIP **Goals** are set to measure progress towards addressing the highest priority water quality condition (bacteria) to protect recreational uses.

WQIP **Strategies** are the existing or planned activities or projects that can be implemented to demonstrate reasonable progress towards achieving the goals.

Provision B.3 of Order R9-2013-0001 (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 San Diego River (SDR) Watershed. 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 in receiving waters.

Wet Weather is defined as >0.2" of rain within a 24 hour period and the following 72 hours.

Dry Weather is defined as all other days where rainfall is <0.2" within a given 24 hour period.

Provision B.3 defines the goals of the Water Quality Improvement Plan (WQIP) and the strategies and schedules for achieving those goals. The goals include interim and final numeric (i.e., quantifiable) goals for the highest priority water quality condition (HPWQC), fecal indicator bacteria (bacteria), for wet weather and dry weather in the lower watershed.

Bacteria are important indicators for recreational beneficial uses. Fecal indicator bacteria do not cause illness directly, but some epidemiologic studies[1] have shown correlations between the presence of indicator bacteria and gastrointestinal illness caused by pathogens. Indicator bacteria are used as detection surrogates or proxies for pathogens because they are easier and less costly to measure. Allowable bacteria loads for the San Diego River Watershed are defined by the Bacteria Total Maximum Daily Load (TMDL), identified in Attachment E of the Permit. The purpose of the Bacteria TMDL is to protect the health of those who recreate in waterbodies receiving runoff from the San Diego River Watershed by reducing the amount of bacteria discharged to the waterbodies through urban runoff, stormwater, and other sources.

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[1] For example: EPA/600/R-10/168: "Report on the 2009 National Epidemologic and Environmental Assessment of Recreational Water Epidemiology Studies (NEEAR): Boquerón Beach, Puerto Rico, and Surfside Beach, SC of the paper published in Environmental Health" (PDF, 449pp., 16.78 MB)

The control of bacteria presents unique challenges, since they are ubiquitous in the environment, are living organisms and the amount of bacteria from regrowth[2] as well as natural sources can be significant. Anthropogenic sources and natural sources contribute to bacteria within the watershed. To better understand the contribution from natural sources of bacteria, the San Diego Municipal Copermittees are currently carrying out a San Diego Bacteria Reference Study. The objective of this study is to collect necessary data to account for the natural sources of bacteria in a watershed that are beyond the control of the Copermittees.

Anthropogenic sources of fecal indicator bacteria are caused or produced by humans and include, but are not limited to, failing septic systems, illegal sewage disposal, and pet waste.

Natural sources of fecal indicator bacteria include, but are not limited to, bird and wildlife feces, re-suspension from sediment, and regrowth.

The Bacteria TMDL requires Participating Agencies to attain required load reductions during both dry weather and wet weather conditions within a 10- and 20-year compliance timeline, respectively. The goals within the WQIP are focused to demonstrate progress towards compliance with the Bacteria TMDL and the strategies are the actions to be taken to obtain compliance.

Multi-benefit strategies have been prioritized to achieve goals for bacteria as well as other pollutants, and will thereby address both the highest priority and other priority water quality conditions (PWQCs) in the San Diego River Watershed. PWQC were identified according to the process described in Section 2.3 of the WQIP and typically include conditions where water quality analyses has identified and confirmed that the constituent or condition is not meeting water quality standards and the stormwater conveyance system is a likely contributor to the condition. The PWQCs were identified in Provision B.2 of the WQIP and are presented in Table 1.

Table 1. Priority Water Quality Conditions in San Diego River Watershed Management Area

	Dry Weather	Wet Weather
Highest Priority Water Quality Condition	• Bacteria	• Bacteria
Priority Water Quality Condition	• Nitrogen and Phosphorus • Total Dissolved Solids • Eutrophic Conditions • Index of Biological Integrity	• None

[2] Colford Jr., J. M., T. J. Wade, K. C. Schiff, C. C. Wright, J. F. Griffith, S. K. Sandhu, S. Burns, M. Sobsey, G. Lovelace, and S. B. Weisberg. 2007. "Water Quality Indicators and the Risk of Illness at Beaches With Nonpoint Sources of Fecal Contamination." Epidemiology, 18(1): 27-35, January 2007.

An iterative, adaptive management approach will be used that will improve water quality and increase the effectiveness of strategies will be used to achieve the numeric goals for bacteria. The approach, with corresponding WQIP Provision B.3 sections noted, is presented in Figure 1, and will be discussed further in Provision B.5.

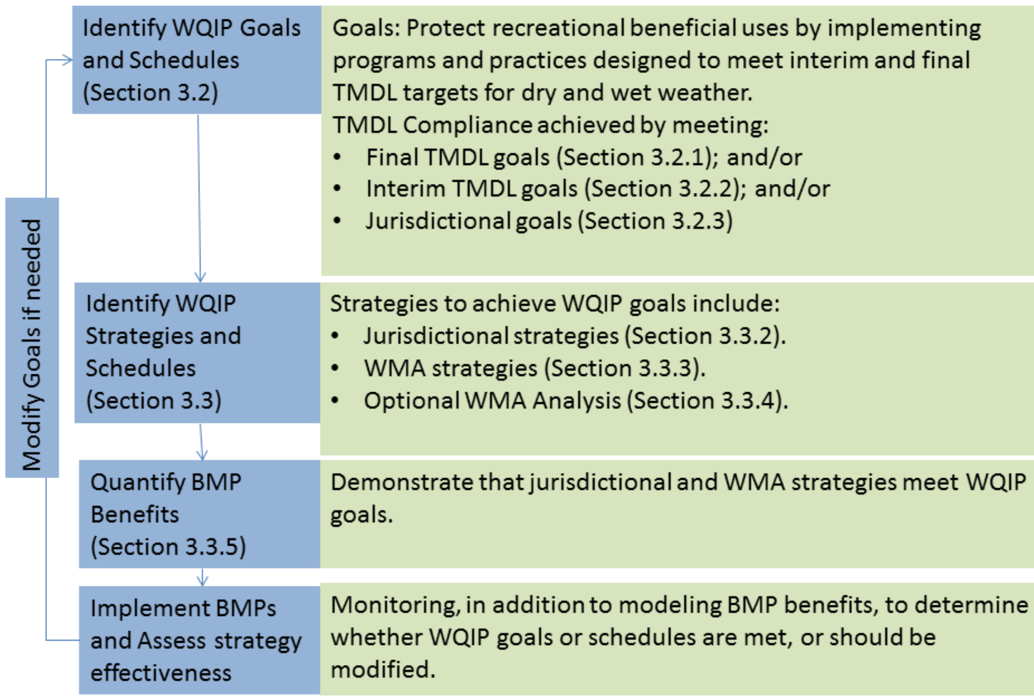

Figure 1. Approach for Achieving WQIP Goals

3.1.1 *WATER QUALITY IMPROVEMENT PLAN DEVELOPMENT PROCESS*

The WQIP is being developed in three phases. The first phase of WQIP development identified the priority water quality conditions and potential water quality improvement strategies and was summarized in the first WQIP submittal. The process for development and implementation of the WQIP is outlined by the diagram below. This chapter addresses the “Develop Goals” and “Develop Strategies” steps of the diagram. This chapter also summarizes the second phase of WQIP development and includes:

- Identification of the numeric goals for bacteria in the watershed;
- Strategies that will be implemented to achieve the numeric goals;
- Development of the optional watershed management area analysis; and

Figure 2. WQIP Development and Implementation Process

- Public participation and involvement.

The third phase of the Water Quality Improvement Plan will include a monitoring and assessment program (Provision B.4) to provide feedback to program managers, and an adaptive management process (Provision B.5) to facilitate modifications to the strategies and schedules to meet the goals as new information becomes available.

3.1.2 *Public Participation*

As required by the Permit, the San Diego River Participating Agencies are implementing a public participation process to solicit data, information, and recommendations for the development of the WQIP. On September 23, 2013, the San Diego River Participating Agencies issued a public call for data and information, announced future public workshops, and advertised a schedule of the opportunities for the public to participate and provide comments during the various stages of the WQIP development process. The public workshops were held on October 3, 2013 and on June 26, 2014 at the County of San Diego Chambers. Public comments, received at workshops and submitted online, were considered during development of the WQIP. Comments during the public workshop focused on controlling anthropogenic sources of bacteria, education and outreach to address pet waste, and reducing pollutant impacts. Responses to public comments will be provided prior to the finalization of the WQIP in June 2015.

The San Diego River Participating Agencies formed a WQIP Consultation Panel (Panel) to provide recommendations during the development of the WQIP. The Panel consists of representatives from the Regional Water Board, the environmental community, the development community, and an additional member from the industrial community. The Panel includes the following individuals:

- Christina Arias (Regional Water Board)
- Jim Peugh, primary; Joe Thompson, alternate (Environmental Community)
- Brendan Hastie, primary; Mike McSweeney, alternate (Development Community)
- Nancy Gardiner, Industrial Environmental Association (At-large Seat)

The first Panel meeting was held on January 29, 2014 at the City of San Diego Public Utilities Auditorium to discuss Provision B.2, *Priority Water Quality Conditions*. The second Panel meeting was held at the County of San Diego on August 20, 2014 to discuss Provision B.3, Goals, *Strategies and Schedules*. A third Panel meeting was held on October 29, 2014 at the County of San Diego to discuss draft goals. The San Diego River Participating Agencies coordinated the schedules for the public participation process among the San Diego County Watershed Management Areas to provide the public time and opportunity to participate during the development of the WQIPs. Feedback received at the workshops, via online submission, and at panel meetings was considered during the development of goals, strategies and schedules. In response to the Consultation Panel's comment on the draft Provision B.3 document, the goals were streamlined and the text expanded to provide a comprehensive explanation of the anticipated outcomes and how the outcomes would be measured. Additionally, a strategy section was added to improve the linkage between the actions and the anticipated outcomes.

3.2 Water Quality Improvement Goals and Schedules

The purpose of establishing goals is to "support Water Quality Improvement Plan implementation and measure reasonable progress towards addressing the highest priority water quality condition" [B.3.a.(1)]. The permit requires that goals be reflective of criteria or indictors to measure incremental progress towards addressing the highest priority water quality condition [HPWQC] over the course of implementation of the WQIP.

As described in Chapter 2 of this WQIP, bacteria is the HPWQC for dry and wet weather in the San Diego River watershed. The goals of the WQIP are focused to achieve compliance with the Bacteria TMDL from Attachment E of the Permit, which presents different options or pathways to achieve compliance. The goals are presented for dry and wet weather conditions as follows:

- Interim jurisdictional goals based on 5-year Permit terms.
- Interim goals based on the interim Bacteria TMDL compliance pathways.
- Final goals based on final Bacteria TMDL compliance options.

The latter two types of goals are already established in Attachment E of the Permit, and are herein referred to as "required goals". These goals are presented in this WQIP to reflect the multiple pathways outlined in the Permit for compliance with the TMDL. Each compliance pathway would result in water quality improvements, but each demonstrates the improvements in a different way. Since the permit allows any of these pathways to be followed to achieve compliance (i.e. demonstration of progress toward all compliance pathways is not required), the compliance pathways are independent of each other.

The compliance pathways are based on three types of metrics:

- receiving water conditions that are evaluated by comparing measured conditions with water quality objectives (numeric values and allowable exceedance frequencies – included to account for natural sources of bacteria);
- conditions of discharges from Copermittee's storm drain outfalls that are evaluated by comparing measured conditions to water quality objectives and/or required load reductions; and
- Implementation of the WQIP (i.e., establishment of goals, implementation of strategies and schedules).

Modeling has been conducted to establish numeric targets for the goals. Since there is an opportunity in 2016 to update the bacteria TMDL based on sound scientific studies, which may amend the current targets, goals may be modified based on outcomes of the bacteria TMDL revision process. As the WQIP is implemented, the Participating Agencies will use adaptive management, as discussed in Section 4 of this WQIP (to be submitted in June 2015), to re-evaluate goals and improve strategies to effectively address priorities.

Figure 3 illustrates the timelines and relationships between the goals; additional details on the proposed schedule are provided in Section 3.2.4.

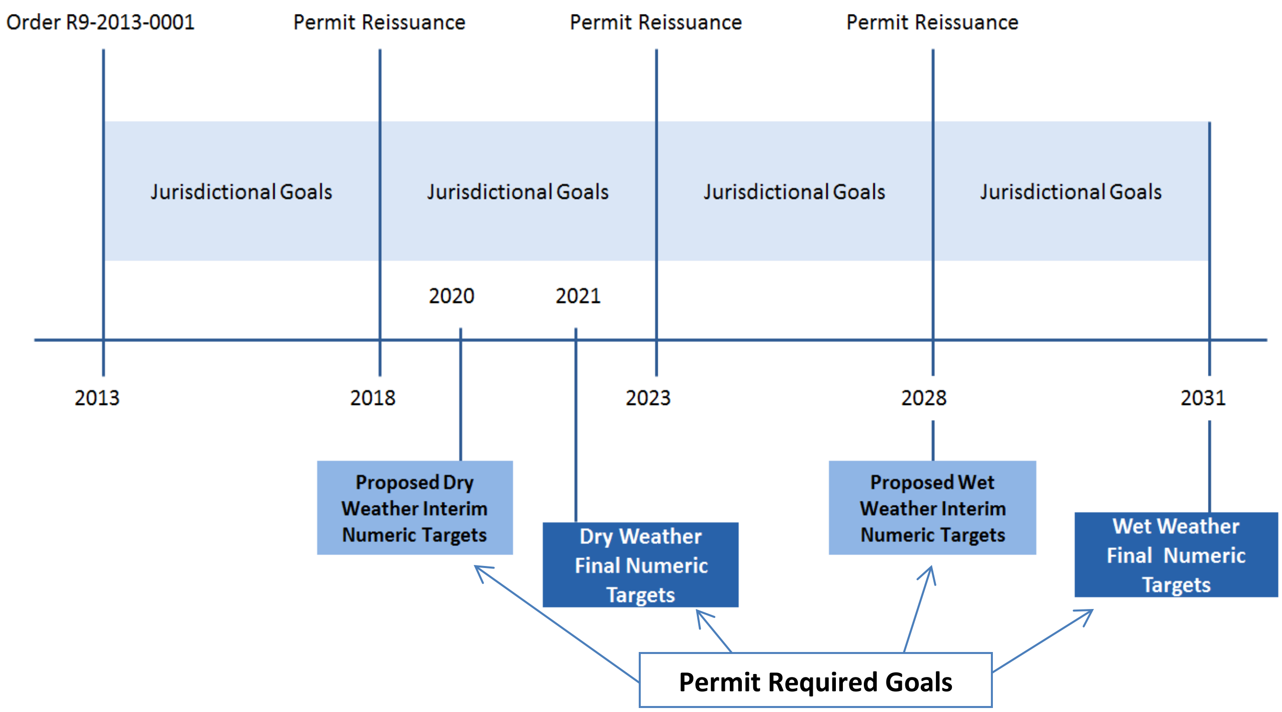

Figure 3. Timelines and Relationships between Bacteria TMDL Numeric Targets

3.2.1 *Compliance Pathways for Required Interim Goals*

Since each compliance pathway provides an independent option to demonstrate progress and ultimately compliance with the TMDL, any one of the following compliance pathways may be used for assessment purposes in the WQIP. That is, all pathways do not have to be assessed, but are options for use in the WQIP. The compliance pathways to achieve interim required goals, summarized from Attachment E of the Permit, are presented in Table 2.

Table 2. Compliance Pathways to Achieve Required Interim TMDL Goals

<table>
<tr><th rowspan="2">Pathway</th><th rowspan="2">Title</th><th rowspan="2">Interim Target</th><th rowspan="2">Metric</th><th colspan="3">Values to be met</th></tr>
<tr><th>Indicator</th><th>Dry[c]</th><th>Wet</th></tr>
<tr><td rowspan="3">1
OR</td><td rowspan="3">Meet bacteria allowable exceedance frequency of receiving water objectives</td><td rowspan="3">No exceedances of the interim receiving water limitations;</td><td rowspan="3">Exceedance frequencies as measured in receiving waters.</td><td>Total Coliform[a]</td><td>.28% AEF[d]</td><td>46% AEF</td></tr>
<tr><td>Fecal Coliform</td><td>0% AEF</td><td>43% AEF</td></tr>
<tr><td>Enterococcus</td><td>1.5% AEF</td><td>49%(creeks) 51% (Beaches) AEF</td></tr>
<tr><td>2
OR</td><td>No discharge from stormwater drain outfalls</td><td>No direct or indirect discharge from the Participating Agencies' storm drain outfalls to the receiving water;</td><td>Assessment of presence/absence of flow and connectivity with receiving water.</td><td colspan="3">Flow observations or measurements</td></tr>
<tr><td rowspan="3">3
OR</td><td rowspan="3">Reduce loads at storm drain outfalls</td><td rowspan="3">The pollutant load reductions for discharges from the Participating Agencies' outfalls are greater than the required load reduction;</td><td rowspan="3">Pollutant load reductions.</td><td>Total Coliform</td><td>37.02% reduction</td><td>19.07% reduction</td></tr>
<tr><td>Fecal Coliform</td><td>34.72% reduction</td><td>26.61% reduction</td></tr>
<tr><td>Enterococcus</td><td>46.98% reduction</td><td>21.37% reduction</td></tr>
<tr><td>4
OR</td><td>Show Exceedances are from natural sources</td><td>Demonstrate that exceedances of final receiving water limitations are due to loads from natural sources</td><td>Implement Natural Source Exclusion (NSE) Approach</td><td colspan="3">Monitoring and assessment of receiving water and watershed which supports the NSE approach</td></tr>
<tr><td>5
OR</td><td>No exceedances of final receiving water limitations</td><td>There are no exceedances of the final receiving water limitations in the receiving water at, or downstream of Participating Agencies' stormdrain outfalls</td><td>Assessment of receiving water</td><td colspan="3">Monitoring and assessment of receiving water indicating limitations have not been exceeded</td></tr>
<tr><td>6</td><td>Implement WQIP and use adaptive management</td><td>The Participating Agencies develop and implement an accepted WQIP[b]</td><td>Implementation of jurisdictional strategies</td><td colspan="3">Implementation of jurisdictional strategies as developed in accepted WQIP and designed to meet interim goals 1, 2 and/or 3.</td></tr>
</table>

a. Receiving water limitations for total coliform only apply to beaches.

b. The WQIP must provide reasonable assurance that the interim TMDL compliance requirements in Attachment E of the Permit will be met via implementation, must be accepted by the San Diego Regional Water Board, and must be fully implemented by the Participating Agencies.

c. Dry weather measurements at beaches.

d. AEF - allowable exceedance frequency is the percent of samples that can exceed the single sample maximum of geometric mean and still be in compliance; the AEF is calculated based on the presence of bacteria loading from natural sources

In addition to the interim goals, achievement of any of the final goals will satisfy compliance with the interim TMDL requirements, as they are more stringent than the interim goals.

3.2.2 *Compliance Pathways for Required Final Goals*

Similar to the interim TMDL goals, the final TMDL goals include multiple pathways to demonstrate compliance. The final goal pathways, summarized from Attachment E of the Permit, are presented in Table 3.

Table 3. Pathways to Achieve Required Final TMDL Goals

Compliance Pathway	Final Target	Final Metric	Measurement: Indicator	Dry Weather			Wet Weather	
				SSM[a]	GM[b]	AEF[c]	SSM	AEF
1 OR	No exceedances of the final receiving water limitations in the receiving water;	Bacteria concentrations (MPN or CFU/100 ml) and exceedance frequencies in receiving waters are less than or equal to allowable values;	Total Coliform[d]	10,000	1,000	0%	10,000	22%
			Fecal Coliform	400	200	0%	400	22%
			Enterococcus (beaches)	104	35	0%	104	22%
			Enterococcus (creeks)	61	33		61	
2 OR	No direct or indirect discharge from the Participating Agencies' storm drain outfalls to the receiving water;	Assessment of presence/absence of flow and connectivity with receiving water;	Flow observations or measurements.					
3 OR	There are no exceedances of the final effluent limitations at the Participating Agencies' storm drain outfalls;	Bacteria concentrations (MPN or CFU/100 ml) and exceedance frequencies in discharges;		Dry			Wet	
				SSM	GM	AEF[e]	SSM	AEF[f]
			Total Coliform[g]	10,000	1,000	0%	10,000	22%
			Fecal Coliform	400	200	0%	400	22%
			Enterococcus (beaches)[h]	104	35	0%	104	22%
			Enterococcus (creeks)[i]	61	33		61	
4 OR	The pollutant load reductions for discharges from the Participating Agencies' storm drain outfalls are greater than or equal to the final load reductions;	Load reductions in discharges are greater than or equal to required load reductions. The calculation requires an understanding of the baseline load[j], which can be used to estimate a target load reduction;		Percent Reduction (Dry)			Percent Reduction (Wet)	
			Total Coliform	74.03%			34.7%	
			Fecal Coliform	69.44%			34.7%	
			Enterococcus	93.96%			34.7%	
5 OR	Exceedances of the final receiving water limitations in the receiving water are due to loads from natural sources and pollutant loads from the Participating Agencies' storm drain outfalls are not causing or contributing to the exceedances;	Microbial source tracking results as measured in the receiving water downstream of stormwater drain outfalls;	Microbial source tracking results show anthropogenic markers are below the limits of reporting in the receiving water at the time of the exceedance in most samples.					
6	The Participating Agencies develop and implement an adopted Water Quality Improvement Plan that includes a watershed model or other watershed analytical tool(s)	Implementation of jurisdictional strategies designed to meet goals. Use an adaptive management approach to improve implementation of jurisdictional strategies to reach goals.	Implementation of jurisdictional strategies as outlined in the WQIP, and of the required monitoring and assessment program.					

a SSM = single sample maximum or the highest allowable concentration of bacteria contained in one discreet sample

b GM = geometric mean calculated based on multiple samples over a given time frame as defined by the Ocean Plan

c AEF = allowable exceedance frequency is the percent of samples that can exceed the single sample maximum of geometric mean and still be in compliance; the AEF is calculated based on the presence of bacteria loading from natural sources

d Receiving water limitations for total coliform only apply to beaches.

e For dry weather days, the dry weather bacteria densities must be consistent with the single sample maximum REC-1 water quality objectives in the Ocean Plan for discharges to beaches and the Basin Plan for discharges to creeks and creek mouths.

f The 22% single sample maximum allowable exceedance frequency only applies to wet weather days.

g Total coliform effluent limitations only apply to storm drain outfalls that discharge to the Pacific Ocean Shorelines and creek mouths listed in Table 6.0 of Attachment E of Order R9-2013-0001.

h This enterococcus effluent limitation applies to storm drain discharges to segments of areas of the Pacific Ocean Shoreline listed in Table 6.0 of Attachment E of Order R9-2013-0001.

i This enterococcus effluent limitation applies to storm drain discharges to segments of areas of the creeks or creek mouths listed in Table 6.0 of Attachment E of Order R9-2013-0001.

j The baseline loads for the lower SDR watershed were determined through modeling, and are presented in Appendix B. Wet weather target load reductions (TLRs) for this WQIP were taken from the City of San Diego Phase II CLRP (Tetra Tech 2013). Fecal coliform was used to represent all bacteria for the purposes of this modeling.

3.2.3 *Jurisdictional Goals*

The Participating Agencies have each developed "jurisdictional goals" to demonstrate individual progress towards interim and final TMDL goals and to meet the overall purpose of the Permit: to protect the physical, chemical and biological integrity of waterbodies. The Permit does not require each jurisdiction to have numeric goals in every permit term, only that one jurisdiction or the overall watershed has a numeric goal for each permit term. The implementation of goals will depend upon approval of funding in future annual budgets.

Each jurisdiction has developed its own goals that will result in a positive, measureable impact on water quality in the San Diego River Watershed. Wet and dry weather jurisdictional goals are proposed for each 5-year permitting cycle, through the implementation period of the Bacteria TMDL (2021 for dry weather and 2031 for wet weather). Jurisdictional goals for each participating agency are summarized below and in Tables 4 through 13.

3.2.3.1 Jurisdictional Goals for City of El Cajon

The City of El Cajon has established a dry weather goal for the 2013-2018 permit term involving the reduction of controllable dry weather persistent flows. Specifically, El Cajon's goal is to reduce the volume of dry weather flows or the number of storm drains with dry weather flows by 10%. The City of El Cajon will establish a baseline to for the volume reduction in 2015. Following the establishment of the baseline and initial reduction, El Cajon will maintain a 10% reduction in flows or the number of storm drains with dry weather flows and expand reduction based on program effectiveness and funding availability.

Table 4. City of El Cajon Dry Weather Jurisdictional Numeric Goals

Title	Metric	Baseline	Outcome	1st Permit Term Numeric Goals 2013 - 2018	2nd Permit Term Numeric Goals 2018 - 2023	
					TMDL Interim Compliance Date April 4, 2020 (b)	TMDL Final Compliance Date April 4, 2021
Reduce controllable dry weather persistent flows	% reduction of flow volume or number of outfalls with flows mitigated from persistently flowing storm drain outfalls.	Baseline will be developed from previous dry weather monitoring data.	Effectively reduce controllable dry weather flow from storm drain outfalls to receiving water.	Reduce the volume of dry weather flows or the number of storm drains with dry weather flows by 10%.	Maintain 10% reduction in flows or the number of storm drains with dry weather flows and expand reduction based on results of previous actions and availability of funds.	Effectively reduce dry weather discharges from storm drain outfalls to the receiving water.
Transient encampment removal events	Increase the number of annual transient encampment removal events throughout the City's drainage channels.	Yearly average of five (5) removal events during R9-2007-0001 permit cycle to help remove 25 cubic yards of trash and debris.	Increase annual transient encampment removal events to a minimum of eight (8) annual events to increase to 40 cubic yards of trash and debris to help reduce bacterial pollutant loads for total coliform fecal coliform and enterococcus.	Reduce gross pollutants that may contribute to bacteria loads by increasing the number of cubic yards of debris collected from drainage channels.	Continue to conduct a minimum of 8 transient encampment removal events per year and adjust the number of events accordingly to achieve compliance.	Continue to conduct a minimum of 8 transient encampment removal events per year and adjust the number of events accordingly and achieve compliance to achieve compliance with load reduction of 37.02% total coliform, 34.72% fecal coliform and 46.98% enterococcus respectively.

Table 5. City of El Cajon Wet Weather Jurisdictional Numeric Goals

Title	Metric	Baseline	Outcome	1st Permit Term 2013 - 2018	2nd Permit Term 2018 - 2023	3rd Permit Term 2023 - 2028	4th Permit Term 2028 - 2033
						Meet TMDL Interim Compliance Date April 4, 2028 (c) (d)	Meet TMDL Final Compliance Date April 4, 2031
Non-structural BMP (Creek Cleanup)	Reduce bacterial loads in Forrester Creek	5 cubic yards of solid waste (i.e. trash and debris) per cleanup event	Reduce trash and debris to help reduce bacteria loads.	Sponsor, coordinate with jurisdictions creek clean up events in 1 focused management area, bi-annually; segregate and quantify waste materials.	Sponsor, coordinate with jurisdictions creek clean up events in 1 focused management area, bi-annually; segregate and quantify waste materials.	Sponsor, coordinate with jurisdictions creek clean up events in 1 focused management area, bi-annually; segregate and quantify waste materials.	Reduce bacteria loads by an additional 14% (total 19 %) from the storm drain outfalls by continues implementation of programmatic Non-structural BMPs.
Non-structural BMP (Pet Waste Outreach)	Reduce bacterial loads in Forrester Creek	5 cubic yards of solid waste (i.e. trash and debris) per event	Reduce trash and debris to help reduce bacteria loads.	Expand pet waste management outreach to 1 focused management area; or to large properties owners (i.e. apartments, commercial facilities).	Expand pet waste management outreach to 1 focused management area; or to large properties owners (i.e. apartments, commercial facilities).	Expand pet waste management outreach to 1 focused management area; or to large properties owners (i.e. apartments, commercial facilities and educational institutions).	Reduce bacteria loads by an additional 14% (total 19 %) from the storm drain outfalls by continues implementation of programmatic Non-structural BMPs.
Structural BMPs feasibility study , adaptive management	Develop structural BMPs to help reduce bacterial load by 30%-40% to help meet wet weather TMDL allocations	Total Coliform 3,101 MPN/100mL (2004-2010 SDR outlet); Fecal Coliform Jurisdictional load (1993 Water year) $2{,}000\text{x}10^{12}$ MPN/yr; Enterococcus	Reduce total coliform, fecal coliform and enterococcus by 30-40%.	Develop feasibility study to assess dry/wet weather treatment control BMPs and draft environmental impact report for treatment control BMPs.	Complete EIR for treatment control BMPs (High Rate Media Filter - Gross Solids Filter).	Collaborate with other watershed jurisdictions for planning, conceptual design and full design for select BMPs engineering, siting, and environmental review as funding becomes available.	Operate and manage full scale BMPs (i.e. High Rate Media Filter), coordinate with the County of San Diego.

Title	Metric	Baseline	Outcome	1st Permit Term 2013 - 2018	2nd Permit Term 2018 - 2023	3rd Permit Term 2023 - 2028	4th Permit Term 2028 - 2033
						Meet TMDL Interim Compliance Date April 4, 2028 (c) (d)	Meet TMDL Final Compliance Date April 4, 2031
		252 MPN/100mL (2004-2010 SDR outlet)					
Implement WQIP with focus on programmatic BMPs and use adaptive management to increase effectiveness	Percent Total Coliform bacterial load reduction	Total Coliform 3,101 MPN/100mL (2004-2010 SDR outlet)	Reduce total coliform bacterial load by 19.07% from storm drain outfalls to help meet TMDL load reduction.	Implement programmatic (non-structural) BMPs to help achieve source reduction of bacterial loads from storm drain outfalls.	Reduce bacterial loads by 1% from storm drain outfalls through continued implementation of programmatic BMPs and structural BMP utilizing an adaptive management.	Reduce bacteria loads by an additional 4 % (total of 5%) from the storm drain outfalls by continued implementation of programmatic BMPs and structural BMPs.	Reduce bacteria loads by an additional 14% (total 19 %) from the storm drain outfalls by continues implementation of programmatic BMPs and structural BMPs.
Implement WQIP with focus on programmatic BMPs and use adaptive management to increase effectiveness	Percent Fecal Coliform bacterial load reduction	Fecal Coliform Jurisdictional load (1993 Water year) $2{,}000 \times 10^{12}$ MPN/yr	Reduce fecal coliform bacterial load by 26.61% from storm drain outfalls to help meet TMDL load reduction.	Implement programmatic (non-structural) BMPs to help achieve source reduction of bacterial loads from storm drain outfalls.	Reduce bacterial loads by 1% from storm drain outfalls through continued implementation of programmatic BMPs and structural BMP utilizing an adaptive management.	Reduce bacteria loads by an additional 4 % (total of 5%) from the storm drain outfalls by continued implementation of programmatic BMPs and structural BMPs.	Reduce fecal coliform bacterial load by 26.61% from the storm drain outfalls by continuing the implementation of programmatic BMPs and structural BMPs.
Implement WQIP with focus on programmatic BMPs and use adaptive management	Percent Enterococcus bacterial load reduction	Enterococcus 252 MPN/100mL (2004-2010 SDR outlet)	Reduce enterococcus bacterial load by 21.37% from storm drain outfalls to help meet TMDL load reduction.	Implement programmatic (non-structural) BMPs to help achieve source reduction of bacterial loads from storm drain outfalls.	Reduce bacterial loads by 1% from storm drain outfalls through continued implementation of programmatic BMPs and structural BMP utilizing an adaptive management.	Reduce bacteria loads by an additional 4 % (total of 5%) from the storm drain outfalls by continued implementation of programmatic BMPs and structural BMPs.	Reduce enterococcus bacterial load by 21.37% from the storm drain outfalls by continuing the implementation of programmatic BMPs and structural BMPs.

Title	Metric	Baseline	Outcome	1st Permit Term 2013 - 2018	2nd Permit Term 2018 - 2023	3rd Permit Term 2023 - 2028	4th Permit Term 2028 - 2033
						Meet TMDL Interim Compliance Date April 4, 2028 (c) (d)	Meet TMDL Final Compliance Date April 4, 2031
to increase effectiveness							

3.2.3.2 Jurisdictional Goals for City of La Mesa

The City of La Mesa has established the dry and wet weather goal of performing a creek restoration project on Alvarado Creek, upstream of the box culvert at the SR-125 freeway. The restoration will involve 900 feet of restoration along the creek. Following the completion of the restoration project, the City of La Mesa will conduct the Alvarado Trunk Main Sewer Replacement Project. The project will replace approximately .75 miles of trunk sewer located under or in very close proximity to Alvarado Creek.

Table 6. City of La Mesa Dry Weather Jurisdictional Numeric Goals

Title	Metric	Baseline	Outcome	1st Permit Term Numeric Goals 2013 - 2018	2nd Permit Term Numeric Goals 2018 - 2023	
					TMDL Interim Compliance Date April 4, 2020 (b)	TMDL Final Compliance Date April 4, 2021
Creek restoration project	Linear Feet of Structural Projects	Existing channel conditions	Structural Project Completion	Perform 900 LF of Alvarado Creek restoration program.	Conduct Alvarado Trunk Main Sewer Replacement Project which will replace approx. 0.75 miles of trunk sewer located under or in very close proximity to Alvarado Creek.	Meet TMDL Final Compliance Requirements [Attachment E, 6.b(3)]

Table 7. City of La Mesa Wet Weather Jurisdictional Numeric Goals

Title	Metric	Baseline	Outcome	1st Permit Term 2013 - 2018	2nd Permit Term 2018 - 2023	3rd Permit Term 2023 - 2028	4th Permit Term 2028 - 2033
						Meet TMDL Interim Compliance Date April 4, 2028 (c) (d)	Meet TMDL Final Compliance Date April 4, 2031
Creek restoration project	Linear Feet of Structural Projects	Existing channel conditions	Structural Project Completion	Perform 900 Linear Feet of Alvarado Creek restoration program.	Conduct Alvarado Trunk Main Sewer Replacement Project which will replace .75 miles of trunk sewer.	Comply with any of the TMDL Interim Compliance Requirements [Attachment E, 6.c(3)]	Comply with any of the TMDL Final Compliance Requirements [Attachment E, 6.b(3)]

3.2.3.3 Jurisdictional Goals for City of Santee

Recognizing that urban runoff is generally a controllable source that contributes to the mobilization of bacteria, the City of Santee will primarily focus its efforts on addressing dry weather runoff. Based on cumulative monitoring studies conducted by various organizations such as the San Diego River Park Foundations State of the River Report and those referenced and summarized within the Comprehensive Load Reduction Plan, the known sources of bacteria include anthropogenic (human and pet contributions), high density areas and industry (multi-family housing, high use areas such as retail centers, and eateries), outdoor water use and urban runoff (over irrigation, pavement washing), and natural (wildlife) contributors. Based on historical data from the City of Santee's Monitoring Program, the primary areas of concern (where bacteria exceedances are consistently measured) are at the outfalls along the river between Cuyamaca Street and Carlton Hills Boulevard.

With the overall objective of reducing or stopping controllable (non-permitted) sources of urban runoff, the City of Santee has selected four actions/goals for dry weather compliance: 1) Implement a dry-weather inspection and investigation program (separate from the monitoring program component); 2) Implement a 'complete property' inspection program which focuses attention to high density or high-use areas including multi-family housing developments and industrial/commercial centers; 3) Implement a component to the existing inspection program which addresses housekeeping practices at eateries; and 4) Promote outdoor water use efficiency and conservation practices.

For the first goal, the City will develop and implement a plan for conducting dry weather flow inspections and investigations of those areas tributary to the channels that are commonly known to have dry weather flows (Woodglen Vista Creek and Sycamore Creek). By performing inspection and upstream investigations on a routine basis, the City hopes to attain a reduction of outfalls with persistent flows. With the second goal, the City will map its inventory of businesses and multifamily – high density housing developments in correlation to the known bacteria exceedance outfalls, to identify high-priority areas to target program efforts. The City will inspect these properties in their entirety, as opposed to business based (ie: complete malls, retail centers, etc). Inspections will focus toward dumpster / trash enclosure maintenance. For the third goal, the City will implement a targeted approach to address housekeeping practices at local eateries to include grease management, trash enclosures, and outdoor seating areas. Lastly, efforts will address outdoor water use through partnerships with both the Santee Unified School District and Padre Dam Municipal Water District. The City will enhance its efforts to encourage outdoor water efficiency and conservation to prevent runoff through outreach, education, and inspections.

For the wet weather goals, the city of Santee will address trash removal as a way to prevent the mobilization and regrowth of bacteria. Plans include partnering with other organizations on river and/or community clean-up events, improvements to the encampment inspection and removal program, and increasing the number of pet waste stations and trash bins in regional parks. Efforts will be focused on those geographical areas that are identified to be contributing to the highest bacteria levels (as described in the dry-weather goals). Following this effort, Santee plans to retrofit a total of 1.6 acres of drainage area. Planning and conceptual design for structural BMPs will be conducted as need and funding becomes available.

Success will be measured by routine monitoring – both visual and physical sampling. Therefore, the City will implement a complimentary monitoring program that will be able to demonstrate program effectiveness, and progress toward attaining goals. Through an iterative approach, the City will be able to refine efforts as needed to improve the progress toward achieving the Bacteria goals within the WQIP and to comply with the TMDL. Success will be determined based on the ability to achieve measurable reductions in average bacterial loads within the City's jurisdiction.

Table 8. City of Santee Dry Weather Jurisdictional Numeric Goals

Title	Metric	Baseline	Outcome	1st Permit Term Numeric Goals 2013 - 2018	2nd Permit Term Numeric Goals 2018 - 2023	
					TMDL Interim Compliance Date April 4, 2020 (b)	TMDL Final Compliance Date April 4, 2021
Dry Weather Investigations	Visual confirmation	Number of dry weather flows based on 2013-2014 monitoring records.	Achieve a 25% reduction in urban runoff / dry weather flows, as measured at outfalls.	Implement a dry-weather inspection and investigation program (separate from the monitoring program component). Dedicate 10% of compliance inspection hours to conduct dry weather investigations.	Reduce the number of storm drain outfalls with dry weather flows in areas tributary to Woodglen Vista Creek and Sycamore Creek by 10%.	Reduce the number of storm drain outfalls with dry weather flows in areas tributary to Woodglen Vista Creek and Sycamore Creek by an additional 15% (25% total).
'Complete Property' Inspection Program	Visual and physical confirmation; monitoring of targeted outfalls to be performed before and during implementation	Average loading (monitoring year 2012-2013)	Achieve 25% reduction of bacteria load levels at outfalls downstream of high priority areas.	Inspect 50% high priority, high-density use areas (residential & commercial/industrial). Focused inspections on pavement, landscape and trash enclosures.	Inspect remaining high priority, high-density use areas (residential & commercial/industrial). Focused inspections on pavement, landscape and trash enclosures.	Identify problem sites and implement escalating enforcement actions to achieve full compliance.
Eateries Inspection Program	Visual and physical confirmation; monitoring of targeted outfalls to be performed before and during implementation	Average loading (monitoring year 2012-2013)	Achieve measurable reduction of bacteria load levels at outfalls downstream of high priority areas.	Inspect 50% of high priority eateries. Focused inspections on grease storage, trash enclosures, outdoor seating areas	Inspect remaining high priority eateries. Focused inspections on grease storage, trash enclosures, outdoor seating areas	Identify problem sites and implement escalating enforcement actions to achieve full compliance.
Outdoor Water Use Efficiency and Conservation	Pre & post surveys; reduction in water use.	Surveys; Average water use per capita; dry weather monitoring data	Achieve measurable reduction of average bacteria load levels at outfalls downstream from high priority areas.	Develop Residential Management Area (RMA) program. Distribute outreach materials addressing outdoor water use, water conservation, and water quality to all high-	Review 50% of projects that require landscape and irrigation plans for compliance with the City's Landscape Ordinance. Participate and/or promote incentive programs.	Full implementation of RMA program. Review 100% of landscape and irrigation plans for compliance with the City's Landscape Ordinance.

Title	Metric	Baseline	Outcome	1st Permit Term Numeric Goals 2013 - 2018	2nd Permit Term Numeric Goals 2018 - 2023	
					TMDL Interim Compliance Date April 4, 2020 (b)	TMDL Final Compliance Date April 4, 2021
				priority properties (areas). Partner with Santee School District to disseminate information and integrate efforts.		

Table 9. City of Santee Wet Weather Jurisdictional Numeric Goals

Title	Metric	Baseline	Outcome	1st Permit Term 2013 - 2018	2nd Permit Term 2018 - 2023	3rd Permit Term 2023 - 2028	4th Permit Term 2028 - 2033
						Meet TMDL Interim Compliance Date April 4, 2028 (c) (d)	Meet TMDL Final Compliance Date April 4, 2031
Retrofit projects	Acreage retrofitted	Existing retrofitted areas include Forester Creek and Woodglen Vista Creek	Retrofit a total of 2 acres of drainage area	Identify candidate locations for off-site compliance. Develop Water Quality Equivalencies (credit system).	Implement off-site (alternative) Compliance Program.	Develop and implement a plan for a Green Streets (a.k.a Complete Streets Program). Develop minimum BMPs for all CIP projects.	Full implementation of Alternative Compliance Program and Complete Streets program.
Trash Management Program	Trash removal rates/quantities (Tonnage removed); visual surveys	Average number of encampments; trash removal rate/quantity	Reduce average number of river encampments; decreased presence of trash (reduced removal rate/quantities)	Bi-monthly river encampment sweeps with follow up trash removal. Increase efforts to provide referrals to local community services.	Increase accessibility to various waste disposal needs.	Secure funding or community investments to provide and maintain public sanitary facilities.	Obtain community involvement to implement regular disposal and cleanup events.

3.2.3.4 Jurisdictional Goals for City of San Diego

In addition to the numeric goals based on Attachment E of the Permit identified in Tables 2 and 3, which demonstrate sustained water quality improvement over longer periods of time, interim wet and dry weather performance-based goals have been established by the City of San Diego to measure short-term jurisdictional progress toward achieving the final goals during the current permit cycle (Table 10).

The City of San Diego established a jurisdictional wet and dry weather interim numeric goal to develop and implement a policy that requires the inclusion of green infrastructure features on all suitable City projects, including non-SUSMP (Standard Urban Stormwater Management Plan) projects. This policy will be coordinated with ongoing efforts to update City design manuals and low-impact (LID) design standards for public LID BMPs. To guide implementation of the new policy, a green infrastructure program will be initiated in parallel. The program will begin with research and recommendations for ideal methods for green infrastructure project siting and prioritization within the City, but will ultimately result in the construction of additional green infrastructure projects. By FY 2018, the City will have implemented this policy, attained City Council approval, and constructed four green infrastructure BMPs within the WMA that will treat an estimated 58.4 acres of drainage area.

The City also established a jurisdictional dry weather interim numeric goal to implement a suite of irrigation runoff reduction programs that include more targeted education and outreach, enhanced business inspections, additional water conservation rebate programs, and increased enforcement. By FY 2018, the City anticipates a ten percent reduction in flow from its persistently flowing outfalls in the WMA during dry weather based on these efforts. Historical dry weather monitoring data will be used to establish baseline flows from persistency flowing outfalls.

Table 10. City of San Diego Dry Weather Jurisdictional Numeric Goals

Compliance Pathways		Baseline	Assessment Period and Fiscal Year		
			Current Permit Term	FY 16-20	FY 21-25
			FY18	FY19[1]	FY21[1]
Receiving Water % Days Exceeding WQO	Fecal coliform	12.6% Days Exceeding WQO (2002[2])	See performance measures	6.3%	0%
	Enterococcus	19% Days Exceeding WQO (2002[2])		9.5%	0%
OR					
MS4 Discharges % Days Exceeding WQO	Fecal coliform	Historic MS4 dry weather data will be used to identify the baseline in the first annual report	See performance measures	0%	0%
	Enterococcus			0%	0%
OR					
MS4 Discharges % Load Reduction	Fecal coliform	0% Load Reduction (2002 TMDL Model)	See performance measures	49.4%	98.8%
	Enterococcus			49.9%	99.9%
OR					
MS4 Discharges Implement Accepted Water Quality Improvement Plan		Metric for compliance analysis is MS4 discharge % load reduction (above). Interim compliance is implementation of strategies and schedule based on analysis results (Appendix E). Final compliance is implementation of BMPs based on analysis results and demonstration of compliance with any of the compliance pathways through monitoring and assessment. See Section 3.3.4 and Appendix E for modeling discussion			
OR					
MS4 Discharges # of Direct or Indirect MS4 Discharges to Receiving Water		Number of persistently flowing major MS4 outfalls provided in the Monitoring and Assessment Program Section of this WQIP	See performance measures	0	0
OR					
% of Exceedances of	Fecal coliform	Not available	100%	100%	100%

Compliance Pathways		Baseline	Assessment Period and Fiscal Year		
			Current Permit Term	FY 16-20	FY 21-25
			FY18	FY19[1]	FY21[1]
Final Receiving Water WQOs due to Natural Sources[3]	*Enterococcus*		100%	100%	100%

Performance Measures

Suite of Strategies to Measure Performance during First Permit Term	Baseline	FY18
Develop green infrastructure policy, attain City Council approval, and construct green infrastructure BMPs to improve water quality during wet and dry weather	0 acres treated in 2002, the year used as baseline in the Bacteria TMDL	58.4 acres of drainage area treated through construction of 4 green infrastructure BMPs
Irrigation runoff reduction programs including targeted education and outreach, enhanced inspections, rebates[4], and increased enforcement	Historical dry weather monitoring data will be used to establish a baseline in the first WQIP annual report	10% reduction in flow from baseline measured at persistently flowing outfalls in the WMA during dry weather

1. Denotes total maximum daily load (TMDL) interim and final water quality-based effluent limitation (WQBEL).
2. The existing exceedance frequency was calculated based on available monitoring data between 1996 and 2002 per MS4 Permit requirements and presented in more detail in Appendix B.
3. Demonstration of exceedances of final receiving water limitations due to natural sources includes demonstration that pollutant loads from MS4s are not causing or contributing to exceedances.
4. City of San Diego rebates include grass replacement, rainwater harvesting, downspout disconnect, and microirrigation.

% = percent; FY = fiscal year; WQO = Water Quality Objective

Table 11. City of San Diego Wet Weather Jurisdictional Numeric Goals

Compliance Pathways		Baseline	Goals by Assessment Period and Fiscal Year				
			Current Permit Term (FY14 – FY18)	FY 16-20	FY 21-25	FY 26-30	FY 31-36
			FY18	FY19	FY24[1]	FY29	FY31[1]
Receiving Water % Days Exceeding WQO	Fecal coliform	72% Days Exceeding WQO (2002 TMDL Model)	See performance measures	72%[2]	43%	35%	22%
	Enterococcus – San Diego River	78% Days Exceeding WQO (2002 TMDL Model)		78%[2]	49%	36%	22%
	Enterococcus – Pacific Ocean Shoreline	81% Days Exceeding WQO (2002 TMDL Model)		81%	51%	37%	22%
OR							
MS4 Discharges % Days Exceeding WQO	Fecal coliform	Historic MS4 wet weather data will be used to identify the baseline in the first annual report	See performance measures	22%	22%	22%	22%
	Enterococcus			22%	22%	22%	22%
OR							
MS4 Discharges % Load Reduction	Fecal coliform	0% Load Reduction (2002 TMDL Model)	See performance measures	5.2%	17.3%	23.9%	34.7%
	Enterococcus			4.2%	14.1%	19.5%	28.2%
OR							
MS4 Discharges Implement Accepted Water Quality Improvement Plan		Metric for compliance analysis is MS4 discharge % load reduction (above). Interim compliance is implementation of strategies and schedule based on analysis results (Appendix B). Final compliance is implementation of BMPs based on analysis results and demonstration of compliance with any of the compliance pathways through monitoring and assessment. See Section 3.3.5 and Appendix D for modeling results.					
OR							
MS4 Discharges # of Direct or Indirect MS4 Discharges to Receiving Water		Number of flowing major MS4 outfalls during wet weather monitoring (See Monitoring and Assessment Section of this	See performance measures	0	0	0	0

Compliance Pathways		Baseline	Goals by Assessment Period and Fiscal Year				
			Current Permit Term (FY14 – FY18)	FY 16-20	FY 21-25	FY 26-30	FY 31-36
			FY18	FY19	FY24[1]	FY29	FY31[1]
		WQIP).					
OR							
% Exceedances of Final Receiving Water WQOs due to Natural Sources[3]	Fecal coliform	Not available	100%	100%	100%	100%	100%
	Enterococcus		100%	100%	100%	100%	100%

Performance Measures		
Suite of Strategies to Measure Performance during First Permit Term	**Baseline**	**FY18**
Develop green infrastructure policy, attain City Council approval, and construct green infrastructure BMPs to improve water quality during wet and dry weather	0 acres treated in 2002, the year used as baseline in the Bacteria TMDL	58.4 acres of drainage area treated through construction of 4 green infrastructure BMPs

1. Denotes total maximum daily load (TMDL) interim and final water quality-based effluent limitation (WQBEL).
2. Denotes existing wet weather frequency as modeled in the Bacteria TMDL. With limited baseline monitoring data available, this goal reflects a reasonable estimate considering the difficulty in demonstrating progress within the receiving water during wet weather in a short amount of time. Furthermore, development and redevelopment of the urban environment has occurred since the Bacteria TMDL baseline loads were calculated in 2001. As such, this goal demonstrates that progress has been made by the Responsible Agencies by maintaining the existing wet weather exceedance frequency.
3. Demonstration of exceedances of final receiving water limitations due to natural sources includes demonstration that pollutant loads from MS4s are not causing or contributing to exceedances.

3.2.3.5 Jurisdictional Goals for County of San Diego

The County of San Diego has established dry weather numeric goals for the highest priority water quality condition of bacteria in the San Diego River watershed. To comply with the Permit's final TMDL compliance requirements, anthropogenic dry weather discharges from storm drain outfalls to the receiving water must be eliminated. Throughout the implementation of the WQIP, adaptive management will be used to evaluate reasonable progress toward the numeric goals and to consider changes to program design and project implementation, as needed to meet goals and as funding becomes available. This process will be further described in the final WQIP.

The dry weather goal was established to eliminate anthropogenic (excludes groundwater and other exempt or permitted non-stormwater flow) dry weather flow in storm drains to zero, in order to reduce pollutant loading to water bodies during dry weather. This goal will be accomplished through the implementation of numerous JRMP strategies to mitigate dry weather flows from storm drain outfall, as described in the County of San Diego JRMP. In particular, the County has shifted to a more active field program to better locate and abate dry weather flow. County Stormwater Staff spend a greater frequency of time present in Unincorporated communities identifying nuisance anthropogenic flows and addressing them through appropriate education and enforcement strategies. All County staff members have been trained to identify and report illicit discharges and illicit connections during required annual stormwater training; this training has been updated to reflect recent Permit changes.

In addition to the increase in County staff field surveillance, staff is also implementing a focused program to reduce flow at targeted storm drain outfalls that have demonstrated persistent dry weather flow conditions. Using dry weather monitoring data collected from 2013 to 2015, the County has determined 19 priority outfalls in the San Diego River Watershed that will be monitored for dry weather flow regularly. If dry weather flows are detected, staff will initiate a field investigation to seek out and abate the source of flow.

Using the above strategies, The County will target to reduce the number of persistently flowing outfalls by 20% by 2018. Alternatively, the County may demonstrate a 20% decrease in the aggregate flow of the stormwater outfalls by 2018. A baseline volume of flow would be established during FY 2015-16 through special monitoring studies. Efforts will be adaptively managed to mitigate dry weather flows and consider designing small-scale structural controls as needed during the second Permit term. For the final TMDL compliance goal, scheduled for April 2021, the overall goal is no discharges from the County of San Diego's storm drain outfalls to the receiving water, as demonstrated through the storm drain outfall monitoring program.

The County has established several wet weather numeric goals for the highest priority water quality condition of bacteria in the San Diego River watershed. One of the compliance options for the TMDL requires a 34.7% reduction of the bacteria load from storm drain outfalls by 2031. Half of the load reduction, 17.35%, is required by the interim TMDL target date. Programmatic approaches and structural BMPs are estimated to reduce bacteria loads by 10% and 24.7%, respectively.

The programmatic approach involves reducing bacteria loads from storm drain outfalls. The metric established is the implementation of the stormwater program, resulting in an estimated 10% reduction of the bacteria loads needed to meet compliance. The baseline established for the goal is to reduce the overall bacteria loads of 1,727x10^12 MPN/yr by 10%, demonstrated by the analytical spreadsheet approach. The load reduction is anticipated to take place incrementally by permit term, with a 2% reduction during the second permit term, a 4% reduction during the third permit term, and a 4% reduction during the fourth permit term. If the modeled reductions are not confirmed by monitoring, then program adjustments will be made according to the adaptive management process. This may require the incorporation of more effective strategies, changes in program design, or incorporation of additional structural BMPs if funding is available.

The County will implement distributed BMPs with the desired outcome of reducing bacteria loads from storm drain outfalls based on quantitative modeling estimates and bacteria loads reduced annually from storm drain outfalls. Retrofit projects implemented from 2003-2009 were used in the quantitative model to reduce the baseline loads. The percent reduction of baseline loads from drainage retrofitted was utilized as the metric for the retrofit goals. The first permit term goal includes the retrofitting of 392 acres through redevelopment requirements (treatment control BMPs), which results in a reduction of the baseline loads. Further planning and design will be developed in future permit terms as needed and as funding becomes available, with the goal of meeting the required reductions of the baseline load by the April 2031 final TMDL compliance, through construction of additional distributed structural BMPs for a reduction of up to 4% of bacteria loads.

The County also has a goal of developing a small-scale residential incentive program. This program is a public-private partnership program focused on residential participation. Opportunities to expand the program to include business community participation will also be explored. The outcome of the goal is the capture and use, or diversion of, bacteria loads from storm drain outfalls to landscaped areas. The metric for the goal is the percent reduction of baseline loads from construction of small-scale BMPs. An analytical spreadsheet was used to estimate the bacteria load reduction from rooftop stormwater runoff (Appendix C). The first permit term will be utilized for planning and evaluation of the feasibility of a pilot residential incentive program to encourage rain water use through rain barrels, roof downspouts redirected to landscaped areas, rain gardens and other small scale infiltration BMPs. If feasible, the second through the forth permit terms will include expansion of the program through incremental increases in the program scale (up to approximately 12% of single-family residences), and measured through reductions in the baseline bacteria loads of an estimated 2% for the second term, 6% for the third term, and a total of 9.8% by the forth term.

The County of San Diego also has established a multi-benefit goal of reducing bacteria in the stormwater conveyance system through implementation of structural BMPs. A partnership will be established with the Lakeside River Park Conservancy for potential structural BMP implementation. The baseline used for the goal includes quantitative modeling to estimate percent load reductions from structural BMPs, with the metric of a total bacteria load reduction of 11% of the baseline. The planning, full design, engineering, siting, and environmental review for select BMPs, will be conducted beginning in the second permit term as needed and as funding becomes available. Planning will continue through the third permit term. During the fourth permit term, the structural BMP(s) will be constructed, if needed and if funding is available, to meet final compliance load reduction goals (as demonstrated through modeling). The following structural BMP or equivalent will result in 11% load reduction based on the quantitative modeling summarized in Section 3.3.5 and detailed in Appendix D.

- SDCO-R-01: Regional BMP - Wet Pond/Subsurface flow wetland (Partnership with Lakeside River Park Conservancy)

- Suite of distributed BMPs
    - retrofits such as permeable pavement of parking lots, non-traveled right of way, and other localized infiltration or bioretention BMPs

Water quality monitoring of structural BMPs will be used to determine compliance with the final Bacteria TMDL goal.

Because there is uncertainty inherent in some of the modeling parameters used to estimate load reduction benefits, optional strategies have been developed for consideration to achieve load reduction goals if necessary. These will be implemented as necessary based on the adaptive management model upon which this WQIP is based. Optional jurisdictional strategies include methods that agencies may pursue if additional measures are necessary to meet and 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 and benefit as compared to other options and strategies, and the availability of funding.

Table 12. County of San Diego Dry Weather Jurisdictional Numeric Goals

Dry Weather Multi-Benefit Numeric Goals for Highest Priority Water Quality Condition - Bacteria(3)						
Title	Metric	Baseline	Outcome	1st Permit Term Numeric Goals 2013 - 2018	2nd Permit Term Numeric Goals 2018 - 2023	
					TMDL Interim Compliance Date April 4, 2020 (2)	TMDL Final Compliance Date April 4, 2021
Eliminate anthropogenic dry weather flows (1) from storm drain outfalls	% reduction of flow volume or number of outfalls with persistent flows	To be established FY 15-16 using dry weather flow measurements.	Effectively eliminate anthropogenic dry weather flow from storm drain outfalls to receiving water.	Reduce by 20 % the aggregate flow volume or the number of persistently flowing outfalls.	Reduce by 75 % the aggregate flow volume or the number of persistently flowing outfalls.	Effectively eliminate anthropogenic dry weather discharges from storm drain outfalls to the receiving water.

1. Here and throughout this table, the term "dry weather flows" excludes groundwater, other exempt or permitted non-stormwater flows, and sanitary sewer overflows.
2. Request moving Interim TMDL Compliance Date from April 4, 2017 (per Attachment E, 6.c(1)) to April 4, 2020 to allow adequate time to investigate and mitigate dry weather flows through the adaptive management process of the WQIP.
3. The County of San Diego is concerned that a long-term funding source is not identified for constructing and maintaining structural BMPs, if structural BMPs are needed to meet compliance.

Table 13. County of San Diego Wet Weather Jurisdictional Numeric Goals

Wet Weather Multi-Benefit Numeric Goals for Highest Priority Water Quality Condition - Bacteria[3]							
Title	Metric	Baseline	Outcome	1st Permit Term 2013 - 2018	2nd Permit Term 2018 - 2023	3rd Permit Term 2023 - 2028 Meet TMDL Interim Compliance Date April 4, 2028 [1] [2]	4th Permit Term 2028 - 2033 Meet TMDL Final Compliance Date April 4, 2031
Implement WQIP with focus on programmatic BMPs and use adaptive management to increase effectiveness	% bacterial load reduction	1,727 x 10^{12} MPN during Water Year 2003	Reduce baseline bacteria loads by 10 % from storm drain outfalls to meet TMDL required load reductions.	Implement programmatic (non-structural) BMPs to achieve source reduction of bacteria loads from the storm drain outfalls.	Reduce bacteria loads by 2 % from the storm drain outfalls through continued implementation of programmatic BMPs and, based on adaptive management, focus and enhance efforts where needed .	Reduce bacteria loads by an additional 4% (total 6%) from the storm drain outfalls by continued implementation of programmatic BMPs.	Reduce bacteria loads by an additional 4% (total 10 %) from the storm drain outfalls by continued implementation of programmatic BMPs.
Structural BMPs (as needed and as funding is available)	% bacterial load reduction based on quantitative model	1,727 x 10^{12} MPN during Water Year 2003	Reduce baseline bacteria loads by 24.7% from storm drain outfalls to receiving water to meet TMDL required load reductions.	Reduce by 1% the baseline bacteria loads from distributed BMPs constructed between 2003 and 2009 during redevelopment.	Reduce bacteria loads by an additional 2 % through participation in the downspout disconnect public private partnership program. Begin planning & design for additional long-term structural BMPs.	Reduce bacteria loads by an additional 6% through additional participation in the downspout disconnect public private partnership program. 3.3 % reduction through BMPS required through redevelopment; Continue planning & permitting for long-term structural BMPs.	Reduce bacteria loads by a total of 13.3% from constructed distributed and regional structural BMPs (11%), and redevelopment (public-private partnerships (2.3%).

1. Request moving Interim TMDL Compliance Date from April 4, 2021 (per Attachment E, 6.c(1)) to April 4, 2028 to allow adequate time to monitor progress through the adaptive management process of the WQIP
2. Progress toward final goals will be monitored and if implemented distributed BMPs are not enough then additional structural BMPs based on quantitative modeling conducted as part of the WQIP will be considered. To prepare for this contingency additional design and planning work will be conducted during Permit 2 and are included in the optional jurisdictional strategies of Provision B.3 Goals, Strategies and Schedule report. The County of San Diego is concerned that a funding source to construct, operate and maintain structural controls is not identified.
3. The County of San Diego is concerned that a long-term funding source is not identified for constructing and maintaining structural BMPs, if structural BMPs are needed to meet compliance.

3.2.3.6 Jurisdictional Goals for Caltrans

Caltrans storm water flows are not included in the Municipal Stormwater Permit; however, Caltrans is subject to similar requirements through its own stormwater permit (State Board, 2012b). Caltrans has voluntarily contributed to the Water Quality Improvement Plan effort to provide a consistent and subwatershed-wide approach to meeting applicable TMDL requirements. The baseline strategies are continuously implemented and augmented as resources become available. Attachment IV to the Caltrans Stormwater Permit outlines a methodology for prioritizing stream segments included in TMDLs to which Caltrans is subject. The permit establishes BMP implementation requirements, evaluated in terms of compliance units. Caltrans is expected to achieve 1,650 compliance units per year through the implementation of retrofit BMPs, cooperative implementation, and post-construction treatment beyond permit requirements.

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

Caltrans' jurisdiction areas include roadways, land adjacent to roadways, and facilities. Caltrans' jurisdictional strategies specifically focus on BMP implementation to reduce known pollutants within these areas. Caltrans' strategies vary from those of other Responsible Agencies (in both type and name) to best address freeway characterization discharges from its right-of-way. Strategies include programs developed by Caltrans Headquarters for statewide execution and District 11 implementation. Caltrans' implementation of strategies with the WMA is dependent on legislative approval. For Bacteria TMDLs, Caltrans is expected to eliminate dry weather flows by implementing control measures to ensure effective prohibition (Provision B.2 of the Stormwater Permit). For wet weather flows, Caltrans is expected to implement control measures or BMPs to prevent discharge of bacteria from the right-of-way; this can be source control and preemptive activities such as street sweeping, cleanup of illegal dumping, and public education on littering. Implementation of these controls is per the TMDL prioritization list currently under development.

3.2.4 *SCHEDULE FOR COMPLIANCE WITH INTERIM AND FINAL GOALS*

The proposed schedule below reflects the time necessary to implement the proposed strategies outlined in Section 3.3 of the WQIP and detailed in Appendices C, D, and E. Since there is an opportunity in 2016 to update the bacteria TMDL based on sound scientific studies, which may modify the current targets, the Participating Agencies propose an alternative schedule for interim TMDL compliance dates. The proposed schedule for achievement of final Bacteria TMDL (and the final jurisdictional goals) is consistent with final compliance schedules contained in the Permit. The proposed schedule for the interim and final goals is provided in Table 14.

Table 14. Proposed Compliance Dates for Goals

Condition	Compliance Date
Interim Dry weather	April 4, 2020 [a]
Final Dry weather	April 4, 2021
Interim Wet weather	April 4, 2028 [a]
Final Wet weather	April 4, 2031

[a] The interim schedules presented in the Permit are April 4, 2017 for dry weather and April 4, 2021 for wet weather; as allowed by the Permit, the Participating Agencies propose an alternative schedule for interim TMDL compliance dates.

As stated above, the Participating Agencies propose an alternative schedule for interim TMDL compliance dates. Key considerations to support moving the Dry Weather Bacteria Interim Goal from 2017 to 2020 include:

- Allow time to ramp up efforts and leverage strategies to comply with the 2013 Permit requirement to effectively prohibit discharge of dry weather flows from the storm drain outfalls to waterbodies; and
- Allow time to investigate the sources of discharges to the storm drain system that may include the following activities:
  - Ramp up efforts to address spray from over-irrigation and leverage efforts with the water conservation message from the water districts in response to the current drought conditions; and
  - Prioritize discharges from storm drain outfalls using, for example, visual observation, genetic test results, closed circuit television, or other methods, and characterize the source(s) of persistent dry weather flows.

Key considerations to support moving wet weather interim goal from 2021 to 2028 include:

- Allow time to build on the successes of the nonstructural approaches such as education and outreach to the public to pick up pet waste, increased usage of downspout disconnects and rain barrels, increased use of swales and other bioretention devices to treat rainfall close to the source.
- Allow time for the current processes on potential updates to the Bacteria TMDL from stakeholder studies and a statewide update to the bacteria standards to evolve as these efforts could affect the number and/or sizing of structural controls:

    - The Copermittees have the opportunity to revisit the Bacteria TMDL in 2016 and are in the process of conducting studies to provide the scientific basis for proposed changes to the Bacteria TMDL.
    - The State Water Resources Control Board is conducting an effort to update the California bacterial standards for recreational activities to consider the United State Environmental Protection Agency's 2012 Recommended Recreational Guidelines. The scheduled adoption date is 2016.
- Assuming approximately seven years is required for a structural BMP to go from the planning phase through to construction, and if project planning began in 2017, the first complete structural BMP could be installed by 2024, if needed, to meet interim compliance goals. This exceeds the current interim deadline of 2021. Additional time is required to demonstrate the effectiveness of structural BMPs and to leverage lessons learned to cost effectively plan an implementation schedule for additional structural BMPs. For jurisdictions in multiple watersheds, an interim compliance date of 2028 provides the flexibility in having a staggered phasing plan for different watersheds.
- The County of San Diego is concerned that a long term funding source has not been identified to for the construction and ongoing operation and maintenance of the structural BMPS. An interim compliance date of 2028 allows additional time needed to pursue a long term funding source.

The goals will be achieved through implementation of the strategies summarized in Section 3.3 and further detailed in Appendices C, D, and E. The strategies are designed to attain the required and jurisdictional goals for the San Diego River Watershed and would be implemented at the jurisdictional scale.

3.3 Water Quality Improvement Strategies

Multi-benefit Approach

Strategies were selected based on their ability to address multiple pollutants in addition to bacteria, and their potential to provide other benefits such as habitat, water resources, aesthetic, air quality, downstream stream integrity, and flood/drainage benefits.

Once the goals have been set, the Participating Agencies must develop strategies to meet the goals. As with the goals, each jurisdiction has developed its own strategies that will be implemented to work toward its goals. The Participating Agencies have also developed optional watershed strategies that, if needed, would be implemented through coordination amongst the Participating Agencies. The jurisdictional strategies for each participating agency are presented in the tables in Appendix A.

3.3.1 *Link Between Goals and Strategies*

The strategies are generally broad in nature and include suites of programmatic (a.k.a. non-structural) and structural BMPs that are expected to improve conditions within the watershed. The majority of the strategies selected are multi-benefit in nature, addressing multiple pollutants, beyond bacteria. As an example, a goal may call for reduction of bacteria loads at storm drain outfalls in order to meet the interim, and then the final TMDL requirements. Strategies that could be implemented to achieve this goal may include programs for illicit discharge identification, reporting and enforcement; approaches to address impacts of septic systems and sanitary sewers; designating and requiring BMPs for construction projects; addressing impacts of irrigation runoff; implementing or improving pet waste and trash management programs. Additionally, targeting key issues in residential areas could include homeowner's association collaborations,

Non-Structural Strategies Management actions or programs designed to address pollutant loading at the source.

Distributed Structural Strategies - Treatment or volume mitigation BMPs implemented at the neighborhood, parcel or site scale and designed to detain, retain, filter, remove, or prevent the release of pollutants to receiving waters.

Regional Structural Strategies - Treatment or volume mitigation BMPs implemented to treat stormwater from sub-watershed or catchment scale drainage areas.

outreach tasks and materials consisting of mailing lists, door-to-door handouts and promoting water conservation rebates. While each of these example strategies would help reduce multiple pollutants, they would all reduce bacteria loading to the storm water conveyance system and thereby improve conditions within the watershed. Section 3.3.5.4 provides quantification of these strategies and compares them to the target load reduction needed to meet Permit requirements.

Green BMPs (or Green Infrastructure) are defined as distributed or centralized/regional stormwater control measures that utilize natural treatment processes that emphasize infiltration, capture and use, and biofiltration, thereby addressing nearly all pollutants. Green BMPs may provide flood/drainage, habitat, water resources, aesthetic, air quality, and downstream stream integrity benefits. Typical types of Green BMPs include, but are not limited to bioretention and biofilters, green streets, rain gardens, infiltration trenches and swales, pocket parks and wetland systems.

3.3.2 *Description of Strategies*

The Permit establishes that WQIP strategies should be identified based on their likelihood to "effectively prohibit non-stormwater discharges to the stormwater conveyance system, reduce pollutants in storm water discharges from the stormwater conveyance system to the maximum extent practicable, protect the beneficial uses of receiving water from storm drain 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 WQIP may be categorized as either non-structural, or structural BMPs (including both distributed and regional green BMPs). Non-structural BMPs can be municipal programmatic or regulatory measures, public education and outreach, financial incentives, or other management programs designed to effect behavioral changes. Distributed structural green BMPs include features such as rainwater harvesting and Low Impact Development-type solutions. Regional structural BMPs include large-scale bioretention systems and treatment wetlands (see appendices D and E).

This WQIP prioritizes non-structural BMPs for early implementation, with emphasis on those which most directly address risks to human health. Source control measures will also be aggressively implemented early on to address dry weather compliance goals to reduce all non-permitted non-stormwater discharges. Dry weather load reductions associated with the dry weather compliance goals are further discussed in Appendix E. Wet weather load reductions will be achieved through implementation of both non-structural and structural BMPs.

Within this larger framework, criteria for strategy selection include:

- BMP effectiveness for reduction of bacteria and priority water quality conditions;
- Provision of multiple benefits, including but not limited to habitat, recreation, economic, and water resources benefits; and
- The degree to which the strategy is sustainable, implementable, and cost-effective.

Potential non-structural and structural BMP strategies were identified in Section 2.5 of this WQIP. The following subsections describe the specific strategies within each of these categories that are being proposed for implementation.

3.3.3 *JURISDICTIONAL STRATEGIES*

The Participating Agencies have identified jurisdictional strategies that will be implemented as part of their Jurisdictional Runoff Management Programs (JRMP) that are designed to effectively prohibit non-stormwater discharges to the stormwater conveyance system, 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 3.2. The jurisdictional strategies are detailed further in Appendix A.

The jurisdictional strategies can be categorized into three types:

- Strategies building on the required JRMP elements in Provision E of the Permit. These include the JRMP requirements as well as modifications and enhancements within the program elements to provide a more focused approach specifically addressing bacteria;
- Optional jurisdictional strategies that may be implemented to achieve the interim and final goals; and
- Coordinated strategies involving cooperation between multiple agencies working towards the common goals within the watershed.

3.3.3.1 Jurisdictional Runoff Management Plan (JRMP) Approach

Under the Stormwater Permit, four primary jurisdictional programs are required to be included in each participating agency's JRMP. Each program is required to have its own inventory of sources. The four primary programs are:

- Illicit Discharge Detection and Elimination (stormwater outfall inventory) [D.2];
- Development Planning (Priority Development Project and BMP inventory) [E.3];
- Construction Management (Construction site inventory) [E.4]; and
- Existing Development Management (Industrial, Commercial, Municipal, Residential inventories) [E.5].

The Participating Agencies have identified known and suspected sources contributing to bacteria loading and BMPs to address the sources of bacteria in Provision B.2. These known and suspected sources include storm drain outfalls with persistent (non-stormwater or dry weather) flow and certain land use activities. The number of outfalls in each participating agency's jurisdiction with persistent flow is included in Table 15. The numbers of pollutant generating facilities, areas, and activities associated with the construction and existing development inventories for each jurisdiction are presented in Table 16.

Table 15. Number of Copermittee Stormwater Outfalls with Persistent Non-Stormwater Flow

Jurisdiction	Persistent Outfalls[a]
City of El Cajon	3
City of La Mesa	8
City of Santee	13
City of San Diego	86
County of San Diego	9

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

Table 16. Pollutant Generating Facilities, Areas, and/or Activities

<table>
<tr><th>Land Use</th><th>County of San Diego</th><th>City of San Diego</th><th>City of Santee</th><th>City of La Mesa</th><th>City of El Cajon</th></tr>
<tr><td>Construction Sites</td><td>288</td><td>247</td><td>14</td><td>28</td><td>12</td></tr>
<tr><td>Commercial Sites</td><td>493</td><td rowspan="2">3,703</td><td>540</td><td>342</td><td>700</td></tr>
<tr><td>Industrial Sites</td><td>79</td><td>N/A</td><td>17</td><td>104</td></tr>
<tr><td>Municipal Sites</td><td>40</td><td>57</td><td>17</td><td>49</td><td>34</td></tr>
<tr><td>Parks/Recreational Areas</td><td>25</td><td>67</td><td>279 acres</td><td>--</td><td>78 acres</td></tr>
</table>

Nonstructural BMPs that will be implemented to address bacteria include those required by Provision E of the Permit. Some of these programs are new, required under the most recent Permit, while others are existing programs that have been implemented by the participating agencies for many years. Additional strategies and BMPs have been developed to complement the existing Permit requirements for JRMPs. The Participating Agencies have also included suggestions received by the public at workshops.

The following subsections and tables describe the potential sources of bacteria and the strategies and BMPs that the Participating Agencies will employ through their JRMP to address bacteria and other pollutants and associated sources within the watershed. Each jurisdiction will take specific actions to implement the strategies. These actions, included in Appendix A, provide a bridge from the planning level strategies developed in the Water Quality Improvement Plan to each jurisdiction's JRMP. For a full description of the non-structural BMPs, including specific policies and procedures, the reader is referred to the JRMP documents for each jurisdiction that are concurrently being developed with the WQIP.

Caltrans' jurisdiction areas include roadways, land adjacent to roadways, and facilities; Caltrans' jurisdictional strategies specifically focus on BMP implementation to reduce known pollutants within these areas. Caltrans is not a party to the regional Permit; however, Caltrans is subject to TMDL requirements through its statewide Permit (SWRCB, 2013). Caltrans' strategies vary from those of other Responsible Agencies (in both type and name) to best address typical discharges from its jurisdictional areas. Strategies include programs being implemented by both Caltrans

Headquarters for statewide execution and District 11 for local implementation; implementation of these strategies within the San Diego River Watershed is dependent on state funding. Caltrans has voluntarily contributed to the Water Quality Improvement Plan effort to provide a consistent approach to meeting applicable Draft Sediment TMDL and Bacteria TMDL requirements. The strategies developed will be implemented as resources are available.

For Bacteria TMDLs, Caltrans is expected to eliminate dry weather flows by implementing control measures to ensure effective prohibition (Provision B.2 of the Permit). For wet weather flows, Caltrans is expected to implement control measures/BMPs to prevent discharge of bacteria from its ROW; this can be source control and preemptive activities such as street sweeping, clean-up of illegal dumping and public education on littering. Implementation of these controls is per their TMDL prioritization list. For more information related to the Caltrans stormwater program, the reader should refer to their Stormwater Management Plan (July 2012).

3.3.3.2 Illicit Discharge Detection and Elimination

Strategies to address bacteria loading developed by the Participating Agencies related to the Illicit Discharge Detection and Elimination (IDDE) Program are described in Table 17. While the focus is on bacteria, these strategies address multiple pollutant sources and constituents. For each strategy, the table identifies the agencies that will implement associated programs and what sources and pollutants will be addressed. Details on the jurisdictional programs that the agencies will implement to support these watershed strategies, including the schedules for implementation and the frequencies in which these programs will be implemented, are included in Appendix A.

Table 17. Jurisdictional Strategies Related to the Illicit Discharge Detection and Elimination Program

San Diego River Watershed Illicit Discharge Detection and Elimination Program Strategies	Agency						Pollutant Sources					Highest Priority Water Quality Condition	Priority Water Quality Conditions			
	City of El Cajon	City of La Mesa	City of San Diego	City of Santee	County of San Diego	Caltrans	Residential	Municipal	Commercial	Industrial	Construction	Bacteria	Nutrients	Eutrophic Conditions	Total Dissolved Solids	Index of Biotic Integrity
1. Engage the public, jurisdictional staff, and other agency staff to proactively identify and report illicit discharges.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
2. Develop and implement approaches to address the impacts of septic systems within the watershed.	•	•			•											
3. Develop and implement approaches to address the impacts of homeless activities within the watershed.	•	•		•								•	•	•		
4. Develop and implement approaches to reduce the impacts of public and private sanitary sewer systems within the watershed.	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
5. Implement monitoring programs to provide new information to refine the prioritization of drainage areas.	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
6. Actively educate public on prohibitions related to illicit discharges and connections.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

3.3.3.3 Development Planning

Previous Stormwater permits in 2001 and in 2007 designated specific types of new development and redevelopment projects as "priority development projects" or PDPs, requiring specific site design, source control, and structural treatment control BMPs to be implemented for qualifying projects. The 2007 Stormwater Permit also required certain PDPs to implement controls to mitigate increases in peak flow and volumes of stormwater. With the 2013 Stormwater Permit, these requirements were further intensified with the new requirement for full on-site retention of the 24-hour 85th percentile storm volume. With limited exceptions, new development and redevelopment projects are required to *retain* stormwater and its associated pollutants (including bacteria) on-site, to reduce the impacts on receiving waters during storm events. In most cases, the post-construction BMPs are also designed to intercept and infiltrate dry weather flows, providing significant pollutant reduction, and often full elimination under ambient conditions.

Priority Development Projects (PDPs) are new development and redevelopment projects that create, add, or replace large areas of impervious surfaces and are subject to stormwater retention and hydromodification requirements, in addition to the source control and treatment control requirements for all projects.

Projects that meet the following conditions are classified as PDPs:

- Residential development: new development creating 10,000 square feet of impervious surfaces or redevelopment creating/replacing 5,000 square feet or more;
- Commercial developments: new development creating 10,000 square feet of impervious surfaces or redevelopment creating/replacing 5,000 square feet or more;
- Parking lots with 5,000 square feet or more of impervious surface; and
- Streets, roads, highways, and freeways with 5,000 square feet or more of impervious surface.

The implementation of baseline permit requirements for new development and redevelopment projects will mitigate pollutants (including bacteria and other priority water quality conditions) and ensure that these projects do not cause degraded water quality conditions downstream of the project site.

Participating Agencies will implement permit requirements, aligned outreach and training programs, and are considering the potential for an alternative compliance program (further discussed in Section 3.4). These elements make up the strategies for the Development Planning element of the programs. The strategies developed to implement the Development Planning Program, focusing on bacteria where applicable, are included in Table 18. The table includes the strategies to be implemented by the Participating Agencies and the sources and pollutants that will be addressed. Details describing the programs that the agencies will implement to support these watershed strategies, including the schedules for implementation and the frequencies that these programs will be implemented, are included in Appendix A.

Table 18. Jurisdictional Strategies Related to the Development Planning Program

San Diego River Watershed Development Planning Program Strategies	Agency						Pollutant Sources					Highest Priority Water Quality Condition	Priority Water Quality Conditions			
	City of El Cajon	City of La Mesa	City of San Diego	City of Santee	County of San Diego	Caltrans	Residential	Municipal	Commercial	Industrial	Construction	Bacteria	Nutrients	Eutrophic Conditions	Total Dissolved Solids	Index of Biotic Integrity
1. Provide updated materials, enhanced outreach, and training to convey land development requirements.	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•
2. Develop and implement LID programs to complement standard permit requirements.	•		•	•			•	•	•	•		•	•	•		
3. Implement a Watershed Management Area Analysis to develop watershed specific requirements for structural BMP implementation and identify a list of candidate projects that could be used as alternative compliance options for Priority Development Projects.	•	•	•	•	•		•	•	•	•		•	•	•	•	•
4. Consider development of an alternative compliance program for Priority Development Projects.	•	•	•	•	•		•	•	•	•		•	•	•	•	•
5. Implement a post construction BMP program for development projects to ensure proper construction and maintenance.	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•
6. Enforce post construction requirements related to new and redevelopment.	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•

3.3.3.4 Construction Management

Based on the evaluations performed in the Long Term Effectiveness Assessment[3], construction sites are unlikely to be a significant source of bacteria loading. However, there are particular sources and/or activities on construction sites that have the potential to general bacteria including vehicle equipment, maintenance, and repair, portable toilets, and waste storage/handling (i.e., trash).

The participating agencies have been implementing construction stormwater programs for several permit terms. Over this time, agency staff and the construction community have become well trained in construction stormwater management. Additional oversight is required per the State Construction General Permit (Order 2009-0009-DWQ) for sites greater than one acre. With this amount of focus, the limited sources of bacteria related to construction are well addressed via the existing permit requirements. For this reason, the Participating Agencies will focus on the baseline programs as required under the 2013 Stormwater Permit.

Table 19 summarizes the various strategies developed to implement the Construction Program, focusing on bacteria where possible. The table includes the strategies to be implemented by the Participating Agencies and the sources and pollutants that will be addressed. Details describing the programs that the agencies will implement to support these watershed strategies, including the schedules for implementation and the frequencies in which these programs will be implemented, are included in Appendix A.

[3] The San Diego Stormwater Copermittees, Urban Runoff Management Programs, "2011 Long-Term Effectiveness Assessment", available on the Project Clean Water website: http://www.projectcleanwater.org/index.php?option=com_content&view=article&id=184%3Along-term-effectiveness-assessment&catid=16&Itemid=91

Table 19. Jurisdictional Strategies Related to the Construction Management Program

San Diego River Watershed Construction Management Program Strategies	Agency						Pollutant Sources					Highest Priority Water Quality Condition	Priority Water Quality Conditions			
	City of El Cajon	City of La Mesa	City of San Diego	City of Santee	County of San Diego	Caltrans	Residential	Municipal	Commercial	Industrial	Construction	Bacteria	Nutrients	Eutrophic Conditions	Total Dissolved Solids	Index of Biotic Integrity
1. Ensure that minimum BMPs are designated and required for construction projects.	•	•	•	•	•	•					•	•	•	•		
2. Provide enhanced outreach and coordination to convey construction requirements.	•	•	•	•	•	•					•	•	•	•		

3.3.3.5 Existing Development Management

The Existing Development Management Program addresses a variety of sources including commercial/industrial, residential, and municipal areas and activities. The distribution of baseline bacteria loads within the lower watershed by Participating Agency is illustrated in Figure 4. A majority of the land uses within the lower watershed are regulated under the Existing Development Management Program. For the purposes of the baseline loading analysis, as well as subsequent BMP implementation analyses presented in this WQIP, land use loads attributable to federal and tribal land ownership are not considered part of the Participating Agencies' load since the Participating Agencies do not have jurisdiction over these lands. Similarly, loading from agricultural land uses is not considered part of the Participating Agencies' load because the TMDL identifies Conditional Waivers of Waste Discharge Requirements as the mechanism to address discharges from controllable non-point sources (SDRWQCB 2010, p. A47). Open space loading is also shown as a separate category here, consistent with the TMDL. However, it should be noted that this general land use category includes parks and other undeveloped areas that are located within the Participating Agencies' jurisdictional areas and that drain to or through the stormwater conveyance system.

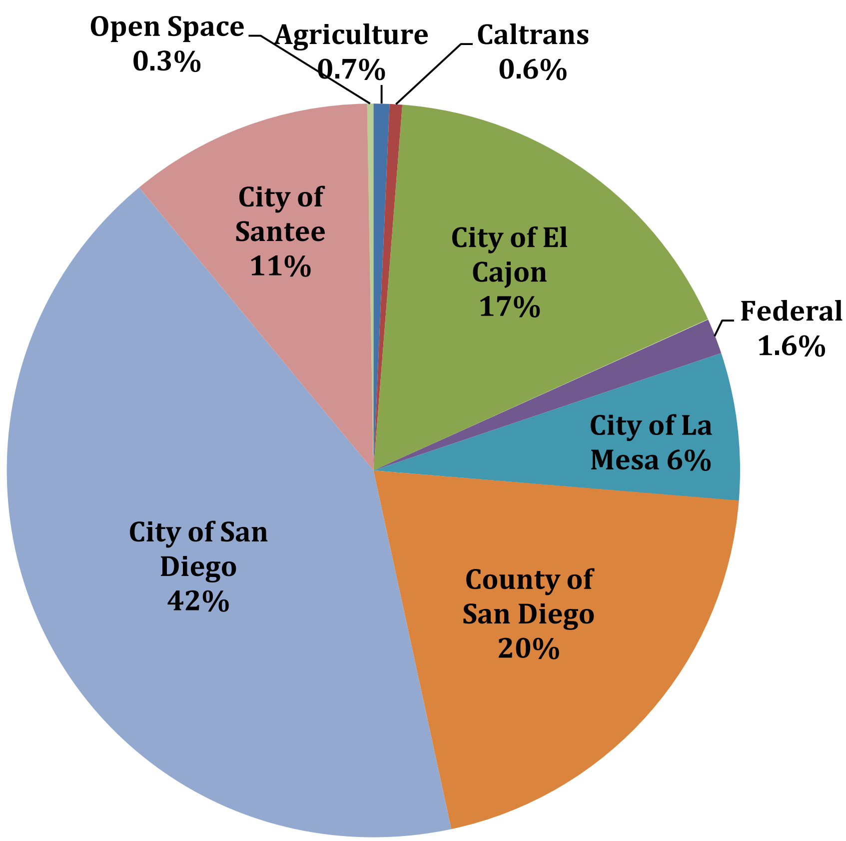

Figure 4. Wet Weather FC Modeled Loads in the San Diego River Watershed by Land Use/ Jurisdictional Category, Water Year 2003.

Using experience gained through the implementation of the Existing Development Management Program, Participating Agencies identified strategies which will address bacteria within their jurisdictions. These strategies build on existing programs established during previous Permit cycles.

Table 20 summarizes the various strategies to be implemented within the Existing Development Management Program to focus on bacteria. The table includes the strategies to be implemented by the Participating Agencies and the sources and pollutants that will be addressed. Details describing the programs that the agencies will implement to support these watershed strategies, including the schedules for implementation and the frequencies that these programs will be implemented, are included in Appendix A.

Table 20. Jurisdictional Strategies Related to the Existing Development Management Program

San Diego River Watershed Existing Development Management Program Strategies	Agency						Pollutant Sources					Highest Priority Water Quality Condition	Priority Water Quality Conditions			
	City of El Cajon	City of La Mesa	City of San Diego	City of Santee	County of San Diego	Caltrans	Residential	Municipal	Commercial	Industrial	Construction	Bacteria	Nutrients	Eutrophic Conditions	Total Dissolved Solids	Index of Biotic Integrity
1. Maintain and improve data tracking methods for existing development inventories where necessary.	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•
2. Develop and implement approaches to address the impacts of improper water use and irrigation runoff.	•	•	•	•	•		•	•	•	•		•	•	•	•	
3. Improve and/or continue existing pet waste programs.	•	•	•	•	•		•	•				•	•	•		
4. Improve trash management strategies within the watershed.	•	•	•	•	•	•	•	•	•	•		•				
5. Develop and implement approaches to reduce the impacts of public and private sanitary sewer systems within the watershed.	•	•	•	•	•		•	•	•	•		•	•	•		
6. Improve and implement existing outreach programs to target key sources and pollutants.	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•
7. Enhance existing Stormwater maintenance programs.	•			•		•		•				•				
8. Develop and implement targeted programs to address issues in residential areas.	•	•	•	•	•		•					•	•	•	•	
9. Improve existing inspection programs to more efficiently target key sources.	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•

San Diego River Watershed Existing Development Management Program Strategies	Agency						Pollutant Sources					Highest Priority Water Quality Condition	Priority Water Quality Conditions			
	City of El Cajon	City of La Mesa	City of San Diego	City of Santee	County of San Diego	Caltrans	Residential	Municipal	Commercial	Industrial	Construction	Bacteria	Nutrients	Eutrophic Conditions	Total Dissolved Solids	Index of Biotic Integrity
10. Actively enforce stormwater and urban runoff requirements for existing development.	•	•	•	•	•		•	•	•	•		•	•	•	•	•
11. Identify and facilitate retrofit opportunities in areas of existing development.	•	•	•	•	•	•	•	•	•			•	•	•	•	
12. Perform strategic monitoring to improve understanding of sources and water quality within the watershed.					•		•	•	•	•		•	•	•	•	•
13. Improve coordination between agencies.	•	•		•	•		•	•				•	•	•		

3.3.3.6 *Optional Jurisdictional Strategies*

Optional jurisdictional strategies include those that agencies may implement if specific considerations are met to achieve interim and final numeric goals as defined by the water quality improvement plan. 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. Some optional strategies that may be implemented are included in Table 21.

Table 21. Optional Jurisdictional Strategies

Optional Strategy and Program	Participating Agency						Consideration(s) for Implementation	Funding
	City of El Cajon	City of La Mesa	City of San Diego	City of Santee	County of San Diego	Caltrans		
Support workgroup to provide sanitation and trash management for persons experiencing homelessness and determine if the program is suitable and appropriate for jurisdictional needs to meet goals. (IDDE)			•	•			The triggers the City must have to participate in this optional strategy include: 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, 3) staff resources are identified and secured, 4) partners have been identified and formal MOUs have been developed, and 5) consensus and community support has been achieved.	Funding needs have not been determined at this time.
Identify strategy, resources, and funding to support mapping and assessment of agricultural operations. (Existing Development)				•			Where progress towards interim or final goals is not significant and source investigations indicate that agricultural operations are a source of bacteria causing receiving water exceedances.	Funding needs have not been determined at this time.
Improve database and mapping capabilities for management of existing development. (Existing Development)				•			As funding sources for project are available.	Funding needs have not been determined at this time.

Optional Strategy and Program	Participating Agency						Consideration(s) for Implementation	Funding
	City of El Cajon	City of La Mesa	City of San Diego	City of Santee	County of San Diego	Caltrans		
Coordinate with County of San Diego and identify resources and funding to implement a program to target on-site wastewater treatment (septic) systems. May include mapping and risk assessment, inspection, or maintenance practices. (Existing Development)							Where progress towards interim or final goals is not significant and source investigations indicate that on-site wastewater treatment systems are a source of bacteria causing receiving water exceedances.	Funding needs have not been determined at this time.
Conduct an assessment to determine if implementation an urban tree canopy (UTC) program would benefit water quality and other City goals. (Existing Development)			•				This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, 3) staff resources are identified and secured, 4) partners have been identified and formal MOUs have been developed, and 5) consensus and community support has been achieved.	Funding needs have not been determined at this time.
Conduct a feasibility study to test Permeable Friction Course (PFC), porous asphalt that overlays impermeable asphalt. (Development Planning, Existing Development)			•				This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, and 3) staff resources are identified and secured.	Funding needs have not been determined at this time.

Optional Strategy and Program	Participating Agency						Consideration(s) for Implementation	Funding
	City of El Cajon	City of La Mesa	City of San Diego	City of Santee	County of San Diego	Caltrans		
As opportunities arise and funding sources are identified, , protect areas that are functioning naturally by avoiding impervious development and degradation on unpaved open space areas, creating permanent open space protections on undeveloped city-owned land, and accepting privately-owned undeveloped open areas. (Development Planning, Existing Development)			•				This strategy may be implemented if there is interest in participation by the public or private entity with current control of the land. Conditions to be met also include 1) identification of partners, if needed (public, private, non-profit), 2) identification of costs and potential sources of funding, 3) final agreement by public or private entity with current control of the land, 4) final agreement by all other participating partners, 5) funding in place, and 6) if it can be determined that the benefit of preventing increased pollutant loads and minimizing impacts of future growth through land conservation is a more cost effective strategy to meet interim and final numeric goals than other recommended strategies included in this plan.	Variable depending on need.

Optional Strategy and Program	Participating Agency: City of El Cajon	City of La Mesa	City of San Diego	City of Santee	County of San Diego	Caltrans	Consideration(s) for Implementation	Funding
Conduct a Sustainable Return on Investment (SROI) analysis to estimate strategies' co-benefits and impacts to the public and private sector on a common scale.			•				Perform a feasibility study to determine if implementing an UTC program would be beneficial to the City's goals. UTC intercepts rainfall through increased coverage of leaves, branches, and stems and reduces runoff from the storm drainage system. Benefits associated with enhancing an UTC include reducing heat island effects and air pollution in addition to aesthetics and community benefits. Where feasible, native trees will be utilized to prevent invasive trees from migrating to open spaces and to conserve water. This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, and 3) staff resources are identified and secured.	Funding needs have not been determined at this time.
Create a fund that allows habitat acquisition, protection enhancement, and restoration in conjunction with other cooperating entities including community groups, academic institutions, state county, and federal agencies, etc.			•				This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, 3) staff resources are identified and secured, 4) partners have been identified and formal MOUs have been developed, and 5) consensus and community support has been achieved.	Funding needs have not been determined at this time.

Optional Strategy and Program	Participating Agency						Consideration(s) for Implementation	Funding
	City of El Cajon	City of La Mesa	City of San Diego	City of Santee	County of San Diego	Caltrans		
Participate in a watershed council or group if one is established.			•				This strategy may be triggered as 1) partners have been identified and formal MOUs have been developed and 2) consensus and community support has been achieved.	Funding needs have not been determined at this time.
Implement additional trash segregation projects. (Existing Development)			•				Where progress towards interim or final goals is not significant and it is determined that additional strategies will be necessary to meet final goals.	Variable depending on type of project.
Increase collaboration between watershed stakeholders, regulators, managers, and researchers. (Development Planning)	•			•	•		Dependent on the results of the Watershed Management Area Analysis, feasibility of implementation, and availability of funding.	Costs are depending on results of WMAA; funding sources have not been identified at this time.
Consider Alternative Compliance Program for Land Development – potential to address retrofits and rehabilitation (Development Planning)	•		•	•	•		Dependent on the results of the Watershed Management Area Analysis, feasibility of implementation, and availability of funding.	Costs have not been quantified but would include costs for program development, administration, and transactions. A source of funding has not been identified.

Optional Strategy and Program	Participating Agency						Consideration(s) for Implementation	Funding
	City of El Cajon	City of La Mesa	City of San Diego	City of Santee	County of San Diego	Caltrans		
Consider Green Street Retrofits or other small-scale retention or infiltration controls (Existing Development)	•	•	•	•	•	•	Where progress towards interim or final goals is not significant and watershed analysis indicates the need for distributed BMPs to attain the final goals, green streets will be considered where funding is available.	Project Dependent and contingent on need and adequate funding.
Investigate opportunities for restoration on Forester Creek, Wood Glen Vista Creek, and Sycamore Creek				•			Where progress towards final goals is not significant and watershed analysis indicates the need for additional structural BMPs to attain the final goals, structural options will be considered where funding is available.	
Consider distributed and/or Regional Structural BMPs (e.g., detention basins, treatment systems)	•	•	•	•	•	•	Where progress towards final goals is not significant and watershed analysis indicates the need for additional structural BMPs to attain the final goals, structural options will be considered where funding is available.	Project Dependent and contingent on need and adequate funding.

Optional Strategy and Program	Participating Agency						Consideration(s) for Implementation	Funding
	City of El Cajon	City of La Mesa	City of San Diego	City of Santee	County of San Diego	Caltrans		
Consider dry Weather Flow Diversions	•	•	•	•	•	•	Where progress towards interim or final dry weather goals is not significant and watershed analysis indicates the need for additional BMPs to attain the final goals, dry weather diversions may be considered where funding is available.	Project Dependent and contingent on need and adequate funding.
Consider retrofit projects in areas of existing development	•	•	•	•	•	•	Dependent on the results of the Watershed Management Area Analysis, feasibility of implementation, and availability of funding.	Project Dependent and contingent on need and adequate funding.
Consider stream, channel, and/or habitat rehabilitation projects	•	•	•	•	•	•	Dependent on the results of the Watershed Management Area Analysis, feasibility of implementation, and availability of funding.	Project Dependent and contingent on need and adequate funding.
Consider groundwater characterization study		•					Where results of stormwater outfall monitoring indicated that groundwater is a contributing source of persistent flows and funding is available.	Project Dependent and contingent on need and adequate funding.

Optional Strategy and Program	Participating Agency						Consideration(s) for Implementation	Funding
	City of El Cajon	City of La Mesa	City of San Diego	City of Santee	County of San Diego	Caltrans		
Investigate public-private partnership incentives program to encourage installation of structural BMPs on existing development					•		Dependent on the availability of opportunities for retrofits	Seek grant support and collaborations with non-government and other agencies

The decision to implement one or more optional strategies will be determined though the adaptive management process. As part of the adaptive management process, progress towards interim and final goals will be assessed annually, and once every five years, as part of the Report of Waste Discharge (ROWD); the ROWD assessment process will consider:

- progress towards interim and final goals,
- implementation status of the strategies and BMPs,
- the appropriateness of the numeric goal(s), and
- the proximity (i.e., timeframe) of the final goal(s).

The ROWD assessment will aid the adaptive management process. Where the assessments indicate that the goals are appropriate and significant progress has not been achieved by the strategies and BMPs implemented, the Participating Agencies will update the watershed analysis with the most recent information available to determine whether the final goal can be met through continued implementation of the WQIP as it is. If the results are affirmative, the Participating Agencies will continue implementing the WQIP as planned. Where significant progress has not been achieved, the final goal has been determined appropriate, and is within the near term (e.g., 5- 10 years), the Participating Agencies will move forward to implement select optional strategies based on available funding as necessary to meet the goal. The flexibility of the adaptive management process will allow each jurisdiction to adjust WQIP implementation to maximize their ability to achieve the goals.

3.3.3.7 Optional Watershed Management Area Strategies

Agencies have identified multiple coordinated efforts to be implemented within the San Diego River Watershed. Several of these are included in the jurisdictional programs supporting the watershed strategies, while others are included as optional strategies. These coordinated efforts are summarized in Table 22.

Table 22. Optional Watershed Management Area Strategies

Strategy and Program	Lead Agency	Cooperating Agencies	Optional Strategy	Implementation Timeframe
Increase collaboration between watershed stakeholders, regulators, managers, and researchers	City of El Cajon	City of Santee	Yes	To be determined; dependent on outcomes of WMAA
Regional workgroup to provide sanitation and trash management for persons experiencing homelessness and determine if the program is suitable and appropriate for jurisdictional needs to meet goals.	None designated	City of San Diego, City of Santee	Yes	To be determined; dependent on establishment of workgroup.
Coordinate with County of San Diego and identify resources and funding to implement a program to target on-site wastewater treatment (septic) systems. May include mapping and risk assessment, inspection, or maintenance practices.	None designated	County of San Diego	Yes	To be determined; dependent on assessments, investigations, and available funding.

3.3.4 *Quantification of Dry Weather Strategies*

Dry weather load reductions were calculated using a tiered approach to demonstrate reasonable assurance that the strategies will achieve compliance. First, the quantifiable nonstructural BMP load reductions were estimated then the gap between these aggressive source control programs and the TMDL required reduction level was filled using dry weather structural solutions when necessary.

The dry weather load reduction quantification approach involves similar steps for the suite of dry weather nonstructural BMPs included in this WQIP (including irrigation runoff reduction and commercial/industrial good housekeeping). The first step was to calculate the load generated by the targeted pollutant source that the BMP will address, by using a percentage of the total Participating Agency pollutant baseline load[4] which was taken from source tracking studies. Once the targeted pollutant source load was calculated, the potential load reduction benefit was calculated using the estimated effectiveness of the selected BMP. These values were based on literature when available, and if not, on best professional judgment. In both cases, predicted levels of uncertainty are high. The following sections provide a brief description of the specific quantification approach for each dry weather nonstructural BMP, along with relevant assumptions and assumption explanations.

Additionally, some dry weather structural controls may also be implemented to achieve the TMDL required reduction levels. Dry weather structural BMPs may include but are not limited to: low flow diversions to sewers, storm drain lining, catch basin dry wells, street gutter permeable pavement, bioretention swales, and regional BMPs.

Dry weather goals are discussed further in section 3.3.6.3

3.3.5 *Wet Weather Structural Strategies*

Provision 6.b.(3).(f).(ii) of Attachment E of the Permit references an analysis that utilizes a watershed model or other analytical tools to demonstrate that the implementation of the WQIP would meet the established goals. This analysis, which is required for this compliance demonstration, is referred to herein as the BMP benefits quantification. This section describes the methodology used to conduct the BMP benefits quantification. It presents the results of the analysis, which demonstrate that the proposed jurisdictional strategies and watershed strategies meet the WQIP goals. Not only does this analysis show compliance with the Permit, and it also offers the following.

1. It gives the Participating Agencies a defensible basis for the number, type, size, location, and phasing of the strategies/BMPs identified.

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[4] The baseline load was assumed to be proportional to the flow (i.e. if x% of the flow was from irrigation runoff than, x% of the load was from irrigation runoff).

2. It gives the Regional Board confidence in the WQIP strategies that the Participating Agencies have proposed (increasing likelihood of WQIP approval).
3. It is a flexible tool that can accommodate the WQIP's future adaptive management process – i.e., models can be improved with future monitoring data, and the list of strategies/BMPs can be updated accordingly as a result.
4. If desired, alternative regulatory scenarios can be evaluated using the models – for example, how implementation costs change as a result of a potential TMDL reopener outcome.

The overall WQIP approach will be to prioritize early implementation of non-structural BMPs. The structural BMP controls are designed to address wet weather flows. As required in the Attachment E of the Permit, the structural BMPs proposed in the WQIP are equivalent to the suite of BMPs proposed in the SDR CLRP.

As with other optional strategies, structural BMPs would be implemented as needed and as funding is available by the individual entities, organizations, or Participating Agencies. The WQIP does not oblige the Participating agencies to construct the measures but identifies those that may be effective in attenuating pollutant loading to meet final numeric goals.

Outside the City of San Diego, locations for proposed distributed and regional structural BMPs were identified using the U.S. Environmental Protection Agency model SWMM-based, Structural BMP Prioritization and Analysis Tool (SBPAT). The SBPAT was used to prioritize catchments within the watershed based on their potential to generate the highest pollutant loads during wet weather events. This allows identification of locations within the watershed that offer the greatest potential benefits in terms of load reductions through implementation of BMPs. Consistent with the objective of prioritizing strategies with a multi-pollutant benefit, this catchment prioritization analysis was conducted to consider nitrogen and phosphorus in addition to bacteria, the HPWQC.

Within the City of San Diego a similar process was used to identify and prioritize locations for distributed and regional BMPs; however, the City of San Diego used the System for Urban Stormwater Treatment and Analysis Integration (SUSTAIN) during the assessment process.

Appendix B provides a detailed description of how the wet weather baseline loads were determined, and appendix D provides a description of wet weather structural BMP load reduction calculations and methods.

3.3.5.1 Implemented Distributed Structural BMPs

Baseline loads in the WQIP included loads from development that occurred between the TMDL year (2003) and 2009, since the WQIP baseline load was developed using 2009 land use data. As such, structural BMPs that were implemented between the TMDL year (2003) and 2009 as mitigation to this anticipated development were considered as part of the overall pollutant load reduction to be achieved by the WQIP. Appendix D presents a list of these projects and a map with their locations is shown in Figure 5 and the load reductions are summarized in Table 23.

No credit is given in the WQIP for BMPs to be implemented as mitigation to new development after 2009 as it is assumed that the loads mitigated by the BMPs will offset the additional loads generated by new development (i.e. no net decrease in pollutant load). Refer to Appendix B where the role of implemented structural BMPs in the WQIP's baseline load calculations is discussed.

Table 23. Estimated Load Reductions from Distributed BMPs

Distributed BMPs	Water Quality (FC Load) Benefits (10^12 MPN reduction/year) [Low – High]
Implemented Distributed Projects	53 [29 – 62]
Potential Distributed Projects	397 [214 – 463]

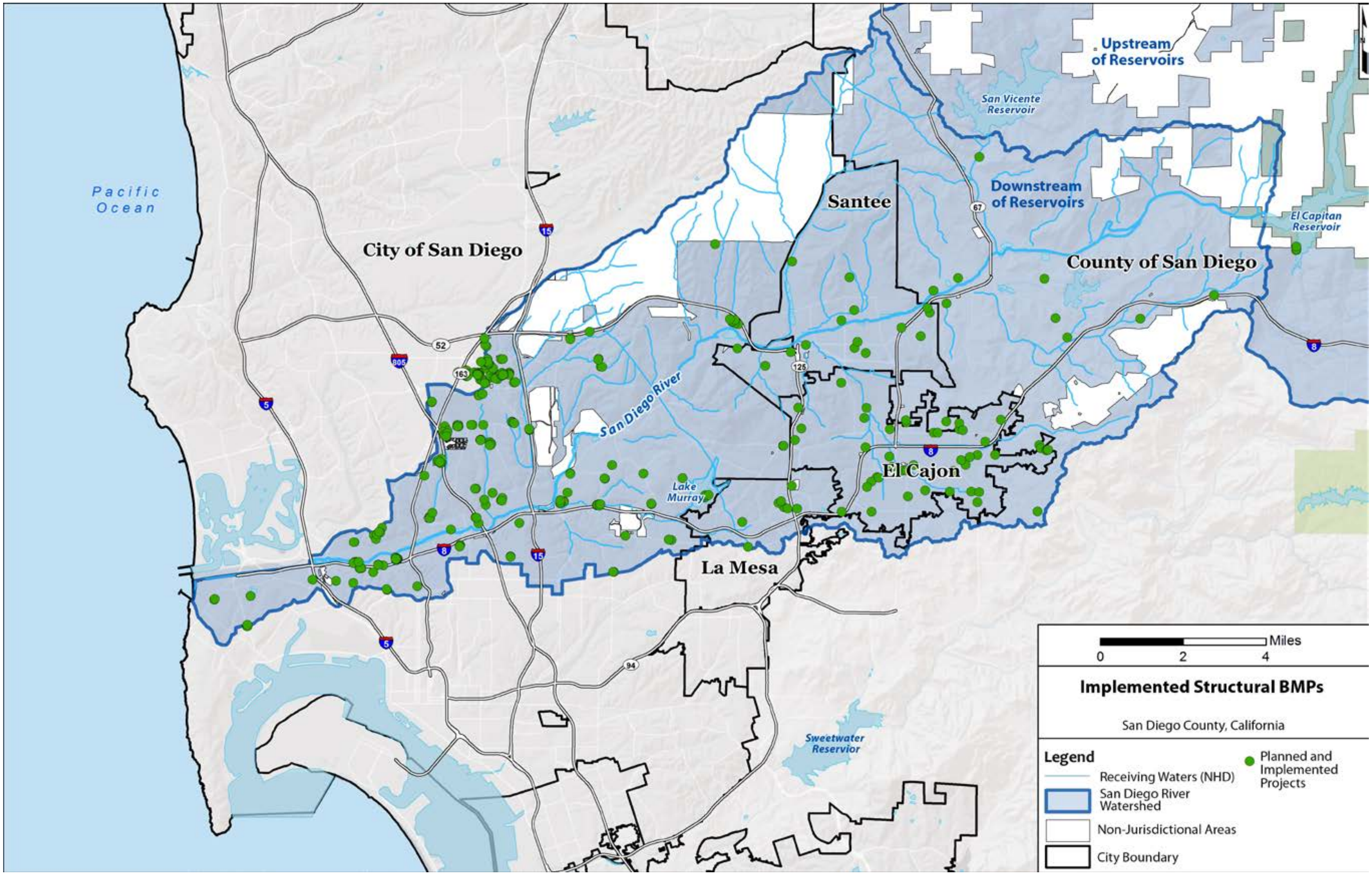

Figure 5. San Diego River Watershed Implemented Structural BMPs

3.3.5.2 Proposed Distributed Structural BMPs

Distributed structural BMPs would be implemented as needed by the individual Participating Agencies. Determination of need will be based on modeling and the adaptive management process described above and using the ROWD assessment process.

To determine appropriate locations for distributed structural BMPs, the San Diego River watershed catchments were analyzed to determine their potential to contribute to pollutant loads, and those with the greatest potential were selected to focus BMP efforts. These focused catchments were further screened for potential distributed BMP opportunities. The catchments where implementation of proposed distributed BMPs would offer the greatest load-reduction are shown in Figures 6. The methodology for selection of BMP types and locations is detailed in Appendix D.

Table 24. Water Quality Benefits from Proposed Distributed Structural BMPs[a]

BMP Type	FIB-FC load reduction % of Average Municipal Land Use Load)
	Average [Low-High]
Potential Public Private Partnership Program	8.5% [1.6% - 15%]
Redevelopment through Permit-Required LID Implementation	4.3% [3.4% - 5.1%]
Implemented Projects	1.1% [0.6% - 1.3%]
Future Projects	8.6% [4.6% - 10%]

[a] Load reductions are for the County of San Diego, and Cities of El Cajon, Santee, and La Mesa.

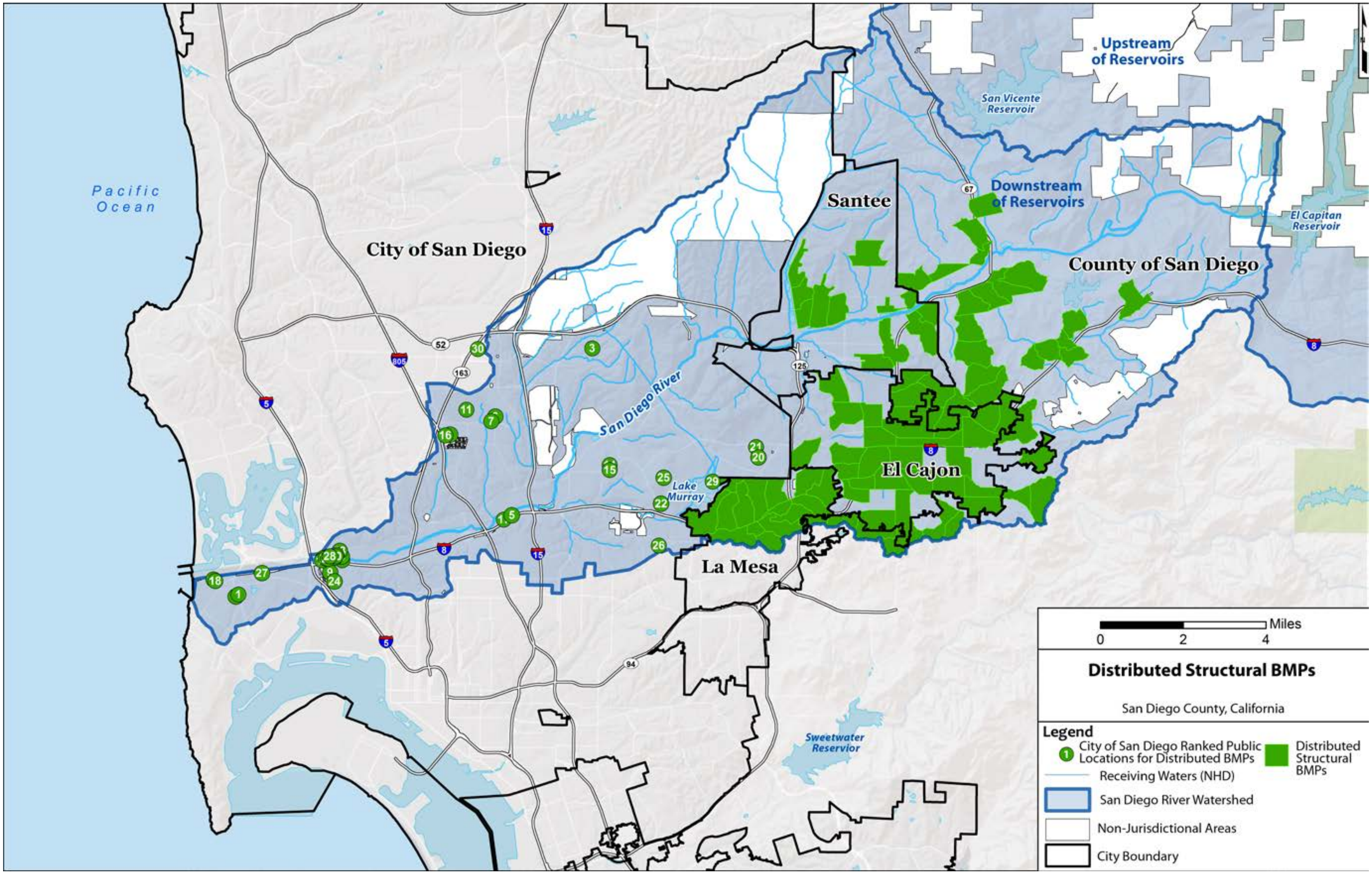

Figure 6. Proposed Catchments for Implementation of Distributed Structural BMPs

3.3.5.3 *Proposed Regional Structural BMPs*

As with distributed structural BMPs, regional structural BMPs would be implemented as needed and as funding is available by the individual Participating Agencies. The determination of need will be based on the adaptive management process and using the ROWD assessment process. The WQIP does not oblige the Participating agencies to construct the measures but identifies those that may be effective in attenuating pollutant loading to meet target objectives.

Using SBPAT and LSPC/Sustain, potential locations for regional structural BMPs were determined by identifying catchments located downstream of multiple, hydrologically linked catchments that have high pollutant loads. Within these catchments, appropriate sites were selected and, based on each site's physical characteristics, site specific BMPs were selected. The locations of proposed regional BMPs are shown in Figure 7 and summarized below in Table 25.

Table 25. Estimated Load Reductions from Regional BMPs

Location/Name	Water Quality (FIB-FC Load) Benefits (10^12 MPN reduction/year)
	WY 2003 [Low - High]
SDCo-R-01	128 [92 - 145]
SDCo-R-02	14 [10 - 16]
SDCo-R-03	55 [33 - 64]
CoS-R-01	20 [11 - 24]
CoS-R-02	6 [4 - 7]
MJ-R-01	166 [77 - 198]
MJ-R-02	36 [21 - 42]
Totals	425 [247 - 496]

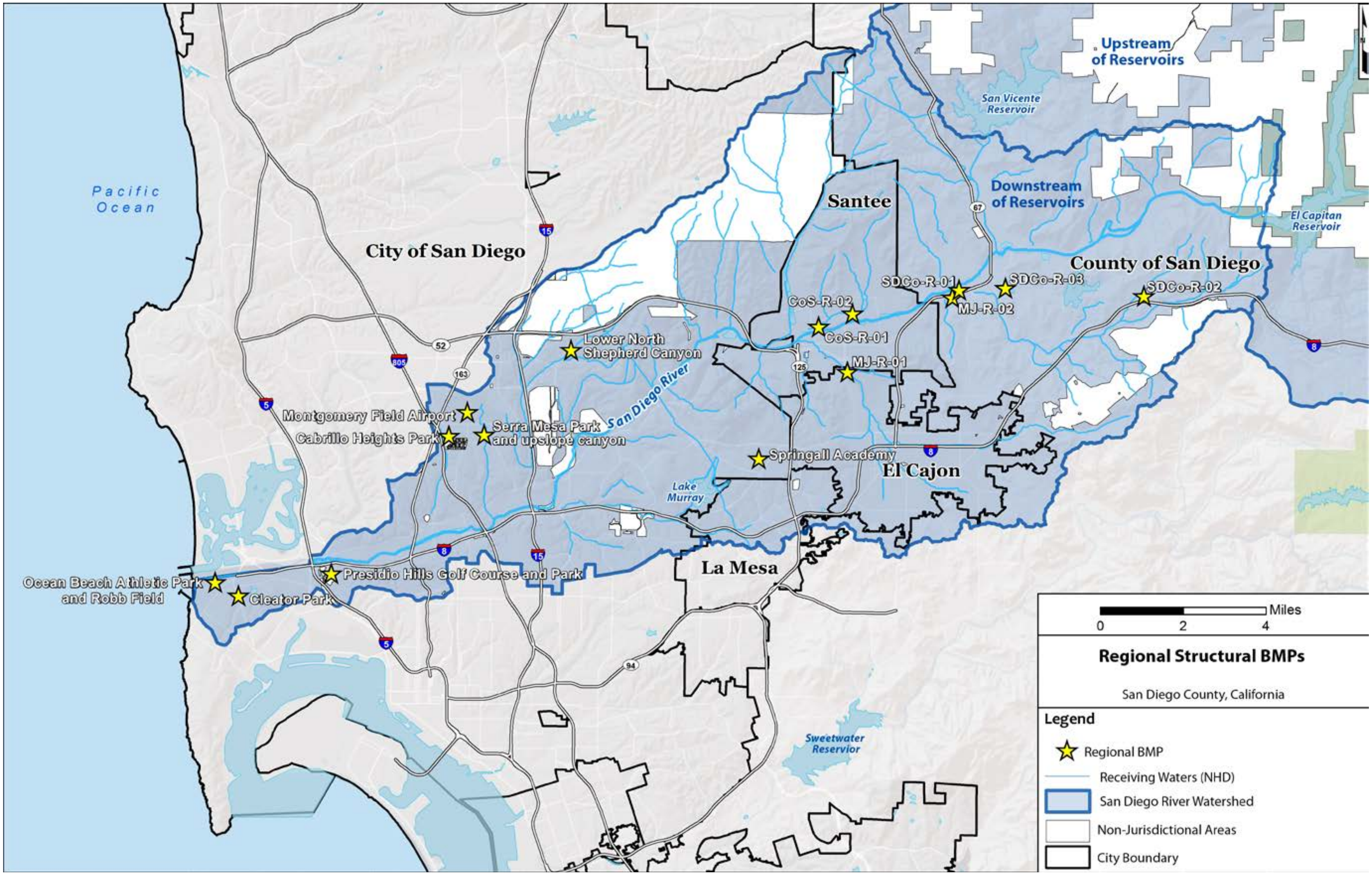

Figure 7. Locations of Proposed Regional Structural BMPs

3.3.5.4 *Stream Restoration/Enhancement Projects*

Stream restoration/enhancement projects that were implemented after 2003 to add or replace impacted habitat with habitat having similar functions of equal or greater ecological value within the San Diego River Watershed were given load reduction credit as these projects treat stormwater that comes in contact with enhanced and/or created vegetation.

Stream Restoration/Enhancement projects include the following:

- Forester Creek
- Woodglen Vista Creek
- Las Colinas Channel (future proposed project)
- Alvarado Channel Restoration (future proposed project)

Locations of stream restoration projects are shown in Figure 8, load reductions summarized in Table 26, and discussed further in Appendix D.

Table 26. Estimated Load Reductions from Stream Enhancement/Restoration Projects

Location/Name	Water Quality (FIB-FC Load) Benefits (10^12 MPN reduction/year)
Forester Creek	55 [13 - 96]
Woodglen Vista Creek	4 [1 - 6]
Las Colinas Channel	2 [0 - 3]
Alvarado Channel Restoration	6 [2 - 11]
Totals	67 [16 - 117]

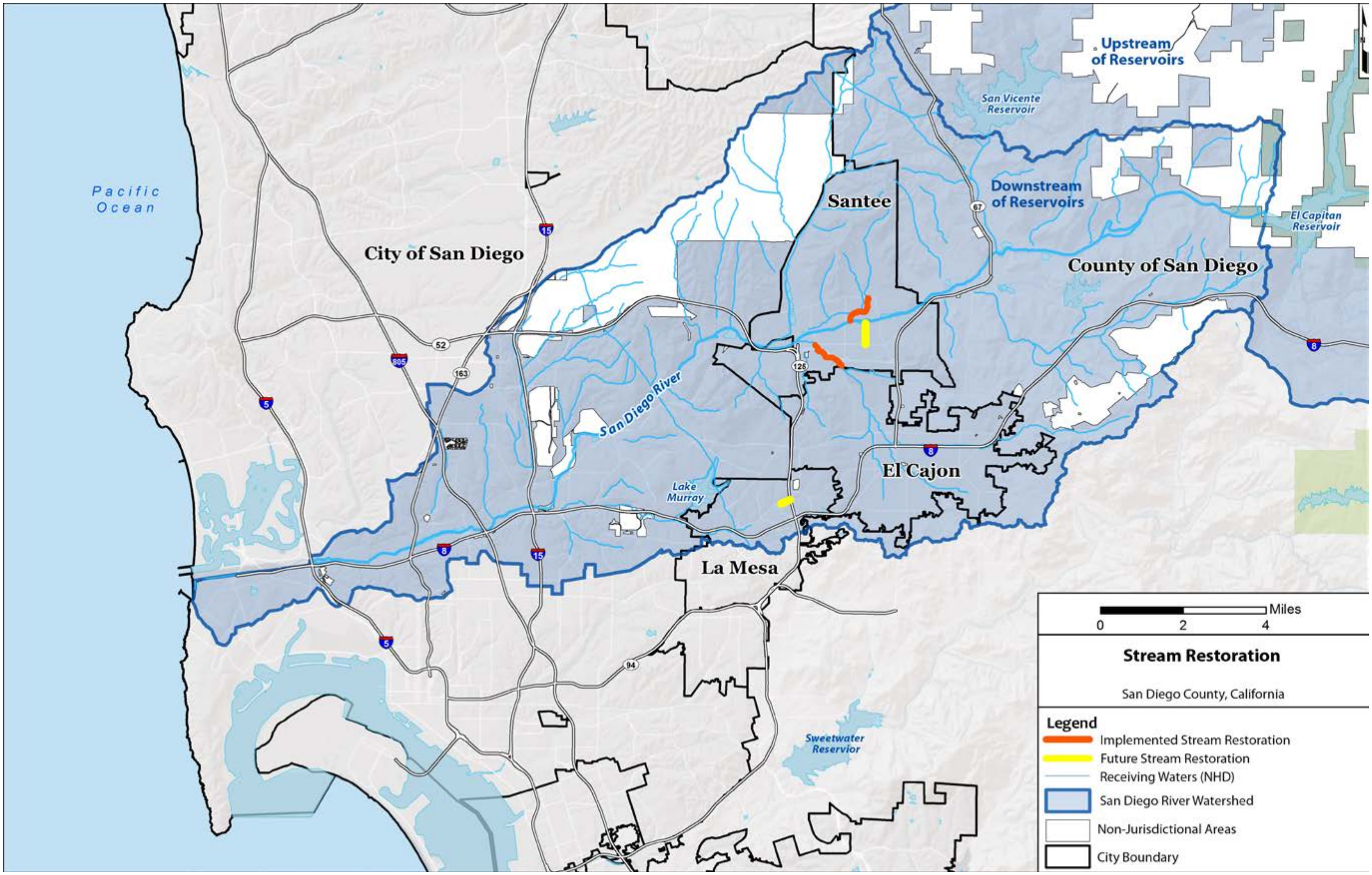

Figure 8. Stream Restoration Projects for San Diego River Watershed

3.3.6 *BMP BENEFITS QUANTIFICATION METHODOLOGY*

In order to assess the ability of the proposed jurisdictional strategies (Section 3.3.2), watershed management area strategies (Section 3.3.3), and structural strategies (Section 3.3.4) to achieve WQIP numeric goals, load reductions expected to result from the implementation of these strategies were estimated for wet weather and dry weather. The processes by which load reductions were estimated for wet weather BMPs (public-private partnership programs only), structural wet weather BMPs, and dry weather non-structural and structural BMPS are described in Appendices C, D, and E, respectively.

3.3.6.1 Wet Weather Non-Structural BMPs

A distinction must be made between those with sufficient available data to be modeled (the public-private partnership programs) and those that cannot be modeled due to limited data. The methodology used to quantify the benefits achieved by public-private partnership programs (i.e., LID incentive programs, redevelopment and LID implementation) was as follows:

1. Identify the source(s) addressed by the BMP;
2. Calculate the source(s) area that will be addressed by the BMP;
3. Estimate the effectiveness of the BMP at reducing the load generated by the source(s); and
4. Calculate the BMP pollutant load reduction benefit from the information obtained in Step 2 and Step 3.

Due to limited data quantifying their effectiveness, wet weather bacteria load reductions of potential BMPs identified in Provision B.2, section 2.5.1 are not as readily modeled, including:

- Identification and control of sewage discharge to Copermittee stormwater systems,
- Trash cleanups,
- Onsite wastewater treatment source reduction,
- Good landscaping practices, including use of drip irrigation and SMART irrigation controllers
- Commercial/industrial good housekeeping,
- Pet waste controls,
- Animal facilities management,
- Erosion monitoring and repair,
- Stormwater catch basin and channel cleaning,
- Street and median cleaning, and
- Education and outreach.

To account for the expected pollutant load reduction from these other non-modeled, non-structural BMPs, an additional ten percent reduction is initially included in the quantification. The inclusion of these other non-structural BMPs or programmatic BMPs in the WQIP and their assumed ten percent load reduction could be evaluated and updated throughout the implementation period as pollutant loading and BMP performance data is collected.

The City of San Diego was able to model non-structural BMPs using SUSTAIN. This process is described in Appendix D.

The quantification of the load reduction for non-structural BMPs currently being implemented by Caltrans followed a similar approach and is included in Appendix D.

3.3.6.2 Wet Weather Structural BMPs

To identify a program of activities that will be capable of achieving TMDL-required bacteria load reductions, the Participating Agencies used a robust computer model with the ability to simulate hydrologic and pollutant loadings and to evaluate various BMP implementation scenarios. The water quality model was used to estimate the bacteria load reductions predicted to achieve compliance under various BMP implementation scenarios.

The WQIP identifies a suite of potential non-structural and structural BMPs. The WQIP does not oblige the Participating Agencies to construct the measures, but identifies those that may be effective in reducing pollutant loading to reach final numeric goals. BMPs were identified based on their cost and potential effectiveness in reducing pollutant loading in the watershed, with the goal of achieving estimated target load reductions for wet and dry weather. For the structural BMPs proposed in this WQIP for the, load reductions during wet weather were calculated using SBPAT as described in Appendix D. In general, design criteria for each selected BMP were first defined considering site constraints (in particular, acreage available for each BMP footprint), BMP performance data, and local regulations. Once a BMP was identified and design criteria defined for each feasible BMP opportunity site, the impact of implementing this suite of BMPs on water quality in the region was evaluated.

One of the key multiple benefits of these strategies is the removal of nutrients in addition to bacteria.

The predicted wet weather load reductions for nitrate and phosphorus equal 79,100 and 14,200 lbs. /year, respectively.

3.3.6.3 Dry Weather BMP Water Quality Benefit Estimation

Appendix E describes dry weather load reduction quantification values, results, assumptions, and methods for the potential nonstructural and structural BMPs included in this WQIP (see provision B.2 chapter, section 2.5.1). The quantitative assessment of nonstructural BMP (including irrigation runoff reduction and commercial/industrial inspections) dry weather effectiveness follows a similar, but slightly different approach to the assessment of wet weather Public-Private Partnership Programs (see section 3.3.5.1), including:

1. Identify the source(s) addressed by the non-structural BMP;
2. Calculate the load generated by the source(s) addressed by the non-structural BMP;
3. Estimate the effectiveness of the non-structural BMP at reducing the load generated by the source(s); and
4. Calculate the non-structural BMP pollutant load reduction benefit from the information obtained in Step 2 and Step 3.

Additional dry weather non-structural BMPs that the Participating Agencies may implement include:

- Identification and control of sewage discharge to Participating Agency stormwater systems,
- Water waste/conservation ordinances,
- Car washing runoff ordinances,
- Water conservation outreach and education, and
- Other non-storm water flow reduction strategies as needed.

Furthermore, some dry weather structural controls may also be implemented to achieve the TMDL required fecal coliform reduction levels. These dry weather structural BMPs may include but are not limited to: low flow diversions to sewers, storm drain lining, catch basin dry wells, street gutter permeable pavement, bioretention swales, regional BMPs, etc. Table 27 provides a summary of the dry weather quantification results and corresponding assumptions and references.

Table 27. Summary of Dry Weather Quantification Results

Quantification Item	Quantitative Result[1]	Assumptions/References
Average Annual storm drain outfall bacteria dry weather load in the watershed	33.6 x 10^12 MPN/year	The baseline storm drain load was calculate by the model developed for the TMDL
Required bacteria load reduction	69.4% of the baseline stormwater load	San Diego Stormwater Permit Attachment E, Table 6.6
Expected load reduction from quantifiable dry weather nonstructural BMPs (Smart controller and turf grass replacement rebates, and Commercial/industrial site inspections/audit)	8.2 to 38% of the baseline Stormwater load	See following sections and Appendix E for assumptions and references. Additional benefits are expected from dry weather BMPs that were not quantified and these benefits constitute an additional level of conservatism.
Expected load reduction from all dry weather structural BMPs	31 to 61% of baseline stormwater load	To ensure that the required bacteria load reduction is achieved, structural BMPs may be implemented to this level.
Average stormwater total load reduction	69.4% of the baseline stormwater load	

1. The average annual baseline load and expected load reductions do not include contributions from the City of San Diego.

3.3.6.4 Wet Weather BMP Water Quality Benefit Estimation

Wet weather bacteria load reductions for each BMP type proposed for implementation by 2031 are provided in Table 28. The table presents the average, low, and high estimates for load reduction – the low and high estimates reflect variability in baseline pollutant loading (based on land uses) and variability in BMP effectiveness, and represent the 25th and 75th percentile of the modeled predictions.

Table 28. Summary of Modeled Wet Weather Load Reductions

BMP Category	FC Load Reduction (% of Average Municipal Land Use Load) 2003 WY Load [Low-High Range][a]
Programmatic BMPs	10% [9.2%-11%]
Potential Public Private Partnership Program	8.5% [1.6%-15%]
Redevelopment through Permit-Required LID Implementation	4.3% [3.4% - 5.1%]
Implemented Distributed	1.1% [0.6%-1.3%]
Stream Restoration BMPs	1.4% [0.3% - 2.5%]
Potential Distributed	8.6% [4.6%-10%]
Potential Regional	9.2% [5.3%-11%]
Load Reduction Adjustment	-4.0% [-1.6% - -5.8%]
Load Reduction Sum	39% [24% - 50%]
Target Load Reduction	**34.7%**

[a] Load reductions are for the County of San Diego, and Cities of El Cajon, Santee, and La Mesa.

This analysis is applicable to the County of San Diego, City of El Cajon, City of Santee, City of La Mesa and Caltrans. Load reduction benefits for the City of San Diego were taken from the Phase II CLRP and Table 29 provides a summary of those load reductions.

Table 29 summarizes load reduction percentages estimated in the Phase II CLRP for the suite of BMPs proposed for implementation in the City of San Diego's jurisdiction. As shown in the table, these BMPs are expected to result in a load reduction percentage that meets the TLR percentage. For all jurisdictions except the City of San Diego, a summary of the predicted wet weather load reductions from each BMP type proposed for implementation within the San Diego River Watershed, as well as the variability in potential BMP type performance, is included in Appendix D. In addition to the reductions in loading of the HPWQC and nutrients, the strategies proposed in this WQIP are expected to provide a number of other water resource benefits, including mitigation of physical and biological impairments. These benefits are also presented in further detail in Appendices D and E.

Table 29. Summary of Wet Weather Load Reductions for the City of San Diego

Condition	Non-structural (not modeled)	Non-structural (modeled)	Centralized on Public	Distributed on Public	Green Streets	Centralized on Acquired Private Land	Total [b]
Wet weather	10.00%	0.37%	2.76%	8.29%	13.28%	N/A	**34.70%**
Dry Weather [a]	10.00%	90.00%	-	-	-	N/A	**100.00%**

[a] Dry weather flow and load reductions reflect only runoff in urban sub-watershed.

[b] The load reduction analysis and scheduling of BMPs was performed for final targets only. Interim targets and associated schedules will further evaluated through an adaptive process as BMPs are implemented and their effectiveness is assessed.

Table 30. Watershed Load Reduction Summary

Load Reduction Category	FC Load Reduction (% of Load)
Target Load Reduction	34.7%
Predicted Wet Weather Load Reduction[a]	39% [24% - 50%]
Predicted Wet Weather Load Reduction for City of San Diego	34.7%
San Diego River Watershed Load Reduction	**37%**

[a] Load reductions are for the County of San Diego, and Cities of El Cajon, Santee, and La Mesa

3.3.7 *City of El Cajon Example Strategies*

The City of El Cajon identified administrative policies, urban development management programs, and innovative pilot projects, and is investing in research for site locations for green infrastructure and other treatment BMPs throughout its jurisdiction in the San Diego River watershed. Strategies such as education and outreach that target irrigation runoff, rebate and incentive opportunities for rain barrels and downspout disconnection, pilot green infrastructure projects, and multiuse treatment areas are considered across the City's jurisdiction.

The following strategies are examples of those selected by the City of El Cajon and planned for implementation. A complete list of strategies planned for implementation and a description of each strategy is provided in Appendix A. The strategies and schedules are subject to change and are contingent upon annual budget approvals and funding availability. They will be modified through the adaptive management process as needed.

Development Planning

The City of El Cajon is currently updating BMP design manual procedures to specify stormwater requirements. Additionally, El Cajon is working on the development and implementation of LID programs involving downspout disconnection, proprietary BMPs, and rainwater harvesting in appropriate areas and for applicable projects. El Cajon is also implementing source control, low-impact development, and on-site structural controls for priority development projects.

Existing Development

The City of El Cajon plans to maintain and update their watershed-based inventory of existing development. El Cajon also has plans for outreach to homeowners associations in a targeted manner. Further targeted outreach by way of printed materials to residential areas is planned, along with focused inspections, to target key sources of pollutants. Strategies will be developed to identify opportunities for retrofit projects along with stream, channel, and habitat rehabilitation projects in areas of existing development. The Forrester Creek Bacteria Management Plan implementation is scheduled for FY15-16.

Public Education and Participation

A key City strategy to enhance watershed stewardship and awareness of water quality is through public education and participation in the City of El Cajon.

3.3.8 *City of La Mesa Example Strategies*

The City of La Mesa identified administrative policies, innovative pilot projects, urban development management programs, and is investing in research for site locations for green infrastructure and other treatment BMPs throughout its jurisdiction in the San Diego River watershed. Strategies such as education and outreach that target irrigation runoff, rebate and incentive opportunities, pilot green infrastructure projects, and multiuse treatment areas are considered across the City's jurisdiction.

The following strategies are examples of those selected by the City of La Mesa and planned for implementation. A complete list of strategies planned for implementation and a description of each strategy is provided in Appendix A. The strategies and schedules are subject to change and are contingent upon annual budget approvals and funding availability. They will be modified through the adaptive management process as needed.

Development Planning

The City of La Mesa is currently updating BMP design manual procedures to specify stormwater requirements. Additionally, La Mesa is implementing source control, low-impact development, and on-site structural controls for priority development projects.

Existing Development

The City of La Mesa continues to maintain and update their watershed-based inventory of existing development. La Mesa also coordinates with I Love a Clean San Diego on installation of cigarette ashcans throughout the downtown area to manage trash. La Mesa plans to explore options for coordination with Helix Water District concerning water conservation programs.

Structural Strategies – Green Infrastructure

The City of La Mesa is carrying out a restoration project at Alvarado Creek involving 900 feet of channel restoration to enhance the ecological value of the creek.

Public Education and Participation

A key City strategy to enhance watershed stewardship and awareness of water quality is through public education and participation in the City of La Mesa.

3.3.9 *CITY OF SANTEE EXAMPLE STRATEGIES*

The City of Santee identified administrative policies, urban development management programs, and innovative pilot projects, and is investing in research for site locations for green infrastructure and other treatment BMPs throughout its jurisdiction in the San Diego River watershed. Strategies such as education and outreach that target irrigation runoff, rebate and incentive opportunities for rain barrels and downspout disconnection, pilot green infrastructure projects, and multiuse treatment areas are considered across the City's jurisdiction.

The following strategies are examples of those selected by the City of Santee and planned for implementation. A complete list of strategies planned for implementation and a description of each strategy is provided in Appendix A. The strategies and schedules are subject to change and are contingent upon annual budget approvals and funding availability. They will be modified through the adaptive management process as needed.

Development Planning

The City of Santee is currently updating BMP design manual procedures to specify stormwater requirements. Additionally, Santee is also implementing source control, low-impact development, and on-site structural controls for priority development projects.

Existing Development

The City of Santee plans to maintain and update their watershed-based inventory of existing development. Santee also has plans for outreach to homeowners associations in a targeted manner. Santee will coordinate with the Padre Dam Municipal Water District on outreach, enforcement, and incentive programs to address impacts of improper water use and irrigation runoff. The City of Santee plans to develop a demonstration project for drought tolerant and native landscaping, permeable surfaces, and other low-impact development in coordination with the San Diego River Trail Expansion. Santee also has plans for outreach to homeowners associations in a targeted manner. Further targeted outreach by way of printed materials to residential areas is planned, along with focused inspections, to target key sources of pollutants. Strategies will be developed to identify opportunities for retrofit projects in areas of existing development

Public Education and Participation

A key strategy for the City of Santee to enhance watershed stewardship and awareness of water quality is through public education and participation.

3.3.10 City of San Diego Example Strategies

The City of San Diego has identified administrative policies, urban development management programs, and innovative pilot projects, and is investing in research for site locations for green infrastructure and other treatment BMPs throughout its jurisdiction in multiple watersheds. These water quality improvement strategies are expected to provide the greatest benefits to the watershed and its residents, businesses, and communities within the City's jurisdictional boundaries. Furthermore, the City is currently developing a framework to evaluate other[5] potential additional benefits that the recommended strategies may provide beyond improved water quality. These other benefits may be financial, environmental, or societal. The recommended strategies will be evaluated on the basis of the number of other benefits they may provide, and could guide future updates to the Water Quality Improvement Plan.

The following strategies are examples of those selected by the City of San Diego and planned for implementation. A complete list of strategies planned for implementation and a description of each strategy is provided in Appendix A. In San Diego River, an analysis using a watershed model was conducted to identify the strategies required to be implemented to meet interim and final goals. The strategies and implementation schedules identified in Appendix A provide reasonable assurance that numeric goals will be met based on that analysis. The adaptive management process provides the framework to evaluate progress toward meeting the goals and allows for modification of strategies, if necessary. Furthermore, the strategies and schedules are subject to change and are contingent upon annual budget approvals and funding availability. However, ff strategies are modified, the analysis will be updated as needed to provide assurance that numeric goals will be met.

These strategies will be implemented by the City of San Diego; they are not intended to be implemented by private entities (e.g., development, business, industry, etc.); however, some of the City's strategies, such as development planning, may have implications for private entities.

The City of San Diego will address discharges of bacteria and other pollutants through activities on public land across its jurisdiction in the San Diego River WMA. The following example strategies

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

provide multiple benefits by addressing bacteria, and also other water quality pollutants such as trash and sediment.

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

In FY 2016 the City of San Diego will begin developing a policy that will require the inclusion of green infrastructure features on all suitable City projects, including non-SUSMP projects. This policy will be coordinated with ongoing efforts to update City design manuals and low-impact (LID) design standards for public LID BMPs. The program will begin with research and recommendations for ideal methods for green infrastructure project siting and prioritization within the City. By FY 2018, the City will complete construction of green infrastructure and/or green streets projects as detailed in the corresponding structural strategies.

Existing Development – Enhanced Property-Based Inspection Program

In FY 2016, the City plans to administer, as part of their existing development program, an enhanced property-based inspection program. The enhanced property-based inspection program is intended to increase the number of discharges prevented through property-based inspections and increased minimum BMP implementation. The City conducted an extensive multi-year pilot study of its business inspection program and found that more discharges were discovered and abated by inspecting large properties rather than individual businesses. For example, instead of inspecting one restaurant in a strip-mall, the entire strip-mall would be inspected as one property. Enhanced property-based inspections will be conducted at appropriate frequencies and using appropriate methods such as property- or area-based inspections, as specified in the Municipal Permit (Provision E.5). The program will also require implementation of minimum BMPs for existing development (commercial, industrial, municipal, and residential) that are specific to the facility, area types, and pollutant-generating activities (PGAs).

Existing Development – Increased Enforcement

The City intends to enhance enforcement responses by increasing the number of Code Compliance staff. Between FY 2016 and FY 2019, the City is planning to gradually hire additional Code Compliance Officers and support staff to increase compliance with statutes, ordinances, permits, contracts, orders, and other requirements for IDDE, development planning, construction management, and existing development as detailed in the City's Enforcement Response Plan. This effort will target increased enforcement of irrigation runoff and water-using mobile businesses.

Source Reduction Initiatives

The City of San Diego will continue to implement source reduction initiatives, where feasible. Bans or progressive phase-outs to be considered include pesticides and herbicides on landscapes, leaf blowers, plastic bags, and architectural copper (generally a legacy issue). The City will also consider legislative mandate and cooperative implementation of copper-free brake pads on city-owned vehicles to reduce pollutant deposition.

The City also plans expansion of programs to target irrigation runoff and other dry weather pollutant sources. These strategies primarily target meeting dry weather goals, but may also have wet weather benefits. Because dry weather strategies tend to target the elimination of dry weather flows, they provide load reduction benefits to most water quality pollutants.

Existing Development – Residential and Commercial Rebate Programs Targeting Water Quality

The City plans to continue and expand its landscape-based rebate program to target water quality impacts from residential and commercial areas in FY 2016 and beyond. Expansion of this program may occur by providing for additional rebates and/or distribution of promotional and information material and brochures to community groups, libraries, and recreational centers. Educational material would emphasize watershed stewardship and encourage the implementation of designated BMPs through rebates for rain barrel BMPs in residential areas and grass replacement BMPs, downspout disconnection BMPs, and micro-irrigation BMPs in residential and commercial areas.

Increased Public Education and Participation

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

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

Cost of Service Study

The City plans to conduct a Cost of Service Study starting in FY 2015. This study will examine the full cost of flood control and storm water strategies needed to comply with storm water regulations for the City of San Diego. The City of San Diego's Watershed Asset Management Plan will be used as the basis for the study.

3.3.11 *County of San Diego Example Strategies*

The County of San Diego reviewed various implementation approaches, programmatic policies, opportunities for innovative potential projects, and is researching the viability of green infrastructure as well as potential structural and distributed BMPs throughout the unincorporated areas. Much of the County of San Diego's jurisdiction within the San Diego River Watershed Management Area consists of unincorporated and predominantly undeveloped land, open space, and low-density residential areas. The jurisdictional strategies reflect the need to address these types of land uses and associated stormwater issues. As such, the County has outlined strategies to enhance current programs, identify prospective opportunities, and develop innovative approaches to stormwater program management.

Strategies including education and outreach that target irrigation runoff, rebate and incentive opportunities, pilot green infrastructure projects, and multiuse treatment areas will be considered across the County's jurisdictional area.

The following strategies represent several examples selected by the County of San Diego. A complete list of strategies and a description of each strategy is provided in Appendix A. The strategies and schedules are subject to change, and are contingent upon programmatic need and funding availability. They will be modified through the adaptive management process as needed.

Stormwater Discharges – Wet Weather Bacteria Reduction through Implementation of Residential Large Property Pet Waste Management Program

The County currently implements pet waste management in county parks and will continue to do so, with plans to expand the program to an additional focused management area. The County plans to continue targeting parks and other public areas to reduce negative impacts to habitat, wildlife, and water quality.

Stormwater Discharges – Wet Weather Bacteria Reduction through Implementation of Public Education and Participation Programs

An important approach to heighten watershed stewardship and mindfulness of water quality is through public education and participation. The County will continue its public education and participation programs. The County develops, improves, and distributes outreach materials; performs outreach presentations in schools; provides outreach to large residential properties; performs an over-irrigation outreach pilot; and provides educational workshops. The County also plans to implement a Sustainable Landscapes Program and a pilot Homeowners Association Outreach and Coordination project. Furthermore, the County sponsors numerous trash collection events in targeted areas of the watershed.

Stormwater Discharges – Wet Weather Bacteria Reduction through Implementation of Structural and Distributed BMPs

The County of San Diego will continue to investigate opportunities for green infrastructure implementation on public parcels. The County will develop a strategy to identify candidate areas of existing development that are appropriate for retrofit projects. The County plans to evaluate the feasibility of a pilot residential incentive program. The program could encourage rain water use through installation of rain barrels, roof downspouts redirected to landscaped areas, rain gardens & other small scale bioretention/ infiltration BMPs.

The County will continue to consider green infrastructure or small scale structural BMPs to capture dry weather flows as needed.

Residential Programs

The County proposes promoting and encouraging implementation of designated BMPs in residential areas in the near future, including residential irrigation runoff reduction programs. These programs will be developed to address the impacts of improper water use and excessive irrigation runoff. A residential inspections tracking program will also begin by FY16.

3.3.12 *Schedules for Implementing Strategies*

The following sections will detail the proposed schedules for phasing in the strategies discussed above. As noted earlier, the overall WQIP strategy is to pursue aggressive non-structural controls as the primary method for achieving wet weather load reduction goals and the sole method for achieving wet and dry weather load reduction goals. The benefits calculations summarized in Section 3.3.5 and Appendices D, E, and F support the viability of this strategy.

However, there is uncertainty inherent in some of the parameters used to estimate these load reduction benefits. Therefore, structural control options have also been selected to achieve load reduction goals if necessary. These will be implemented as necessary based on the adaptive management model upon which this WQIP is based.

3.4 PERMIT COMPLIANCE

Load reduction modeling for the structural and non-structural BMPs as detailed in Appendices B – E was performed to provide a reasonable assurance that the load reduction target for the San Diego River watershed management area can be achieved through implementation of this WQIP.

From Specific Provision 6.b.(3)(f) of the Permit, responsible jurisdictions must:

(i) Incorporate the BMPs required under Specific Provision 6.b.(2)(c)[7] as part of the Water Quality Improvement Plan,

(ii) Include an analysis in the Water Quality Improvement Plan, utilizing a watershed model or other watershed analytical tools, to demonstrate that the implementation of the BMPs required under Provision 6.b.(2)(c) achieves compliance with Specific Provisions 6.b.(3)(a), 6.b.(3)(b), 6.b.(3)(c), 6.b.(3)(d), and/or 6.b.(3)(e).

Load reduction modeling for the structural and programmatic (non-structural) BMPs as detailed in Appendices B-E was performed to provide a reasonable assurance that the load reduction target for the San Diego River watershed management area can be achieved through implementation of this WQIP. Table 31 summarizes the total quantified benefits for the proposed suite of BMPs relative to the required load reduction for the HPQWC. Table 31 below compares the required target load reduction for bacteria with the predicted wet weather load reduction. As shown, the predicted wet weather load reduction is greater than the estimated target load reduction to meet the HPWQC final numeric goal.

3.5 OPTIONAL WATERSHED MANAGEMENT AREA ANALYSIS

The Permit provides an innovative pathway for Participating Agencies to provide offsite alternative compliance options to their land development programs by performing watershed-specific analyses characterizing each watershed. In past permit cycles, waivers from onsite structural BMPs were possible, but only on a site-by-site basis, without consideration of the overall needs of the watershed. In contrast, the current Permit provides an option for Participating Agencies to promote implementation of controls on a watershed-based scale established by a greater understanding of the watershed needs and priorities, with the intent of greater overall water quality benefit. As indicated in the Southern California Coastal Water Research Project (SCCWRP) report (2012) that forms the basis of this provision, the first step in achieving this goal 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." The Watershed Management Area Analysis (WMAA), as denoted in the Permit, is an optional task intended to characterize important processes and characteristics of each watershed through creation of GIS layers that include the following information:

[7] The Water Quality Improvement Plans for the applicable Watershed Management Areas in Table 6.0 must incorporate the Comprehensive Load Reduction Plans (CLRPs) required to be developed pursuant to Resolution No. R9-2010-0001.

- 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 intermittent;
- Current and anticipated future land uses;
- Potential coarse sediment yield areas; and
- Locations of existing flood control structures and channel structures, such as stream armoring, constrictions, grade control structures, and hydromodification or flood management basins.

The Participating Agencies may use the data generated from the characterization analyses indicated above for two purposes:

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

Understanding that development of a WMAA is on a watershed-by-watershed basis could be time and funding intensive, the Participating Agencies elected to perform the watershed characterization and hydromodification management exemption mapping on a regional scale under a separate but concurrent effort to development of the WQIPs. The geospatial data and technical documentation from this project has been packaged individually for each watershed, with the San Diego River WMAA package in Appendix F.

3.5.1 *Candidate Projects*

The Permit allows Participating Agencies to develop a program as part of their overall JRMP that potentially allows development projects 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 such, the County of San Diego, the City of San Diego, the City of Santee, and the City of El Cajon have elected to identify a list of potential projects, using the Regional WMAA data, as indicated in the San Diego River Candidate Project lists that appears in Appendix F. The effort to identify these projects is described in the associated San Diego River-specific WMAA data assessment that also appears in Appendix F. It should be noted that only the Candidate Project list is being supplied in the WQIP and the specific provisions and programmatic details of any potential Alternative Compliance programs that may be implemented by individual Participating Agencies is not part of the WQIP.

3.5.2 *Hydromodification Management Exemptions*

Hydromodification, which is caused by both altered storm water flow and altered sediment flow regimes, is largely responsible for degradation of creeks, streams, and associated habitats in the San Diego Region. The purpose of the hydromodification management requirements in the Regional Stormwater 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.

The March 2011 Final Hydromodification Management Plan (HMP) identified certain exemptions from hydromodification management requirements by presenting "HMP applicability criteria." The Regional Stormwater Permit maintains some of these HMP applicability criteria. However, some of the applicability criteria are not included under the Regional Stormwater Permit unless the area or receiving water is mapped in the WMAA. Based on the results of the WMAA, the following exemptions from hydromodification management are proposed for the San Diego River watershed:

Receiving waters that are **exempt** based on the Regional Stormwater Permit include:

- The Pacific Ocean
- Lakes and Reservoirs
- Existing underground storm drains or concrete-lined channels draining directly to the ocean

Receiving waters or conveyance systems that are **recommended to be exempt** in the San Diego River Watershed based on studies that were prepared as part of the Regional WMAA includes:

- San Diego River from Pacific Ocean to confluence with San Vicente Creek;
- Forester Creek stabilized reach from the confluence with the San Diego River to Prospect Avenue; and
- Existing underground storm drains or concrete-lined channels discharging directly to the above receiving waters. These systems were identified based on stormwater data provided by the Copermittees via the data call. These systems may not represent all discharges to the above receiving waters. Additional systems may be considered exempt if there is no evidence of erosion at the outfall of the conveyance system, and any other criteria determined by the local jurisdiction.

3.6 References

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B.3 Chapter Appendix A – Jurisdictional Strategies

San Diego River Illicit Discharge Detection and Elimination Program Strategies City of El Cajon	Implementation Timeframe	Frequency
1. Engage the public, jurisdictional staff, and other agency staff to proactively identify and report illicit discharges.		
Utilize municipal personnel and contractors to identify and report illicit discharges and connections.	Current	Continuous
Facilitate public reporting of illicit discharges and connections via telephone and email.	Current	Continuous
Coordinate with upstream entities to prevent illicit discharges from upstream sources from entering the MS4.	Current	Continuous
2. Develop and implement approaches to address the impacts of septic systems within the watershed.		
Investigate and eliminate illicit discharges and connections.	Current	Continuous
4. Develop and implement approaches to reduce the impacts of public and private sanitary sewer systems within the watershed.		
Implement practices and procedures to prevent/limit infiltration of seepage from sanitary sewers to the MS4.	Current	Continuous
Implement practices and procedures to address spills with the potential to enter the MS4.	Current	Continuous
Investigate and eliminate illicit discharges and connections.	Current	Continuous
5. Implement monitoring programs to provide new information to refine the prioritization of drainage areas.		
Conduct transitional MS4 outfall discharge program[1] to identify persistent/transient flows.	FY 14-15	Twice per Year
Conduct watershed specific MS4 outfall discharge program to identify persistent/transient flows.	FY 15-16	TBD
6. Actively educate public on prohibitions related to illicit discharges and connections.		
Investigate and eliminate illicit discharges and connections.	Current	Continuous
Enforce legal authority to ensure all illicit discharges and connections that are identified are eliminated.	Current	As Needed
Optional Jurisdictional Strategies		
Maintain MS4 map to facilitate implementation of the IDDE program.	Current	Annual

San Diego River Watershed Development Planning Program Strategies City of El Cajon	Implementation Timeframe	Frequency
1. Provide updated materials, enhanced outreach, and training to convey land development requirements.		
Establish criteria designating priority development projects for new development and redevelopment projects.	FY 15-16	One Time
Update BMP design manual procedures to specify stormwater requirements applicable to development and redevelopment projects, identify and design appropriate BMPs, establish maintenance criteria, and establish alternative compliance options (where implemented).	Current	One Time
2. Develop and implement LID programs to complement standard permit requirements.		
Implement downspout disconnection program for industrial, commercial, and residential projects.	Current	Project Specific
Implement proprietary BMPs where appropriate for industrial, commercial, and residential projects.	Current	Project Specific
Implement rainwater harvesting where appropriate for industrial, commercial, and residential projects.	Current	Project Specific
3. Implement a Watershed Management Area Analysis to develop watershed specific requirements for structural BMP implementation and identify a list of candidate projects that could be used as alternative compliance options for Priority Development Projects.		
Develop and implement a Watershed Management Area Analysis to develop watershed specific requirements for structural BMP implementation.	FY 15-16	One Time
5. Implement a post construction BMP program for development projects to ensure proper construction and maintenance.		
Implement source control, LID, and on-site structural controls for all priority development projects.	Current	Continuous
Implement a program that ensures that all structural BMPs are designed, constructed, and maintained on PDPs.	Current	Continuous
Inspect all high priority structural BMPs prior to the rainy season for Copermittees.	Current	Annual
6. Enforce post construction requirements related to new and redevelopment.		
Require implementation of source control and low impact development (LID) BMPs for all development projects.	Current	Continuous

San Diego River Watershed Construction Management Program Strategies City of El Cajon	Implementation Timeframe	Frequency
1. Ensure that minimum BMPs are designated and required for construction projects.		
Require submittal of pollution control plan, construction BMP plan, and/or erosion and sediment control plan for projects requiring local permits involving soil disturbance activities.	Current	Continuous
Review and confirm that the submitted plan is in compliance.	Current	Continuous
Maintain, update, and prioritize a watershed based inventory of all projects issued local permits that allow soil disturbing activities.	Current	Quarterly
Implement or require implementation of BMPs that are site specific, seasonally appropriate, and appropriate to the construction phase year round.	Current	Continuous
Inspect construction sites at an appropriate frequency to require and confirm compliance with local permits and ordinances, as well as the MS4 Permit requirements.	Current	Per JRMP
Enforce legal authority to ensure inventoried construction projects are in compliance with all requirements.	Current	As Needed

San Diego River Existing Development Management Program Strategies City of El Cajon	Implementation Timeframe	Frequency
1. Maintain and improve data tracking methods for existing development inventories where necessary.		
Maintain and update a watershed based inventory of existing development (i.e., commercial, industrial, and municipal facilities and residential areas).	Current	Annual
2. Develop and implement approaches to address the impacts of improper water use and irrigation runoff.		
Provide or expand targeted outreach to homeowners associations	FY 15-16	Continuous
3. Improve and/or continue existing pet waste programs.		
Continue implementation of pet waste bag dispensers in public parks	Current	Continuous
4. Improve trash management strategies within the watershed.		
Implement a schedule of operation and maintenance for public streets, unpaved roads, paved roads, and paved highways.	Current	Continuous
5. Develop and implement approaches to reduce the impacts of public and private sanitary sewer systems within the watershed.		
Implement controls to prevent infiltration of sewage into the MS4 from leaking sanitary sewers.	Current	Continuous
6. Improve and implement existing outreach programs to target key sources and pollutants.		
Provide targeted outreach via printed materials to residential areas	FY 15-16	Continuous
7. Enhance existing MS4 maintenance programs.		
Implement a schedule of operation and maintenance activities for the MS4 and related structures.	Current	Per JRMP
Consider implementation of dry weather flow diversions depending on outcome of Watershed Management Area Analysis	FY 15-16	As Needed and Funding Allows
8. Develop and implement targeted programs to address issues in residential areas.		
Conduct residential management area focused inspections.	FY 15-16	Per JRMP
9. Improve existing inspection programs to more efficiently target key sources.		
Conduct inspections of inventoried existing development to ensure compliance. Each area/activity inspected once every five years minimum, with equivalent of 20% of inventory inspected annually.	Current	Per JRMP

San Diego River Existing Development Management Program Strategies City of El Cajon	Implementation Timeframe	Frequency
10. Actively enforce stormwater and urban runoff requirements for existing development.		
Designate and require minimum set of BMPs required for all inventoried existing development.	Current	One Time
Enforce legal authority to ensure inventoried existing development facilities and/or areas are in compliance with all requirements.	Current	As Needed
11. Identify and facilitate retrofit opportunities in areas of existing development.		
Develop a strategy to identify opportunities and facilitate the implementation of retrofit projects in areas of existing development.	FY 15-16	One Time
Consider implementation of green streets depending on WMAA results	FY 15-16	Dependent on Results, Need, and Funding
Optional Jurisdictional Strategies		
Require implementation of BMPs to address application, storage, and disposal of pesticides, herbicides, and fertilizers on commercial, industrial, and municipal properties.	Current	Continuous
Develop a strategy to identify opportunities and facilitate the implementation of stream, channel, and/or habitat rehabilitation projects in areas of existing development.	FY 15-16	One Time
Forrester Creek Bacteria Management Plan implementation	FY 15-16	Continuous

San Diego River Illicit Discharge Detection and Elimination Program Strategies City of La Mesa	Implementation Timeframe	Frequency
1. Engage the public, jurisdictional staff, and other agency staff to proactively identify and report illicit discharges.		
Utilize municipal personnel and contractors to identify and report illicit discharges and connections.	Current	Continuous
Provide enhanced internal training for field staff related to illicit discharges.	FY 15-16	Annual
Facilitate public reporting of illicit discharges and connections via telephone and email.	Current	Continuous
Coordinate with Helix Water District regarding water line flushing and discharges to the MS4	FY 15-16	Continuous
Coordinate with upstream entities to prevent illicit discharges from upstream sources from entering the MS4.	Current	Continuous
2. Develop and implement approaches to address the impacts of septic systems within the watershed.		
Investigate and eliminate illicit discharges and connections.	Current	Continuous
3. Develop and implement approaches to address the impacts of homeless activities within the watershed.		
Cleanup of encampment sites on public and private lands.	FY 15-16	As Needed
Coordination with La Mesa Police Department to perform routine sweeps	FY 15-16	Continuous
4. Develop and implement approaches to reduce the impacts of public and private sanitary sewer systems within the watershed.		
Require all Food Service Establishments to install grease removal equipment to prevent fats, oils, and grease from obstructing sewer lines	FY 15-16	Continuous
Increase outreach to facilities and residences generating fats, oils, and grease.	FY 15-16	Continuous
Implement practices and procedures to prevent/limit infiltration of seepage from sanitary sewers to the MS4.	Current	Continuous
Implement practices and procedures to address spills with the potential to enter the MS4.	Current	As Needed
Implement sanitary sewer system rehabilitation program (e.g., condition assessments, prioritization, pipe replacement)	FY 15-16	Continuous
Investigate and eliminate illicit discharges and connections.	Current	Continuous

San Diego River Illicit Discharge Detection and Elimination Program Strategies City of La Mesa	Implementation Timeframe	Frequency
5. Implement monitoring programs to provide new information to refine the prioritization of drainage areas.		
Conduct transitional MS4 outfall discharge program[1] to identify persistent/transient flows.	FY 14-15	Twice per Year
Conduct watershed specific MS4 outfall discharge program to identify persistent/transient flows.	FY 15-16	Twice per Year
6. Actively educate public on prohibitions related to illicit discharges and connections.		
Investigate and eliminate illicit discharges and connections.	Current	Continuous
Enforce legal authority to ensure all illicit discharges and connections that are identified are eliminated.	Current	As Needed
Optional Jurisdictional Strategies		
Maintain MS4 map to facilitate implementation of the IDDE program.	Current	Annual

San Diego River Watershed Development Planning Program Strategies City of La Mesa	Implementation Timeframe	Frequency
1. Provide updated materials, enhanced outreach, and training to convey land development requirements.		
Establish criteria designating priority development projects for new development and redevelopment projects.	FY 15-16	One Time
Update BMP design manual procedures to specify stormwater requirements applicable to development and redevelopment projects, identify and design appropriate BMPs, establish maintenance criteria, and establish alternative compliance options (where implemented).	Current	One Time
3. Implement a Watershed Management Area Analysis to develop watershed specific requirements for structural BMP implementation and identify a list of candidate projects that could be used as alternative compliance options for Priority Development Projects.		
Develop and implement a Watershed Management Area Analysis to develop watershed specific requirements for structural BMP implementation.	FY 15-16	One Time
4. Consider the development of an alternative compliance program for Priority Development Projects.		
Consider implementation of an alternative compliance program to provide off-site alternatives for pollutant control and hydromodification management.	FY 18-19	Continuous
5. Implement a post construction BMP program for development projects to ensure proper construction and maintenance.		
Implement source control, LID, and on-site structural controls for all priority development projects.	Current	Continuous
Implement a program that ensures that all structural BMPs are designed, constructed, and maintained on PDPs.	Current	Continuous
Inspect all high priority structural BMPs prior to the rainy season for Copermittees.	Current	Annual
6. Enforce post construction requirements related to new and redevelopment.		
Require implementation of source control and low impact development (LID) BMPs for all development projects.	Current	Continuous
Enforce legal authority to ensure all development projects are in compliance with all post construction requirements.	Current	As Needed
Update ordinances to reflect new land development requirements.	FY 15-16	One Time

San Diego River Watershed Construction Management Program Strategies City of La Mesa	Implementation Timeframe	Frequency
1. Ensure that minimum BMPs are designated and required for construction projects.		
Require submittal of pollution control plan, construction BMP plan, and/or erosion and sediment control plan for projects requiring local permits involving soil disturbance activities.	Current	Continuous
Review and confirm that the submitted plan is in compliance.	Current	Continuous
Maintain, update, and prioritize a watershed based inventory of all projects issued local permits that allow soil disturbing activities.	Current	Quarterly
Implement or require implementation of BMPs that are site specific, seasonally appropriate, and appropriate to the construction phase year round.	Current	Continuous
Inspect construction sites at an appropriate frequency to require and confirm compliance with local permits and ordinances, as well as the MS4 Permit requirements.	Current	Per JRMP
Enforce legal authority to ensure inventoried construction projects are in compliance with all requirements.	Current	As Needed
2. Provide enhanced outreach and coordination to convey construction requirements.		
Increase coordination with internal engineering and building inspections programs through internal meetings and enhanced training.	FY 15-16	Continuous

San Diego River Existing Development Management Program Strategies City of La Mesa		Implementation Timeframe	Frequency
1.	Maintain and improve data tracking methods for existing development inventories where necessary.		
	Maintain and update a watershed based inventory of existing development (i.e., commercial, industrial, and municipal facilities and residential areas).	Current	Annual
2.	Develop and implement approaches to address the impacts of improper water use and irrigation runoff.		
	Increase outreach regarding over irrigation.	FY 15-16	Continuous
	Install weather based irrigation controllers in municipal parks.	FY 15-16	On Going
	Explore options for coordination with Helix Water District regarding water conservation programs.	FY 15-16	Continuous
3.	Improve and/or continue existing pet waste programs.		
	Continue implementation of pet waste program.	Current	Continuous
	Provide focused outreach to residents using kiosks in municipal parks.	FY 15-16	Continuous
4.	Improve trash management strategies within the watershed.		
	Coordinate with I Love a Clean San Diego to install cigarette ashcans throughout the downtown area.	FY 15-16	Continuous
	Perform trash assessments and outreach targeting multi-family residential land uses.	FY 15-16	Continuous
	Increase street sweeping frequencies in priority areas.	FY 15-16	Continuous
5.	Develop and implement approaches to reduce the impacts of public and private sanitary sewer systems within the watershed.		
	Implement controls to prevent infiltration of sewage into the MS4 from leaking sanitary sewers.	Current	Continuous
	Perform coordinated inspections for stormwater and FOG at food service establishments.	Current	Continuous
6.	Improve and implement existing outreach programs to target key sources and pollutants.		
	Provide enhanced internal training to parks staff.	FY 15-16	Annual
	Provide enhanced internal training to street maintenance staff.	FY 15-16	Annual
8.	Develop and implement targeted programs to address issues in residential areas.		
	Prioritize residential management areas for focused inspections.	FY 15-16	Continuous
9.	Improve existing inspections programs to more efficiently target key sources.		
	Perform evaluations of businesses for exposure to stormwater though increased patrols and inspections.	FY 15-16	Per JRMP

San Diego River Existing Development Management Program Strategies **City of La Mesa**	**Implementation Timeframe**	**Frequency**
10. Actively enforce stormwater and urban runoff requirements for existing development.		
Increase coordination with City Code Enforcement where properties are out of compliance.	FY 15-16	As Needed
Increased enforcement as appropriate as a result of increased business inspections.	FY 15-16	As Needed
11. Identify and facilitate retrofit opportunities in areas of existing development.		
Install weather based irrigation controllers in municipal parks.	FY 15-16	Continuous
13. Improve coordination between agencies.		
Explore options for coordination with Helix Water District regarding water conservation programs.	FY 15-16	Continuous
Optional Jurisdictional Strategies		
Alvarado Creek Restoration Project	FY 15-16	One Time Project

San Diego River Illicit Discharge Detection and Elimination Program Strategies City of Santee	Implementation Timeframe	Frequency
1. Engage the public, jurisdictional staff, and other agency staff to proactively identify and report illicit discharges.		
Utilize municipal personnel and contractors to identify and report illicit discharges and connections.	Current	Continuous
Facilitate public reporting of illicit discharges and connections via telephone and email.	Current	Continuous
Coordination with Padre Dam Municipal Water District regarding sanitary sewer overflow notifications and cleanup.	Current	Continuous
Coordinate with upstream entities to prevent illicit discharges from upstream sources from entering the MS4.	Current	Continuous
2. Develop and implement approaches to address the impacts of homeless activities within the watershed.		
River "sweeps" to address homeless encampments twice per month.	Current	Twice per Month
Weekly patrols of known encampment areas.	Current	Weekly
Implement Bicycle Patrol Team in conjunction with San Diego County Sherriff's Department	FY 15-16	Continuous
Improved coordination between Public Works staff and San Diego County Sherriff's Department.	Current	Continuous
Provide waste stations for homeless encampments (e.g., portable toilets, trash receptacles)	FY 15-16	TBD
Continue coordination of Enforcement Team including the Fire Marshall, Code Enforcement, Stormwater Program Manager, City Attorney, and Sherriff's Department	Current	Continuous
3. Develop and implement approaches to reduce the impacts of public and private sanitary sewer systems within the watershed.		
Coordination with Padre Dam Municipal Water District regarding sanitary sewer overflow notifications and cleanup.	Current	Continuous
Increase use of fact sheet for sewer maintenance.	Current	Continuous
Implement practices and procedures to prevent/limit infiltration of seepage from sanitary sewers to the MS4.	Current	Continuous
Implement practices and procedures to address spills with the potential to enter the MS4.	Current	Continuous
Investigate and eliminate illicit discharges and connections.	Current	Continuous

San Diego River Illicit Discharge Detection and Elimination Program Strategies City of Santee	Implementation Timeframe	Frequency
4. Implement monitoring programs to provide new information to refine the prioritization of drainage areas.		
Conduct transitional MS4 outfall discharge program[1] to identify persistent/transient flows.	FY 14-15	Twice per Year
Conduct watershed specific MS4 outfall discharge program to identify persistent/transient flows.	FY 15-16	Twice per Year
5. Actively educate public on prohibitions related to illicit discharges and connections.		
Investigate and eliminate illicit discharges and connections.	Current	Continuous
Enforce legal authority to ensure all illicit discharges and connections that are identified are eliminated.	Current	As Needed
Optional Jurisdictional Strategies		
Maintain MS4 map to facilitate implementation of the IDDE program.	Current	Annual

San Diego River Watershed Development Planning Program Strategies City of Santee	Implementation Timeframe	Frequency
1. Provide updated materials, enhanced outreach, and training to convey land development requirements.		
Establish criteria designating priority development projects for new development and redevelopment projects.	FY 15-16	One Time
Update BMP design manual procedures to specify stormwater requirements applicable to development and redevelopment projects, identify and design appropriate BMPs, establish maintenance criteria, and establish alternative compliance options (where implemented).	Current	One Time
2. Develop and implement LID programs to complement standard permit requirements.		
Require full enclosures for trash areas.	FY 15-16	Continuous
3. Implement a Watershed Management Area Analysis to develop watershed specific requirements for structural BMP implementation and identify a list of candidate projects that could be used as alternative compliance options for Priority Development Projects.		
Develop and implement a Watershed Management Area Analysis to develop watershed specific requirements for structural BMP implementation.	FY 15-16	One Time
4. Consider the development of an alternative compliance program for Priority Development Projects.		
The City will consider implementation of an alternative compliance program to provide off-site alternatives for pollutant control and hydromodification management, dependent on need and funding.	FY 18-19	One Time
5. Implement a post construction BMP program for development projects to ensure proper construction and maintenance.		
Implement source control, LID, and on-site structural controls for all priority development projects.	Current	Continuous
Implement a program that ensures that all structural BMPs are designed, constructed, and maintained on PDPs.	Current	Continuous
Inspect all high priority structural BMPs prior to the rainy season for Copermittees.	Current	Annual
6. Enforce post construction requirements related to new and redevelopment.		
Require implementation of source control and low impact development (LID) BMPs for all development projects.	Current	Continuous
Enforce legal authority to ensure all development projects are in compliance with all post construction requirements.	Current	As Needed

San Diego River Watershed Construction Management Program Strategies City of Santee	Implementation Timeframe	Frequency
1. Ensure that minimum BMPs are designated and required for construction projects.		
Require submittal of pollution control plan, construction BMP plan, and/or erosion and sediment control plan for projects requiring local permits involving soil disturbance activities.	Current	Continuous
Review and confirm that the submitted plan is in compliance.	Current	Continuous
Maintain, update, and prioritize a watershed based inventory of all projects issued local permits that allow soil disturbing activities.	Current	Quarterly
Implement or require implementation of BMPs that are site specific, seasonally appropriate, and appropriate to the construction phase year round.	Current	Continuous
Inspect construction sites at an appropriate frequency to require and confirm compliance with local permits and ordinances, as well as the MS4 Permit requirements.	Current	Per JRMP
Enforce legal authority to ensure inventoried construction projects are in compliance with all requirements.	Current	As Needed
Target construction sites with increased enforcement as appropriate, especially related to trash management.	FY 15-16	As Needed
2. Provide enhanced outreach and coordination to convey construction requirements.		
Provide internal staff training related to construction stormwater management.	Current	Annual
Provide public education and outreach targeting the construction industry.	FY 15-16	Continuous
Coordination with engineering and building inspections divisions to address SSOs caused by debris in sanitary sewer lines following new construction; review sign off procedures to ensure that debris in lines is avoided.	FY 15-16	Continuous

San Diego River Existing Development Management Program Strategies City of Santee	Implementation Timeframe	Frequency
1. Maintain and improve data tracking methods for existing development inventories where necessary.		
Maintain and update a watershed based inventory of existing development (i.e., commercial, industrial, and municipal facilities and residential areas).	Current	Annual
2. Develop and implement approaches to address the impacts of improper water use and irrigation runoff.		
Coordinate with Padre Dam Municipal Water District to encourage proper enforcement of water conservation requirements.	FY 15-16	Continuous
Coordinate with Padre Dam Municipal Water District to provide joint outreach to residents and businesses regarding irrigation practices.	FY 15-16	Continuous
Coordinate with Padre Dam Municipal Water District to increase incentive programs	FY 15-16	Continuous
Coordinate with County of San Diego to promote Sustainable Landscapes Program.	FY 15-16	Continuous
Develop education and outreach to reduce over-irrigation.	FY 15-16	TBD
3. Improve and/or continue existing pet waste programs.		
Pet Waste Bag Dispenser Stations in City Parks and Residential Areas	Current	Continuous
4. Improve trash management strategies within the watershed.		
Develop and distribute "Keep Lids Closed" stickers for dumpsters.	FY 15-16	Continuous
Target commercial centers for increased enforcement, especially related to trash management.	FY 15-16	As Needed
Coordination with Santee School District for trash management.	Current	Continuous
Implement a schedule of operation and maintenance for public streets, unpaved roads, paved roads, and paved highways.	Current	Continuous
Require sweeping and maintenance of private roads in targeted areas.	Current	Continuous
Continue reporting and evaluating volumes of trash removed from illegal dumping activities	Current	Annual
Develop outreach program similar to the "Don't Trash California" campaign, including updates to existing outreach materials.	Current	Continuous
Enhance and expand trash cleanups through community-based organizations involving target audiences.	FY 15-16	TBD

San Diego River Existing Development Management Program Strategies City of Santee	Implementation Timeframe	Frequency
5. Develop and implement approaches to reduce the impacts of public and private sanitary sewer systems within the watershed.		
Implement controls to prevent infiltration of sewage into the MS4 from leaking sanitary sewers.	Current	Continuous
Develop a strategy to identify and provide outreach to gray water system owners	FY 15-16	One Time
6. Improve and implement existing outreach programs to target key sources and pollutants.		
Increase seasonal specific outreach related to water use via business journals.	FY 15-16	Quarterly
Enhanced outreach to pool owners and maintenance companies - due to economic downturn, people have stopped maintaining pools, when flushed, may contain bacteria.	FY 15-16	Continuous
Golf Course - outreach specific to management of landscaping and water use; bio solids use as fertilizer/storage.	FY 15-16	Continuous
SDR Trail Expansion (City Parks) - interpretive signage; demonstration project for drought tolerant/native landscaping, permeable surfaces, and other LID.	FY 15-16	One Time Project
Improve consistency and content of websites to highlight enforceable conditions and reporting methods.	FY 15-16	One Time Update
Enhance school and recreation-based education and outreach.	FY 15-16	TBD
7. Enhance existing MS4 maintenance programs.		
Implement a schedule of operation and maintenance activities for the MS4 and related structures.	Current	Per JRMP
Prioritized MS4 cleaning program based on land use density and traffic flows.	Current	Per JRMP
Investigate potential to use ultra-violet lights in the MS4.	FY 15-16	One Time
Implement invasive species removal projects in coordination with San Diego River Conservancy.	Current	As Needed
8. Develop and implement targeted programs to address issues in residential areas.		
Conduct residential management area focused inspections.	FY 15-16	Per JRMP
Prioritize residential management areas for focused inspections.	FY 15-16	Continuous
Provide or expand targeted outreach to homeowners associations.	FY 15-16	TBD
Provide targeted outreach via printed materials to residential areas.	FY 15-16	Continuous

San Diego River Existing Development Management Program Strategies City of Santee	Implementation Timeframe	Frequency
9. Improve existing inspections programs to more efficiently target key sources.		
Conduct inspections of inventoried existing development to ensure compliance. Each area/activity inspected once every five years minimum, with equivalent of 20% of inventory inspected annually.	Current	Per JRMP
10. Actively enforce stormwater and urban runoff requirements for existing development.		
Designate and require minimum set of BMPs required for all inventoried existing development.	Current	One Time
Increase identification and enforcement of actionable erosion and slope stabilization issues on private property and require stabilization and repair.	FY 15-16	Continuous
Enforce legal authority to ensure inventoried existing development facilities and/or areas are in compliance with all requirements.	Current	As Needed
11. Identify and facilitate retrofit opportunities in areas of existing development.		
Develop a strategy to identify opportunities and facilitate the implementation of retrofit projects in areas of existing development.	FY 15-16	One Time
Consider implementation of green streets depending on WMAA results.	FY 15-16	Dependent on Results, Need, and Funding
Coordinate with Padre Dam Municipal Water District to increase incentive programs	FY 15-16	Continuous
Coordinate with County of San Diego to promote Sustainable Landscapes Program.	FY 15-16	Continuous
13. Improve coordination between agencies.		
Increased public outreach through external professional organizations (e.g., APWA, ASCE, Chamber of Commerce) - leveraging groups/contacts/newsletter.	FY 15-16	TBD
Coordinate with Padre Dam Municipal Water District to encourage proper enforcement of water conservation requirements.	FY 15-16	Continuous
Coordinate with Padre Dam Municipal Water District to provide joint outreach to residents and businesses regarding irrigation practices.	FY 15-16	Continuous
Coordinate with Padre Dam Municipal Water District to increase incentive programs.	FY 15-16	Continuous
Coordinate with County of San Diego to promote Sustainable Landscapes Program.	FY 15-16	Continuous

San Diego River Existing Development Management Program Strategies City of Santee	Implementation Timeframe	Frequency
Optional Jurisdictional Strategies		
Require implementation of BMPs to address application, storage, and disposal of pesticides, herbicides, and fertilizers on commercial, industrial, and municipal properties.	Current	Continuous
Develop a strategy to identify opportunities and facilitate the implementation of stream, channel, and/or habitat rehabilitation projects in areas of existing development.	FY 15-16	One Time

San Diego River Illicit Discharge Detection and Elimination Program Strategies County of San Diego	Implementation Timeframe	Frequency
1. Engage the public, jurisdictional staff, and other agency staff to proactively identify and report illicit discharges.		
Develop and implement a strategy for investigating and addressing ICIDs.	FY 15	One Time
Maintain MS4 map to facilitate implementation of the IDDE program.	Current	Annual
Provide enhanced and focused training for County field staff related to illicit discharges.	FY 16	Annual
Refer homeless issue complaints to Sheriff or appropriate jurisdictions.	Current	Continuous
Bilingual hotline answered by I Love a Clean San Diego (ILACSD; live operator) with multiple avenues for online reporting.	FY 16	Continuous
Coordinate with upstream entities to prevent illicit discharges from upstream sources from entering the MS4.	Current	Continuous
2. Develop and implement approaches to address the impacts of septic systems within the watershed.		
Address septic system failures where observed.	Current	As Needed
3. Develop and implement approaches to reduce the impacts of public and private sanitary sewer systems within the watershed.		
Coordinate spill response with responsible sewer agencies.	Current	Continuous
Implement practices and procedures to address spills with the potential to enter the MS4.	Current	Continuous
4. Implement monitoring programs to provide new information to refine the prioritization of drainage areas.		
Monitor MS4 outfalls for discharges of potential ICIDs.	Current	Annual
5. Actively enforce prohibitions related to illicit discharges and connections.		
Investigate and eliminate illicit discharges and connections.	Current	Continuous
Enforce legal authority to ensure all illicit discharges and connections that are identified are eliminated.	Current	As Needed
Update ordinances to reflect current ICID requirements and strategies.	FY 15-16	One Time
Implement escalating enforcement responses to compel compliance with statutes, ordinances, permits, contracts, orders, and other requirements for IDDE, development planning, construction management, and existing development in the Enforcement Response Plan.	Current	Continuous

San Diego River Illicit Discharge Detection and Elimination Program Strategies County of San Diego	Implementation Timeframe	Frequency
Optional Jurisdictional Strategies		
Implement septic system rebate program with availability of grant funding.	FY 16	Continuous
Develop a pilot online septic system maintenance outreach program.	Current	Continuous
In collaboration with the Department of Environmental Health, consider development of incentive programs for pumping septic systems in high risk areas adjacent to waterways (within 600 ft.) or stormwater system; subject to grant funding.	TBD	TBD
In collaboration with the Department of Environmental Health, consider developing program for on-site wastewater treatment (septic) systems. May include mapping and risk assessment, inspection, or maintenance practices.	TBD	TBD
Consider collaboration with wastewater agencies to identify where sewer and stormwater infrastructure are in close proximity and confirm the absence of flow at nearby stormwater MS4 outfall during dry weather.	TBD	TBD
Collaborate with watershed partners to evaluate feasibility of invasive plant and invasive/feral animal removal.	Current	Continuous
Consider collaboration with watershed partners to remove invasive non-native plants (Arundo) upstream areas rivers or tributaries to increase flood and fire protection and reduce the number of unauthorized encampments on the river bottom.	TBD	TBD
Investigate the feasibility of developing a pilot program (including training) - volunteer surveillance program.	FY 16-17	Continuous
Conduct dry weather Microbial Source Tracking study at MS4 outfalls with flow; further prioritization of drainage areas.	FY15	One time

San Diego River Watershed Development Planning Program Strategies County of San Diego	Implementation Timeframe	Frequency
1. Provide updated materials, enhanced outreach, and training to convey land development requirements.		
Update BMP Design Manual procedures to determine nature and extent of storm water requirements applicable to development projects and to identify conditions of concern for selecting, designing, and maintaining appropriate structural BMPs.	In Development	FY 16
Conduct BMP Design Manual training - Internal	FY 16	One Time
Conduct BMP Design Manual training – External	FY 16	One Time
2. Implement a Watershed Management Area Analysis to develop watershed specific requirements for structural BMP implementation and identify a list of candidate projects that could be used as alternative compliance options for Priority Development Projects.		
Develop and implement a Watershed Management Area Analysis to develop watershed specific requirements for structural BMP implementation.	FY 15-16	One Time
3. Consider the development of an alternative compliance program for Priority Development Projects.		
Consider implementation of an alternative compliance program to provide off-site alternatives for pollutant control and hydromodification management.	Future	In development
4. Implement a post construction BMP program for development projects to ensure proper construction and maintenance.		
All development projects: Implement or require implementation of source control BMPs to minimize pollutant generation at each project and implement LID BMPs to maintain or restore hydrology of the area, where applicable and feasible.	Current	Continuous
Priority Development Projects (PDP): In addition to requirement for all development projects, implement or require implementation of onsite structural BMPs to control pollutants and manage hydromodification for PDPs.	Current	Continuous
Implement a program that requires and confirms PDP structural BMPs are designed, constructed, and maintained to remove pollutants.	Current	Continuous
5. Enforce post construction requirements related to new and redevelopment.		
Enforce legal authority to ensure all development projects are in compliance with all post construction requirements.	Current	Continuous
Update county ordinance related to land development; reference to updated BMP manual.	FY 15	One Time

San Diego River Watershed Development Planning Program Strategies County of San Diego	Implementation Timeframe	Frequency
Implement escalating enforcement responses to compel compliance with statutes, ordinances, permits, contracts, orders, and other requirements for IDDE, development planning, construction management, and existing development in the Enforcement Response Plan.	Current	Continuous
Optional Jurisdictional Strategies		
Investigate feasibility of developing a Green Streets Program.	TBD	TBD
Consider feasibility of developing an alternative compliance program to enable "offsite" compliance for new and redevelopment projects.	TBD	TBD
Investigate feasibility of Land Acquisitions for habitat restoration or preservation.	TBD	TBD
Investigate feasibility of Retrofitting projects in areas of existing development.	TBD	TBD
Consider collaboration with COSD internal departments to leverage mutually beneficial projects to promote retrofits to include installation of controls to address priority pollutants, if feasible.	TBD	TBD
Investigate feasibility of planning for Structural BMPs.	TBD	TBD
Consider the need to plan, design, and conduct environmental review for the following or equivalent structural BMPs to reduce bacteria and other priority pollutants, as needed. • SDR WQIP - SDCo-R-01, wet pond/subsurface flow wetland. • SDR WQIP - SDCo-R-02, infiltration basin. • SDR WQIP - SDCo-R-03, enhanced constructed wetland. • SDR WQIP - MJ-R-01, gross solids and trash removal. • SDR WQIP - MJ-R-02, infiltration basin.	TBD	TBD
Investigate feasibility of Incentives.	TBD	TBD
Investigate feasibility of Detention basins.	TBD	TBD
Investigate feasibility of Treatment systems.	TBD	TBD
Investigate feasibility of Stream, channel, and/or habitat rehabilitation projects.	TBD	TBD

San Diego River Watershed Construction Management Program Strategies County of San Diego	Implementation Timeframe	Frequency
1. Ensure that minimum BMPs are designated and required for construction projects.		
Maintain and update a watershed-based inventory of all construction projects issued a local permit that allows ground disturbance or soil disturbing activities.	FY 16	Quarterly
Implement or require implementation of BMPs that are site specific, seasonally appropriate, and appropriate to the construction phase year round.	TBD	Continuous
Enforce legal authority to ensure inventoried construction projects are in compliance with all requirements.	Current	As Needed
Update county ordinance related to construction; reference to existing grading ordinance	Current	As Needed
Implement escalating enforcement responses to compel compliance with statutes, ordinances, permits, contracts, orders, and other requirements for IDDE, development planning, construction management, and existing development in the Enforcement Response Plan.	Current	Continuous
Notify the SDWB by email (Nonfilers_R9waterboards.ca.gov) within five (5) calendar days of issuing escalated enforcement to a construction site that poses a significant threat to water quality as a result of violations or other noncompliance	FY 16	Continuous
Notify the SDWB by email (Nonfilers_R9waterboards.ca.gov) any persons required to obtain coverage under the statewide Industrial General Permit and Construction General Permit and failing to do so, within five (5) calendar days from the time the Copermittee become aware of the circumstances.	FY 16	Continuous
2. Provide enhanced outreach and coordination to convey construction requirements.		
Conduct internal training on Construction Management	Current	Annual

San Diego River Existing Development Management Program Strategies County of San Diego		Implementation Timeframe	Frequency
1.	Maintain and improve data tracking methods for existing development inventories where necessary.		
	Maintain and update a watershed-based inventory of all existing development that may discharge a pollutant load to and from the MS4.	Current	Annual
	Make improvements to tracking watershed based inventories via consolidated database	FY 16	Continuous
	Designate a minimum set of BMPs required for all existing development inventories, including special event venues. The designated minimum BMPs must be specific to facility or area types and pollutant generating activities, as appropriate.	Current	Continuous
2.	Develop and implement approaches to address the impacts of improper water use and irrigation runoff.		
	Develop Sustainable Landscapes Program based on available grant funding	FY 16	Continuous
	Conduct over irrigation outreach pilot study	Current	One Time
	Conduct Homeowners Associations Outreach and Coordination Pilot Study	Current	Continuous
3.	Improve and/or continue existing pet waste programs.		
	Facilitate pet waste management in county Parks through outreach or bad dispensers.	Current	Continuous
	Conduct large residential property pet waste management outreach	Current	Continuous
4.	Improve trash management strategies within the watershed.		
	Sponsor Trash Collection Events (public outreach/part).	Current	Multiple per Year
5.	Develop and implement approaches to reduce the impacts of public and private sanitary sewer systems within the watershed.		
6.	Improve and implement existing outreach programs to target key sources and pollutants.		
	Create an Equestrian BMP Handbook.	FY 16	One Time
	Develop, improve, and distribute outreach materials for existing development.	Current	Continuous
	Conduct outreach presentations to elementary, middle, and high school students.	FY 15-16	Multiple per Year
	Conduct enhanced outreach to mobile landscaping service providers.	FY 15-16	Continuous
	Conduct large property residential pet waste management outreach.	FY 15-16	TBD

San Diego River Existing Development Management Program Strategies County of San Diego	Implementation Timeframe	Frequency
Conduct Educational Workshops (e.g., IPM, manure management).	Current	TBD
Conduct Education & Outreach Effectiveness Survey.	Current	Annual
7. Enhance existing Stormwater maintenance programs.		
Operate and maintain (inspect and clean) MS4 and related structures (catch basins, storm drain inlets, detention basins, etc.).	Current	Continuous
Operate and maintain (e.g., inspect, sweep) County maintained streets, unpaved roads, paved roads, and paved highways	Current	Continuous
8. Develop and implement targeted programs to address issues in residential areas.		
Focused residential inspections based on strategic assessments (modeling, MST, persistent flows, regulatory, monitoring data, SFR/MFR (112 RMAs based on HSA).	FY 16	5-year timeframe
Implement a public education and participation program to promote and encourage development of programs, management practices and behaviors that reduce the discharge of pollutants in storm water prioritized by high risk behaviors, pollutants of concern, and target audiences.		
9. Improve existing inspections programs to more efficiently target key sources.		
Conduct inspections of inventoried existing development to ensure compliance.	Current	Per JRMP
Implementation of operation and maintenance activities (inspection and cleaning) for MS4 and related structures (catch basins, storm drain inlets, detention basins, etc.).	Current	Annual
10. Actively enforce stormwater and urban runoff requirements for existing development.		
Require implementation of minimum BMPs for existing development (commercial, industrial, municipal, and residential) that are specific to the facility, area types and pollutant generating activities, as appropriate.	Current	Continuous
Require implementation of BMPs to address application, storage, and disposal of pesticides, herbicides, and fertilizers on commercial, industrial, and municipal properties.	Current	Continuous
Designate a minimum set of BMPs required for all inventories existing development, including special event venues. The designated minimum BMPs must be specific to facility or area types and pollutant generating activities, as appropriate.	Current	One Time
Enforce legal authority to ensure inventoried existing development facilities and/or areas are in compliance with all requirements.	Current	As Needed
Update county ordinance related to existing development; reference	FY 15	One Time

San Diego River Existing Development Management Program Strategies County of San Diego	Implementation Timeframe	Frequency
to existing guidance documents.		
Implement escalating enforcement responses to compel compliance with statutes, ordinances, permits, contracts, orders, and other requirements for IDDE, development planning, construction management, and existing development in the Enforcement Response Plan.	Current	Continuous
11. Develop and implement a strategy to identify and facilitate retrofit opportunities in areas of existing development.		
Develop a strategy to identify opportunities and facilitate the implementation of retrofit projects in areas of existing development.	FY 15-16	One Time
Promote and encourage implementation of designated BMPs at residential areas.	FY 16	Continuous
12. Perform strategic monitoring to improve understanding of sources and water quality within the watershed.		
13. Improve coordination between agencies.		
Collaborate with partner agencies and groups to promote incentive programs for BMP retrofits, including rain barrels, smart controllers, soil sensors, turf replacement, etc.	Current	Continuous
Optional Jurisdictional Strategies		
Consider development of incentive programs for water conservation (turf replacement, smart irrigation controllers, irrigation modifications, sustainable landscapes, rain barrels), in collaboration with water agencies and others, to reduce priority pollutants.	TBD	TBD
Investigate the feasibility of developing and implementing an incentive program for BMP Retrofits (Public- Private Partnerships – a County sponsored program to offer incentives for rain barrel installation, downspout disconnects from the stormdrain system, etc.)	TBD	TBD
Consider partnerships with Master Gardeners to provide education opportunities on water use and practices for gardening.	TBD	TBD
Consider collaboration with community groups to provide "boots on the ground" local information to focus implementation efforts on reducing bacteria and other pollutants, close to the source.	TBD	TBD
Consider collaboration with watershed partners to encourage consistent messaging to specific targeted audiences (commercial, residents, and others) to conserve water and mitigate dry weather flows.	TBD	TBD

San Diego River Existing Development Management Program Strategies County of San Diego	Implementation Timeframe	Frequency
Investigate the feasibility of improvements to inspections data tracking through mobile phone applications	FY 16	Concurrent with Inspections
Investigate the feasibility of a residential inspections tracking program via mobile platform - miles, violations, etc.	FY 16	Concurrent with Inspections
Develop a strategy to identify candidate areas of existing development for stream, channel, and/or habitat rehabilitation projects and facilitate implementation of such projects.	FY 15	One Time
Develop and implement Stormwater Quality Master Plans for Special Drainage Fee Areas.	Current	Continuous
Consider expanding Homeowners Associations Outreach and Coordination, as needed and as funding is identified.	TBD	TBD
Implement full scale residential pet waste projects (commitments, large property, urban).	TBD	TBD
Consider evaluation and reprioritization of the Agriculture, Weights, and Measures stormwater program to determine inspection priorities for agricultural and related facilities.	TBD	TBD

San Diego River Watershed Optional Strategies County of San Diego
Consider collaboration with watershed partners on Round 4 of Proposition 84 IRWM grant opportunities to fund targeted educational programs, building of structural controls (brick and mortar projects), or incentive programs to reduce runoff.
Consider collaboration with watershed partners and Regional Water Quality Control Board on effective measures to reduce potential impact of pollutant loads to waterways from unauthorized encampments.
Consider investigating diverting persistent dry weather flows from storm drains to sanitary sewer, where feasible.
Consider the design of structural controls for persistent unpermitted dry weather flows where outreach has been unsuccessful and groundwater or other non-MS4 sources has been ruled out
Consider developing a strategy to evaluate opportunities to naturalize concrete stormwater conveyances, and identify potential funding sources (such as grants) for design and implementation.
Consider collaboration with Caltrans on their implementation of TMDLs at stream reaches on the Caltrans TMDL Prioritization List that are within the County's jurisdiction.

CALTRANS

San Diego River Watershed Illicit Discharge Detection and Elimination Program Strategies Caltrans	Implementation Timeframe	Frequency
1. Engage the public, jurisdictional staff, and other agency staff to proactively identify and report illicit discharges.		
Utilize municipal personnel and contractors to identify and report illicit discharges and connections.	Current	Continuous
Facilitate public reporting of illicit discharges and connections via telephone and email.	Current	Continuous
Coordinate with upstream entities to prevent illicit discharges from upstream sources from entering the MS4.	Current	Continuous
Annual training for appropriate staff on implementation of ICID and Illegal Dumping Response Plan.	FY 15-16	Annual
Develop and implement procedures for educating the public with respect to ICIDs and illegal dumping.	Current	One Time, Continuous
2. Develop and implement approaches to reduce the impacts of public and private sanitary sewer systems within the watershed.		
Implement practices and procedures to address spills with the potential to enter the MS4.	Current	Continuous
Investigate and eliminate illicit discharges and connections.	Current	Continuous
3. Actively educate public on prohibitions related to illicit discharges and connections.		
Investigate and eliminate illicit discharges and connections.	Current	Continuous
Optional Jurisdictional Strategies		
Develop and Implement an IC/ID and Illegal Dumping Response Plan	FY 15-16	One Time, Continuous
Develop and implement procedures for investigating, remediating, and eliminating illicit connections and discharges.	Current	One Time, Continuous
Develop and implement procedures for the prevention of illegal dumping.	Current	One Time, Continuous

San Diego River Watershed Development Planning Program Strategies Caltrans	Implementation Timeframe	Frequency
1. Provide updated materials, enhanced outreach, and training to convey land development requirements.		
Stormwater Treatment BMP Technology Report and Stormwater Monitoring and BMP Development Status Report	FY 15-16	One Time/Annual
2. Implement a post construction BMP program for development projects to ensure proper construction and maintenance.		
Implement a program that ensures that all structural BMPs are designed, constructed, and maintained on PDPs.	Current	Continuous
Structural BMPs (which retain water for more than 96 hours) inventory	Current	Annual
Structural BMP inventory (which retain water for more than 96 hours) to California Department of Public Health electronically	Current	Annual
Inspect all high priority structural BMPs.	Current	Annual
3. Enforce post construction requirements related to new and redevelopment.		
Enforce legal authority to ensure all development projects are in compliance with all post construction requirements.	Current	As Needed

San Diego River Watershed Construction Management Program Strategies Caltrans	Implementation Timeframe	Frequency
1. Ensure that minimum BMPs are designated and required for construction projects.		
Implement or require implementation of BMPs that are site specific, seasonally appropriate, and appropriate to the construction phase year round.	Current	Continuous
2. Provide enhanced outreach and coordination to convey construction requirements.		
Provide internal staff training related to construction stormwater management.	Current	Annual
Provide public education and outreach targeting the construction industry.	Current	Continuous
Develop and implement new construction guidance as needed to comply with new Statewide Construction General Permit (CGP)	TBD	As Needed

San Diego River Existing Development Management Program Strategies Caltrans	Implementation Timeframe	Frequency
1. Maintain and improve data tracking methods for existing development inventories where necessary.		
Maintain and update a watershed based inventory of existing development (i.e., commercial, industrial, and municipal facilities and residential areas).	Current	Annual
2. Improve trash management strategies within the watershed.		
Implement "Don't Trash California" campaign.	Current	Continuous
Promote "On the Job with Caltrans Litter Removal" video	Current	Continuous
Implementation of Adopt-A-Highway Statewide Program through coordination with local organizations.	Current	Continuous
Report and evaluate trash and litter activities.	Current	Annual
Implement a schedule of operation and maintenance for public streets, unpaved roads, paved roads, and paved highways.	Current	Continuous
Implement highway maintenance activities as required.	Current	Continuous
3. Improve and implement existing outreach programs to target key sources and pollutants.		
Implement and annually evaluate public education program.	Current	Annual
Co-sponsor CASQA's Water Quality Newsflash	Current	Monthly
Implementation of Statewide Storm Drain Stenciling Program	Current	Continuous
Develop and implement Facility Pollution Prevention Plans via templates and guidance documents.	Current	Continuous
Develop and implement guidance to ensure industrial activities and facilities are covered by the Industrial General Permit as required.	Current	Continuous
Develop and implement a Municipal Coordination Plan	FY 15-16	Continuous
4. Enhance existing MS4 maintenance programs.		
Implement a schedule of operation and maintenance activities for the MS4 and related structures.	Current	Per SWMP
5. Improve existing inspections programs to more efficiently target key sources.		
Conduct inspections of inventoried existing development to ensure compliance. Each area/activity inspected once every five years minimum, with equivalent of 20% of inventory inspected annually.	Current	Per SWMP

San Diego River Existing Development Management Program Strategies **Caltrans**	**Implementation Timeframe**	**Frequency**
6. Identify and facilitate retrofit opportunities in areas of existing development.		
Develop a strategy to identify opportunities and facilitate the implementation of retrofit projects in areas of existing development.	FY 15-16	One Time
Optional Jurisdictional Strategies		
Require implementation of BMPs to address application, storage, and disposal of pesticides, herbicides, and fertilizers on commercial, industrial, and municipal properties.	Current	Continuous
Implement and evaluate the Vegetation Controls Program	Current	Continuous

ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
	Jurisdictional Strategies						
	Development Planning						
	All Development Projects						
CSD-1	Establish guidelines and standards for all development projects; provide technical support related to implementation of source control BMPs to minimize pollutant generation at each project and implement LID BMPs to maintain or restore hydrology of the area or implement easements to protect water quality, where applicable and feasible.	Refer to JRMP (currently under development).	City-wide	Prior to FY16	Ongoing	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-1.1	Investigation and research of emerging technology.	Annually the Construction & Development Standards Group identifies new tasks to conduct literature review, communication with researchers outside of the City, physical testing and experimentation of new or emerging technologies, and other research with the goal of updating tools available for reducing pollutant loads from development and redevelopment sites.	City-wide	Prior to FY16	As needed	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-1.2	Approve and implement a green infrastructure policy.	The City will begin developing a policy in FY16 that will increase the green infrastructure requirements for City CIP projects. This policy will be coordinated with ongoing efforts to update City design manuals and LID design standards for public LID BMPs.	City-wide on public parcels	FY16 (Begin)	As needed	T&SW with DSD and PWD	TBD
CSD-1.3	Develop Design Standards for Public LID BMPs.	Improve quality of design to ensure efficiency and reliability in public designs.	City-wide	FY14-FY15	As needed	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-1.4	Outreach to impacted industry regarding minimum BMP requirement updates.	Affects commercial, industrial, and residential development.	City-wide	FY15	As needed	TBD	TBD
CSD-2	Train staff on LID regulatory changes and LID practices.	Formal training is required for all staff involved in development plan review to increase knowledge of LID BMPs. Goal of training associated with LID practices and regulations is to promote LID implementation and to avoid adverse conditions such as trees planted within swales, or planned drainage patterns which obstruct or inhibit LID performance.	City-wide	FY16	As needed	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-3	Amend municipal code and ordinances, including zoning ordinances, to facilitate and encourage LID opportunities. Ensure consistency with the City of San Diego's BMP Design Manual. Update the Storm Water Standards Manual accordingly.	Municipal codes and ordinances will be brought to City Council for consideration to encourage LID implementation (e.g., runoff detention and filtration using natural filters and stormwater retention for reuse). LID stormwater management will be encouraged in proposed codes and ordinances associated with development and redevelopment projects, which are brought to City Council for consideration.	City-wide	FY15	As needed	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-4	Create a manual that outlines right-of-way design standards.	Create a manual that includes flood control performance standards, permanent BMP elements design standards, design standards for green streets and other BMPs, and maintenance access. Provides drainage and streets design standards. Opportunity to merge various existing manuals and provide consistency.	City-wide	FY15	One time	T&SW with DSD and PWD	TBD

ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-5	Provide technical education and outreach to the development community on the design and implementation requirements of the MS4 Permit and Water Quality Improvement Plan requirements.	Technical education and outreach to the development community includes outreach on design standards, City design manuals, and the WMAA.	City-wide	Prior to FY16	Ongoing	T&SW with DSD	TBD
	Priority Development Projects (PDPs)						
CSD-6	For PDPs, provide technical support to other City departments to ensure implementation of on-site structural BMPs to control pollutants and manage hydromodification by developing City wide storm water development standards and design guidelines.	Coordinate with other City departments to promote and confirm a thorough understanding of requirements for implementing structural BMPs that control pollutants and manage hydromodification. Included in that understanding are requirements to confirm proper design and construction through processes controlled by other City departments.	City-wide	FY16	Ongoing	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-6.1	Institute a program to verify and enforce maintenance and performance of treatment control BMPs.	Refer to JRMP (currently under development).	City-wide	FY16	Ongoing	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-7	Update BMP Design Manual procedures to determine nature and extent of storm water requirements applicable to development projects and to identify conditions of concern for selecting, designing, and maintaining appropriate structural BMPs.	Refer to JRMP (currently under development).	City-wide	FY15	Every 5 years/ permit cycle	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-7.1	Amend BMP Design Manual for trash areas. Require full four-sided enclosure, siting away from storm drains and cover. Consider the retrofit requirement.	Amend BMP Design Manual and zoning standards/requirements which address reduction of pollutants for common areas of trash build-up (e.g. restaurants, supermarkets, "big box" retail stores with food, pet stores). Most effective method for source control of bacteria and trash is to employ four-sized trash enclosures with a cover over trash areas.	City-wide	FY15	One time	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-7.2	Amend BMP Design Manual for animal-related facilities, such as such as animal shelters, "doggie day care" facilities, veterinary clinics, breeding, boarding and training facilities, groomers, and pet care stores.	Amend BMP Design Manual and zoning requirements (including retrofits) to provide supplemental standards for animal facilities (including animal shelters, dog daycares, veterinary clinics, groomers, pet car stores, and breeding, boarding, and training facilities). Supplemental standards may include requiring covered trash enclosures, identification of landscaped relief areas on site plans, ensuring drainage connections and treatment swales for areas that will not drain to the sanitary sewer, as well as inspection of grading, drainage, and landscaping for outdoor exercise areas.	City-wide	FY15	One time	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-7.3	Amend BMP Design Manual for nurseries and garden centers.	Amend BMP Design Manual to provide supplemental standards for plant nurseries and garden centers. Standards will focus on reducing irrigation runoff, and loading of sediment, pesticides, and nutrients. Measures may include: covered outdoor storage, green waste management BMPs, improved irrigation efficiency to reduce dry-weather runoff, and containment of runoff from impervious areas where plants and materials are stored.	City-wide	FY15	One time	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD

ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-7.4	Amend BMP Design Manual for auto-related uses.	Amend BMP Design Manual to provide supplemental standards for automotive-related uses to reduce loading of metals, oils, grease, and trash. Measures may include: four-sized covered trash enclosures, and careful review of auto-related usage areas (e.g. garage bays at repair shops) for grading, drainage, and drain connections to sanitary sewer systems.	City-wide	FY15	One time	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-8	Develop and administer an alternative compliance program for on-site structural BMP implementation (includes identifying Watershed Management Area Analysis [WMAA] candidate projects). Refer to Section 4.2.5.	Refer to JRMP (currently under development).	City-wide	FY15	Ongoing	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-8.1	Create a fund that allows habitat acquisition, protection enhancement, and restoration in conjunction with other cooperating entities including community groups, academic institutions, state county, and federal agencies, etc.	This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, 3) staff resources are identified and secured, 4) partners have been identified and formal MOUs have been developed, and 5) consensus and community support has been achieved.	City-wide	Optional	TBD	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
	Construction Management						
CSD-9	Coordinate with other City departments to promote and confirm a thorough understanding of requirements for implementing temporary BMPs that control sediment and other pollutants during the construction phase of projects. Included in that understanding are requirements to inspect at appropriate frequencies and effectively enforce requirements through process controlled by other City departments.	Refer to JRMP (currently under development).	City-wide	FY16	Ongoing	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
	Existing Development						
	Commercial, Industrial, Municipal, and Residential Facilities and Areas						
CSD-10	Administer a program to require implementation of minimum BMPs for existing development (commercial, industrial, municipal, and residential) that are specific to the facility, area types, and PGAs, as appropriate. Includes inspection of existing development at appropriate frequencies and using appropriate methods.	Refer to JRMP (currently under development).	City-wide	FY16	Ongoing	T&SW with DSD, PUD, & PWD	TBD
CSD-10.1	Update minimum BMPs for existing residential, commercial, and industrial development. Specific updates to BMPs include required street sweeping, catch basin cleaning, and maintenance of private roads and parking lots in targeted areas.	Refer to JRMP (currently under development).	City-wide	FY15	Every 5 years	T&SW	TBD
CSD-10.2	Outreach to property managers and trash haulers to elevate the emphasis of power washing as a pollutant source.	Emphasis will be placed on non-compliant washing as an enforceable violation.	City-wide Residential, commercial and industrial areas	FY15	Ongoing	T&SW	TBD

ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-10.3	Implement property based inspections.	Property-based inspections increase awareness and responsibility for individual properties to tackle issues associated with trash, landscapes, and parking areas. Expanding beyond the business-level inspections will achieve different and more effective opportunities for education, outreach, inspection, and enforcement to encourage water conservation strategies.	City-wide	Prior to FY16	Ongoing	T&SW	TBD
CSD-10.4	Review policies and procedures to ensure discharges from swimming pools meet permit requirements.	Verify and bring to City Council for consideration an update (as needed) for the City's Municipal Code (43.0301) to meet new permit requirements for swimming pool discharges.	City-wide	FY15	As needed	T&SW, City Attorney (Civil & Criminal)	TBD
CSD-11	Promote and encourage implementation of designated BMPs for residential and non-residential areas.	Landscape-based rebates are a "gateway" for adoption of other beneficial practices and are one of the nonstructural methods which address impacts from single-family residential areas (City of San Diego 2011 program development background study). Residential incentives can include: education and training (neighborhood watershed field days), and aggressive subsidies or rebates for grass replacement and rainwater harvesting. Existing programs will be expanded overall, and also have targeted expansion within specific subwatershed, particularly with highest water quality priority conditions.	City-wide Residential and Commercial Areas	Prior to FY16	Ongoing	T&SW with DSD, PUD, PWD, MWD, CWA & local water agencies	TBD
CSD-11.1	Residential and Commercial BMP: Rain Barrel	The existing PUD rebate program will continue for residential properties and expand for commercial properties for water collection, conservation, and reuse with rain barrels.	City-wide Residential Areas	Prior to FY16	Ongoing	T&SW with DSD, PUD, PWD, & local water agencies	TBD
CSD-11.2	Residential and Commercial BMP: Grass Replacement	The existing PUD grass replacement cash rebate program will continue and expand for residential and commercial properties. Program encourages a reduction in water use through the conversion of non-artificial grass to water wise plant material, while maintaining a high level of living landscape to benefit the environment.	City-wide Residential and Commercial Areas	Prior to FY16	Ongoing	T&SW with DSD, PUD, PWD, & local water agencies	TBD
CSD-11.3	Residential and Commercial BMP: Downspout Disconnect	Disconnecting downspouts provide alternate runoff pathways from rooftops, sidewalks, driveways, and roads. Disconnecting downspouts from residential areas to pervious land can allow for depression storage and infiltration.	City-wide Residential and Commercial Areas	FY16	Ongoing	T&SW with DSD, PUD, PWD, & local water agencies	TBD
CSD-11.4	Residential and Commercial BMP: Microirrigation	The existing PUD micro-irrigation rebate program will continue and increase for residential and commercial properties. Application of microirrigation aims to improve the efficiency of landscape irrigation through the precise application of water.	City-wide Residential Areas	Prior to FY16	Ongoing	T&SW with DSD, PUD, PWD, & local water agencies	TBD
CSD-11.5	Onsite Water Conservation Survey	Provide free outdoor water conservation surveys to commercial and residential customers to reduce overirrigation and to encourage water conservation.	City-wide Residential and Commercial Areas	Prior to FY16	Ongoing	T&SW with DSD, PUD, PWD, & local water agencies	TBD
	MS4 Infrastructure						

ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-12	Implementation of operation and maintenance activities (inspection and cleaning) for MS4 and related structures (catch basins, storm drain inlets, channels as allowed by resource agencies, detention basins, etc.) for water quality improvement and for flood control risk management.	Refer to JRMP (currently under development).	City-wide	FY16	Ongoing	T&SW	TBD
CSD-12.1	Proactively repair and replace MS4 components to provide source control from MS4 infrastructure.	In order to limit inflow of pollutants and reduce pollutant loads, proactive measures will be taken to improve, repair, and replace MS4 components. The City of San Diego will start a multi-year program of repairing and replacing storm drain pipes to reduce sediment loading to the MS4. Development of an assessment management program and bond issues will be addressed. Exploration of daylighting pipes will take place where feasible and appropriate.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-13	Coordinate with other City departments (PUD) to implement controls to prevent infiltration of sewage into the MS4 from leaking sanitary sewers.	Refer to JRMP (currently under development).	City-wide	FY16	Ongoing	T&SW with PUD	TBD
CSD-13.1	Identify sewer leaks and areas for sewer pipe replacement prioritization.	Risk assessment to include identifying targeted areas (age, location, proximity to MS4), coming up with methodology, pilot, desktop exercise/analysis.	City-wide	FY16	As needed	T&SW with PUD	TBD
	Roads, Street, and Parking Lots						
CSD-14	Implement operation and maintenance activities for public streets, unpaved roads, paved roads, and paved highways	Refer to JRMP (currently under development).	City-wide	FY16	Ongoing	T&SW	TBD
	Pesticide, Herbicides, and Fertilizer BMP Program						
CSD-15	Require implementation of BMPs to address application, storage, and disposal of pesticides, herbicides, and fertilizers on commercial, industrial, and municipal properties. Includes education, permits, and certifications.	Refer to JRMP (currently under development).	City-wide	FY16	Ongoing	T&SW with Parks and Rec	TBD
	Retrofit and Rehabilitation in Areas of Existing Development						
CSD-16	Develop and implement a strategy to identify candidate areas of existing development appropriate for retrofitting projects and facilitate the implementation of such projects.	Refer to JRMP (currently under development). The Offsite Alternative Compliance Program will include methods for identifying and assessing potential retrofit projects in existing development areas. Retrofit project selection will be based upon a variety of factors including proximity to high priority water quality conditions, potential pollutant load removal effectiveness, and feasibility of implementation. The program will include protocols related to funding mechanisms for project construction and long-term maintenance, payment and credit structures, and water quality equivalency standards.	City-wide	TBD	Ongoing	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD

ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-17	Develop and implement a strategy to identify candidate areas of existing development for stream, channel, or habitat rehabilitation projects and facilitate implementation of such projects.	Refer to JRMP (currently under development). The Offsite Alternative Compliance Program will include methods for identifying and assessing potential stream, channel, or habitat rehabilitation projects in existing development areas. Rehabilitation project selection will be based upon a variety of factors including existing stream or habitat degradation, potential future cumulative stream or habitat impacts, and feasibility of implementation. The program will include protocols related to funding mechanisms for project construction and long-term maintenance, payment and credit structures, and water quality equivalency standards.	City-wide	TBD	Ongoing	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
	Illicit Discharge, Detection, and Elimination (IDDE) Program						
CSD-18	Implement Illicit Discharge, Detection, and Elimination (IDDE) Program per the JRMP. Requirements include: maintaining an MS4 map, using municipal personnel and contractors to identify and report illicit discharges, maintaining a hotline for public reporting of illicit discharges, monitoring MS4 outfalls, and investigating and addressing any illicit discharges.	Refer to JRMP (currently under development).	City-wide	Prior to FY16	Ongoing	T&SW	TBD
	Public Education and Participation						
CSD-19	Implement a public education and participation program to promote and encourage development of programs, management practices, and behaviors that reduce the discharge of pollutants in storm water prioritized by high-risk behaviors, pollutants of concern, and target audiences.	Refer to JRMP (currently under development).	City-wide	Prior to FY16	Ongoing	T&SW	TBD
CSD-19.1	Continue implementation of a Pet Waste Program.	Pet Waste Program includes outreach on "Scoop the poop", installation of posts for dispensers, distribution of lawn signs, and attendance at dog-related community activities.	City-wide	Prior to FY16	Ongoing	T&SW with Parks and Rec	TBD
CSD-19.2	Promote and encourage implementation of designated BMPs in commercial and industrial areas.	Provide education and outreach on BMPs for commercial businesses and industrial facilities.	City-wide Non-residential Areas	Prior to FY16	Ongoing	T&SW with PUD; Funding: Prop 84 and water districts (MWD)	TBD
CSD-19.3	Expand outreach to homeowners' association (HOA) common lands and HOA incentives.	Approaches to consider include: offering incentives to HOAs and maintenance districts to adopt water-conserving/efficiency and stormwater-reduction changes to their landscapes, irrigation, and maintenance; conducting workshops with property managers; providing supplemental standards, inspection, or enforcement for HOA-managed properties.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-19.4	Develop an outreach and training program for property managers responsible for HOAs and maintenance districts.	Approaches to engage HOAs and property managers include: conducting workshops with property managers, providing supplemental standards, inspections or enforcement around HOA properties, and offering incentives to HOAs and maintenance districts to adopt changes to landscapes, irrigation, or maintenance which promote water conservation or stormwater reduction. Property managers are also a target for enhanced outreach.	City-wide	FY16	Ongoing	T&SW	TBD

ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-19.5	Enhance and expand trash cleanups through community-based organizations involving target audiences.	Increase effectiveness and reach of trash/beach cleanups and community based efforts by engaging community groups to self-define and carry-out trash clean-ups. Longstanding partnerships and sponsorships with I Love A Clean San Diego and others are recommended to be continued and enhanced. To effectively target stream clean-up efforts, focus on partnerships with community organizations which provide strong engagement with target audiences and communities.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-19.6	Improve consistency and content of websites to highlight enforceable conditions and reporting methods.	Websites will be updated to provide a user-friendly format and clarity for stormwater violations, conditions which citizens can and should report, and how to make such reports. Examples of reports for common incidents will be developed and posted which may vary locally and regionally. Photographs of allowable practices as well as illegal practices should be shown for utmost clarity. Displaying hotline numbers prominently on the website and near the photographs of illegal practices will ensure that those seeking to report will be able to do so easily. Also ensure hotline number and website are searchable and can be retrieved by simple internet searches.	City-wide	Prior to FY16	Ongoing	T&SW	TBD
CSD-19.7	Enhance school and recreation-based education and outreach.	Develop curriculum and establish distribution in public schools. Includes education on water conservation.	City-wide	FY15	Ongoing	T&SW, PUD with community-based organization	TBD
CSD-19.8	Develop education and outreach to reduce irrigation runoff.	Example approaches to reduce or eliminate irrigation runoff may include: education and outreach, prohibition, enhanced enforcement of existing prohibitions, and pilot projects such as the City of Del Mar's pilot door hanger project.	City-wide	Prior to FY16	Ongoing	T&SW with PUD	TBD
CSD-19.9	Develop regional training for water-using mobile businesses.	Consider development of supplemental standards for mobile businesses including: covered trash enclosures, careful review of washing areas (grading, drainage, landscaping, sanitary sewer system connectivity), and appropriate signage (either through zoning for retrofits or "best fix" approaches, or through BMP Design Manual standards). Businesses may include carpet cleaners, tile installers, plumbers, etc.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-19.10	Enhance education and outreach based on results of effectiveness survey and changing regulatory requirements.	Use effectiveness surveys to enhance existing education and outreach programs while proactively keeping up with and incorporating changing regulatory requirements.	City-wide	FY16	Ongoing	T&SW	TBD
	Enforcement Response Plan						
CSD-20	Continue to implement escalating enforcement responses to compel compliance with statutes, ordinances, permits, contracts, orders, and other requirements for IDDE, development planning, construction management, and existing development in the Storm Water Code Enforcement Unit's Standard Operating Procedures (SOPs) - Enforcement Response Plan.	Refer to JRMP (currently under development).	City-wide	Prior to FY16	Ongoing	T&SW with PUD, other City enforcement compliance programs	TBD

ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-20.1	Increase enforcement of irrigation runoff.	Increased enforcement policies against irrigation runoff will be established in tandem with the education and outreach programs on how these actions lead to pollutant loading. By shifting to property-based inspections irrigation runoff can be handled as enforceable violations once the public is well-informed.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-20.2	Increase enforcement of water-using mobile businesses.	In addition to education, pollution associated with mobile business sources can be handled through policy, code development, inspections of business practices, and enforcement.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-21	Increase enforcement of all minimum BMPs for existing residential, commercial, and industrial development.	Increased enforcement of existing development minimum BMPs.	City-wide	FY16	As needed	T&SW	TBD
CSD-22	Increase enforcement associated with property-based inspections.	Shifting inspections from businesses-specific to property-based will increase effectiveness and sense of responsibility and ownership. Education and outreach must be followed up with inspection and enforcement of regulations to encourage proper landscape and water conservation strategies.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-23	Increase enforcement of sweeping and maintenance of private roads and parking lots in targeted areas.	Refer to Minimum BMPs in JRMP.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-24	Increase identification and enforcement of actionable erosion and slope stabilization issues on private property and require stabilization and repair.	Eroding and unstable slope areas on private property (excluding construction sites) will be identified as potential sediment loading sources and subject to enforcement. In the short term, this will target enhanced inspection and enforcement programs to ensure inspectors address erosion and slope instability for the purpose of education.	City-wide	FY16	Ongoing	T&SW	TBD
	Additional Nonstructural Strategies						
CSD-25	Conduct a Comprehensive Benefits Analysis to identify benefits other than water quality that are applicable to each of the specific WQIP strategies.	The analysis identifies which other benefits apply to each strategy, and documents the assumptions making those linkages. The delineation of other benefits to strategies includes a general description of each benefit, and a listing of the assumptions that were made to link those benefits to strategies. In addition, the other benefits are characterized with respect to who is directly affected: the city, local residents, local businesses, or visitors. This analysis may be used as part of the adaptive management process to modify future strategies.	City-wide	FY15	One time	T&SW	TBD
CSD-26	Address and clean up trash from transient encampments with collaboration from the Homeless Outreach Team.	Coordinate with the Homeless Outreach Team to respond to transient encampment trash complaints.	City-wide	FY16	Ongoing	T&SW with Police, ESD, Urban Corps, Alpha Project	TBD
CSD-27	Continue participating in source reduction initiatives.	Source reduction initiatives are ultimately the most effective measure to remove pollutants from surface waters, where feasible. Bans or progressive phase-outs that may be considered include: leaf blowers, plastic bags, architectural copper (generally a legacy issue), as well as prohibiting or more aggressively regulating vehicle washing. Additional source reduction initiatives to consider include pesticide sales at hardware stores and irrigation supply stores.	City-wide	Prior to FY16	Ongoing	T&SW	TBD

ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-27.1	Coordinate with Fleet Services to replace City-owned vehicle brake pads with copper-free brake pads as they become commercially available.	Consider legislative mandate and cooperative implementation of copper-free brake pads on city-owned vehicle to reduce pollutant deposition.	City-wide	FY18	Ongoing	T&SW, ESD with PWD (Fleet Services)	TBD
CSD-28	Proactively monitor for erosion, and complete minor repair and slope stabilization on municipal property.	Actively identify and repair eroding slopes that may be contributing to sediment loading. Prepare an inventory and assessment of eroding areas and their risk to surface waters. Follow assessment with a schedule for ongoing inspection and stabilization (potentially based on a number or percentage of sites annually). Consider Caltrans program as a template.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-29	Conduct special studies.	Special studies will be conducted to gather data to identify pollutant sources, appropriate targets, or other information. Includes collaboration with universities.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-29.1	Participate in Reference Watershed Study.	The San Diego Regional Reference Stream Study (currently being conducted by the Southern California Coastal Water Research Project). The study will develop numeric targets that account for "natural sources" to establish the concentrations or loads from streams in a minimally disturbed or "reference" condition. Refer to Section 5.1 for further details.	Region-wide	Prior to FY16	One time	T&SW, SCCWRP, Regional copermittees	TBD
CSD-29.2	Participate in Reference Beach Study.	The San Diego Regional Reference Beach Study will develop numeric targets that account for "natural sources" to establish the concentrations or loads from the beach in a minimally disturbed or "reference" condition. The purpose of this monitoring program is to advise the public of potential health risks that could occur with water contact recreation at local beaches. DEH will post a health advisory notice or close a beach when FIB results are above REC-1 water quality standards.	Region-wide (San Diego River)	Prior to FY16	One time	T&SW, SCCWRP, Regional copermittees	TBD
CSD-29.3	Conduct a Cost of Service Study.	Conduct a Cost of Service Study that will examine the full cost of flood control and storm water strategies needed to comply with storm water regulations for the City of San Diego. The City of San Diego's Watershed Asset Management Plan will be used as the basis for the study.	City-wide	FY16	One time	TBD	TBD
CSD-30	Conduct Sustainable Return on Investment (SROI) analysis to estimate strategies' co-benefits and impacts to the public and the private sector on a common scale.	SROI is an economics-based framework for evaluating quantitative and qualitative performance metrics and monetizing them, if possible, along a triple bottom line (i.e. financial, societal, and environmental). This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, 3) staff resources are identified and secured, 4) partners have been identified and formal MOUs have been developed, and 5) consensus and community support has been achieved.	City-wide	Optional	TBD	T&SW and public participation	TBD

ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-31	Collaborate with the County, if a County-led regional social services effort is established, to provide sanitation and trash management for individuals experiencing homelessness and determine if the program is suitable and appropriate for jurisdictional needs to meet goals.	Support a non-profit or consortium to provide sanitation services associated with hygiene as well as trash management for persons experiencing homelessness. Rented or purchased shower/sanitary trailers providing mobile showers may be organized at specifically scheduled locations and times. This provision has been proposed as a method for preventing surface water usage for sanitation and bathing, as well as opportunity for outreach and referral by social service agencies. The trash management services will include providing trash bags, trash collection areas, and shower/sanitary facilities at centers which provide daytime shelter to their clients, or on a mobile-basis for known transit camps. This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, 3) staff resources are identified and secured, 4) partners have been identified and formal MOUs have been developed, and 5) consensus and community support has been achieved.	City-wide	Optional	TBD	T&SW	TBD
CSD-32	Participate in an assessment to determine if implementation of an urban tree canopy (UTC) program would benefit water quality and other City goals, where feasible.	Perform a feasibility study to determine if implementing an UTC program would be beneficial to the City's goals. UTC intercepts rainfall through increased coverage of leaves, branches, and stems and reduces runoff from the storm drainage system. Benefits associated with enhancing an UTC include reducing heat island effects and air pollution in addition to aesthetics and community benefits. Where feasible, native trees will be utilized to prevent invasive trees from migrating to open spaces and to conserve water.This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, and 3) staff resources are identified and secured.	City-wide	Optional	TBD	Planning Dept. with T&SW, SANDAG, and Nature Conservancy	TBD
CSD-33	Conduct a feasibility study to test Permeable Friction Course (PFC), a porous asphalt that overlays impermeable asphalt.	Perform an assessment to determine the feasibility of implementing PFC on City streets. PFC, an overlay of porous asphalt, is an innovative roadway material that improves driving conditions in wet weather and water quality. Placed in a layer 25-50mm thick on top of regular impermeable pavement, PFC allows rainfall to drain within the porous layer rather than on top of the pavement. PFC has also been shown to reduce concentrations of pollutants commonly observed in highway runoff. PFC incorporates stormwater treatment into the roadway surface and does not require additional right-of-way. This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, and 3) staff resources are identified and secured.	City-wide	Optional	One time	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD

ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-34	As opportunities arise and funding sources are identified, protect areas that are functioning naturally by avoiding impervious development and degradation on unpaved open space areas, creating permanent open space protections on undeveloped city-owned land, and accepting privately-owned undeveloped open areas.	This strategy may be implemented if there is interest in participation by the public or private entity with current control of the land. Conditions to be met also include 1) identification of partners, if needed (public, private, non-profit), 2) identification of costs and potential sources of funding, 3) final agreement by public or private entity with current control of the land, 4) final agreement by all other participating partners, 5) funding in place, and 6) if it can be determined that the benefit of preventing increased pollutant loads and minimizing impacts of future growth through land conservation is a more cost effective strategy to meet interim and final numeric goals than other recommended strategies included in this plan (Chesapeake Bay Commission, 2013).	City-wide	Optional	TBD	TBD	TBD
CSD-35	Participate in a watershed council or group if one is established.	This strategy may be triggered as 1) partners have been identified and formal MOUs have been developed and 2) consensus and community support has been achieved.	City-wide	Optional	TBD	TBD	TBD
CSD-36	Prohibit introduction of invasive plants in new development and redevelopment projects.	Coordinate with the City's Development Services Department to continue to prohibit introduction of invasive species such as Arundo donax and Cortaderia selloana for new development or redevelopment projects as specified in the City's municipal code for landscape.	City-wide	Prior to FY16	Ongoing	T&SW with DSD	TBD
	Green Infrastructure						
CSD-37	Bioretention at Allied Gardens Recreation Area.	Bioretention designed for Allied Gardens Recreation Area to treat a 4.5-acre drainage area.	San Diego River WMA	FY16	Ongoing	T&SW with PWD	TBD
CSD-38	Bioretention at Famosa Slough.	Bioretention planned for Famosa Slough to treat a 10.3-acre drainage area.	San Diego River WMA	FY17	Ongoing	T&SW with PWD	TBD
CSD-39	6 Vegetated Swales in Mission Trails Regional Park E. Fortuna Equestrian Staging Area	6 Vegetated Swales planned for Mission Trails Regional Park E. Fortuna Equestrian Staging Area	San Diego River WMA	FY17	Ongoing	T&SW with PWD	TBD
CSD-40	20.1 ac of bioretention have been identified as potential opportunities for green infrastructure implementation on public parcels to treat a 502.5-acre drainage area.	Staggered construction, operation, and maintenance of 20.1 ac of bioretention to treat a 502.5-acre drainage area.	San Diego River WMA	FY22	Ongoing	TBD	TBD
CSD-41	Cabrillo Heights Rain Garden	Rain garden constructed on Kearny Villa Rd. used to treat a 6-acre drainage area.	San Diego River WMA	Prior to FY16	Ongoing	T&SW with PWD	TBD
	Green Streets						
CSD-42	43.61 acres of green streets have been identified as potential opportunities for green street projects to treat a 1090.25-acre drainage area.	Staggered construction, operation and maintenance of 43.61 acres of green streets to treat a 1090.25-acre drainage area.	San Diego River WMA	FY27	Ongoing	TBD	TBD
	Multiuse Treatment Areas						
	Infiltration and Detention Basins						
CSD-43	Cleator Park	Construction, operation and maintenance of a subsurface detention/infiltration system that would treat about 333 acres of drainage area on 3.8 acres of available space (APN 4491100800). Subsurface detention basins would be designed and constructed per all applicable City safety codes and standards.	San Diego River WMA	FY19	Ongoing	T&SW with PWD	TBD

ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-44	Cabrillo Heights Park	Construction, operation and maintenance of a subsurface detention/infiltration system that would treat about 238 acres of drainage area on 14 acres of available space (APN 4210500100 and 4213201100). Subsurface detention basins would be designed and constructed per all applicable City safety codes and standards.	San Diego River WMA	FY19	Ongoing	T&SW with PWD	TBD
CSD-45	Presidio Hills Golf Course and Park	Construction, operation and maintenance of a subsurface detention/infiltration system that would treat about 142 acres of drainage area on 12 acres of available space (APN 4425200800). Subsurface detention basins would be designed and constructed per all applicable City safety codes and standards.	San Diego River WMA	FY21	Ongoing	T&SW with PWD	TBD
CSD-46	Montogmery Field Airport	Construction, operation and maintenance of a subsurface detention/infiltration system that would treat about 410 acres of drainage area on 410 acres of available space (APN 4212901100). Subsurface detention basins would be designed and constructed per all applicable City safety codes and standards.	San Diego River WMA	FY21	Ongoing	T&SW with PWD	TBD
CSD-47	Ocean Beach Athletic Park and Robb Field	Construction, operation and maintenance of a subsurface detention/infiltration system that would treat about 315 acres of drainage area on 83 acres of available space (APN 4488000100). Subsurface detention basins would be designed and constructed per all applicable City safety codes and standards.	San Diego River WMA	FY21	Ongoing	T&SW with PWD	TBD
CSD-48	Lower North Shepherd Canyon	Construction, operation and maintenance of a subsurface detention/infiltration system that would treat about 757 acres of drainage area on 37 acres of available space (APN 3733022600, 3730715500, and 3733022400). Subsurface detention basins would be designed and constructed per all applicable City safety codes and standards.	San Diego River WMA	FY24	Ongoing	T&SW with PWD	TBD
CSD-49	Springall Academy	Construction, operation and maintenance of a subsurface detention/infiltration system that would treat about 324 acres of drainage area on 11 acres of available space (APN 4574000400). Subsurface detention basins would be designed and constructed per all applicable City safety codes and standards.	San Diego River WMA	FY24	Ongoing	T&SW with PWD	TBD
CSD-50	Serra Mesa Park and upslope canyon	Construction, operation and maintenance of a subsurface detention/infiltration system that would treat about 267 acres of drainage area on 20 acres of available space (APN 4213000700 and 421032200). Subsurface detention basins would be designed and constructed per all applicable City safety codes and standards.	San Diego River WMA	FY24	Ongoing	T&SW with PWD	TBD
	Stream, Channel and Habitat Rehabilitation Projects						

ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-51	If interim load reduction goals are not met and additional stream, channel, and habitat rehabilitation projects are required, implement as needed.	This strategy may be triggered as 1) funding to address MS4 discharges is identified and secured, 2) staff resources are identified and secured, 3) partners have been identified and formal MOUs have been developed, 4) permits required by regulatory agencies are secured, and 5) This strategy may be triggered as 1) funding to address MS4 discharges is identified and secured, 2) staff resources are identified and secured, 3) partners have been identified and formal MOUs have been developed, 4) permits required by regulatory agencies are secured, 5) consensus and community support has been achieved, and 6) it can be determined that the benefit of preventing increased pollutant loads and minimizing impacts of future growth through land conservation is a more cost effective strategy to meet interim and final numeric goals than other recommended strategies included in this plan (Chesapeake Bay Commission, 2013).	Areas identified during feasibility studies	Optional	TBD	T&SW	TBD
	Water Quality Improvement BMPs						
	Proprietary BMPs						
CSD-52	3 Drain Inserts in Complex Street Green Mall.	3 drainage inserts planned for implementation in Complex Street Green Mall.	San Diego River WMA	FY17	Ongoing	T&SW with PWD	TBD
CSD-53	Park Ridge hydrodynamic separator	A hydrodynamic separator used to treat onsite runoff of 37.6 acres.	San Diego River WMA	FY17	Ongoing	T&SW with PWD	TBD
CSD-54	El Capitan Reservoir	3 drainage inserts planned for implementation in El Capitan Reservoir.	San Diego River WMA	Prior to FY16	Ongoing	T&SW with PWD	TBD
CSD-55	Murray Reservoir	5 drainage inserts planned for implementation in Murray Reservoir.	San Diego River WMA	Prior to FY16	Ongoing	T&SW with PWD	TBD
CSD-56	San Vicente Reservoir	1 drainage insert planned for implementation in San Vicente Reservoir.	San Diego River WMA	Prior to FY16	Ongoing	T&SW with PWD	TBD
CSD-57	Serra Mesa/Kearny Mesa Library	A hydrodynamic separator used to treat onsite runoff at Serra Mesa/Kearny Mesa Library.	San Diego River WMA	Prior to FY16	Ongoing	T&SW with PWD	TBD
	Dry Weather Flow Separation and Treatment Projects						
CSD-58	If interim load reduction goals are not met and additional dry weather flow separation and treatment projects are required, implement as needed.	Construction of dry weather flow separation and treatment projects, where identified. This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, 3) staff resources are identified and secured, and 4) permits required by regulatory agencies are secured.	Downstream reaches where persistent dry weather flows have been observed	Optional	TBD	T&SW with PWD	TBD
	Trash Segregation						
CSD-59	If interim load reduction goals are not met and additional trash segregation projects are required, implement as needed.	Construction of trash segregation (Trash Guards, etc.) projects, where identified. This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, 3) staff resources are identified and secured, and 4) permits required by regulatory agencies are secured.	High-loading areas city-wide	Optional	TBD	T&SW with PWD	TBD

DSD= Development Services Department; PUD = Public Utilities Department; PWD = Public Works Department; T&SW = Transportation and Storm Water Division; WAMP = Watershed Asset Management Plan; "Refer to Section X" will be updated upon submittal of the City's JRMP in June 2015; TBD = will be determined during the next fiscal year.

Table 2. City of San Diego Annual Schedule

Construction
Ongoing Implementation/ O&M
As needed/Design

ID	Strategy	Location	Implementation or Construction Year Start	FY 15 and Earlier	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35
	Jurisdictional Strategies																							
	Development Planning																							
	All Development Projects																							
CSD-1	Establish guidelines and standards for all development projects; provide technical support related to implementation of source control BMPs to minimize pollutant generation at each project and implement LID BMPs to maintain or restore hydrology of the area or implement easements to protect water quality, where applicable and feasible.	City-wide	Prior to FY16	Ongoing																				
CSD-1.1	Investigation and research of emerging technology.	City-wide	Prior to FY16	As Needed																				
CSD-1.2	Approve and implement a green infrastructure policy.	City-wide on public parcels	FY16 (Begin)	As Needed																				
CSD-1.3	Develop Design Standards for Public LID BMPs.	City-wide	FY14-FY15	As Needed																				
CSD-1.4	Outreach to impacted industry regarding minimum BMP requirement updates.	City-wide	FY15	As Needed																				
CSD-2	Train staff on LID regulatory changes and LID practices.	City-wide	FY16		As Needed																			
CSD-3	Amend municipal code and ordinances, including zoning ordinances, to facilitate and encourage LID opportunities. Ensure consistency with the City of San Diego's BMP Design Manual. Update the Storm Water Standards Manual accordingly.	City-wide	FY15	As Needed																				
CSD-4	Create a manual that outlines right-of-way design standards.	City-wide	FY15	One time																				
CSD-5	Provide technical education and outreach to the development community on the design and implementation requirements of the MS4 Permit and Water Quality Improvement Plan requirements.	City-wide	Prior to FY16	Ongoing																				
	Priority Development Projects (PDPs)																							
CSD-6	For PDPs, provide technical support to other City departments to ensure implementation of on-site structural BMPs to control pollutants and manage hydromodification by developing City wide storm water development standards and design guidelines.	City-wide	FY16		Ongoing																			

ID	Strategy	Location	Implementation or Construction Year Start	FY 15 and Earlier	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35
CSD-6.1	Institute a program to verify and enforce maintenance and performance of treatment control BMPs.	City-wide	FY16		Ongoing																			
CSD-7	Update BMP Design Manual procedures to determine nature and extent of storm water requirements applicable to development projects and to identify conditions of concern for selecting, designing, and maintaining appropriate structural BMPs.	City-wide	FY15	Cycle																				
CSD-7.1	Amend BMP Design Manual for trash areas. Require full four-sided enclosure, siting away from storm drains and cover. Consider the retrofit requirement.	City-wide	FY15	One time																				
CSD-7.2	Amend BMP Design Manual for animal-related facilities, such as such as animal shelters, "doggie day care" facilities, veterinary clinics, breeding, boarding and training facilities, groomers, and pet care stores.	City-wide	FY15	One time																				
CSD-7.3	Amend BMP Design Manual for nurseries and garden centers.	City-wide	FY15	One time																				
CSD-7.4	Amend BMP Design Manual for auto-related uses.	City-wide	FY15	One time																				
CSD-8	Develop and administer an alternative compliance program for on-site structural BMP implementation (includes identifying Watershed Management Area Analysis [WMAA] candidate projects). Refer to Section 4.2.5.	City-wide	FY15	Ongoing																				
CSD-8.1	Create a fund that allows habitat acquisition, protection enhancement, and restoration in conjunction with other cooperating entities including community groups, academic institutions, state county, and federal agencies, etc.	City-wide	Optional												If triggered, begin planning, acquiring funding and resources									
	Construction Management																							
CSD-9	Coordinate with other City departments to promote and confirm a thorough understanding of requirements for implementing temporary BMPs that control sediment and other pollutants during the construction phase of projects. Included in that understanding are requirements to inspect at appropriate frequencies and effectively enforce requirements through process controlled by other City departments.	City-wide	FY16		Ongoing																			
	Existing Development																							
	Commercial, Industrial, Municipal, and Residential Facilities and Areas																							
CSD-10	Administer a program to require implementation of minimum BMPs for existing development (commercial, industrial, municipal, and residential) that are specific to the facility, area types, and PGAs, as appropriate. Includes inspection of existing development at appropriate frequencies and using appropriate methods.	City-wide	FY16		Ongoing																			

ID	Strategy	Location	Implementation or Construction Year Start	FY 15 and Earlier	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35
CSD-10.1	Update minimum BMPs for existing residential, commercial, and industrial development. Specific updates to BMPs include required street sweeping, catch basin cleaning, and maintenance of private roads and parking lots in targeted areas.	City-wide	FY15	Cycle																				
CSD-10.2	Outreach to property managers and trash haulers to elevate the emphasis of power washing as a pollutant source.	City-wide Residential, commercial and industrial areas	FY15	Ongoing																				
CSD-10.3	Implement property based inspections.	City-wide	Prior to FY16	Ongoing																				
CSD-10.4	Review policies and procedures to ensure discharges from swimming pools meet permit requirements.	City-wide	FY15	As Needed																				
CSD-11	Promote and encourage implementation of designated BMPs for residential and non-residential areas.	City-wide Residential and Commercial Areas	Prior to FY16	Ongoing																				
CSD-11.1	Residential and Commercial BMP: Rain Barrel	City-wide Residential Areas	Prior to FY16	Ongoing																				
CSD-11.2	Residential and Commercial BMP: Grass Replacement	City-wide Residential and Commercial Areas	Prior to FY16	Ongoing																				
CSD-11.3	Residential and Commercial BMP: Downspout Disconnect	City-wide Residential and Commercial Areas	FY16		Ongoing																			
CSD-11.4	Residential and Commercial BMP: Microirrigation	City-wide Residential Areas	Prior to FY16	Ongoing																				
CSD-11.5	Onsite Water Conservation Survey	City-wide Residential and Commercial Areas	Prior to FY16	Ongoing																				
	MS4 Infrastructure																							
CSD-12	Implementation of operation and maintenance activities (inspection and cleaning) for MS4 and related structures (catch basins, storm drain inlets, channels as allowed by resource agencies, detention basins, etc.) for water quality improvement and for flood control risk management.	City-wide	FY16		Ongoing																			

ID	Strategy	Location	Implementation or Construction Year Start	FY 15 and Earlier	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35
CSD-12.1	Proactively repair and replace MS4 components to provide source control from MS4 infrastructure.	City-wide	FY16		Ongoing																			
CSD-13	Coordinate with other City departments (PUD) to implement controls to prevent infiltration of sewage into the MS4 from leaking sanitary sewers.	City-wide	FY16		Ongoing																			
CSD-13.1	Identify sewer leaks and areas for sewer pipe replacement prioritization.	City-wide	FY16		As Needed																			
	Roads, Street, and Parking Lots																							
CSD-14	Implement operation and maintenance activities for public streets, unpaved roads, paved roads, and paved highways	City-wide	FY16		Ongoing																			
	Pesticide, Herbicides, and Fertilizer BMP Program																							
CSD-15	Require implementation of BMPs to address application, storage, and disposal of pesticides, herbicides, and fertilizers on commercial, industrial, and municipal properties. Includes education, permits, and certifications.	City-wide	FY16		Ongoing																			
	Retrofit and Rehabilitation in Areas of Existing Development																							
CSD-16	Develop and implement a strategy to identify candidate areas of existing development appropriate for retrofitting projects and facilitate the implementation of such projects.	City-wide	TBD																					
CSD-17	Develop and implement a strategy to identify candidate areas of existing development for stream, channel, or habitat rehabilitation projects and facilitate implementation of such projects.	City-wide	TBD																					
	Illicit Discharge, Detection, and Elimination (IDDE) Program																							
CSD-18	Implement Illicit Discharge, Detection, and Elimination (IDDE) Program per the JRMP. Requirements include: maintaining an MS4 map, using municipal personnel and contractors to identify and report illicit discharges, maintaining a hotline for public reporting of illicit discharges, monitoring MS4 outfalls, and investigating and addressing any illicit discharges.	City-wide	Prior to FY16	Ongoing																				
	Public Education and Participation																							
CSD-19	Implement a public education and participation program to promote and encourage development of programs, management practices, and behaviors that reduce the discharge of pollutants in storm water prioritized by high-risk behaviors, pollutants of concern, and target audiences.	City-wide	Prior to FY16	Ongoing																				
CSD-19.1	Continue implementation of a Pet Waste Program.	City-wide	Prior to FY16	Ongoing																				
CSD-19.2	Promote and encourage implementation of designated BMPs in commercial and industrial areas.	City-wide Non-residential Areas	Prior to FY16	Ongoing																				

ID	Strategy	Location	Implementation or Construction Year Start	FY 15 and Earlier	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35
CSD-19.3	Expand outreach to homeowners' association (HOA) common lands and HOA incentives.	City-wide	FY16		Ongoing																			
CSD-19.4	Develop an outreach and training program for property managers responsible for HOAs and maintenance districts.	City-wide	FY16		Ongoing																			
CSD-19.5	Enhance and expand trash cleanups through community-based organizations involving target audiences.	City-wide	FY16		Ongoing																			
CSD-19.6	Improve consistency and content of websites to highlight enforceable conditions and reporting methods.	City-wide	Prior to FY16	Ongoing																				
CSD-19.7	Enhance school and recreation-based education and outreach.	City-wide	FY15	Ongoing																				
CSD-19.8	Develop education and outreach to reduce irrigation runoff.	City-wide	Prior to FY16	Ongoing																				
CSD-19.9	Develop regional training for water-using mobile businesses.	City-wide	FY16		Ongoing																			
CSD-19.10	Enhance education and outreach based on results of effectiveness survey and changing regulatory requirements.	City-wide	FY16		Ongoing																			
	Enforcement Response Plan																							
CSD-20	Continue to implement escalating enforcement responses to compel compliance with statutes, ordinances, permits, contracts, orders, and other requirements for IDDE, development planning, construction management, and existing development in the Storm Water Code Enforcement Unit's Standard Operating Procedures (SOPs) - Enforcement Response Plan.	City-wide	Prior to FY16	Ongoing																				
CSD-20.1	Increase enforcement of irrigation runoff.	City-wide	FY16		Ongoing																			
CSD-20.2	Increase enforcement of water-using mobile businesses.	City-wide	FY16		Ongoing																			
CSD-21	Increase enforcement of all minimum BMPs for existing residential, commercial, and industrial development.	City-wide	FY16		As needed																			
CSD-22	Increase enforcement associated with property-based inspections.	City-wide	FY16		Ongoing																			
CSD-23	Increase enforcement of sweeping and maintenance of private roads and parking lots in targeted areas.	City-wide	FY16		Ongoing																			
CSD-24	Increase identification and enforcement of actionable erosion and slope stabilization issues on private property and require stabilization and repair.	City-wide	FY16		Ongoing																			
	Additional Nonstructural Strategies																							
CSD-25	Conduct a Comprehensive Benefits Analysis to identify benefits other than water quality that are applicable to each of the specific WQIP strategies.	City-wide	FY15	One time																				

ID	Strategy	Location	Implementation or Construction Year Start	FY 15 and Earlier	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35
CSD-26	Address and clean up trash from transient encampments with collaboration from the Homeless Outreach Team.	City-wide	FY16		Ongoing																			
CSD-27	Continue participating in source reduction initiatives.	City-wide	Prior to FY16	Ongoing																				
CSD-27.1	Coordinate with Fleet Services to replace City-owned vehicle brake pads with copper-free brake pads as they become commercially available.	City-wide	FY18				Ongoing																	
CSD-28	Proactively monitor for erosion, and complete minor repair and slope stabilization on municipal property.	City-wide	FY16		Ongoing																			
CSD-29	Conduct special studies.	City-wide	FY16		Ongoing																			
CSD-29.1	Participate in Reference Watershed Study.	Region-wide	Prior to FY16	One time																				
CSD-29.2	Participate in Reference Beach Study.	Region-wide (San Diego River)	Prior to FY16	One time																				
CSD-29.3	Conduct a Cost of Service Study.	City-wide	FY16		One time																			
CSD-30	Conduct Sustainable Return on Investment (SROI) analysis to estimate strategies' co-benefits and impacts to the public and the private sector on a common scale.	City-wide	Optional												If triggered, begin planning, acquiring funding and resources									
CSD-31	Collaborate with the County, if a County-led regional social services effort is established, to provide sanitation and trash management for individuals experiencing homelessness and determine if the program is suitable and appropriate for jurisdictional needs to meet goals.	City-wide	Optional												If triggered, begin planning, acquiring funding and resources									
CSD-32	Participate in an assessment to determine if implementation of an urban tree canopy (UTC) program would benefit water quality and other City goals, where feasible.	City-wide	Optional												If triggered, begin planning, acquiring funding and resources									
CSD-33	Conduct a feasibility study to test Permeable Friction Course (PFC), a porous asphalt that overlays impermeable asphalt.	City-wide	Optional												If triggered, begin planning, acquiring funding and resources									
CSD-34	As opportunities arise and funding sources are identified, protect areas that are functioning naturally by avoiding impervious development and degradation on unpaved open space areas, creating permanent open space protections on undeveloped city-owned land, and accepting privately-owned undeveloped open areas.	City-wide	Optional												If triggered, begin planning, acquiring funding and resources									
CSD-35	Participate in a watershed council or group if one is established.	City-wide	Optional												If triggered, begin planning, acquiring funding and resources									
CSD-36	Prohibit introduction of invasive plants in new development and redevelopment projects.	City-wide	Prior to FY16	Ongoing																				
	Green Infrastructure																							

ID	Strategy	Location	Implementation or Construction Year Start	FY 15 and Earlier	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35
CSD-37	Bioretention at Allied Gardens Recreation Area.	San Diego River WMA	FY16																					
CSD-38	Bioretention at Famosa Slough.	San Diego River WMA	FY17																					
CSD-39	6 Vegetated Swales in Mission Trails Regional Park E. Fortuna Equestrian Staging Area	San Diego River WMA	FY17																					
CSD-40	20.1 ac of bioretention have been identified as potential opportunities for green infrastructure implementation on public parcels to treat a 502.5-acre drainage area.	San Diego River WMA	FY22																					
CSD-41	Cabrillo Heights Rain Garden	San Diego River WMA	Prior to FY16																					
	Green Streets																							
CSD-42	43.61 acres of green streets have been identified as potential opportunities for green street projects to treat a 1090.25-acre drainage area.	San Diego River WMA	FY27																					
	Multiuse Treatment Areas																							
	Infiltration and Detention Basins																							
CSD-43	Cleator Park	San Diego River WMA	FY19																					
CSD-44	Cabrillo Heights Park	San Diego River WMA	FY19																					
CSD-45	Presidio Hills Golf Course and Park	San Diego River WMA	FY21																					
CSD-46	Montogmery Field Airport	San Diego River WMA	FY21																					
CSD-47	Ocean Beach Athletic Park and Robb Field	San Diego River WMA	FY21																					
CSD-48	Lower North Shepherd Canyon	San Diego River WMA	FY24																					
CSD-49	Springall Academy	San Diego River WMA	FY24																					
CSD-50	Serra Mesa Park and upslope canyon	San Diego River WMA	FY24																					
	Stream, Channel and Habitat Rehabilitation Projects																							
CSD-51	If interim load reduction goals are not met and additional stream, channel, and habitat rehabilitation projects are required, implement as needed.	Areas identified during feasibility studies	Optional												If triggered, begin planning (acquire funding and resources, conduct site feasibility analysis and site selection) to implement rehabilitation projects.									
	Water Quality Improvement BMPs																							
	Proprietary BMPs																							

ID	Strategy	Location	Implementation or Construction Year Start	FY 15 and Earlier	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35
CSD-52	3 Drain Inserts in Complex Street Green Mall.	San Diego River WMA	FY17																					
CSD-53	Park Ridge hydrodynamic separator	San Diego River WMA	FY17																					
CSD-54	El Capitan Reservoir	San Diego River WMA	Prior to FY16																					
CSD-55	Murray Reservoir	San Diego River WMA	Prior to FY16																					
CSD-56	San Vicente Reservoir	San Diego River WMA	Prior to FY16																					
CSD-57	Serra Mesa/Kearny Mesa Library	San Diego River WMA	Prior to FY16																					
	Dry Weather Flow Separation and Treatment Projects																							
CSD-58	If interim load reduction goals are not met and additional dry weather flow separation and treatment projects are required, implement as needed.	Downstream reaches where persistent dry weather flows have been observed	Optional												If triggered, begin planning (acquire funding and resources, conduct site feasibility analysis and site selection) to implement dry weather flow separation projects.									
	Trash Segregation																							
CSD-59	If interim load reduction goals are not met and additional trash segregation projects are required, implement as needed.	High-loading areas city-wide	Optional												If triggered, begin planning (acquire funding and resources, conduct site feasibility analysis and site selection) to implement trash segregation projects.									

B.3 Chapter Appendix B – Wet Weather Baseline Loads Quantification Methods & Values

For the Cities of El Cajon, La Mesa, Santee, and the County of San Diego, wet weather baseline loads for fecal coliform[1] were established using the Structural BMP Prioritization and Analysis Tool (SBPAT); a GIS-based water quality analysis tool used to quantify benefits, costs, uncertainties and potential risks associated with storm water quality projects.

For the City of San Diego, the model used incorporates a watershed loading model to estimate baseline water quality and flow conditions, a site-scale BMP optimization model, and a non-linear watershed-scale optimization model to assist with evaluating multiple BMP scenarios concurrently. The modeling approach builds on the information and modeling efforts that were completed during Phase I CLRP development. Existing Loading Simulation Program in C++ (LSPC) watershed models were updated and standardized in Phase II to (1) establish a level of consistency and comparability for areas with similar physical characteristics, and (2) provide reasonable assurance that the modeled existing condition is a representative baseline condition.

Cities of El Cajon, La Mesa, Santee, and the County of San Diego

The quantification/analysis module utilizes a stochastic Monte Carlo method to model water quality based on land use Event Mean Concentrations (EMCs)[2] coupled with continuous hydrologic simulations (produced using the USEPA SWMM model) to calculate annual loads. Since the previously established target load reductions (TLRs) from the Phase II CLRP which are used for this WQIP were developed using data from Water Year (WY) 2003, considered an average rainfall year for the Watershed, the WQIP analysis was also developed using rainfall from WY 2003 to maintain consistency. Several additional calibration checks were performed on the SBPAT model to evaluate its consistency with the Loading Simulation Program in C++ (LSPC) model that was used to develop the target load reductions. Specifically, water quality and hydrologic input parameters were evaluated, and these parameters were adjusted where warranted as described below.

Input Parameter Updates since CLRP Development

Land use EMCs for modeled pollutants selected for WQIP analysis were developed for the San Diego River (SDR) Watershed using storm water monitoring data collected by 1) the City of San Diego solely, and 2) the County of San Diego and the Copermittees of the San Diego Municipal Storm Water Permit as a group. The mean statistics were estimated using San Diego County datasets, but in order to develop more robust variability estimates, the standard deviation statistics were

[1] Fecal coliform is utilized as a surrogate for all FIB since there is an acceptable database of both land use-based storm water concentrations and structural BMP performance for this constituent.

[2] An EMC is an *average* pollutant concentration for a storm water event, whereas instantaneous concentrations throughout a storm are more variable. Land use specific EMC data are used to in watershed models to characterize pollutant concentrations from different catchments which are comprised of various land use mixes.

estimated using the coefficients of variation[3] from the Los Angeles County SBPAT default datasets, which have larger numbers of samples. For pollutants where no San Diego County specific EMC data were available, SBPAT default EMC statistics were used.

Since the San Diego County EMC datasets were based on fewer storms, smaller drainage areas (and therefore a smaller diversity of sites within each land use category) and were collected over a three month period of time within a single season, they may not adequately capture the full variability across multiple storm sizes, antecedent conditions, and wet seasons. In order to address this issue for the WQIP analysis, fecal coliform (FC) land use EMCs were compared with the FC land use EMCs developed for other Southern California-based TMDL compliance plans (Beach Cities WMG 2014). When arithmetic estimates of the log mean differed by more than an order of magnitude, they were compared with arithmetic mean land use concentrations from the LSPC model calibrated for the San Diego Region, and the EMC statistics from the two datasets that were closer to LSPC's arithmetic means (calculated based on land use loads divided by runoff volumes) were selected for use in this WQIP analysis. This resulted in changes to commercial and open space FC EMCs. Table B3 below provides the old and new arithmetic estimates of log mean and log standard deviation for the two land uses and Table B1 below provides the EMCs for all land uses and pollutants used in the WQIP analysis.

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[3] Coefficient of variation = standard deviation divided by the mean

Table B1. Proposed SBPAT EMCs for SLR and SDR Watersheds – Arithmetic Estimates of the Lognormal Summary Statistics (means with standard deviations in parentheses)

Land Use	TSS	TP	DP	NH3	NO3	TKN	Diss Cu	Tot Cu	Tot Pb	Diss Zn	Tot Zn	Fecal Col.
Rural Residential	2,523.76 (3,757.19)	1.59 (1.19)	0.12 (0.08)	0.11 (0.14)	1.50 (3.40)	2.65 (2.45)	4.20 (4.02)	8.36 (5.99)[1]	21.38 (31.41)	14.99 (30.63)	39.19 (34.01)[1]	6,684 (20,245)
Orchard	252.64 (163.89)	0.36 (0.16)	0.13 (0.10)	0.04 (0.04)	26.11 (88.27)	2.31 (1.09)	22.50 (17.50)	100.10 (74.8)	30.20 (34.30)	40.10 (49.10)	274.80 (147.30)	1,344 (3,410)
Single Family Residential	123.41 (183.72)	0.49 (0.37)	0.45 (0.29)	0.49 (0.64)	1.58 (3.59)	2.51 (2.33)	11.42 (10.93)	25.96 (18.6)	13.03 (19.15)	50.02 (102.22)	153.29 (133.04)	35,557 (107,700)
Commercial	127.68 (89.75)	0.32 (0.27)	0.29 (0.25)	1.21 (4.18)	0.55 (0.55)	3.44 (4.78)	16.62 (13.78)	54.84 (44.88)	14.40 (39.60)	224.40 (140.58)	483.7 (306.62)	51,600 (173,400)
Industrial	125.18 (118.15)	0.45 (0.47)	0.26 (0.25)	0.6 (0.95)	0.87 (0.96)	2.87 (2.33)	21.35 (20.78)	53.54 (56.95)	20.52 (58.92)	214.58 (271.47)	428.39 (388.85)	26,703 (34,515)
Education (Municipal)	132.11 (162.75)	0.46 (0.26)	0.26 (0.2)	0.4 (0.99)	0.61 (0.67)	1.71 (1.13)	5.58 (5.03)	12.02 (8.21)	7.43 (10.11)	73.13 (50.73)	174.1 (123.02)	2,148 (6,506)[2]
Transportation	77.80 (83.80)	0.68 (0.94)	0.56 (0.82)	0.37 (0.68)	0.74 (1.05)	1.84 (1.44)	32.40 (25.5)	52.20 (37.5)	9.20 (14.5)	222 (201.7)	292.90 (215.8)	1,680 (456)
Multi-family Residential	39.90 (51.3)	0.23 (0.21)	0.20 (0.19)	0.50 (0.74)	1.51 (3.06)	1.80 (1.24)	7.40 (5.70)	12.10 (5.60)	4.50 (7.80)	77.5 (84.1)	125.10 (101.10)	11,800 (23,700)
Agriculture (row crop)`	999.2 (648.2)	3.34 (1.53)	1.41 (1.04)	1.65 (1.67)	34.40 (116.30)	7.32 (3.44)	22.50 (17.50)	100.10 (74.8)	30.20 (34.3)	40.10 (49.10)	274.80 (147.30)	60,300 (153,000)
Vacant / Open Space	216.60 (1482.8)	0.12 (0.31)	0.09 (0.27)	0.11 (0.25)	1.17 (0.79)	0.96 (0.9)	0.60 (1.90)	10.60 (24.4)	3.00 (13.10)	28.10 (12.90)	26.30 (69.50)	484 (806)

[1] SBPAT default SFR dissolved:total concentration ratio was applied to the Blossom Valley dissolved mean value to estimate Blossom Valley total mean value

[2] FC EMC COV is based on SFR SCCWRP datasets

Mean EMCs in shaded area are based on LA region default SBPAT datasets due to a lack of available San Diego data

Mean EMCs shaded in orange are updated for this WQIP

SBPAT's predicted annual discharge volume for WY 2003 was evaluated by comparing it with LSPC's prediction as well as a measured value based on the stream flow gauge on San Diego River at Fashion Valley (USGS 11023000). These values are shown in Table B2 below. SBPAT's saturated hydraulic conductivity (K_{sat}) and initial moisture deficit input parameter values were adjusted upward to their maximum values (within their reasonable ranges as reported in USDA (1996)) to decrease predicted runoff volumes to better match the measured volume. The revised SBPAT volume, also shown in Table B2, is within 20% of the measured volume and 30% of the LSPC predicted volume.

Table B2. Observed and modeled runoff volumes for WY 2003 at Fashion Valley stream flow gage

Analysis	WY 2003 Total Runoff (acre-feet)
USGS 1102300 stream flow gage at Fashion Valley on San Diego River[1]	20,000
Phase II LSPC model (with irrigation turned off)	18,700
SBPAT model prior to adjustments	28,100
SBPAT model after adjustments	24,000

[1] Dry weather flows were removed from analysis.

Table B3. Updated FC land use EMCs – Arithmetic Estimates of the Lognormal Summary Statistics (means with standard deviations in parentheses)

Land Use	CLRP EMC	WQIP EMC
Commercial	791 [22,846]	51,600[1] [173,400]
Open Space	6,310 [1,310]	484[2] [806]

[1] Commercial fecal coliform EMC based on 2000-2005 SCCWRP Los Angeles region land use data (SCCWRP, 2007b). This EMC dataset is summarized in the SBPAT User's Guide (Geosyntec, 2012).

[2] Open space fecal coliform EMC statistics based on E. *coli* data (divided by 0.85 to adjust to fecal coliform) for Arroyo Sequit reference watershed, or 11 samples collected between December 2004 and April 2006. Data used by LA Regional Board for creek bacterial TMDLs and taken from (SCCCWRP, 2005) and (SCCWRP, 2007a).

Once the parameter adjustments described above were made, SBPAT's predicted annual FC load was divided by the SBPAT predicted annual volume to determine the corresponding average annual FC concentration at the watershed outlet for WY 2003. SBPAT's average concentration at the catchment outlets was then adjusted to account for effects of instream die-off in order to compare this predicted concentration with measured concentration. The adjustment factor was developed using the LSPC model by turning the die-off on and off. This adjusted SBPAT average concentration was compared with a corresponding value from the LSPC model (with die-off turned on), and with an arithmetic mean of measured concentration data taken from the SDR mass loading monitoring station (MLS) for the entire record (n=23, POR=2001-12). These values are shown in Table B4.

Table B4. FC concentration comparison

Dataset	Average FC Concentration (90% Confidence Interval in Parentheses) (MPN/100ml)
Measured data at SDR MLS (n=23, POR=2001-12)	15,400 (6,200 – 24,600)
LSPC model for WY 2003	6,600
SBPAT model for WY 2003 (adjusted with instream die-off for comparison)	23,800

Both LSPC and SBPAT's average concentration for the watershed outlet are within the 90% confidence interval of the measured data. Therefore, SBPAT's predicted annual load (where load is the product of volume and concentration, both of which were individually compared with measured data) is considered reliable for the purpose of this watershed analysis.

BASELINE LOAD CREDIT FOR IMPLEMENTED DEVELOPMENT BMPS

Baseline loads assume 2009 land uses, therefore they include loads from development that occurred between the TMDL year (2003) and 2009. As such, structural BMPs that were implemented on development projects between the TMDL year (2003) and 2009 were considered as part of the overall pollutant load reduction achieved by the WQIP. Appendix E presents a list of these projects, a map with their locations, and describes how these features were modeled. It should be noted that no credit is given for BMPs to be implemented as mitigation to new development after 2009 as it is assumed that the loads mitigated by the BMPs will offset the additional loads generated by new development (i.e. no net decrease in pollutant load).

BASELINE LOAD BREAKDOWN

Figure B1 shows the estimated modeled breakdown of San Diego River wet weather watershed loads by jurisdiction. For the purposes of the baseline loading analysis, as well as subsequent BMP implementation analyses presented in this WQIP, land use loads attributable to federal and tribal land ownership are not considered part of the Participating Agencies' load since the Participating Agencies do not have jurisdiction over these lands. Similarly, loading from agricultural land uses is not considered part of the Participating Agencies' load because the TMDL identifies Conditional Waivers of Waste Discharge Requirements as the mechanism to address discharges from controllable non-point sources (SDRWQCB 2010, p. A47). Open space loading is also shown as a separate category here, consistent with the TMDL. However, it should be noted that this general land use category includes parks and other undeveloped areas that are located within the Participating Agencies' jurisdictional areas and that drain to or through the MS4s.

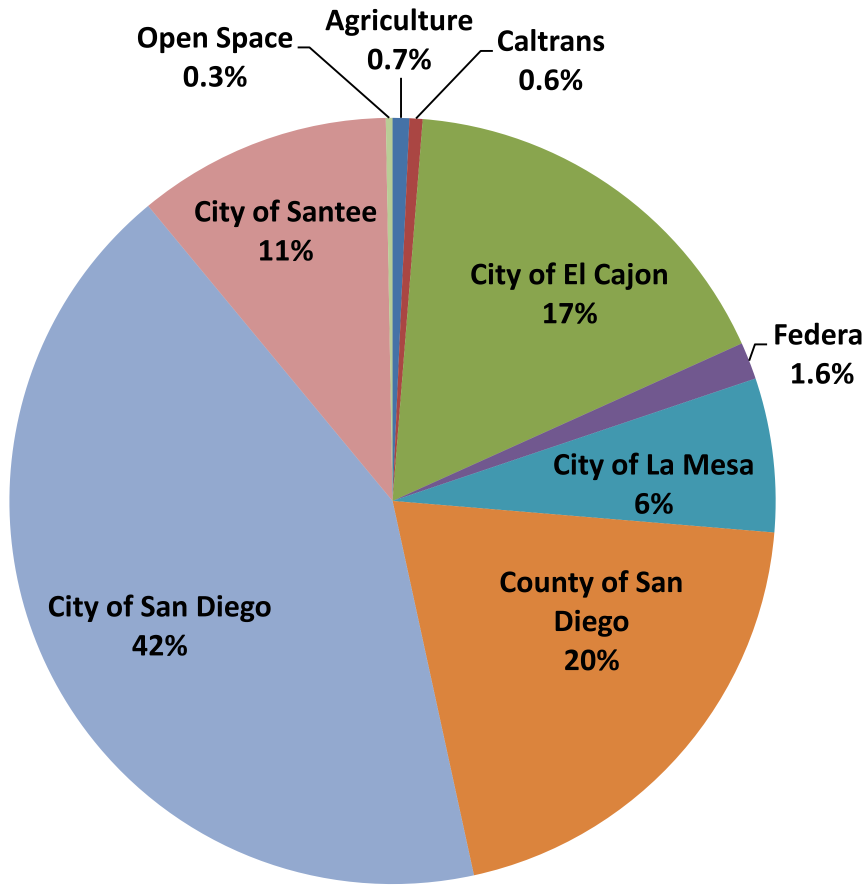

Figure B1. Wet weather FC modeled loads in the San Diego River Watershed, by land use/jurisdictional category, water year 2003

City of San Diego

Determination of TMDL Reduction Objectives

The first step in the load reduction analysis is the interpretation of the TMDLs and their associated numeric goals and WLAs and applying the watershed model for determining necessary pollutant load reductions to meet those objectives. Numeric goals were calculated for each parameter based on the difference between the modeled load and calculated TMDL load for Water Year (WY) 2003. This year represents typical wet and dry weather conditions and provides an appropriate benchmark to use in defining numeric goals and the resulting BMP implementation needs. Modeled loads above the TMDL load were considered as a required reduction and subtracted from the model baseline load to develop an instream load reduction target.

Each parameter has special considerations based on how the Basin Plan Water Quality Objectives (WQOs) are expressed as well as the associated TMDL requirements, and other regulatory requirements. Key compliance elements and the calculated numeric goals and reduction targets are presented in the following sections.

WQOs and TMDL Numeric Targets

The Bacteria TMDL is expressed as both a concentration-based and load-based target. Determination of MS4 compliance, as described in the Basin Plan Amendment, is based on both receiving water conditions and measurements of bacteria loading from MS4 outfalls. The concentration-based receiving water component of the TMDL is reflected by the TMDL targets, which are separated into a dry weather component, based on the geometric mean WQOs, and a wet weather component, based on the single sample WQOs. These targets are used to generate “Receiving Water Limitations” in the TMDL, which means the MS4s are assigned much of the responsibility for attaining the TMDL targets (or, at a minimum, demonstrating that non-MS4 sources are responsible for non-attainment). The San Diego River watershed is subject to those targets assigned to freshwater creeks.

Fecal coliform was used to represent bacteria in the load reduction calculations. The TMDL load for fecal coliform was calculated by multiplying the WQOs by the daily modeled stream flow. Modeled daily loads greater than this threshold were flagged as an exceedance. Modeled daily loads were also classified as occurring on either wet days or dry days because of different compliance requirements. A wet day is defined as a day with at least 0.2 inch of rainfall plus the three following days. Any day not classified as a wet day was considered a dry day. For wet weather, the Bacteria TMDL specifies an allowable exceedance frequency of 22 percent based on reference conditions, while no exceedances are allowed during dry weather. For WY2003, the number of wet days was 42, therefore the number of allowable wet weather exceedance days was 9 (rounded). The allowable exceedance load for wet weather was calculated by summing the top 9 days with the highest modeled daily loads. This load was then subtracted from the modeled wet weather total for the year. The difference between the remaining modeled load and the TMDL load represents the load reduction required for wet weather.

For dry weather, the WQOs represent 30-day geometric mean concentrations that require interpretation for use in developing the associated TMDL load. For the CLRP, a 30-day period in July 2003 was selected for modeling the dry period as it best represents a period unimpacted by rainfall and dominated by dry urban runoff. The 30-day geometric mean concentrations for each parameter were assumed for each dry day during this period and multiplied by the daily modeled flows to calculate the TMDL load. The dry weather load reduction was simply the difference between the modeled existing load and the TMDL load for the total number of dry days.

TMDL Load Reduction Summary

Table B5 presents the calculated wet loads and load reductions required based on the assumptions discussed above. The critical bacteria constituent is fecal coliform bacteria based on wet weather conditions. The assumption used in the CLRP is that by focusing on the critical pollutants for load reduction analyses, other pollutants will be addressed (many of the BMPs address multiple pollutants). Regardless, load reductions for the other pollutants are verified later in the analysis to ensure that necessary reductions are demonstrated.

Table B5. Wet-weather pollutant loads and required reductions

Pollutant	Total Load	Non-Exceedance Load	Allowable Exceedance Load	Exceedance Load	Required Reduction
Fecal Coliform (Billion #/year)	1,494,873	64,568	912,229	518,076	34.7%
Enterococcus (Billion #/year)	10,734,720	65,267	7,643,082	3,026,371	28.2%

B.3 Chapter Appendix C - Wet Weather Non-Structural BMP Descriptions and Load Reduction Quantifications, Methods, and Calculations

Non-structural BMPs are management programs or activities designed to reduce or eliminate pollutant loading by addressing its source. The quantification methods differed slightly between the City of San Diego and the Cities of El Cajon, La Mesa, and Santee and the County of San Diego. The methods and results are described separately in this appendix.

Cities of El Cajon, La Mesa, and Santee and the County of San Diego

To ensure that non-structural BMPs target the most significant sources of bacteria, the following factors were considered: (1) a sources' magnitude, prevalence, potential threat to public health and proximity to receiving water; (2) results from microbial tracking studies conducted in the watershed and region; and (3) best professional judgment.

The wet weather load reduction quantification approach involves similar steps for each of the Public-Private Partnership Programs included in this WQIP. The first step was to identify the source addressed by the program (e.g. bacteria in rooftop runoff). The next step was to calculate the targeted pollutant source area that the BMP will address (e.g. acres of rooftop). Once the targeted pollutant source area was calculated, the unit effectiveness of the selected BMP was modeled in SBPAT for a standard design (e.g. reduction of bacteria load per acre as a result of the implementation of a rain barrel. 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 Public-Private Partnership Program, along with relevant assumptions and assumption explanations. Table C1 provides a summary of wet weather non-structural BMPs and a quantification of water quality benefits.

Table C1. Wet-weather Quantification of Water Quality Benefits (Not including City of San Diego)

BMP Name	Wet or Dry Weather	Land Use Targeted	Pollutant Generating Activity	Quantification Assumptions			Quantification Method	Expected Annual Reduction of MS4 Baseline Load[1,2] by 2031	
				Load Assumption	Units	Citation/Assumptions		Fecal Coliform (10 ^12 MPN and percent) Low Range	High Range
Potential Public Private Partnership Program	Wet Weather	Single Family Residential (SFR)	Residential Roofs	54,474	Parcels of Single Family Residential in Watershed	SANDAG Land Use and Parcel Data	(residential parcels in watershed) * (SFR rooftop area) * [(expected percent of residential area converted to rain barrels) * (annual load reduction per acre conversion to rain barrels) + (expected percent of SFR disconnected to lawns) * (annual load reduction per acre from disconnection to lawn)]	**75** **1.6%**	**710** **15%**
				1500 - 4500	Single Family Residential Rooftop Size	Range developed on a GIS assessment of 20 parcels per jurisdiction			
				0.090	10 ^12 MPN of fecal coliform reduced per impervious acre treated by rain barrels	Modeled in SBPAT using Santee rainfall data, assumed 0.2 inch design storm (equates to one 55 gallon barrel for each 500 sq.-ft roof area), 10-day drain time.			
				0.429	10 ^12 MPN of fecal coliform reduced per impervious acre treated by disconnection	Modeled in SBPAT using Santee rainfall data, assumed area receiving flow would have an infiltration rate of 0.15 in/hr. (C/B soils) and effective depression storage (including root zone) of 0.7 inches, and would be 1/4 the area of contributing flow			
				2.5-10%	Percent of Residential Area Converted to rain barrels	Conversion over 15 years, based on expected effectiveness of incentives program.			
				7.5-30%	Percent of Residential Area Converted to disconnected to pervious area.	Conversion over 15 years, based on expected effectiveness of incentives program.			
Redevelopment through Permit-Required LID Implementation	Wet Weather	All Land Uses covered under SUSMP	Urban development	0.135	10^12 MPN of fecal coliform reduced per Residential Acre Converted	Modeled in SBPAT using Santee rainfall data; Applied standard SUSMP-sized bioretention with underdrains to unit areas of various land uses.	Sum for all land uses of (Load Reduction per Acre Converted) * (Acres Converted per Year) * (Years to 2031) * (+ or - 20%)	**160** **3.4%**	**240** **5.2%**
				0.394	10^12 MPN of fecal coliform reduced per Commercial Acre Converted				
				0.155	10^12 MPN of fecal coliform reduced per Industrial Acre Converted				
				0.006	10^12 MPN of fecal coliform reduced per Education Acre Converted				
				0.002	10^12 MPN of fecal coliform reduced per Transportation Acre Converted				
				995	Acres Residential Converted per year (Land Use Redev. Rate = 0.18%)	Calculated by Extrapolating City of LA Redevelopment Rate From Ballona IP (rate shown in parentheses) to watershed area by land use			
				78.2	Acres Commercial Converted per year (Land Use Redev. Rate = 0.15%)				
				161	Acres Industrial Converted per year (Land Use Redev. Rate = 0.34%)				
				50.2	Acres Education Converted per year (Land Use Redev. Rate = 0.16%)				
				1105	Acres Transportation Converted per year (Land Use Redev. Rate = 2.7%)				
Wet Weather Total							**Total expected load reduction**	**235**	**950**
							% of average MS4 total load	**5.1%**	**20%**

1. The MS4 baseline load for wet weather was calculated in SBPAT and the 25th and 75th Percentiles of the annual load was used to create these ranges.
2. Load reductions do not include benefits from nonstructural BMPs in the City of San Diego.

Private-Public Partnership Program

Figure C1. Residential Rain Barrel and Downspout Disconnect Incentive Program

Two main low impact development BMPs quantified for the incentive program are: 1) a rain barrel program and 2) a downspout disconnect program. The average performance, during wet weather, of these programs per rooftop acre was modeled in SBPAT for WY (2003), consistent with the baseline load calculations (see Section 3.3.1.1 for discussion). The area of implementation was based on land use information and a preliminary assessment of single-family residential homes in the watershed. The extent of single-family residential homes that will be converted to rain barrels was estimated to be 2.5-10% and amount of homes that will disconnect their downspouts was estimated to be 7.5-30% of all SFR homes in the Watershed over a 16 year period, based on the expected effectiveness of the given incentives program. Additional load reduction benefit may be achieved by expanding the program to commercial areas as well.

Benefits from the homes to be retrofitted with rain barrels were estimated by multiplying the area to receive rain barrels with the unit reduction that was modeled in SBPAT using Santee rainfall data, assuming a 0.2 inch design storm (equates to one 55 gallon barrel for each 500 sq.-ft. roof area) and a 10-day drain time.

Benefits from the homes to be treated by disconnecting downspouts were estimated by multiplying the area to receive disconnection with the unit reduction that was modeled in SBPAT using Santee rainfall data, assuming the area receiving flow would have an infiltration rate of 0.15 in/hr. (C/B soils) and effective depression storage (including root zone) of 0.7 inches, and would be 1/4 the area of contributing flow. This program can be implemented in other land uses such as commercial, for example.

Redevelopment through Permit-Required LID Implementation

This WQIP assumes that a portion of already developed areas in the watershed 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 Standard Urban Storm water Management Plan (SUSMP)-sized bioretention system with underdrains was modeled in SBPAT for residential, commercial, industrial, education, and transportation land uses during the TMDL Critical Water Year (2003) to give the bacteria load reductions per acre converted. The rate of redevelopment requiring SUMSP LID implementation for each of these land uses was extrapolated based on the rate analysis done for the Ballona Creek IP. During the 20 year compliance timeline this rate will result in redevelopment of approximately 6% of the MS4 area. For each land use, the load reductions 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 City of San Diego

The purpose of this section is to summarize the extent to which each nonstructural BMP contributes to pollutant removal in the San Diego River watershed. The City of San Diego was able to quantify several types of BMPs that are effective at reducing bacteria loads. These BMPs and their overall load reduction are discussed below.

Street Sweeping

Enhanced street sweeping activities provide direct, additional load reduction for specific pollutants. Sediment and other debris that collect on roadways, medians, and gutters are removed from the watershed with each sweeping, along with the associated mass of other pollutants. However, results presented in Appendix A indicated that street sweeping does little in terms of bacteria load reductions. Since bacteria are the only TMDL pollutant for San Diego River, this BMP is not recommended for the San Diego River watershed.

Catch Basin Cleaning

Enhanced catch basin cleaning programs provide direct, additional load reduction for specific pollutants. Sediment and other debris trapped in catch basins are removed from the collection system with each cleaning, along with the associated mass of other pollutants. However, results presented in Appendix A indicated that catch basin cleaning does little in terms of bacteria load reductions. Since bacteria are the only TMDL pollutant for San Diego River, this BMP is not recommended for the San Diego watershed.

Rain Barrels Incentive Program

Rain barrels act as mechanisms to temporarily detain and re-route runoff from otherwise directly connected impervious areas to nearby pervious areas or other vegetated areas such as rain gardens, swales, and the like. Assumptions about the modeling process and the extent of implementation are presented in Appendix A. Due to the limited extent of implementation of this program, load reduction values are quite small.

Downspout Disconnection Incentive Program

Downspout disconnections provide a similar watershed impact as rain barrels and downspout disconnections are modeled similarly. Assumptions about the modeling process and the extent of implementation are also presented in Appendix A. Implementation of this program is substantially greater than the rain barrel program, although the total load reduction numbers remain small.

Irrigation Runoff Reduction

Irrigation runoff reduction was modeled as a turf conversion and irrigation efficiency program as documented in Appendix A. Turf conversion transforms area from grasses that require regular irrigation to other, native pervious cover which would not require regular irrigation. The irrigation efficiency program sets the goal of eliminating irrigation overspray practices over the course of the 20-year implementation period. It should be noted that the impact of the elimination of irrigation overspray on dry weather pollutant load reductions in the City of San Diego is heavily muted due to the way in which dry weather flows are tabulated for this analysis.

Summary of Modeled Nonstructural BMPs

Finally, all nonstructural BMPs were included in the baseline watershed model to determine the aggregate flow and pollutant load reduction. The combined estimates are presented in Table C2.

Table C2. San Diego River Watershed Bacteria Load Reduction for all Modeled Non-Structural Practices in the City of San Diego

Condition	Fecal Coliform (%)
Wet weather	0.37
Dry weather	45.65

B.3 Chapter Appendix D – Wet Weather Structural BMP Descriptions and Load Reduction Quantifications, Methods, and Calculations

Structural BMPs are engineered systems designed to remove pollutants by simple gravity settling of particulate pollutants, filtration, biological update, media absorption, or any other physical, biological or chemical process. Two types of structural BMPs have been proposed for implementation and modeled for this WQIP: distributed and regional. Distributed structural BMPs are implemented at the neighborhood, parcel or site scale and can include green streets, rainwater harvesting and other low-impact development solutions. Regional structural BMPs are implemented to treat sub-watershed or catchment scale drainage areas and include structures such as subsurface flow wetlands, infiltration basins and constructed wetlands.

The quantification methods differed slightly between the City of San Diego and the Cities of El Cajon, La Mesa, and Santee and the County of San Diego. The methods and results are described separately in this appendix.

Cities of El Cajon, La Mesa, and Santee and the County of San Diego - Load Reduction Methods Information for all Wet Weather Structural BMPs

Load reductions for structural BMPs during wet weather were calculated using SBPAT as described in Appendix C. In general, design criteria for each selected BMP were first defined considering site constraints (in particular, acreage available for each BMP footprint), BMP performance data, and local regulations. For example, for regional BMPs, if there was not adequate space to provide full SUSMP-level treatment, estimated load reductions were based on available area (publicly owned) and benefits were calculated accordingly. Once a BMP was identified and design criteria defined for each feasible BMP opportunity site, SBPAT was used to evaluate the impact of implementing this suite of BMPs on water quality in the region. Details of the methodology and specific design criteria for regional versus distributed BMPs are discussed in the following sections.

Locations for distributed and regional BMPs were identified using the SBPAT catchment prioritization step, which orders catchments within the Watershed based on their potential to generate the highest pollutant loads during wet weather events. This allows identification of locations within the Watershed that offer the greatest potential benefits in terms of load reductions through implementation of BMPs. Consistent with the goal of prioritizing strategies with a multi-pollutant benefit, this catchment prioritization analysis was conducted considering nitrogen and phosphorus (using total suspended solids as a proxy)[4], in addition to the HPWQC.

Implemented Distributed Structural BMPs

Baseline loads in the WQIP included loads from development that occurred between the TMDL year (2003) and 2009, since the WQIP baseline load was developed using 2009 land use data. As such, structural BMPs that were implemented between the TMDL year (2003) and 2009 as mitigation to this anticipated development were considered as part of the overall pollutant load reduction to be achieved by the WQIP. A map with their locations is shown in Figure D1.

No credit is given in the WQIP for BMPs to be implemented as mitigation to new development after 2009 as it is assumed that the loads mitigated by the BMPs will offset the additional loads generated by new development (i.e. no net decrease in pollutant load). Refer to Appendix C where the role of implemented structural BMPs in the WQIP's baseline load calculations is discussed.

Load Reduction Quantification Methods – Specific Design Criteria

- Distributed BMPs were modeled as bioretention and bioretention swales with under drains[5] according to their infiltration capacity. Design criteria for quantifying the distributed parameters were developed using the following assumptions:
- Distributed BMPs within a catchment would be implemented to treat 25 percent of the MS4 area within a given catchment;
- Four (4) percent of the contributing area would be required for treating full SUSMP rainfall depth of 0.75 inches from the contributing area with distributed BMPs. This assumption was based on previous experiences with implementation of similar distributed BMPs;
- For catchments where sufficient land was not available, the design storm was taken to be a fraction of this 0.75 inch storm according to what percent of the contributing area was potentially available for BMP installation;
- Other design criteria for bioretention:
    - Design Volume: governed by available space and contributing area
    - Retention Depth: 12 inches
    - Infiltration Rate: governed by soil type.
- Other design criteria for bioretention swale with under drains:
    - Design Flow Rate: governed by available space and contributing area

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[4] The SBPAT catchment prioritization step does not include an option for phosphorus. Because of this, TSS was used as a proxy for phosphorus, since the majority of phosphorus is associated with solids. The load reduction analysis step in SBPAT does include phosphorus, so no proxy was necessary for this portion of the analysis.

[5] Bioretention-type BMPs are landscaped shallow depressions that capture and filter storm water runoff. These facilities function as a soil and plant-based filtration device that removes pollutants through a variety of physical, biological, and chemical treatment processes. The facilities normally consist of a ponding area, mulch layer, planting soils, plantings, and, optionally, a subsurface gravel reservoir layer.

  - Hydraulic Residence Time: 10 min
  - Longitudinal Slope: 0.03 ft./ft.
  - Manning's Roughness Coefficient: 0.25
- Water Quality Flow Depth: 4 inches
- Retention Depth: 2 inches
- Infiltration Rate: governed by soil type.

Distributed BMPs were grouped according to ranges in sizing criteria, and each group was modeled once using the mean sizing criteria for the group to limit the number of runs in SBPAT. Model results, including pollutant removal and costs, were summed to determine the overall impact of the distributed BMPs. These estimated load reductions are presented in Table D1.

Locations and Descriptions of Implemented Distributed BMPs

The locations of the implemented distributed BMPs are identified in Figure D1 and their descriptions are provided in Table D1.

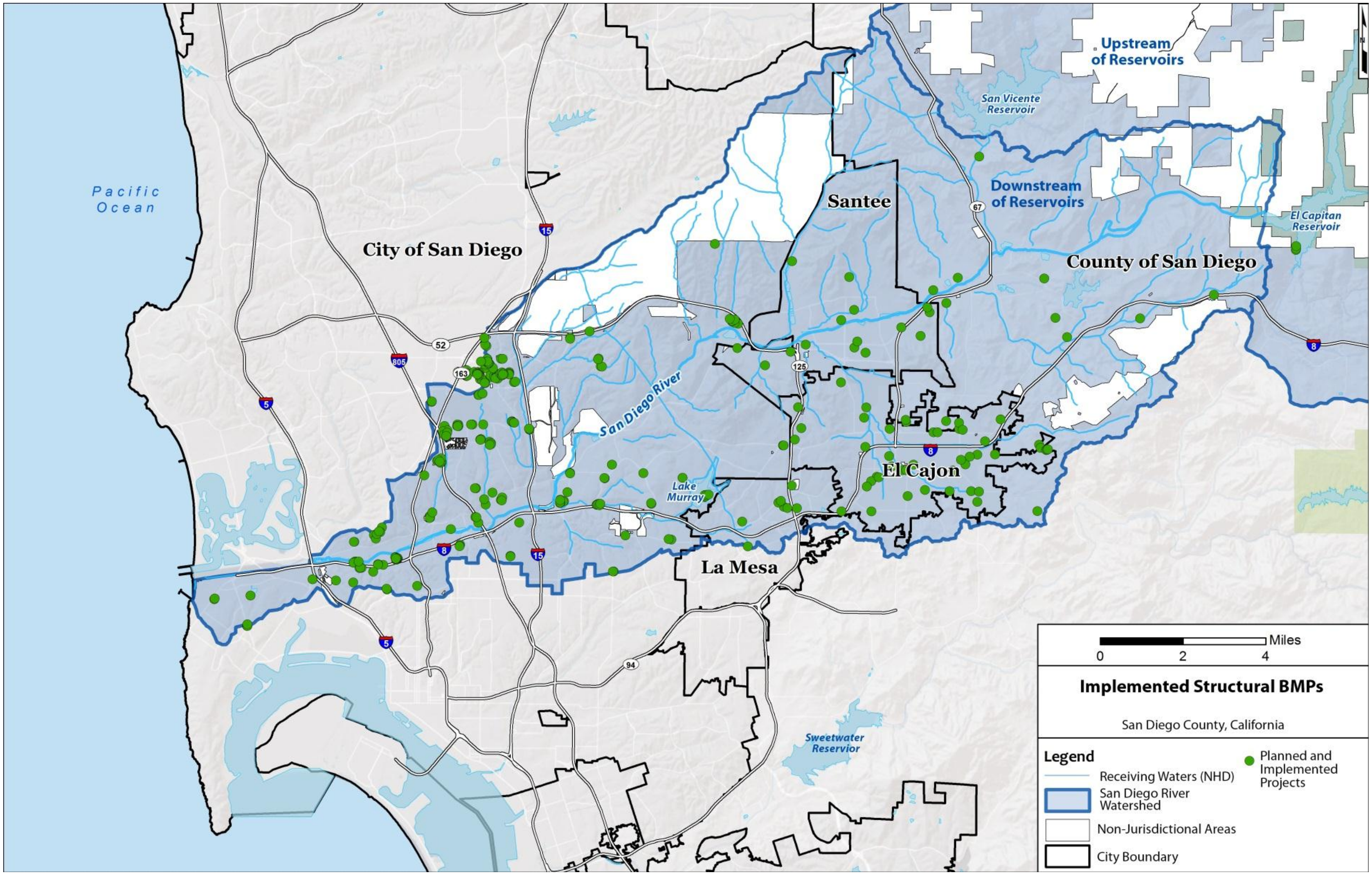


Figure D1. San Diego River Watershed Implemented Distributed Structural BMPs

Table D1. Descriptions of Implemented Distributed Structural BMPs

Jurisdiction	BMP Location	BMPs Implemented	Assumed Drainage Area (acres)	Catchment ID	Baseline Land Use (2009)
County of San Diego	9410 Adlai Terrace, Lakeside	Extended Detention Basin	9.0	1078	SF Residential
County of San Diego	Canita Lomas and Liberatore Lane, El Cajon	Subsurface Infiltration	20.0	1460	SF Residential
County of San Diego	420 Hart Dr, El Cajon and PO Box 1507, Cardiff	Grass Swale	0.5	1476	MF Residential
County of San Diego	9108 Lake Valley Road, Lakeside	Vegetated Filter Strip	1.0	1067	Institutional/Education
County of San Diego	Laurel Canyon Rd a Vista Laurel Pl, Lakeside	Bioretention and Grass Swale	5.5	1175	SF Residential
County of San Diego	9728 Marilla Drive, Lakeside	Bioretention Swale	4.4	1096	SF Residential
County of San Diego	1178 Persimmon Ave, El Cajon	Grass Swale	1.0	1474	MF Residential
County of San Diego	14878 Olde Highway 80, Lakeside	Permeable Paving, Porous Concrete	2.0	1050	Institutional/Education
County of San Diego	15724 Olde Highway 80, El Cajon	Bioretention Swale	1.0	1041	Rural Residential
County of San Diego	10007 Riverford Road, Lakeside	Bioretention Swale	3.0	1188	Industrial
County of San Diego	11905 Riverside Drive, Lakeside	Wet pond	76.0	1187	MF Residential
County of San Diego	Woodside Avenue Extended Detention Basin	Detention basin	301	1185	MF Residential

Jurisdiction	BMP Location	BMPs Implemented	Assumed Drainage Area (acres)	Catchment ID	Baseline Land Use (2009)
City of El Cajon	1501 East Washington Ave, El Cajon	detention basin and filter inserts	0.6	4498	Commercial
City of El Cajon	327/359 El Cajon Blvd, El Cajon	detention basins and inlet filters	1.9	4496	Commercial
City of El Cajon	245 E. Main St. El Cajon	downspout filters	0.1	4501	Commercial
City of El Cajon	1062 N. Second St, El Cajon	grass filter strip	0.6	4513	Commercial
City of El Cajon	605 W. Lexington Ave, El Cajon	gravel filter, rock energy dissipater, and bio-detention basin	0.2	4496	Commercial
City of El Cajon	1401/1409 East Main St, El Cajon	hydrodynamic separation system, inlet filters, and underground detention box	4.0	4484	Commercial
City of El Cajon	442/444 El Cajon Blvd, El Cajon	pervious swale and media filter vaults	0.2	4495	Commercial
City of El Cajon	335/355 North Second St, El Cajon	vegetated swale and outlet filter	0.5	4483	Commercial
City of El Cajon	1190 N. Second St., El Cajon	grass filter strip	0.2	4513	SF Residential
City of El Cajon	1032 Broadway, El Cajon	inlet filter and grass buffer strip	0.3	4502	Commercial
City of El Cajon	343 E Main St, El Cajon	vegetated swales and filter inserts	0.3	4501	Commercial

Jurisdiction	BMP Location	BMPs Implemented	Assumed Drainage Area (acres)	Catchment ID	Baseline Land Use (2009)
City of El Cajon	938 E. Washington Ave, El Cajon	pervious swale	0.4	4501	Commercial
City of El Cajon	1301 N. Marshall Ave, El Cajon	gravel infiltration basin	0.4	4510	Commercial
City of El Cajon	608 Sandra Lane, El Cajon	grass-lined channel	0.4	4489	SF Residential
City of El Cajon	1090 Broadway, El Cajon	grass filter strip and inlet filter inserts	0.4	4513	Commercial
City of El Cajon	613 Sandra Lane, El Cajon	detention basin	0.5	4489	SF Residential
City of El Cajon	403/431 Wisconsin Lane, El Cajon	sand media filter, underground detention basin, and inlet filter	0.5	4487	SF Residential
City of El Cajon	1470 E. Madison Ave, El Cajon	Pervious concrete swale	0.6	4484	Commercial
City of El Cajon	475/487 Foundation Lane, El Cajon	vegetated swale and inlet filter	0.6	4482	SF Residential
City of El Cajon	635 Sandra Lane , El Cajon	Detention basin	0.6	4489	SF Residential
City of El Cajon	1700 E. Main St, El Cajon	Vegetated swales, inlet filter, and infiltration basin	0.6	4507	Commercial
City of El Cajon	1108/1116 Anita Lee Lane, El Cajon	Grassy swales and curb outlet filters	0.6	4494	SF Residential
City of El Cajon	670 El Cajon Blvd, El Cajon	Underground detention pipe and hydrodynamic separator	0.7	4495	MF Residential

Jurisdiction	BMP Location	BMPs Implemented	Assumed Drainage Area (acres)	Catchment ID	Baseline Land Use (2009)
City of El Cajon	1273/1275 E. Main St, El Cajon	Vegetated swale and porous pavement,	0.7	4483	Commercial
City of El Cajon	912/930 Jamacha Rd, El Cajon	Infiltration system, vegetated swale, and storm drain inlet filters	0.8	4497	MF Residential
City of El Cajon	1341 E Main St, El Cajon	vegetated swales, gravel infiltration areas, and inlet filter inserts	0.8	4483	Commercial
City of El Cajon	1380 El Cajon Blvd, El Cajon	underground detention system	0.9	4493	Commercial
City of El Cajon	1326/1350 Wendell Cutting Ct, El Cajon	vegetated swales, underground detention, and inlet filter	1.0	4508	SF Residential
City of El Cajon	2095 East Madison Ave, El Cajon	biofilters and detention basin	1.0	4489	Commercial
City of El Cajon	1539 E. Main Street, El Cajon	underground detention pipe, pervious swale, and inlet filters	1.1	4508	MF Residential
City of El Cajon	2000/2010 Gillespie Way, El Cajon	detention area in parking lot, vegetated swale, and filter inserts	1.7	4504	Industrial
City of El Cajon	1225/1285 East Washington Ave, El Cajon	Biofilters for each new housing unit (perimeter)	1.8	4479	SF Residential

Jurisdiction	BMP Location	BMPs Implemented	Assumed Drainage Area (acres)	Catchment ID	Baseline Land Use (2009)
City of El Cajon	2766 Navajo Rd., El Cajon	Hydrodynamic separation system and underground detention box	2.5	4240	Institutional/Education
City of El Cajon	Grossmont College Drive, El Cajon	hydrodynamic separation system and detention area	2.7	4244	Institutional/Education
City of El Cajon	1630/1632 E Madison Ave, El Cajon	vegetated detention basin and inlet filters	4.1	4484	Institutional/Education
City of El Cajon	198 W Main St, El Cajon	vegetated swales, hydrodynamic separator system, trash enclosure dry wells, and trench drain, downspout, inlet filters	4.7	4496	Commercial
City of El Cajon	1001 W. Bradley Ave, El Cajon	pervious swales, inlet filter, and detention basin	4.8	4510	Industrial
City of El Cajon	2062/2096 Ingamac Way Ave, El Cajon	extended detention basin and grassy swales	4.9	4489	SF Residential
City of El Cajon	1435 E. Washington Ave, El Cajon	vegetated swale, two extended detention basin, and storm drain inlet filters	6.1	4498	SF Residential

Jurisdiction	BMP Location	BMPs Implemented	Assumed Drainage Area (acres)	Catchment ID	Baseline Land Use (2009)
City of El Cajon	Anjuli Ct, El Cajon	Hydrodynamics separator system	6.4	4241	SF Residential
City of El Cajon	965 Arnele Ave, El Cajon	vegetated bioswales, pervious buffer strip, and bioretention swale.	6.9	4511	Commercial
City of El Cajon	298 Fletcher Pkwy, El Cajon	inlet filters, CDS hydrodynamic separator units, and filtration strip next to Garden Center	8.3	4502	Commercial
City of El Cajon	1935/1941 Granite Hills Dr., El Cajon	detention basin and vegetated channel	9.1	4484	SF Residential
City of El Cajon	189 Roanoke Rd, El Cajon	vegetated swales and storm drain inlet filters	10.7	4500	Institutional/Education
City of La Mesa	8085 University Avenue, La Mesa	Vegetated Swale, Vortex Separator	1.0	5294	Commercial
City of La Mesa	8010 Parkway Dr., La Mesa	Media Filter	10.5	5291	Commercial
City of La Mesa	8860/8870 Center Dr., La Mesa	Media Filter, Bioswale	3.2	5288	MF Residential
City of La Mesa	8727/8655 Fletcher Parkway, La Mesa	Media Filter, Drainage inserts	7.0	5287	SF Residential
City of La Mesa	9001 Wakarusa St., La Mesa	Wetland/Detention Area	3.6	5454	Institutional/Education
City of La Mesa	8881 Dallas St., La Mesa	Bioswale, Media Filter	2.7	5285	Institutional/Education

Jurisdiction	BMP Location	BMPs Implemented	Assumed Drainage Area (acres)	Catchment ID	Baseline Land Use (2009)
City of La Mesa	5555 Grossmont center Dr., La Mesa	Media Filter	15.0	5288	Commercial
City of La Mesa	8725 Fletcher Parkway, La Mesa	Media Filter	0.5	5287	Transportation
City of Santee	Aubrey Glen, Hiser Road and Mission Gorge Road	Hydrodynamic Separator System	8.0	3247	MF Residential
City of Santee	Autowerks, APN: 383-112-53	Drainage inserts and grass swales	2.5	3251	Commercial
City of Santee	Autumn wood II, APN: 381-681-20	Hydrodynamic Separator System	10.0	3237	MF Residential
City of Santee	Boys and Girls Club, 8820 Tamberley Way	Grassy swale, drainage inserts.	1.0	3802	Institutional/Education
City of Santee	Cabins at Lake 7, APN: 378 020 49, 376 010 07	Wet pond	20.0	3200	Institutional/Education
City of Santee	Chapparel (Mission View Estates), West of Mesa Road	Bioswales and media filter	2.0	3250	MF Residential
City of Santee	Ciraolo Industrial Building, APN: 381-540-10 and 11	Inlet filters, grass swale, downspout filters	2.0	3262	Industrial
City of Santee	Hartford Insurance, APN: 381-050-59	Vegetated swale, rocky swale, and drainage inserts	6.0	3258	Commercial
City of Santee	Morningside, APN: 384-081-16	Hydrodynamic Separator System	6.0	3258	MF Residential

Jurisdiction	BMP Location	BMPs Implemented	Assumed Drainage Area (acres)	Catchment ID	Baseline Land Use (2009)
City of Santee	Rayo Wholesale, Rayo II, 11495 Woodside Avenue	Grass swale, Grassy detention basin with sand cone filter	3.0	3264	Industrial
City of Santee	Town Center Community Park, APN: 381-050-51, 52, and 381-051-06, 07	Media Filter, bioswales, buffer strips, inlet filters	12	3207	Institutional/Education
City of Santee	Toyota, APN: 383-124-11	Extended detention basin, bioretention, inlet filters	3.0	3255	Commercial
Caltrans	SR 52 Unit 5A	Bioswales	9.8		Transportation
Caltrans	SR 52 Unit 5A	Detention Basin	9.3		Transportation
Caltrans	SR 52 : 52/15 Separation To Mast Boulevard	Bioswales	4		Transportation
Caltrans	SR 52: Cuyamaca Street To Magnolia Avenue	Bioswales	21.5		Transportation
Caltrans	SR 52: Cuyamaca Street To Magnolia Avenue	Detention Basin	9.2		Transportation

Load Reduction Quantifications

The estimated load reductions for the modeled implemented distributed BMPs are presented in Table D2.

Table D2. Estimated Load Reductions from Distributed BMPs

Distributed BMPs	Water Quality (FC Load) Benefits (10^12 MPN reduction/year) [Low – High][a]
Implemented Distributed Projects	53 [29 – 62]
Potential Distributed Projects	397 [214 – 463]

[a] Load reductions are for the County of San Diego, and Cities of El Cajon, Santee, and La Mesa.

Stream Enhancement/Restoration Projects

Stream enhancement/restoration projects, implemented from 2003 and through future proposed projects, were incorporated into the CLRP's load reduction estimates. The intent is not to design these projects to be inundated with untreated water, but to acknowledge the benefits these sites achieve when stormwater comes in contact with these sites. Wet weather benefits for these projects are estimated based on analysis of the project features. However, future flow and bacteria monitoring data should be used to confirm or revise these assumed benefits. The following potential net pollutant load reduction mechanisms were quantified for stream restoration projects:

- Increased volume reductions
- Increased hydraulic residence time
- Increased settleable solids
- Increase in decay coefficient to account for plant assimilative capacity.

Based on project features for each project, a low and high range of benefits are estimated using the two alternatives discussed below. The low and high values from the 4 estimates are used to estimate the load reductions for the project:

- For alternatives, the design flow rate and design volume of both the restored channel and the pre-project channel are assumed considering general water quality design guidelines and typical sediment resuspension velocities.
- For the first alternative, SBPAT BMP performance algorithms- which are based on hydrologic capture calculations conducted using SWMM- and effluent water quality data are used to estimate benefits:
  - A wetlands algorithm is used to estimate benefits associated with enhanced and/or created vegetation;
  - An infiltration algorithm is used to estimate benefits associated with volume reductions.
- For the second alternative, the change in volume reductions, first order decay coefficients, and load reductions associated with settleable solids are estimated based on system design features and a focused literature review.

- For the purpose of quantifying load reductions, it is assumed that restoration projects address dry weather and small storm flows predominantly. If the project is located on a floodplain bench and is only inundated in larger storm events, then benefits should not be claimed for the purpose of summing effective load reductions for comparison to the TLR.

Figure D2 shows locations and Table D3 presents a summary of the WY 2003 FC benefits for stream restoration projects.

Table D3. Estimated Load Reductions from Stream Enhancement/Restoration Projects

Location/Name	Water Quality (FIB-FC Load) Benefits (10^12 MPN reduction/year)[a]
Forester Creek	55 [13 - 96]
Woodglen Vista Creek	4 [1 - 6]
Las Colinas Channel	2 [0 - 3]
Alvarado Channel Restoration	6 [2 - 11]
Totals	67 [16 - 117]

[a] Load reductions are for the Cities of Santee and La Mesa.

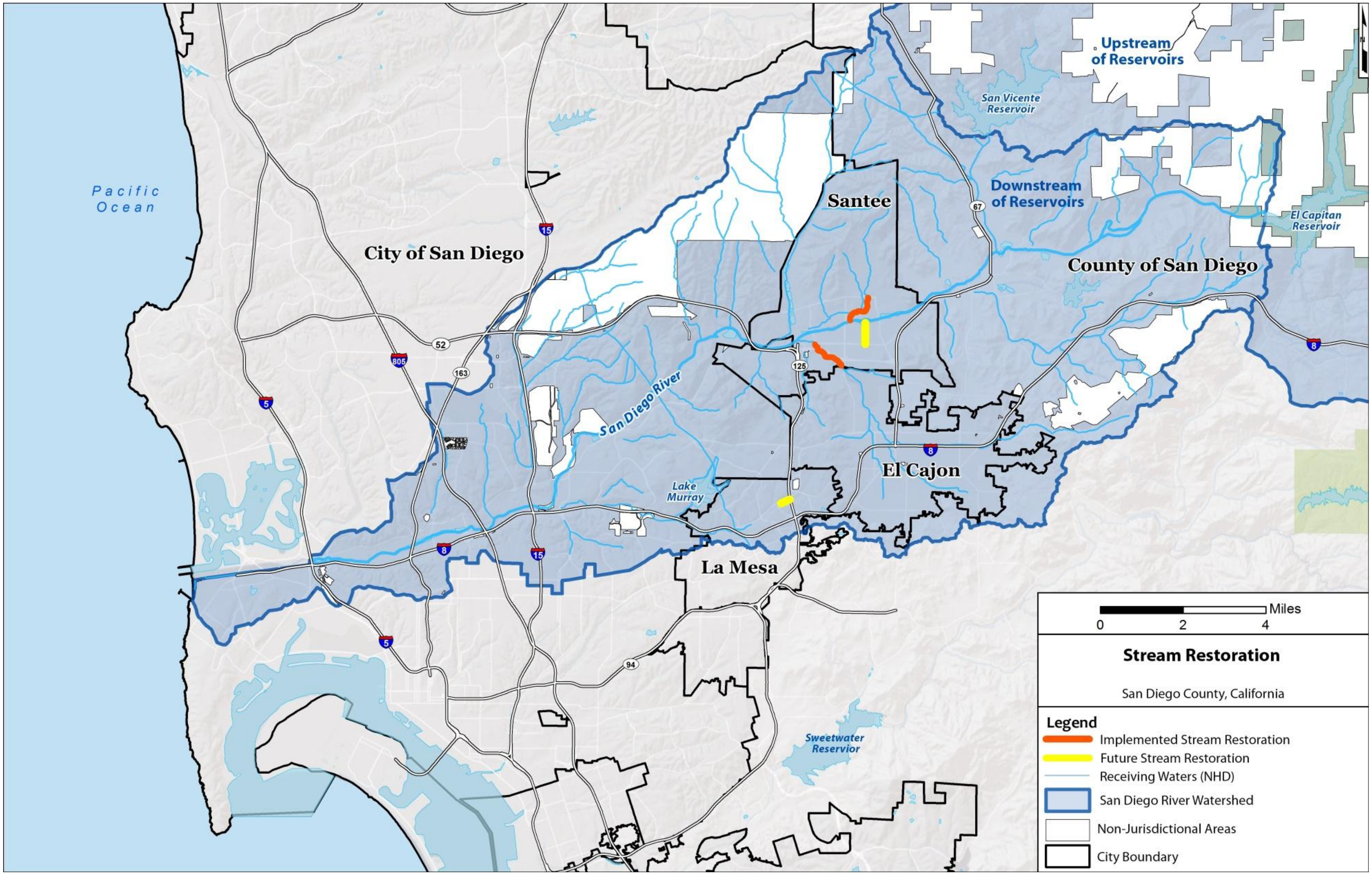


Figure D2. Stream Restoration Projects for San Diego River Watershed.

Proposed (Optional) Distributed Structural BMPs

The methods for quantifying load reductions for the proposed (optional) distributed structural BMPs are the same as those described for the implemented distributed BMPs above.

Catchment Prioritization Methods

Specific catchments within the watershed were identified as preferred locations for distributed structural BMPs. The San Diego River Watershed, downstream of the San Vicente and El Capitan reservoirs, was divided into 531 subcatchments. Using SBPAT, a catchment prioritization index (CPI) score was calculated for each catchment in the San Diego River Watershed. This score is based on the potential for each catchment to contribute pollutant loads, and can therefore be used to focus BMP efforts. The end result is a map of the entire watershed, highlighting the locations where BMPs can be installed with the greatest likelihood to improve water quality or reduce bacteria discharges.

Each catchment was given a normalized, unit-less CPI score between 1 and 5, with 5 representing the highest priority. For a more detailed explanation of the CPI calculation, see Step 1 of the SBPAT User's Guide (Geosyntec 2008). The following is a brief summary of the key elements of this step:

- Pollutant-specific CPI scores were calculated for each land use within a catchment as the product of land use specific pollutant EMCs, 85th-percentile precipitation, and runoff coefficients. These scores were then weighted by the area of each land use category within the catchment. Data used for each land use type is included in Appendix C.

- Individual pollutant CPI scores for each catchment were combined into an integrated CPI score.

- CPI scores were then further refined based on whether a catchment drained to an impaired water body, or a water body with an assigned TMDL. Weights of two and three, respectively, were assigned for catchments draining to impaired water bodies and water bodies with assigned TMDLs.

Results of the CPI analysis for the HPWQC and a combination of the HPWQC and nutrients are shown in Figure D3 and Figure D4.

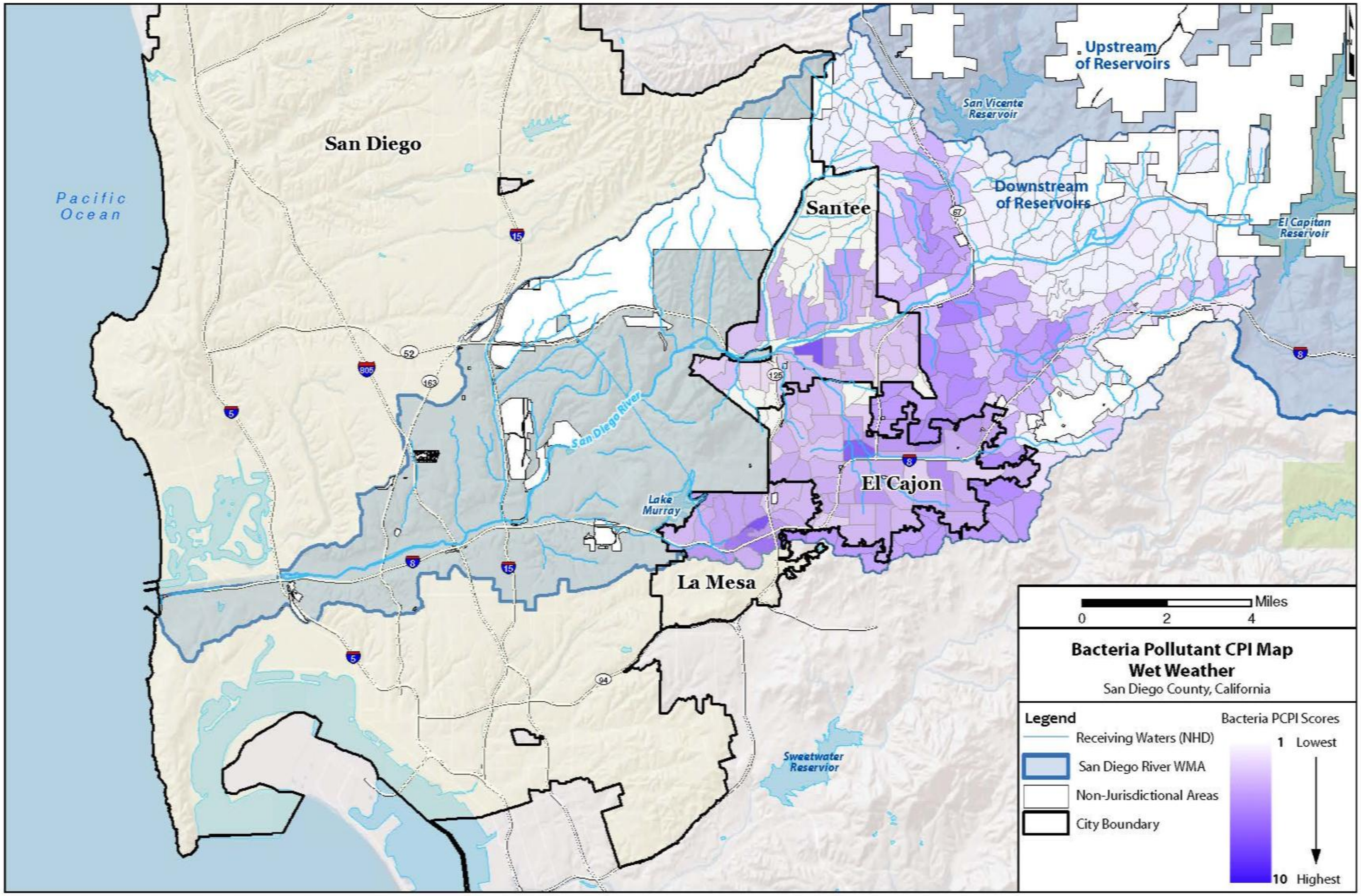


Figure D3. CPI Map for HPWQC

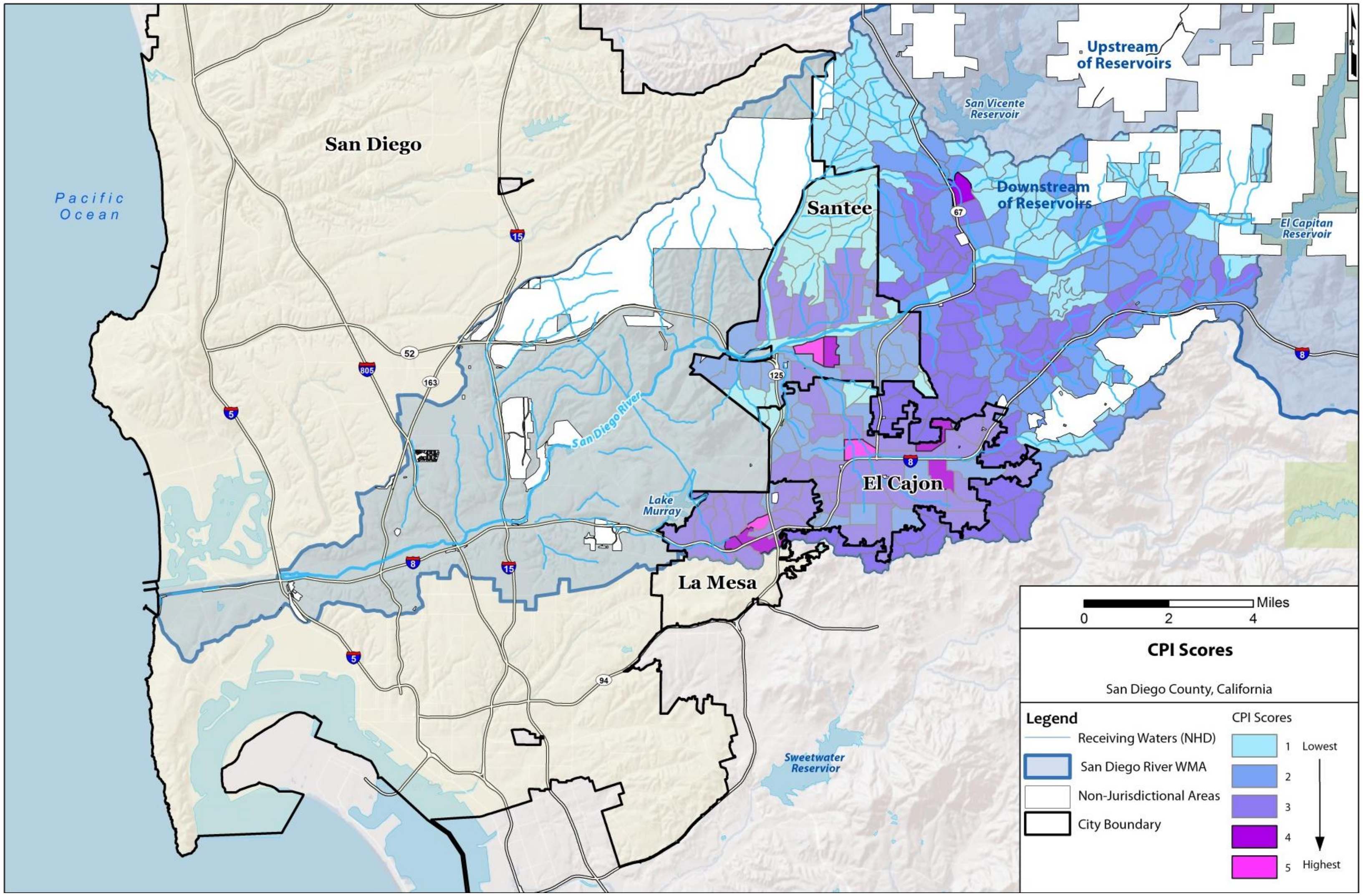


Figure D4. Integrated CPI Map for HPWQC and Nutrients

Catchments were selected as potential locations for future distributed BMPs if they had a CPI score of 3 or higher and had greater than 50 percent of Participating Agency area with the catchment. These catchments were then screened for potential distributed BMP opportunities, based on the presence of non-travelled public rights of ways (ROWs) within the high priority catchments. Based on random sampling of ROWs within the high priority catchments, and using best professional judgment, 40 percent of each sampled individual ROW was identified to be non-travelled and 10 percent of the non-travelled ROW area was assumed, on average, to be suitable for a BMP retrofit. Given the above two findings, four percent of the ROW area within high priority catchments was assumed to be suitable for a distributed BMP retrofit.

Distributed BMP types for retrofits within high priority catchments were selected based on the feasibility of infiltration (i.e., green BMPs) within the retrofit area. Retrofit area is considered feasible for infiltration if more than 50 percent of the retrofit area is categorized as NRCS A, B, or C type soils. The following guidelines were used for identifying candidate distributed BMPs:

- *Infiltration feasible*: Assumed that 50 percent of the drainage area would be treated with infiltration BMPs and the remaining 50 percent would be treated with a non-infiltration BMP.
- *Infiltration infeasible*: Treated with non-infiltration BMPs.

This WQIP assumes that bioretention type BMPs will be implemented for infiltration feasible sites and bioretention swales with underdrain type BMPs will be implemented for infiltration infeasible sites. While designing and implementing site specific distributed BMPs as part of the implementation plan, different BMPs may be selected provided the pollutant reductions achieved through the implemented projects will be equal to or greater than those modeled in this report. A map showing proposed catchments for distributed structural BMPs is shown in Figure D5 and load reduction are summarized in Table D4.

Table D4. Water Quality Benefits from Proposed Distributed Structural BMPs

BMP Type	FIB-FC load reduction % of Average Municipal Land Use Load) Average [Low-High]
Potential Public Private Partnership Program	8.5% [1.6% - 15%]
Redevelopment through Permit-Required LID Implementation	4.3% [3.4% - 5.1%]
Implemented Projects	1.1% [0.6% - 1.3%]
Future Projects	8.6% [4.6% - 10%]

[a] Load reductions are for the County of San Diego, and Cities of El Cajon, Santee, and La Mesa.

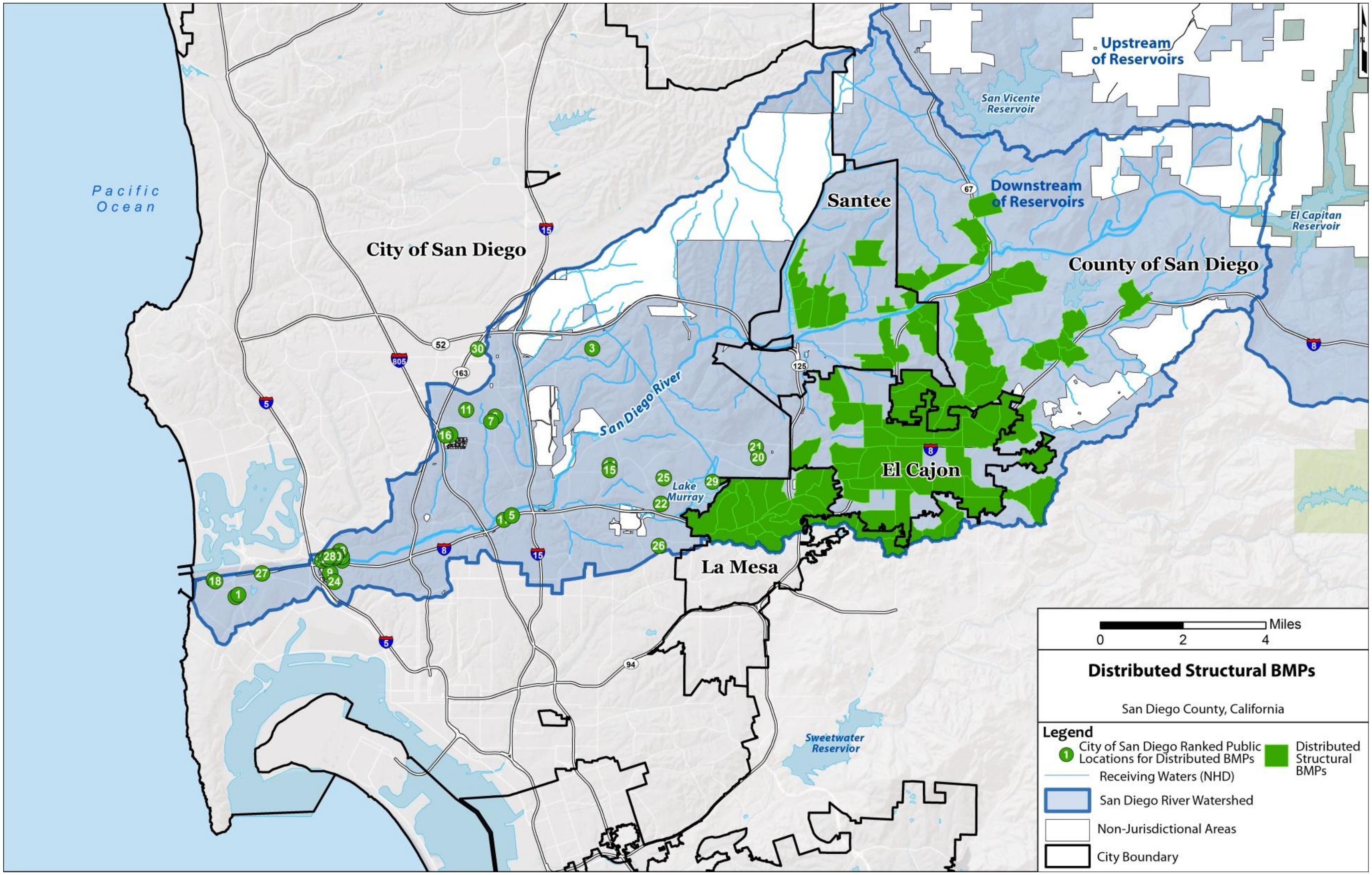


Figure D5. Proposed Catchments for Implementation of (Optional) Distributed Structural BMPs

Proposed Regional Structural BMPs

BMP design criteria for each specific project were developed using the following generalized design criteria:

Infiltration Basin Design Criteria:

- Drawdown time: 48 hours
- Infiltration rate: Per San Diego County treatment BMP design guidelines (County 2011), typical soil infiltration rates based on the NRCS soil texture were used with a factor of safety of two (2)
- Design volume: determined by space available for the BMP
- Depth: governed by the drawdown time and infiltration rate.

Subsurface Flow (SSF) Wetland Design Criteria:

- Hydraulic residence time: 24 hours
- Depth of wetland: 3-4 feet
- Porosity: 0.35-0.4
- Target equalization basin drawdown time: 48 hours
- Design volume: governed by the design depth and space available
- Treatment flow rate: governed by volume and hydraulic residence time.

Wetland/Wet Pond Design Criteria:

- Permanent pool hydraulic residence time: 24 hours
- Permanent pool depth: 4-5 feet
- Permanent pool volume: governed by space available and depth.

Design criteria specific to each project is presented in their respective BMP sheets, which are included below.

Once design criteria were established, SBPAT was used to determine the pollutant reduction that could be achieved through the implementation of these BMPs. This modeling analysis includes continuous hydrologic simulation of runoff quantities and BMP volume capture, as well as stochastic Monte Carlo calculation of pollutant load reduction based on BMP effluent concentrations. See the SBPAT Guidance Manual for further information (Geosyntec 2008).

Catchment Prioritization Methods

A “nodal” catchment prioritization index, or NCPI, is an area-weighted CPI that is based on upstream catchment CPI scores. In other words, use of NCPI allows identification of catchments that are downstream of multiple, hydrologically linked high-priority catchments that may be utilized for potential regional BMP implementation. Using the downstream catchment attribute, an NCPI score for each catchment was computed using an area-weighted average of the CPI scores for tributary catchments. Results of the NCPI analysis are shown in Figure D6.

After the catchments were prioritized, Geosyntec performed a desktop level screening of available public parcels in areas that would receive flows with higher estimated pollutant loading. Jurisdictions also provided parcels for screening. The desktop level screening took into consideration soil types, distance to receiving water, MS4 location, elevation, and surrounding land uses.

Site specific regional BMPs for the screened parcels were selected considering the following criteria:

- *BMP Performance*: Which BMP type is most effective at reducing concentrations of bacteria, nitrogen (nitrate), and phosphorous at this parcel?
- *Site-specific Constraints*: Which BMP type is feasible on the parcel given the location, parcel ownership, and physical characteristics of the site?
- *Costs*: Which BMP type is most cost-effective, both in capital expenditures and expected annual operations and maintenance costs?

The BMPs selected for pollutant removal modeling and cost estimation included subsurface flow wetlands, wetland/wet ponds, and infiltration basins, since these are the only structural BMP technologies capable of removing significant loads of FIB, nitrogen (nitrate), and phosphorous. Figure D7 shows a map of locations for the candidate regional structural BMPs.

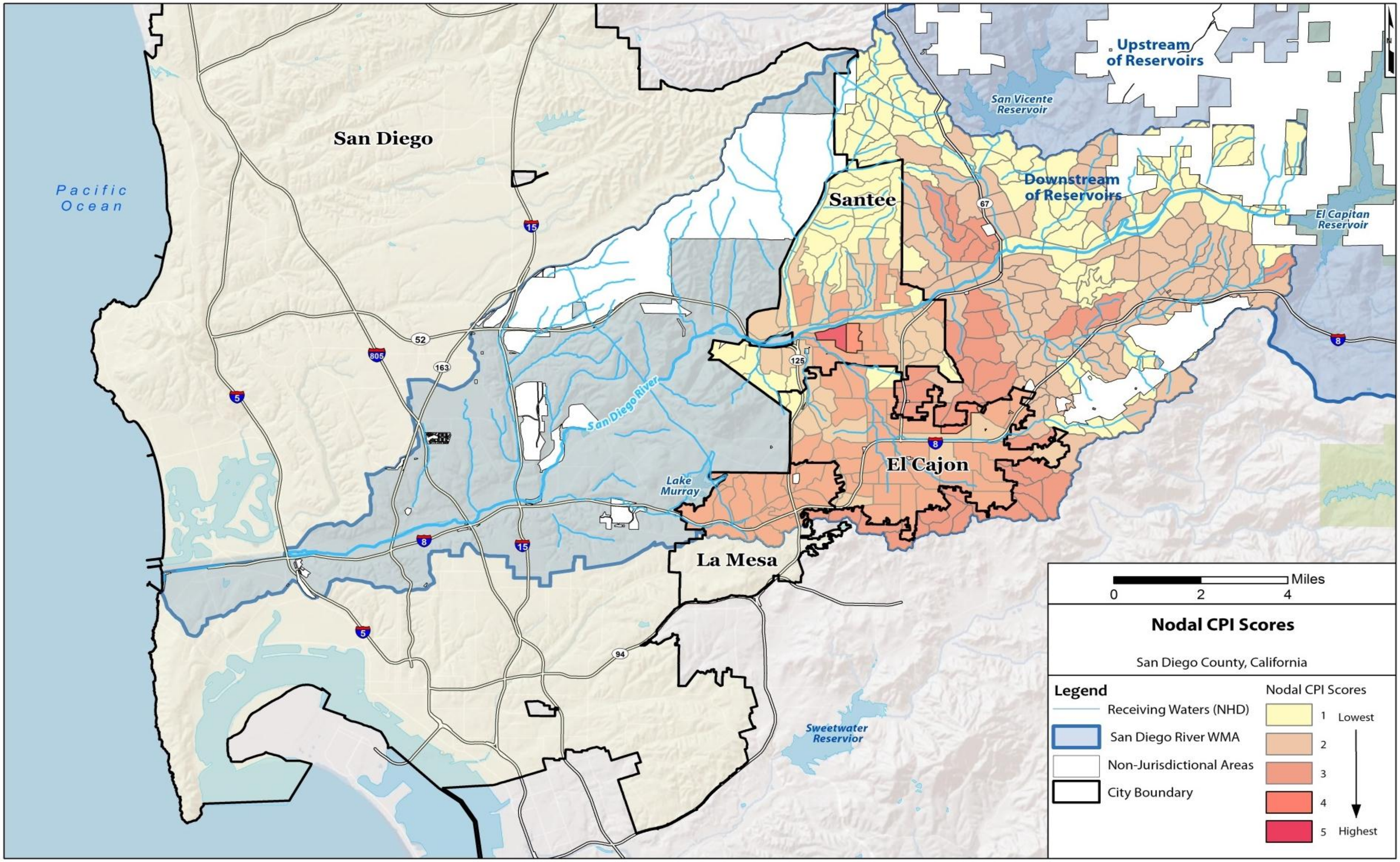


Figure D6. Integrated NCPI Map for Bacteria and Nutrients

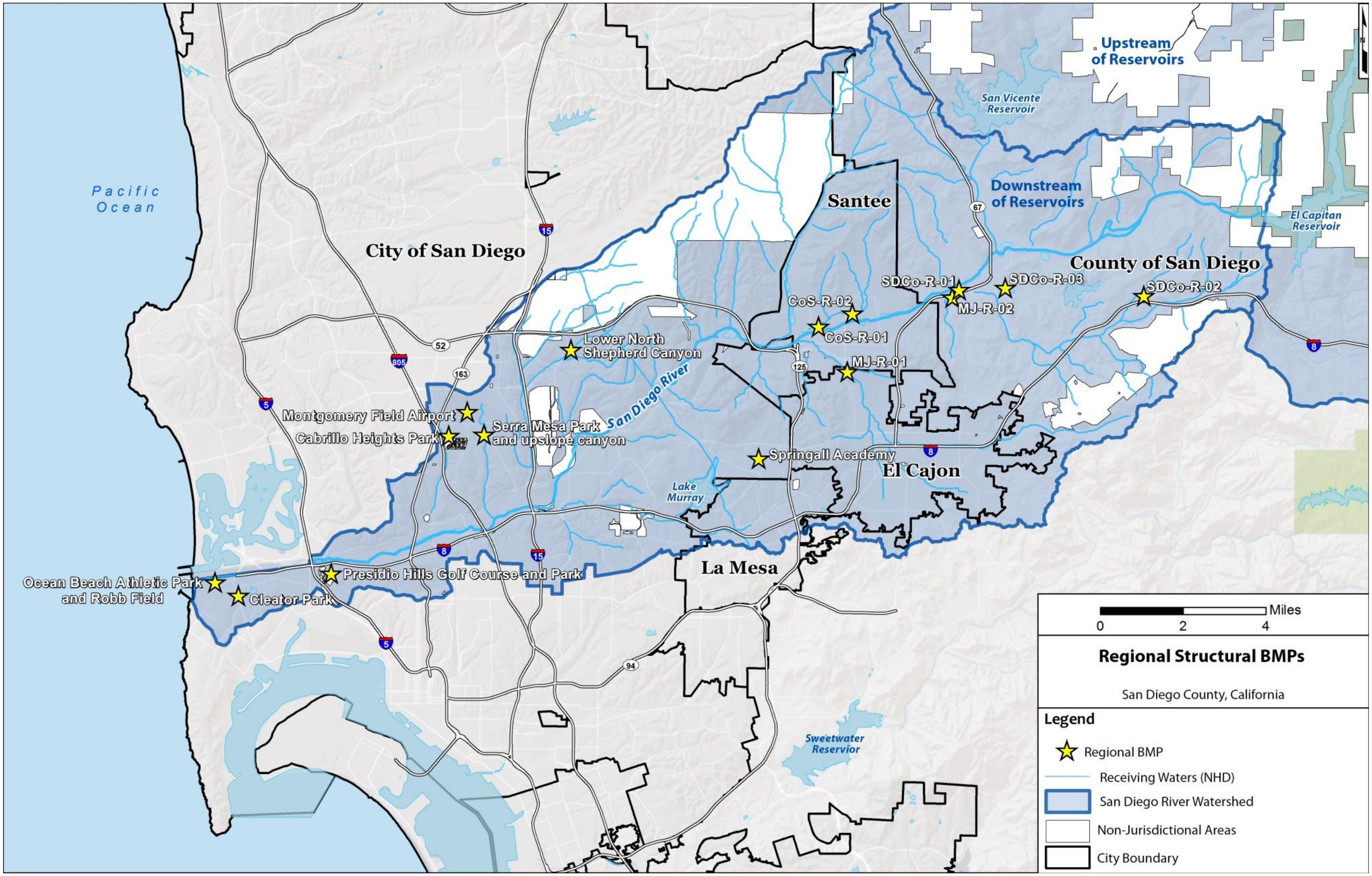


Figure D7. Locations of Proposed Regional Structural BMPs

The proposed regional BMPs are listed in Table D5, and design criteria specific to each project is presented in their respective BMP sheets, included as Figures D8 - D14.

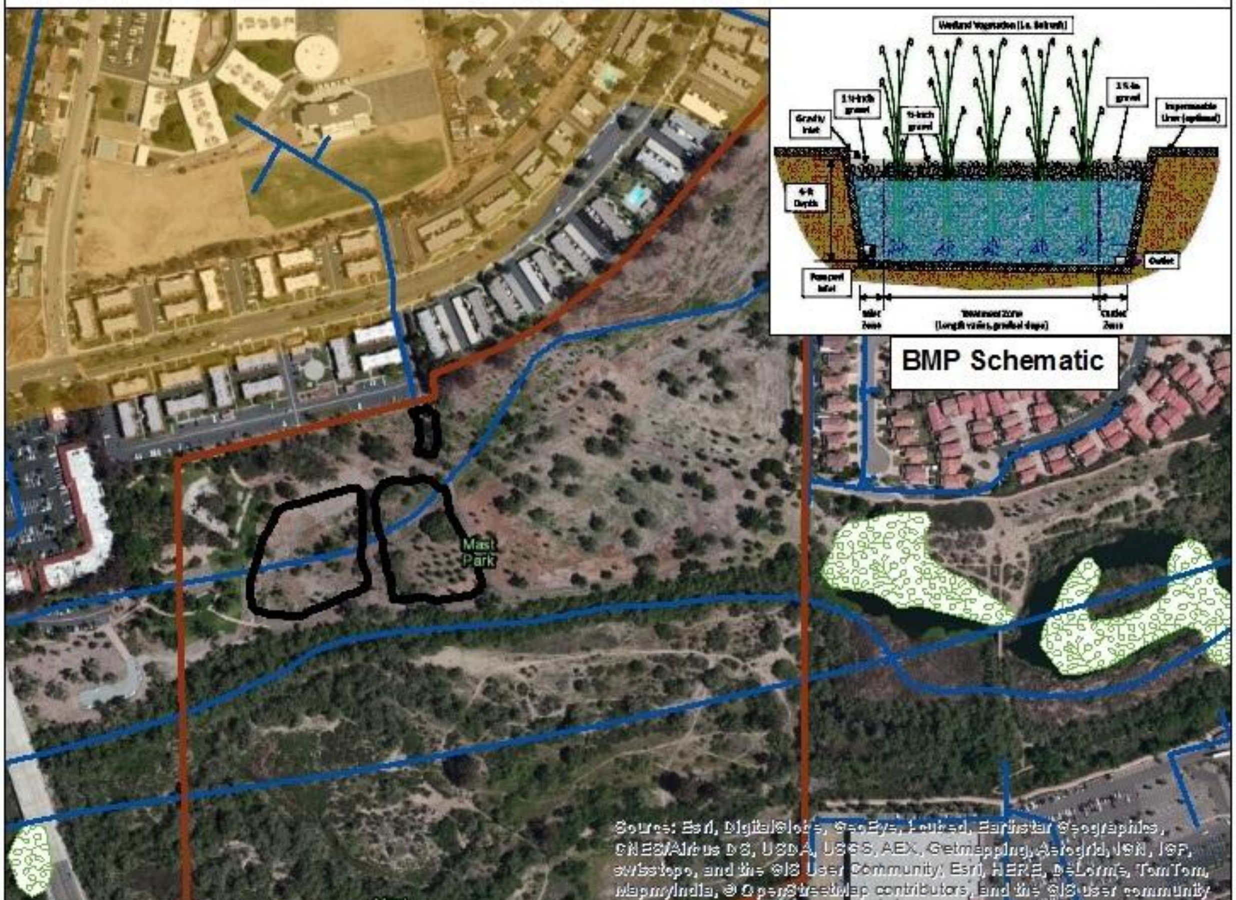
Table D5. List of Proposed Regional BMPs

Figure #	Name	BMP Type
D8	CoS-R-01	SSF Wetlands
D9	CoS-R-02	SSF Wetlands
D10	MJ-R-01	Gross Solids and Trash Removal
D11	MJ-R-02	Infiltration Basin
D12	SDCo-R-01	66% Wetpond and 33% SSF Wetland
D13	SDCo-R-02	Subsurface Infiltration
D14	SDCo-R-03	Constructed Wetland

Figure D8.

San Diego River Watershed Management Area
Water Quality Implementation Plan
Regional BMP Identification and Constraints

CoS-R-01 — **October 2014**



Parcel Information

Owner : City of Santee
Jurisdiction: City of Santee
Constraints in Parcel: High Groundwater
Current Land Use: Park

Project Name: TBD

BMP Information

BMP Proposed: SSF Wetlands
Constraints in Footprint: High Groundwater
Tributary Area: ~ 573 acres;
Diversion from San Diego River = No
BMP Footprint Area: ~3 acres
Equalization Basin: Volume:173,000 cubic feet; Depth: 4 feet
Treatment Flow Rate: 1.0 cfs; Hydraulic Residence Time: 24 hours

LEGEND

- BMP Footprint
- Parcel Boundary
- Storm Drains/Streams
- Wetlands (National Wetlands Inventory)
- Low Permeability Soils (NRCS Type D)

N

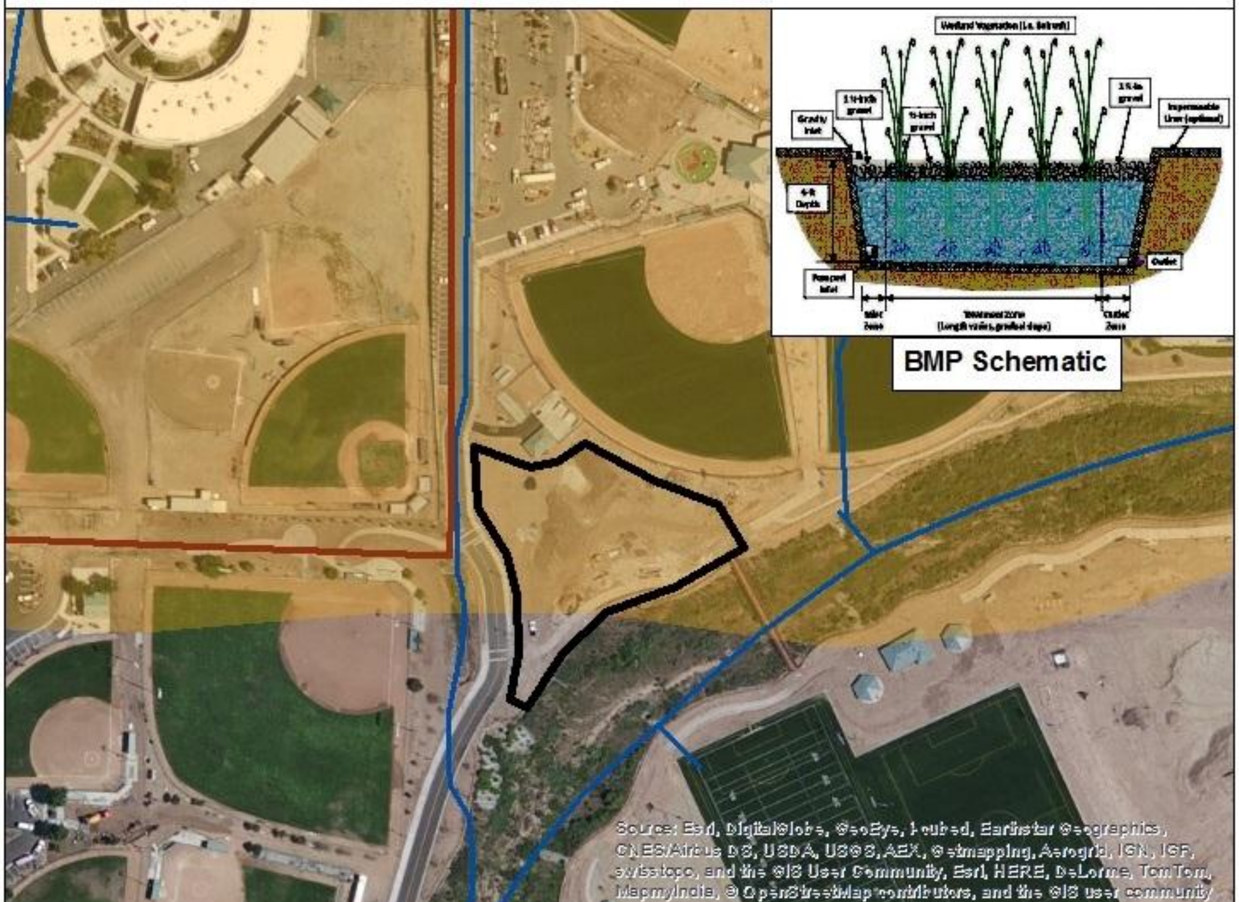
400 200 0 400 Feet

DATA SOURCES: ESRI; SANDAG; SANGIS; USGS

Figure D9.

San Diego River Watershed Management Area
Water Quality Improvement Plan
Regional BMP Identification and Constraints

CoS-R-02 **October 2014**



Parcel Information

Owner : City of Santee
Jurisdiction: City of Santee
Constraints in Parcel: Low Permeable Soils; High Groundwater
Current Land Use: Park and Sports Fields

Project Name: TBD

BMP Information

BMP Proposed: SSF Wetlands
Constraints in Footprint: High Groundwater; Low Permeable Soils
Tributary Area: ~ 100 acres;
Diversion from Wood Glen Vista Creek = No
BMP Footprint Area: ~1.3 acres
Equalization Basin: Volume:170,000 cubic feet; Depth: 4 feet
Treatment Flow Rate: 0.4 cfs; Hydraulic Residence Time: 24 hours

LEGEND

BMP Footprint
Parcel Boundary
Storm Drains/Streams
Wetlands (National Wetlands Inventory)
Low Permeability Soils (NRCS Type D)

N

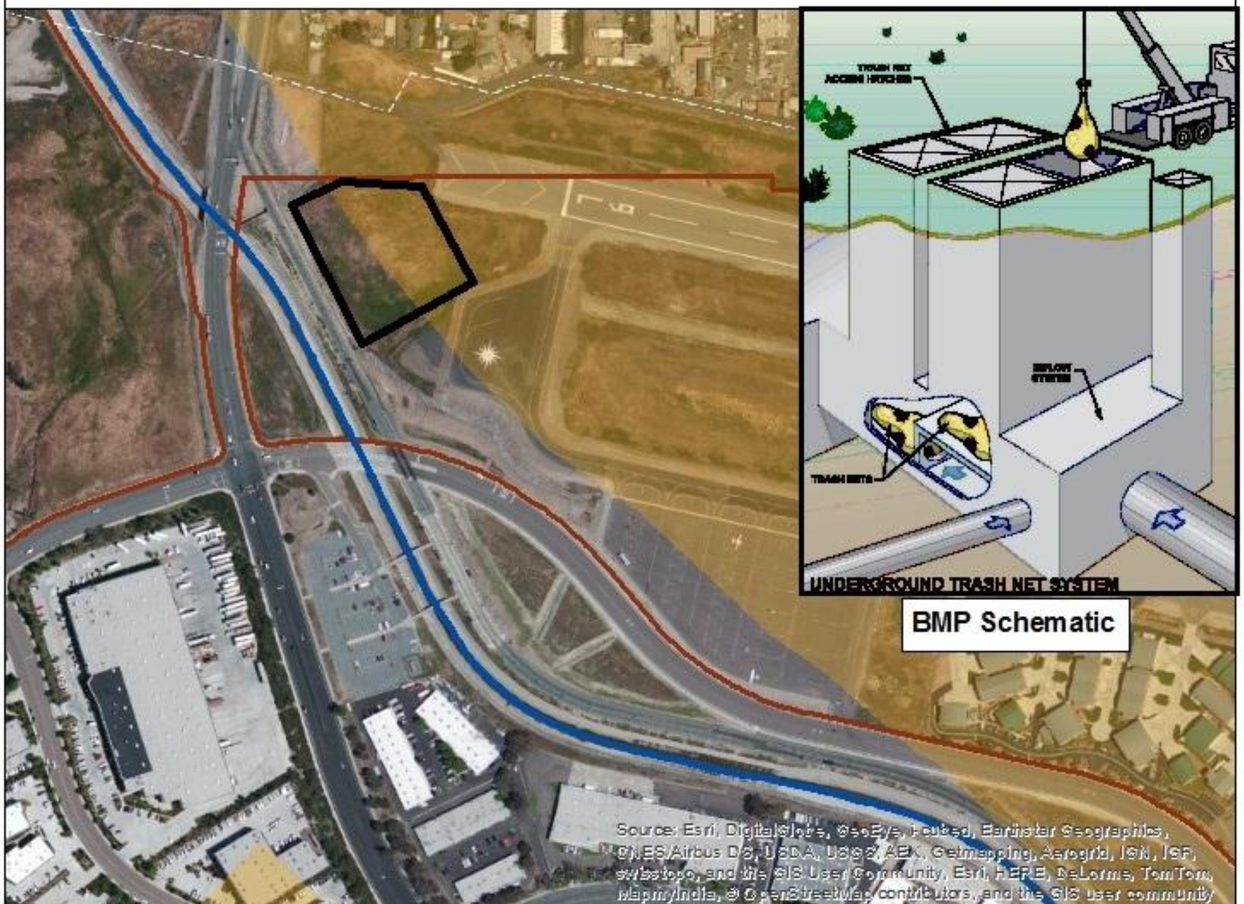
200 100 0 200 Feet

DATA SOURCES: ESRI; SANDAG; SANGIS; USGS

Figure D10.

San Diego River Watershed Management Area
Water Quality Improvement Plan
Regional BMP Identification and Constraints

MJ-R-01 **October 2014**



Parcel Information

Owner : County of San Diego
Jurisdiction: City of El Cajon
Constraints in Parcel: Low permeable soils
Current Land Use: Vacant Space

Project Name: TBD

BMP Information

BMP Proposed: Gross Solids and Trash Removal
Constraints in Footprint: Low permeable soils
Tributary Area: ~ 14,509 acres;
Diversion from Forrester Creek = Yes
BMP Footprint Area: ~ 2.5 acres
Diversion Flow Rate: 100 cfs
Treatment Flow Rate: 25 cfs

LEGEND

BMP Footprint
Parcel Boundary
Storm Drains/Streams
Wetlands (National Wetlands Inventory)
Low Permeability Soils (NRCS Type D)

N

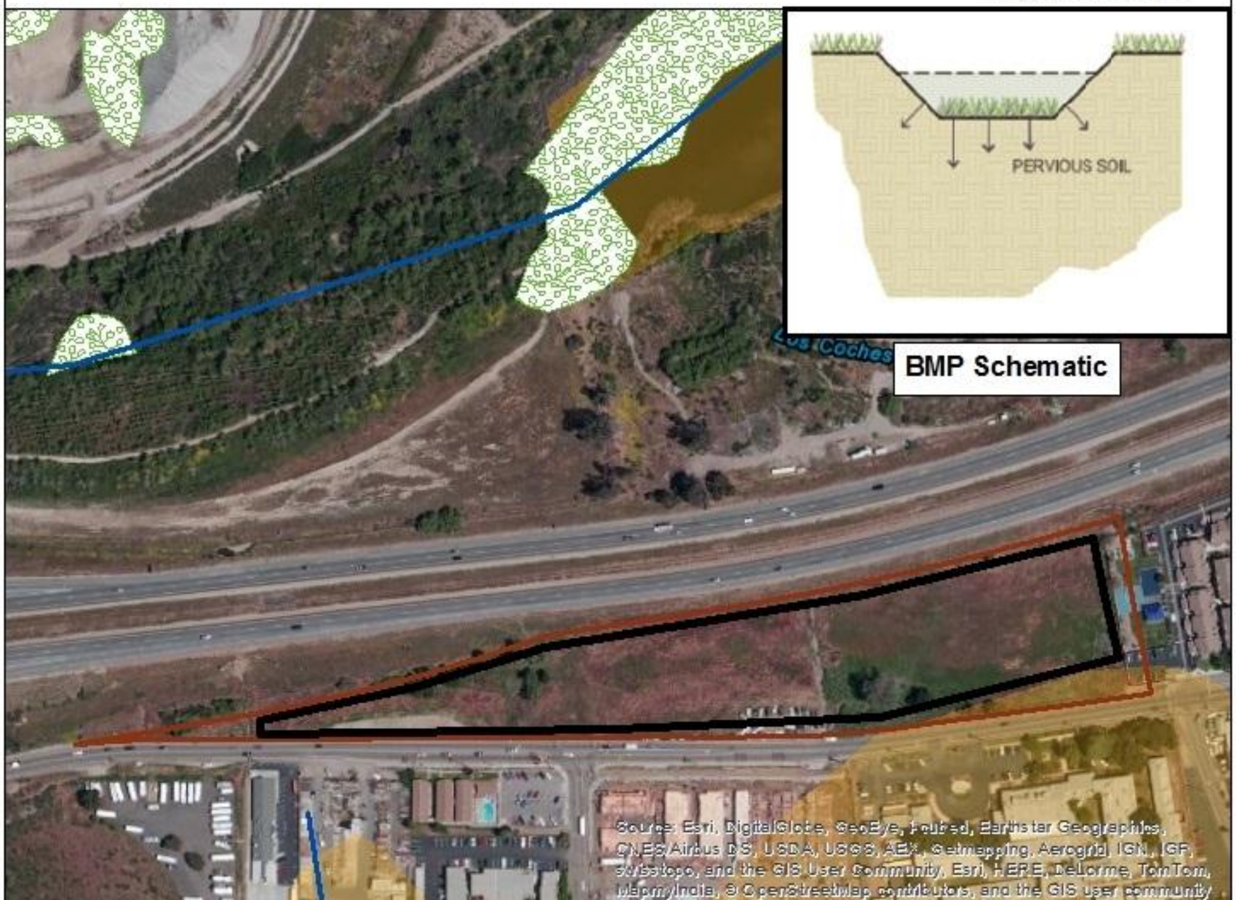
400 200 0 400
Feet

DATA SOURCES: ESRI; SANDAG; SANGIS; USGS

Figure D11.

San Diego River Watershed Management Area
Water Quality Improvement Plan
Regional BMP Identification and Constraints

MJ-R-02 — **October 2014**



Parcel Information

Owner : City of San Diego
Jurisdiction: County of San Diego
Constraints in Parcel: Low Permeable Soils
Current Land Use: Vacant Space
Future Land Use: Vegetated Infiltration Basin

Project Name: TBD

BMP Information

BMP Proposed: Infiltration Basin
Constraints in Footprint: None
Tributary Area: ~ 514 acres
Diversion from San Diego River = No
BMP Footprint Area: ~5.8 acres
Water Quality; Depth: 3 Feet; Volume: 13.1 acre-feet
Infiltration Rate Assumed: 0.75 in/hr

LEGEND

BMP Footprint
Parcel Boundary
Storm Drains/Streams
Wetlands (National Wetlands Inventory)
Low Permeability Soils (NRCS Type D)

N

300 150 0 300 Feet

DATA SOURCES: ESRI; SANDAG; SANGIS; USGS

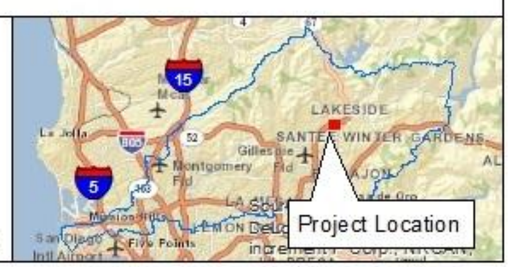
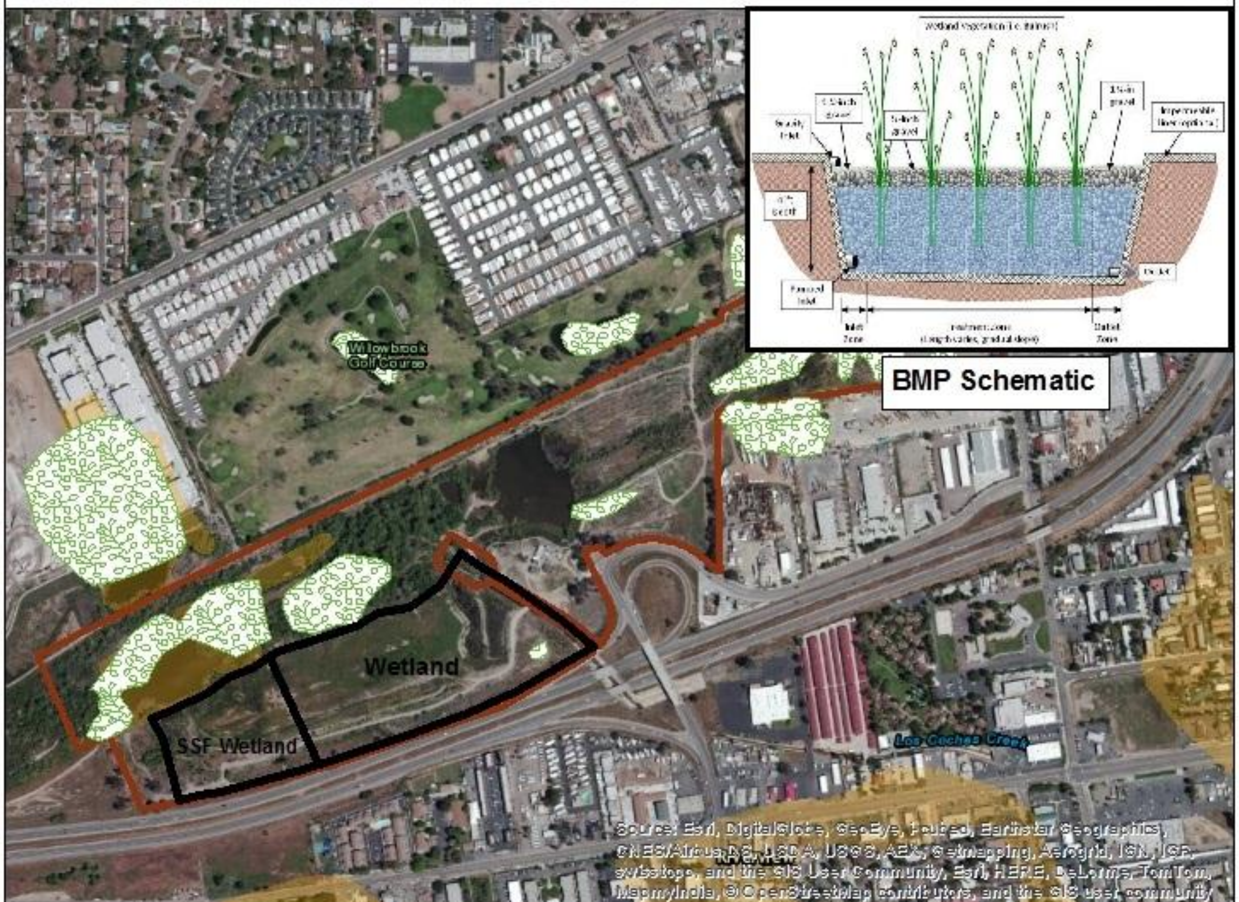


Figure D12.

San Diego River Watershed Management Area
Water Quality Improvement Plan
Regional BMP Identification and Constraints

SDCo-R-01 **October 2014**



Parcel Information
Owner : Lakesides River Park Conservancy
Jurisdiction: County of San Diego
Constraints in Parcel: Wetlands, Low Permeable Soils
Current Land Use: Vacant - Open Space
Note: Concrete lined channel within the BMP footprint will be removed during BMP Implementation

Project Name: TBD

BMP Information
BMP Proposed: 66% Wetpond and 33% SSF Wetland
Constraints in Footprint: Wetlands, High Groundwater
Tributary Area: ~ 29,850 acres;
Diversion from San Diego River = Yes
BMP Footprint Area: ~30 acres
Wet Pond: Volume: 2,308,680 cubic feet; HRT: 24 hours
SSF Wetland: Treatment Flow Rate: 6 cfs; HRT: 24 hours

LEGEND
BMP Footprint
Parcel Boundary
Storm Drains/Streams
Wetlands (National Wetlands Inventory)
Low Permeability Soils (NRCS Type D)

N

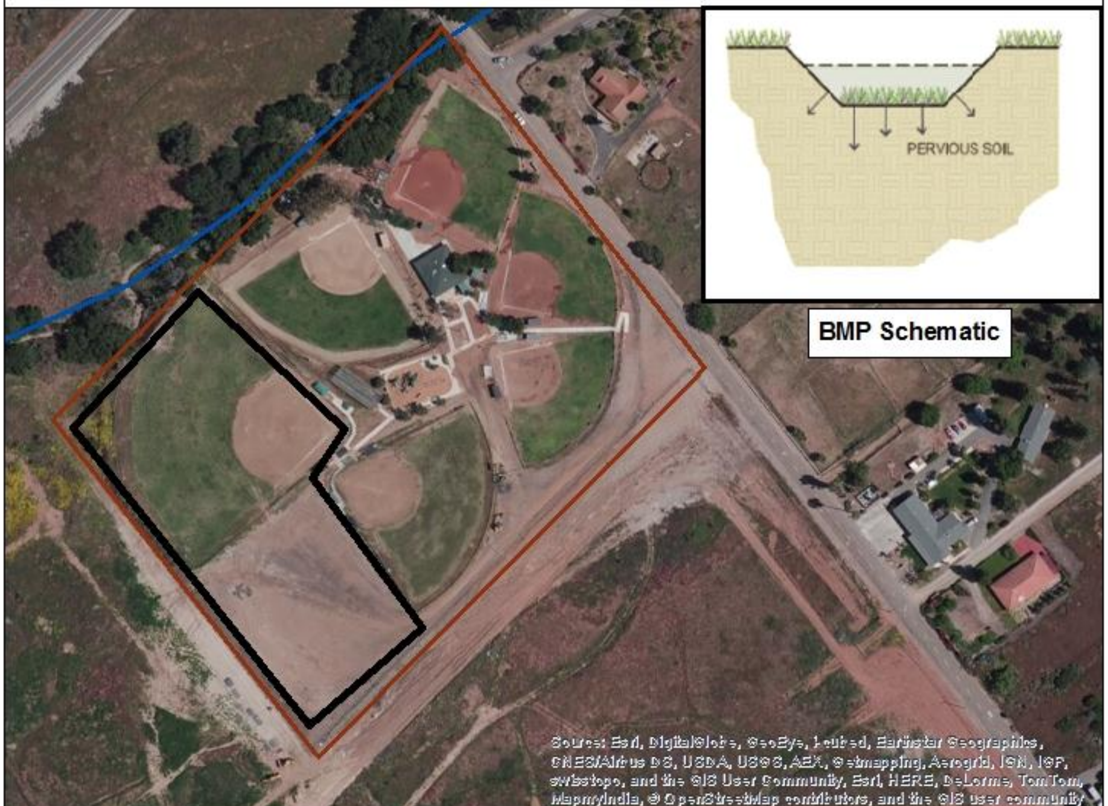
800 400 0 800 Feet

DATA SOURCES: ESRI; SANDAG; SANGIS; USGS

Figure D13.

San Diego River Watershed Management Area
Water Quality Improvement Plan
Regional BMP Identification and Constraints

SDCo-R-02 **October 2014**



Parcel Information
Owner : County of San Diego
Jurisdiction: County of San Diego
Constraints in Parcel: None
Current Land Use: Baseball Fields

Project Name: TBD

BMP Information
BMP Proposed: Infiltration Basin
Constraints in Footprint: None
Tributary Area: ~ 943 acres;
Diversion from Creek = Yes
BMP Footprint: ~ 3 acres
Water Quality; Depth: 4 Feet; Volume: ~300,000 cubic feet
Infiltration Rate Assumed: 1 in/hr

LEGEND
- BMP Footprint
- Parcel Boundary
- Storm Drains/Streams
- Wetlands (National Wetlands Inventory)
- Low Permeability Soils (NRCS Type D)

N

200 100 0 200 Feet

DATA SOURCES: ESRI; SANDAG; SANGIS; USGS

Figure D14.

San Diego River Watershed Management Area
Water Quality Improvement Plan
Regional BMP Identification and Constraints

SDCo-R-03 **October 2014**

Parcel Information

Owner : County of San Diego
Jurisdiction: County of San Diego
Constraints in Parcel: Low Permeable Soils, Wetlands
Current Land Use: Park

Project Name: Lindo Lake Park

BMP Information

BMP Proposed: Enhanced Constructed Wetland
Constraints in Footprint: Low Permeable Soils, Wetlands
BMP Footprint: ~ 11.3 acres
Water Quality; Depth: 4 Feet
Hydraulic Residence Time: 24 hours

LEGEND

BMP Footprint
Parcel Boundary
Storm Drains/Streams
Wetlands (National Wetlands Inventory)
Low Permeability Soils (NRCS Type D)

N

500 250 0 500 Feet

DATA SOURCES: ESRI; SANDAG; SANGIS; USGS

Load Reduction Quantifications

The estimated load reductions for the proposed regional structural BMPs are presented in Table D6.

Table D6. Estimated Load Reductions from Regional BMPs

Location/Name	Water Quality (FIB-FC Load) Benefits (10^12 MPN reduction/year)[a]
	WY 2003 [Low - High]
SDCo-R-01	128 [92 - 145]
SDCo-R-02	14 [10 - 16]
SDCo-R-03	55 [33 - 64]
CoS-R-01	20 [11 - 24]
CoS-R-02	6 [4 - 7]
MJ-R-01	166 [77 - 198]
MJ-R-02	36 [21 - 42]
Totals	425 [248 - 496]

[a] Load reductions are for the County of San Diego, and Cities of El Cajon, Santee, and La Mesa.

Water Quality Benefits and Summary of Estimated Load Reductions

The following sections will describe the benefits expected to result from implementation of the proposed BMPs, including the results of load reduction analyses for the HPWQC and other constituents.

Load Reduction Adjustment Analysis

To improve the reliability of load reduction estimates relative to target load reduction, an analysis was performed to account for overlapping load reductions between structural BMPs. For example, if a given area has both distributed and regional structural BMPs proposed, the estimated load reductions were not assumed to be additive, but rather limited to the lowest effluent concentrations achieved by any structural BMP. Each BMP in the proposed plan was evaluated to identify overlapping load reductions, which were then removed from the total reported benefits to allow a comparison with the target load reduction.

The following assumptions were used for performing the load reduction adjustment analysis:

- Load reductions are uniformly distributed based on the ratio of baseline uncontrolled load.
- Structural BMPs were either categorized as an effluent-based BMP (i.e., BMPs that provide load reduction via treatment only, not volume reduction) or as a volume-reduction BMP (i.e., BMPs that operate on volume reduction primarily).
- For volume-reduction BMPs the overlapping benefits in the captured runoff volume were estimated using the upstream non-overlapping benefits in the captured runoff and the percent load reduction achieved by the BMP.
- For effluent-based BMPs the overlapping benefits in the captured runoff volume were estimated using the upstream non-overlapping benefits in the captured runoff and the total load reduction achieved by the BMP.
- Non-overlapping benefits associated with upstream BMPs in the bypass runoff volume (runoff that exceeds upstream structural BMP design criteria) were considered non-overlapping benefits for the BMP being analyzed.

This load reduction adjustment analysis is an approximate process intended to improve the interpretation of load reduction estimates for use in planning-level assessment of the likelihood of compliance. The degree of precision is intended to be consistent with the degrees of uncertainty relative to sources of loading, BMP performance, ultimate BMP design, interim versus ultimate condition and other factors.

Estimated Load Reductions for HPWQC

Table D7 below shows the summary of predicted wet weather load reductions from each BMP type proposed for implementation within the San Diego River Watershed (for all jurisdictions except the City of San Diego) by 2031 as well as the estimated 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 EMCs) as well as variability in BMP effectiveness and are represented by the 25th and 75th percentile prediction estimates. Quantification of BMP benefits for this WQIP was assessed based on a number of parameters that have inherent uncertainties and natural variability. Parameters which 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 D7. Summary of Wet Weather Load Reductions from WQIP Analysis

BMP Category[1]	FC Load Reduction (% of Average Municipal Land Use Load) 2003 WY Load [Low-High Range]
Programmatic Strategies	10% [9.2%– 11%]
Potential Public Private Partnership Program	8.5% [1.6% - 15%]
Redevelopment through Permit-Required LID Implementation	4.3% [3.4% - 5.1%]
Distributed Structural BMPs	9.7% [5.2% – 11%]
Regional Structural BMPs	9.2% [5.3% - 11%]
Stream Restoration/Enhancement Projects	1.4% [0.3% - 2.5%]
Load Reduction Adjustment	-4.0% [-1.6% - -5.8%]
Load Reduction Sum	39% [24% - 50%]
Target Load Reduction	34.7%

[1] Load reductions are for the County of San Diego, and Cities of El Cajon, Santee, and La Mesa.

Other Water Resources Benefits

In addition to the reductions in loading of the HPWQC and other key constituents of concern, the strategies proposed in this WQIP are expected to provide a number of other water resource benefits, including mitigation of physical and biological impairments. More specifically, these benefits include:

- Beneficial Use[9] of Urban Runoff: Water that is captured and stored in BMPs has the potential to be beneficially harvested and used and thus offset demand for potable water, a critical need within San Diego County.
- Recreation: Larger regional BMPs have the potential to include multi-use elements. In final design of these BMPs there is the opportunity to include features such as trails and bike paths, based on community needs, project partnerships, and site appropriateness that are mutually beneficial to water quality. Distributed BMPs proposed in this WQIP were envisioned as “green streets”, which can enhance the vitality of a commercial or residential avenue and improve the overall quality of life in a neighborhood.
- Wildlife Habitat: In addition to their water quality benefits, BMPs such as regional subsurface flow wetlands may provide additional wetland habitat throughout the San Diego River Watershed that may attract native species.
- Urban Heat Islands: Distributed green streets BMPs may mitigate urban heat island effects (i.e., increased runoff temperatures) by increasing pervious, vegetated areas within heavily urbanized portions of the Watershed.

- Educational Opportunities: Non-structural BMP programs such as Irrigation Runoff Reduction, the Pet Waste Program, and Animal Facilities Management provide the opportunity for public outreach and educational programs that will target behavioral changes, sustainable control at (and avoidance of) the "source", as well as increased public awareness of and investment in water quality improvement projects.

City of San Diego - Load Reduction Methods Information for all Wet Weather Structural BMPs

Watershed modeling simulates the filling, draining, and pollutant removal dynamics of BMPs. These BMPs are broken down into four categories based on the availability of land: (1) centralized BMPs on public land, (2) distributed BMPs on public land, (3) green streets, and (4) centralized BMPs on acquired private land. SUSTAIN was used to model BMP performance and provide cost-benefit optimization within representative catchments. During optimization, BMP sizing was adjusted to optimize the treatment of upstream impervious areas and consider the 85th percentile storm event consistent with existing structural BMP programs. The City of San Diego prioritized jurisdictional catchments by calculating Composite Water Quality Scores for wet and dry weather.

Several analyses were run with a series of scenarios to quantify the effectiveness of each of the structural BMPs on public land first using the SUSTAIN model. The purpose of this section is to summarize the extent to which structural BMPs contribute to pollutant removal in the watershed.

Centralized BMPs on Public Land

The centralized structural BMPs on public parcels incorporated in the model consisted mostly of detention and infiltration facilities. These features were largely located on soils with low infiltration capacities in the San Diego River watershed.

The City also currently operates five low flow diversion facilities within the San Diego River watershed. These were included in the baseline model of existing conditions and are therefore not included within the flow and pollutant load estimates. Based on review of information on these diversions and communications with City staff, a cumulative diverted flow rate of 2.8 cubic feet per second (cfs) was assumed in the model for these facilities, with individual facility locations and diversion rates represented appropriately.

Distributed BMPs on Public Land

Both bioretention and permeable pavement were considered for implementation of distributed BMPs on public parcels. Parcels were screened to identify the opportunity for implementation, accounting for feasibility constraints such as site slope. Both bioretention and permeable pavement options were configured with and without underdrains depending on the underlying soils. For instance, Hydrologic Soil Group B areas were modeled without underdrains and Hydrologic Soil Group C and D areas were modeled with underdrains.

Green Streets

The modeling shows that even the maximum deployment of nonstructural BMPs and centralized and distributed structural BMPs on public land provide only modest pollutant load reductions, well below those needed to meet the WLA reduction requirements. While the above BMPs represent the lowest cost

BMPs for pollutant load reduction, more expensive structural solutions will be required to meet these requirements. The two alternatives considered for this study include green streets and centralized structural BMPs on acquired private land (discussed in the following sub-section). Implementing green streets involves constructing structural BMPs, such as bioretention and permeable pavement in the rights of way of various streets. Although they are more expensive than the previously mentioned BMPs, green streets are very efficient at removing pollutant loads in watersheds because of their proximity to pollutant generating surfaces and their location in the existing surface conveyance infrastructure of the stormwater collection system. Additional advantages of green streets include the fact that they are located in the right of way (and therefore have no land acquisition costs) and are more conveniently accessed for maintenance activities.

A detailed desktop analysis was performed throughout the watershed to evaluate the opportunities for retrofitting existing rights-of-way to green streets. The latest information on road coverage, road type, potential drainage area, soil types, and construction infeasibility was combined to identify the number of potential green streets miles in the watershed. The findings of this analysis were then loaded into SUSTAIN, which comprehensively evaluated and optimized the cost and pollutant removal effectiveness for numerous different combinations of green streets. For the San Diego River Watershed, the implementation of green streets provides sufficient load reductions for the critical pollutant to achieve compliance with WLA targets. Although green streets are expected to provide dry weather load reductions, non-structural BMPs provided 100% load reduction during dry weather so no additional benefits for green streets were quantified in the model.

Centralized BMPs on Acquired Private Land

Due to the high cost of land acquisition associated with centralized structural BMPs on acquired private land, these BMPs are considered a last resort for implementation to meet necessary load reductions. Therefore, not until other BMP options are exhausted will centralized BMPs on private land be considered for the City. This gives much needed time for investigation of other more cost-effective BMP alternatives prior to implementation. For instance, research of nonstructural BMPs not presently modeled may provide definitive results for load reductions that can be later incorporated within the modeling analyses and provide a reduction in lieu of the necessity for centralized structural BMPs on private land. Alternatively, implementation of green streets discussed in the previous section may provide a viable alternative should changes in road redevelopment procedures be achieved. Therefore, centralized structural BMPs on private land are meant to be a placeholder in the CLRP with an attempt to quantify the costs of meeting the load reduction targets beyond what can be presently quantified with nonstructural BMPs and structural BMPs on public land.

Unlike the green streets optimization, which was based upon a detailed desktop analysis of BMP opportunities, the optimization of centralized BMPs on private land was founded on a higher level planning analysis due to the unknown locations and availability of private land acquisition. Specific spatial and climatic characteristics of each individual subwatershed were loaded into SUSTAIN and hypothetical BMPs were simulated with a fixed drainage area necessary to capture the design storm. The optimization analysis included numerous combinations of BMP location and size scenarios to develop a cost effectiveness curve, as an alternative to the green streets approach. For the San Diego River Watershed, the implementation of centralized BMPs on private land provides sufficient load reductions for the critical pollutant to achieve compliance with WLA targets.

Table D8 below shows the summary of predicted load reductions from the programs described above within the San Diego River Watershed the City of San Diego by 2031.

Table D8. San Diego River Watershed Wet Weather Bacteria Load Reductions for the City of San Diego

Condition	Fecal Coliform (%)
Wet weather	34.70
Dry weather[1]	100.0

[1]Dry weather flow and load reductions reflect only runoff in urban subwatershed.

B.3 Chapter Appendix E - Dry Weather Load Reductions

Dry weather load reductions were calculated using a tiered approach. First, the quantifiable nonstructural BMP load reductions were estimated then the gap between these aggressive source control programs and the TMDL required reduction level was filled using dry weather structural solutions when necessary.

The dry weather load reduction quantification approach involves similar steps for the suite of dry weather nonstructural BMPs included in this WQIP (including irrigation runoff reduction and commercial/industrial good housekeeping). The first step was to calculate the load generated by the targeted pollutant source that the BMP will address, by using a percentage of the total Participating Agency pollutant baseline load[6] which was taken from source tracking studies. Once the targeted pollutant source load was calculated, the potential load reduction benefit was calculated using the estimated effectiveness of the selected BMP. These values were based on literature when available, and if not, on best professional judgment. In both cases, predicted levels of uncertainty are high. The following sections provide a brief description of the specific quantification approach for each dry weather nonstructural BMP, along with relevant assumptions and assumption explanations.

Additionally, some dry weather structural controls may also be implemented to achieve the TMDL required reduction levels. These dry weather structural BMPs may include but are not limited to: low flow diversions to sewers, storm drain lining, catch basin dry wells, street gutter permeable pavement, bioretention swales, regional BMPs, etc.

Table E1 provides a summary of the dry weather quantification results and corresponding assumptions and references. The following sections provide a brief description of the specific quantification approach for each dry weather nonstructural BMP, along with relevant assumptions and assumption explanations.

Irrigation Runoff Reduction and Good Landscaping Practices

The portion of the Participating Agency average dry weather FIB load resulting from commercial and residential runoff was estimated using the best professional judgment of Geosyntec Consultants. Based on findings from the San Diego River source tracking study (Weston 2009a), 59-80 percent of commercial and residential runoff is from irrigation. The implementation of this BMP is estimated to reduce irrigation runoff from commercial and residential areas by 25 to 50 percent as found by Berg et al. (2009) in a study in Orange County.

Commercial/Industrial Good Housekeeping

[6] The baseline load was assumed to be proportional to the flow (i.e. if x% of the flow was from irrigation runoff than, x% of the load was from irrigation runoff).

The dry weather loading of fecal coliform from commercial activities runoff was determined using the same approach as for irrigation runoff. The runoff load attributed to commercial areas was estimated using the best professional judgment of Geosyntec Consultants. The San Diego River study found that 15-27 percent of commercial flows are from commercial activities targeted by good housekeeping, such as dumpster leaks and wash-down. The reduction achieved through enhancements was based on the current rate of inspection coverage and effectiveness found in the San Diego County JURMP annual report.

ADDITIONAL DRY WEATHER BENEFITS

In addition to the non-storm water flow reduction strategies described above, various pollutant source control BMPs that are being used for wet weather compliance will also have pollutant reduction benefits during dry weather. These BMPs will include the following program enhancements (i.e., beyond the Permit minimum), with an emphasis on those BMPs that most effectively target urban storm water bacteria sources:

- Street and median sweeping;
- MS4 cleaning;
- Education/outreach and inspection/enforcement to target specific known sources of bacteria and fecal waste, such as:
    - Commercial and food outlets (wash down practices, dumpster and grease trap management, etc.),
    - Pet owners,
    - Equestrian owners/recreators and owners of rural farm animals, and
    - Septic owners; and
- Good landscaping practices.

Table E1.

San Diego River Summary of Dry Weather Quantification of Water Quality Benefits

BMP Name	Wet or Dry Weather	Land Use Targeted	Pollutant Generating Activity	Quantification Assumptions			Quantification Method	Expected Annual Reduction of MS4 Baseline Load[1] by 2021 Fecal Coliform (percent)	
				Load Assumption	Units	Citation/Assumptions		Low Range	High Range
Irrigation Runoff Reduction Enhancements (Incentatives, outreach, and education)	Dry Weather	Residential and Commercial	Irrigation runoff, fertilizers/compost, soil and decaying plant matter, green waste	2.8	10 ^12 Monthly Average MS4 FIB-FC dry-weather load in watershed excluding city of San Digeo areas	Calculated by TMDL model, which was calibrated to monitoring data	(monthly bacteria load) * (12 months per year) * (percent bacteria from runoff) * (percent of runoff from irrigation) * (expected behavior change)	7.4%	33%
				50-80%	Percent of MS4 dry-weather flows (and fecal bacteria loads) from commercial and residential runoff	Best Professional Judgement			
				59-80%	Percent of commercial and residential runoff load generated residential and commercial from irrigation	San Diego River Source ID study, 2009			
				25-50%	Percent reduction in irrigation runoff from irrigation control incentives	Orange County irrigation runoff study, 2004			
Commercial/Industrial Good Housekeeping Enhancements (Inspection, enforcement, outreach)	Dry Weather and Wet Weather	Commercial and Industrial	Dumpsters, outdoor garbage areas, garbage trucks, grease bins, outdoor dining/fast food, washwater	2.8	10 ^12 Monthly Average MS4 FIB-FC dry-weather load in watershed excluding city of San Digeo areas	Calculated by TMDL model, which was calibrated to monitoring data	(monthly bacteria load) * (12 months per year) * (percent bacteria from runoff) * (percent of runoff from commercial activities) * (increase in inspection) * (expected behavior change)	0.7%	5.4%
				25-40%	Percent of MS4 dry-weather flows (and fecal bacteria loads) from commercial and indsutrial runoff	Best Professional Judgement			
				15-27%	Percent of commercial and industrial runoff load generated from commercial and industrial activities	San Diego River Source ID study, 2009			
				25-50%	Percent of commercial and industrial area covered by increased inspection	San Diego County JURMP			
				75-100%	Percent reduction in bacteria loads from enhanced inspections	San Diego County JURMP			
Dry Weather Structural BMPs (low flow diversions to sewers, stormdrain lining, catch basin dry wells, street gutter permeable pavement, bioretention swales, regional BMPs)	Dry Weather and Wet Weather	All Land uses	All Nonstormwater Flows	69.4%	Percent reduction of MS4 FIB-FC dry-weather load to comply with the MS4 permit	San Diego MS4 Permit, Attachment E	(MS4 required percent reduction) - (estimated percent reduction achieved by nonstructural BMPs)	61%	31%
Dry Weather Total							**% of average MS4 total load (33.6 10^12 MPN)**	**69.4%**	**69.4%**

1. Load reductions do not include benefits from nonstructural BMPs in the City of San Diego.

B.3 Chapter Appendix F – Optional Watershed Management Area Analysis (WMAA) Candidate Projects

City of El Cajon

Project Identifier	Watershed Management Area	Hydrologic Area (HA)	Hydrologic Subarea (HSA)	Jurisdiction	Project Name	Ownership		Project Location				Project Origination/Originator		Project Category	Specific Project Type
						Type	Owner Information	Address	APN	Latitude	Longitude	Name	Contact Information		
SDR-10	San Diego River	Lower San Diego	El Cajon	EL CAJON	MJ-R-D-1	Public	S.D. COUNTY	N. MARSHALL AVE. AND CUYAMACA ST., EL CAJON, CA	3871900800	1882196.91	6336553.33	S.D. COUNTY, CITY OF S.D., CITY OF LA MESA, CITY OF EL CAJON, CITY OF SANTEE		Regional BMPs	GROSS SOLIDS AND TRASH REMOVAL

Project Identifier	Watershed Management Area	Jurisdiction	Ownership	Project Location				Project Size & Parameters				Other Notes
			Owner Information	Address	APN	Latitude (X-Coordinate)	Longitude (Y-Coordinate)	Contributing Drainage Area (acres)	Parcel Size (acres)	Project Footprint (acres)	Parameters (with units as necessary)	
Public Parcels Identified as Suitable for Further Assessment to Determine Feasibility of Retrofitting with Green Infrastructure												
Parcels on this list that are 0.25 acres or greater have been assessed using broad assumptions necessary for computer modeling and were found to be potentially effective as an opportunity for contributing to load reduction goals. Considerable further assessment would be required before determining any of these sites to be viable retrofit sites for implementation of Green Infrastructure. That assessment includes verifying public ownership, determining if land use agreements and financing can be established, assessing feasibility based upon further investigation of physical site constraints at a project design level, and determining that construction and necessary approvals, including approvals from regulatory agencies other than the City of San Diego, can be completed within the time constraints in the Municipal Storm Water Permit that pertain to Alternative Compliance.												
1	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4365400600	6271960.61690000000	1858885.13726000000	TBD	8.43	TBD	TBD	TBD
2	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4365400700	6271959.81782000000	1859293.03247000000	TBD	3.91	TBD	TBD	TBD
3	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4210305400	6291729.82911000000	1875381.08817000000	TBD	4.07	TBD	TBD	TBD
4	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4411600400	6263428.84682000000	1855426.39730000000	TBD	7.68	TBD	TBD	TBD
5	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4821705000	6339801.31690000000	1875760.30229000000	TBD	1.22	TBD	TBD	TBD
6	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4830212800	6340225.66102000000	1876652.51839000000	TBD	0.92	TBD	TBD	TBD
7	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4498608300	6258864.54200000000	1855043.39600000000	TBD	1.57	TBD	TBD	TBD
8	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4313202100	6278852.82234000000	1866133.79441000000	TBD	1.58	TBD	TBD	TBD
9	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4212910200	6290284.19036000000	1874074.87660000000	TBD	1.63	TBD	TBD	TBD
10	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3822601200	6349893.72700000000	1891724.34900000000	TBD	7.84	TBD	TBD	TBD
11	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4491100800	6258923.84207000000	1853753.85700000000	TBD	3.80	TBD	TBD	TBD
12	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4631110100	6312244.38913000000	1865532.18088000000	TBD	0.23	TBD	TBD	TBD
13	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3690402300	6289856.34251000000	1884716.71162000000	TBD	4.32	TBD	TBD	TBD
14	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4210305600	6292567.83850000000	1875157.25309000000	TBD	3.60	TBD	TBD	TBD
15	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4426212000	6271214.16355000000	1855369.84926000000	TBD	1.73	TBD	TBD	TBD
16	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4821902100	6338457.74796000000	1872745.29350000000	TBD	1.68	TBD	TBD	TBD
17	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3870300500	6342314.66959000000	1881981.04938000000	TBD	0.88	TBD	TBD	TBD
18	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3941410600	6355018.57753000000	1892436.00776000000	TBD	0.17	TBD	TBD	TBD
19	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4365400800	6271268.62875000000	1859124.10526000000	TBD	1.39	TBD	TBD	TBD
20	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4210305500	6292202.78233000000	1875304.80864000000	TBD	3.17	TBD	TBD	TBD
21	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4498700300	6260981.53292000000	1854769.59111000000	TBD	6.16	TBD	TBD	TBD
22	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4332501600	6294188.80695000000	1865293.28405000000	TBD	132.19	TBD	TBD	TBD
23	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3941410700	6355025.47597000000	1892389.32099000000	TBD	0.17	TBD	TBD	TBD
24	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4640901300	6320460.93349000000	1864753.29555000000	TBD	0.48	TBD	TBD	TBD
25	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4210400700	6285991.12254000000	1874972.35651000000	TBD	0.69	TBD	TBD	TBD
26	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4415900500	6264267.50968000000	1856432.59103000000	TBD	5.23	TBD	TBD	TBD
27	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4210306100	6291246.94719000000	1875814.34568000000	TBD	14.23	TBD	TBD	TBD
28	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3734900600	6304064.40091000000	1885160.24024000000	TBD	5.24	TBD	TBD	TBD
29	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4210306000	6291854.30037000000	1876419.91264000000	TBD	99.22	TBD	TBD	TBD
30	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4212901100	6287850.14331000000	1877338.88703000000	TBD	409.77	TBD	TBD	TBD
31	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4640700900	6319937.71057000000	1864931.80787000000	TBD	2.27	TBD	TBD	TBD
32	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4210500100	6286133.58650000000	1874150.64150000000	TBD	11.35	TBD	TBD	TBD
33	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4425200800	6270702.20031000000	1856524.21687000000	TBD	11.90	TBD	TBD	TBD
34	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	6724900500	6306195.90236000000	1869360.48157000000	TBD	0.52	TBD	TBD	TBD

35	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3562310300	6285679.78309000000	1880196.67901000000	TBD	1.33	TBD	TBD	TBD
36	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4367300500	6272175.03471000000	1858241.73568000000	TBD	18.93	TBD	TBD	TBD
37	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4312900200	6278823.67800000000	1867469.96914000000	TBD	0.22	TBD	TBD	TBD
38	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4495910300	6260495.09176000000	1850354.07084000000	TBD	0.26	TBD	TBD	TBD
39	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4494721300	6260320.56442000000	1850616.08091000000	TBD	0.23	TBD	TBD	TBD
40	San Diego River	City of San Diego	CITY OF SAN DIEGO(OCEAN BEACH RECREATION CENTE	TBD	4484020800	6255666.55073000000	1852339.12233000000	TBD	1.23	TBD	TBD	TBD
41	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4446503600	6280232.33314000000	1853728.47389000000	TBD	0.45	TBD	TBD	TBD
42	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4495821800	6260245.76160000000	1849447.82320000000	TBD	0.13	TBD	TBD	TBD
43	San Diego River	City of San Diego	CITY OF SAN DIEGO TR	TBD	4480230200	6253699.18708000000	1854690.32675000000	TBD	0.17	TBD	TBD	TBD
44	San Diego River	City of San Diego	CITY OF SAN DIEGO TR	TBD	4480210200	6253562.15184000000	1854338.51592000000	TBD	0.29	TBD	TBD	TBD
45	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3690402200	6289474.02403000000	1885098.78900000000	TBD	1.78	TBD	TBD	TBD
46	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3921202000	6355379.75839000000	1896091.09117000000	TBD	0.66	TBD	TBD	TBD
47	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3690402500	6289738.99394000000	1885217.57139000000	TBD	3.30	TBD	TBD	TBD
48	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4212900900	6284861.04809000000	1876285.71277000000	TBD	4.64	TBD	TBD	TBD
49	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4905920200	6325682.31916000000	1863837.62462000000	TBD	0.19	TBD	TBD	TBD
50	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4641500500	6317490.68047000000	1864623.66893000000	TBD	3.74	TBD	TBD	TBD
51	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4365200600	6271142.44352000000	1859047.80426000000	TBD	0.43	TBD	TBD	TBD
52	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4213201100	6285346.12043000000	1874037.59826000000	TBD	2.48	TBD	TBD	TBD
53	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4381504100	6287165.54078000000	1858468.04078000000	TBD	0.05	TBD	TBD	TBD
54	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4212050700	6288077.35470000000	1873946.75638000000	TBD	0.34	TBD	TBD	TBD
55	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4332501900	6293802.54477000000	1863818.43052000000	TBD	0.75	TBD	TBD	TBD
56	San Diego River	City of San Diego	HOUSING AUTHORITY CITY OF SAN DIEGO	TBD	4410904300	6259836.56184000000	1855650.37597000000	TBD	30.18	TBD	TBD	TBD
57	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4365300700	6271285.86682000000	1858506.99406000000	TBD	3.59	TBD	TBD	TBD
58	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4481421500	6255760.59837000000	1855602.76543000000	TBD	4.72	TBD	TBD	TBD
59	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4483011200	6255031.53413000000	1852488.22504000000	TBD	0.31	TBD	TBD	TBD
60	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4483011300	6254970.71662000000	1852531.09105000000	TBD	0.17	TBD	TBD	TBD
61	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4405621400	6294451.46966000000	1858174.02469000000	TBD	0.19	TBD	TBD	TBD
62	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3690402400	6290053.71214000000	1884529.00398000000	TBD	0.12	TBD	TBD	TBD
63	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4292600500	6296323.32065000000	1870275.17901000000	TBD	0.94	TBD	TBD	TBD
64	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4406401500	6297100.41175000000	1858428.57650000000	TBD	1.61	TBD	TBD	TBD
65	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	6724900400	6306327.73599000000	1869653.82859000000	TBD	3.81	TBD	TBD	TBD
66	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3734825700	6305446.72610000000	1885079.04244000000	TBD	0.05	TBD	TBD	TBD
67	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3691702400	6290461.04004000000	1879145.59875000000	TBD	4.38	TBD	TBD	TBD
68	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3920903300	6354563.85941000000	1896080.45007000000	TBD	11.43	TBD	TBD	TBD
69	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4571910900	6329229.84314000000	1872215.84076000000	TBD	0.06	TBD	TBD	TBD
70	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4488000100	6255963.33149000000	1855387.22038000000	TBD	2.24	TBD	TBD	TBD
71	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4631150200	6312874.15265000000	1865311.84055000000	TBD	0.20	TBD	TBD	TBD
72	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4480310400	6253701.82783000000	1855277.48305000000	TBD	2.29	TBD	TBD	TBD
73	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4406302100	6297336.59475000000	1857832.31025000000	TBD	0.13	TBD	TBD	TBD
74	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3920820500	6355272.81129000000	1896450.04317000000	TBD	0.95	TBD	TBD	TBD
75	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3690401800	6290155.86150000000	1884841.55675000000	TBD	2.26	TBD	TBD	TBD
76	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4571911000	6329230.68418000000	1872290.35859000000	TBD	0.05	TBD	TBD	TBD
77	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4413702100	6263016.97365000000	1855507.62373000000	TBD	0.31	TBD	TBD	TBD
78	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4571910800	6329229.09547000000	1872152.76529000000	TBD	0.09	TBD	TBD	TBD
79	San Diego River	City of San Diego	CITY OF SAN DIEGO TR	TBD	4480233300	6253708.41501000000	1854889.23835000000	TBD	0.07	TBD	TBD	TBD
80	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	6723000100	6306309.53263000000	1870229.29455000000	TBD	10.00	TBD	TBD	TBD
81	San Diego River	City of San Diego	CITY OF SAN DIEGO TR	TBD	4480233100	6253747.05150000000	1854860.55682000000	TBD	0.09	TBD	TBD	TBD
82	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3830800500	6329701.97900000000	1885454.06300000000	TBD	0.56	TBD	TBD	TBD
83	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4213920100	6295098.51652000000	1879029.44163000000	TBD	2.51	TBD	TBD	TBD
84	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4415303800	6266415.00735000000	1857123.35748000000	TBD	0.35	TBD	TBD	TBD
85	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3921202100	6355446.89802000000	1896472.95302000000	TBD	0.18	TBD	TBD	TBD
86	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4562311800	6313898.75734000000	1875835.44960000000	TBD	0.14	TBD	TBD	TBD

87	San Diego River	City of San Diego	CITY OF SAN DIEGO TR	TBD	4480230300	6253730.23269000000	1854666.11273000000	TBD	0.09	TBD	TBD	TBD
88	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3690401400	6289290.36376000000	1884800.26081000000	TBD	1.94	TBD	TBD	TBD
89	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4213920300	6295050.33905000000	1878608.69189000000	TBD	1.87	TBD	TBD	TBD
90	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4213330400	6295808.35125000000	1875844.90741000000	TBD	1.20	TBD	TBD	TBD
91	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4366700600	6269821.54600000000	1858353.65900000000	TBD	3.88	TBD	TBD	TBD
92	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4365200300	6270925.14225000000	1858614.33333000000	TBD	2.05	TBD	TBD	TBD
93	San Diego River	City of San Diego	CITY OF SAN DIEGO TR	TBD	4480101700	6253469.27706000000	1853841.89713000000	TBD	1.59	TBD	TBD	TBD
94	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4673502300	6312536.28806000000	1859990.29226000000	TBD	1.57	TBD	TBD	TBD
95	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4391803100	6292003.03464000000	1859796.73346000000	TBD	0.08	TBD	TBD	TBD
96	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3921103000	6355080.12545000000	1894998.70528000000	TBD	0.03	TBD	TBD	TBD
97	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3562130800	6285671.42832000000	1880808.74547000000	TBD	1.77	TBD	TBD	TBD
98	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	6730400100	6313197.82211000000	1868679.51397000000	TBD	10.69	TBD	TBD	TBD
99	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	6720803600	6309440.61130000000	1871513.55714000000	TBD	0.13	TBD	TBD	TBD
100	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	6720802100	6309247.09533000000	1871323.72432000000	TBD	0.16	TBD	TBD	TBD
101	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4213920400	6295037.38844000000	1878368.61079000000	TBD	2.04	TBD	TBD	TBD
102	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4332500500	6292768.98840000000	1863328.69635000000	TBD	2.95	TBD	TBD	TBD
103	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3690401900	6289956.23750000000	1885008.15675000000	TBD	0.86	TBD	TBD	TBD
104	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	6720704900	6309804.62783000000	1871882.58726000000	TBD	0.13	TBD	TBD	TBD
105	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4495910100	6260481.40736000000	1850483.58587000000	TBD	0.47	TBD	TBD	TBD
106	San Diego River	City of San Diego	CITY OF SAN DIEGO TR	TBD	4480411900	6253967.48379000000	1855498.86086000000	TBD	0.42	TBD	TBD	TBD
107	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4392402800	6292006.20419000000	1859730.17894000000	TBD	0.07	TBD	TBD	TBD
108	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4870602500	6337670.66060000000	1871061.19595000000	TBD	1.12	TBD	TBD	TBD
109	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4674022400	6310442.05814000000	1858330.76174000000	TBD	0.12	TBD	TBD	TBD
110	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	6720804300	6309620.77999000000	1871697.63665000000	TBD	0.13	TBD	TBD	TBD
111	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3871214800	6340834.31327000000	1878064.50841000000	TBD	0.25	TBD	TBD	TBD
112	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4366011000	6272889.10345000000	1859503.09661000000	TBD	0.32	TBD	TBD	TBD
113	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4674022500	6310443.18963000000	1858381.19714000000	TBD	0.12	TBD	TBD	TBD
114	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4415900600	6263915.25927000000	1856024.57909000000	TBD	5.55	TBD	TBD	TBD
115	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3830501500	6321576.30802000000	1886091.55834000000	TBD	19.83	TBD	TBD	TBD
116	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	6740400100	6319421.21863000000	1868148.00000000000	TBD	0.49	TBD	TBD	TBD
117	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4830212700	6340556.01913000000	1877394.80076000000	TBD	0.15	TBD	TBD	TBD
118	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4480503600	6254577.81300000000	1855776.05200000000	TBD	1.00	TBD	TBD	TBD
119	San Diego River	City of San Diego	HOUSING AUTHORITY CITY OF SAN DIEGO	TBD	4411330100	6261951.48942000000	1856430.35004000000	TBD	0.53	TBD	TBD	TBD
120	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4405622900	6294888.89840000000	1858466.19678000000	TBD	1.46	TBD	TBD	TBD
121	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4213920200	6295077.95999000000	1878798.82755000000	TBD	1.67	TBD	TBD	TBD
122	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4332501300	6294341.45586000000	1866324.12220000000	TBD	81.07	TBD	TBD	TBD
123	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4415900400	6265417.40896000000	1856122.64545000000	TBD	69.11	TBD	TBD	TBD
124	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4674022300	6310440.91429000000	1858279.77033000000	TBD	0.12	TBD	TBD	TBD
125	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3690840500	6294037.67374000000	1884851.16667000000	TBD	7.57	TBD	TBD	TBD
126	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4364902000	6270654.93519000000	1858667.67901000000	TBD	0.11	TBD	TBD	TBD
127	San Diego River	City of San Diego	CITY OF SAN DIEGO TR	TBD	4480220100	6253572.02370000000	1854949.79630000000	TBD	0.61	TBD	TBD	TBD
128	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	6722702500	6307300.34738000000	1869232.44538000000	TBD	0.52	TBD	TBD	TBD
129	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3733022600	6301507.47354000000	1885150.07590000000	TBD	1.48	TBD	TBD	TBD
130	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4446901500	6282879.18699000000	1853393.90323000000	TBD	0.15	TBD	TBD	TBD
131	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4372911600	6281036.42990000000	1860056.26831000000	TBD	0.31	TBD	TBD	TBD
132	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4366900700	6270371.00000000000	1858512.65800000000	TBD	2.52	TBD	TBD	TBD
133	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4673601300	6313088.10930000000	1860503.49485000000	TBD	0.11	TBD	TBD	TBD
134	San Diego River	City of San Diego	CITY OF SAN DIEGO TR	TBD	4480230100	6253631.08645000000	1854745.01676000000	TBD	0.40	TBD	TBD	TBD
135	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4681612700	6316028.85707000000	1860901.74285000000	TBD	0.22	TBD	TBD	TBD
136	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4394413700	6293575.62045000000	1858445.33155000000	TBD	0.15	TBD	TBD	TBD
137	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4332304600	6291814.77395000000	1863537.82652000000	TBD	2.35	TBD	TBD	TBD
138	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4622102900	6308564.81932000000	1865254.06555000000	TBD	4.02	TBD	TBD	TBD

139	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4494720200	6260267.76877000000	1850650.71282000000	TBD	0.06	TBD	TBD	TBD
140	San Diego River	City of San Diego	CITY OF SAN DIEGO TR	TBD	4480233400	6253689.11331000000	1854902.72886000000	TBD	0.08	TBD	TBD	TBD
141	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4586230100	6306150.05787000000	1867911.12374000000	TBD	0.73	TBD	TBD	TBD
142	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3735212800	6305183.90224000000	1886762.04497000000	TBD	0.16	TBD	TBD	TBD
143	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4422601900	6269417.11896000000	1856255.53774000000	TBD	0.09	TBD	TBD	TBD
144	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4394413600	6293574.78400000000	1858395.33598000000	TBD	0.15	TBD	TBD	TBD
145	San Diego River	City of San Diego	CITY OF SAN DIEGO TR	TBD	4480210100	6253524.17471000000	1854285.49230000000	TBD	0.14	TBD	TBD	TBD
146	San Diego River	City of San Diego	CITY OF SAN DIEGO TR	TBD	4480210400	6253552.32944000000	1854558.38742000000	TBD	0.32	TBD	TBD	TBD
147	San Diego River	City of San Diego	CITY OF SAN DIEGO TR	TBD	4480210300	6253530.73423000000	1854453.20193000000	TBD	0.19	TBD	TBD	TBD
148	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4366601900	6269173.06771000000	1857962.88617000000	TBD	0.72	TBD	TBD	TBD
149	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4332303400	6291498.56307000000	1863079.31481000000	TBD	18.01	TBD	TBD	TBD
150	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4400313700	6299555.90072000000	1862888.94314000000	TBD	0.14	TBD	TBD	TBD
151	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3735004900	6303410.14495000000	1886765.03210000000	TBD	0.24	TBD	TBD	TBD
152	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4681700700	6314310.33009000000	1860315.32716000000	TBD	0.02	TBD	TBD	TBD
153	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3660814900	6323908.98108000000	1888514.07648000000	TBD	0.16	TBD	TBD	TBD
154	San Diego River	City of San Diego	CITY OF SAN DIEGO TR	TBD	4480233200	6253726.41679000000	1854875.74090000000	TBD	0.08	TBD	TBD	TBD
155	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4482302200	6256565.36122000000	1854564.37184000000	TBD	0.15	TBD	TBD	TBD
156	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4484211200	6256726.71361000000	1853674.35503000000	TBD	0.18	TBD	TBD	TBD
157	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3920810300	6354844.07132000000	1896530.61115000000	TBD	0.52	TBD	TBD	TBD
158	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4641500300	6317607.83356000000	1864865.33360000000	TBD	0.23	TBD	TBD	TBD
159	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	6721203600	6308575.21401000000	1870690.59846000000	TBD	0.19	TBD	TBD	TBD
160	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	6721303300	6308793.20165000000	1870904.81496000000	TBD	0.16	TBD	TBD	TBD
161	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4620511900	6309027.48574000000	1867188.01852000000	TBD	0.04	TBD	TBD	TBD
162	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	6721300200	6309031.96128000000	1871125.51034000000	TBD	0.14	TBD	TBD	TBD
163	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4415810900	6266916.57254000000	1856500.37432000000	TBD	0.01	TBD	TBD	TBD
164	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4446901600	6282931.73301000000	1853394.16435000000	TBD	0.16	TBD	TBD	TBD
165	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3710310400	6310651.98763000000	1878510.00185000000	TBD	0.15	TBD	TBD	TBD
166	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	6770360900	6283662.03979000000	1868621.46220000000	TBD	0.14	TBD	TBD	TBD
167	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	3660503200	6329521.56912000000	1898594.50349000000	TBD	4.59	TBD	TBD	TBD
168	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4411821900	6263482.47362000000	1856195.71176000000	TBD	0.04	TBD	TBD	TBD
169	San Diego River	City of San Diego	CITY OF SAN DIEGO	TBD	4400111700	6297774.14941000000	1862842.38430000000	TBD	0.02	TBD	TBD	TBD
Public Parcels Identified as Suitable for Further Assessment to Determine Feasibility of Retrofitting												
Parcels on this list have been assessed using broad assumptions necessary for computer modeling and were found to be potentially effective as an opportunity for contributing to load reduction goals. Considerable further assessment would be required before determining any of these sites to be viable retrofit. That assessment includes verifying public ownership, determining if land use agreements and financing can be established, assessing feasibility based upon further investigation of physical site constraints at a project design level, and determining that construction and necessary approvals, including approvals from regulatory agencies other than the City of San Diego, can be completed within the time constraints in the Municipal Storm Water Permit that pertain to Alternative Compliance.												
N/A	N/A	City of San Diego	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Canyon Site
Project Concept for Green Streets Retrofits – Quantity and Location of Suitable City Streets To-Be-Determined												
The City of San Diego is in the process of identifying potential public street locations that could feasibly be retrofitted with Green Infrastructure and provide a meaningful contribution to pollutant load reduction goals. As locations become verified for feasibility and effectiveness, funding mechanisms under an Alternate Compliance program could potentially be used to fill gaps in construction and maintenance funding necessary for the project to go forward. This is pending the ability to establish suitable legal mechanisms and verify that approvals and construction can be completed within the time constraints in the Municipal Storm Water Permit that pertain to Alternative Compliance.												
170	San Diego River	City of San Diego	City of San Diego	TBD	N/A	N/A	N/A	TBD	89	TBD	TBD	Green Street TBD

Project Identifier	Watershed Management Area	Jurisdiction	Project Name	Ownership		Project Location				Project Category	Specific Project Type
				Type	Owner Information	Address	APN	Latitude	Longitude		
SDR-2	San Diego River	SAN DIEGO	Shepherd Canyon Wetlands Restoration, 6+ Acres		CITY OF SAN DIEGO	N/A	3730715500	1883859.653	6302019.348		
SDR-3	San Diego River	SAN DIEGO	Ruffin Canyon, Free Land from Church, Wetland-Water Filtration		ROMAN CATHOLIC BISHOP OF SAN DIEGO	GLENCOLUM DR	4290101000	1873409.984	6290364.132		
SDR-4	San Diego River	SAN DIEGO	Qualcomm Parking Lot		CITY OF SAN DIEGO	Qualcomm parking lot	4332501600	1865894.05	6294328.208		
SDR-5	San Diego River	SAN DIEGO	St. Columba church canyon area	Private	St. Columba Church	3327 Glencolum Drive, San Diego 92123 The above address is the church address, but the canyon is between the church parking area and Gramercy Drive	4290111000	1873045.19	6290152.379	Stream or Riparian Rehabilitation	Drainage area rehabilitation/restoration
SDR-6	San Diego River	SAN DIEGO	Library Canyon Creek	Public	City of San Diego	9020 Village Glen DriveSan Diego, CA 92123	4210302200	1874517.998	6290493.141	Stream or Riparian Rehabilitation	creek restoration
SDR-1	San Diego River	S.D. COUNTY	Lakeside Conservancy Treatment Wetlands	Public/Private Partnership	Stephanie Gaines 858-694-3493	Lakeside River Park Conservancy 12108 Industry Rd, Lakeside 92040	3822503200	1892675.312	6350636.749	Regional BMP's	Subsurface Treatment Wetlands
SDR-11	San Diego River	S.D. COUNTY	MJ-R-D-4	Public	CITY OF S.D.	WOODSIDE AVE AND SUMMERSUN LANE, LAKESIDE	3822601200	1891735.691	6349833.62	Groundwater Recharge Projects	VEGETATED INFILTRATION BASIN
SDR-7	San Diego River	S.D. COUNTY	Lakeside Conservancy Treatment Wetlands	Public/Private Partnership	Stephanie Gaines 858-694-3493	Lakeside River Park Conservancy 12108 Industry Rd, Lakeside 92040	3822503200	1892675.312	6350636.749	Regional BMP's	Subsurface Treatment Wetlands, REMOVE CONCRETE CHANNEL
SDR-10	San Diego River	EL CAJON	MJ-R-D-1	Public	S.D. COUNTY	N. MARSHALL AVE. AND CUYAMACA ST., EL CAJON, CA	3871900800	1882196.908	6336553.331	Regional BMP's	GROSS SOLIDS AND TRASH REMOVAL
SDR-12	San Diego River	EL CAJON	WING AVENUE FLOOD CONTROL IMPROVEMENTS	Public	S.D. COUNTY	WING AVE. AND BRADLEY AVE., EL CAJON	3871900800	1878741.197	6341639.357	Stream or Riparian Rehabilitation	CHANNEL WIDENING, DEEPENING, AND STABILIZATION
SDR-8	San Diego River	S.D. COUNTY	FLINN SPRINGS AT OAK CREEK	Public/Private Partnership	S.D. COUNTY	FLINN SPRINGS RD AND OAK CREEK RD	3960700700	1892443.175	6374288.121	Regional BMP's	REGIONAL BMP
SDR-9	San Diego River	S.D. COUNTY	SDCO-R-D-2	Public	S.D. COUNTY	FLINN SPRINGS RD AND OAK CREEK RD	3960700300	1892183.914	6374271.571	Groundwater Recharge Projects	SUBSURFACE INFILTRATION
SDR-16	San Diego River	S.D. COUNTY	SDA7 BASIN 050525	Public	FISHBAUGH THOMAS A&ROBIN M	70 FT NW OF ARMENTROUT LN	4024300400	1889269.405	6403009.319	Regional BMP's	BASIN TREATMENT
SDR-13	San Diego River	S.D. COUNTY	SDA7 BASIN 010303	Public	N/A	2400 ALPINE BLVD	4034100800	1884428.875	6404094.705	Regional BMP's	BASIN TREATMENT
SDR-14	San Diego River	S.D. COUNTY	SDA7 BASIN 010317	Public	BRAR CHAMKAUR S&SUKHWINDER K	ALPINE BLVD AND VICTORIA, ALPINE	4040316700	1883968.114	6407286.83	Regional BMP's	BASIN TREATMENT
SDR-15	San Diego River	S.D. COUNTY	SDA7 IN-LINE TREATMENT 010643	Public	S.D. COUNTY	200 FT NE OF FLO DR AND ARNOLD WY	N/A	1884453.626	6401193.025	Regional BMP's	IN-LINE TREATMENT
SDR-17	San Diego River	S.D. COUNTY	SDA7 BASIN OR IN-LINE TREATMENT 011240	Public	POST ROSE M	ARNOLD WAY N OF HARBISON CANYON RD	4034511200	1886662.471	6390044.085	Regional BMP's	BASIN OR IN-LINE TREATMENT
SDR-18	San Diego River	S.D. COUNTY	SDA7 BASIN OR IN-LINE TREATMENT 010840	Public	LAFOND FAMILY TRUST A 08-06-80	100 FT S OF ALPINE BLVD (OFF RAMP FROM I-8 EAST BOUND)	4033811600	1885189.049	6397590.795	Regional BMP's	BASIN OR IN-LINE TREATMENT
SDG-40	San Diego River	S.D. COUNTY	Coleman Creek Rehabilitation	Public	County of San Diego	Coleman Creek located along Julian Road and Coleman Circle	2910404100	1971849.985	6452903.195	Stream Rehabilitation	Filtration in the stream bed

San Diego River Watershed Management Area Analysis

Lake Henshaw

October 3, 2014

Prepared for:
San Diego County Copermittees

Prepared by:

Geosyntec consultants
engineers | scientists | innovators

RICK Engineering Company

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ACRONYMS AND ABBREVIATIONS

%	percent
>	greater than
<	less than
BMP	Best Management Practice
CB	Coarse Bedrock
CEG	Certified Engineering Geologist
CIP	Capital Improvement Project
CLRP	Comprehensive Load Reduction Plan
CSI	Coarse Sedimentary Impermeable
CSP	Coarse Sedimentary Permeable
E_P	Erosion Potential
ET	Evapotranspiration
FB	Fine Bedrock
FEMA	Federal Emergency Management Agency
FIS	Flood Insurance Study
FSI	Fine Sedimentary Impermeable
FSP	Fine Sedimentary Permeable
GIS	Geographic Information System
GLU	Geomorphic Landscape Unit
HA	Hydrologic Area
HCP	Hydromodification Control Plan
HMP	Hydromodification Management Plan
HRU	Hydrologic Response Unit
HSA	Hydrologic Sub Area
HSG	Hydrologic Soil Group
IRWM	Integrated Regional Water Management
JURMP	Jurisdictional Urban Runoff Management Plan
LDW	Land Development Workgroup
LID	Low Impact Development
MAP	Mean Annual Precipitation

ACRONYMS AND ABBREVIATIONS continued

MHPA	Multiple Habitat Planning Area
MS4	Municipal Separate Storm Sewer System
MSCP	Multiple Species Conservation Program
NED	National Elevation Dataset
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
PDP	Priority Development Project
RCB	Reinforced Concrete Box
RCP	Reinforced Concrete Pipe
SCAMP	Southern California Aerial Mapping Project
SCCWRP	Southern California Coastal Water Research Project
SD	San Diego
SDRWQCB	San Diego Regional Water Quality Control Board
S_P	Sediment Supply Potential
SSURGO	Soil Survey Geographic Database
TMDL	Total Maximum Daily Load
USGS	United States Geological Survey
WMA	Watershed Management Area
WMAA	Watershed Management Area Analysis
WQIP	Water Quality Improvement Plan
WURMP	Watershed Urban Runoff Management Plan

1. Introduction

1.1. Background

On May 8, 2013 the California Regional Water Quality Control Board, San Diego Region adopted Order No. R9-2013-0001; NPDES No. CAS 0109266, National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds within the San Diego Region (Regional MS4 Permit). The Regional MS4 Permit, which became effective on June 27, 2013, replaces the previous MS4 Permits that covered portions of the Counties of San Diego, Orange, and Riverside within the San Diego Region. There were two main goals for the Regional MS4 Permit:

1. To have more consistent implementation, as well as improve inter-agency communication (particularly in the case of watersheds that cross jurisdictional boundaries), and minimize resources spent on the permit renewal process.
2. To establish requirements that focused on the achievement of water quality improvement goals and outcomes rather than completing specific actions, thereby giving the Copermittees more control over how their water quality programs are implemented.

To achieve the second goal, the Regional MS4 Permit requires that Water Quality Improvement Plans (WQIPs) be developed for each Watershed Management Area (WMA) within the San Diego Region. As part of the development of WQIPs, the Regional MS4 Permit provides Copermittees an option to perform a Watershed Management Area Analysis (WMAA) through which watershed-specific requirements for structural BMP implementation for Priority Development Projects can be developed for each WMA. This report presents the Copermittees' approach and results for the regional elements of the WMAA developed for the San Diego County area.

1.2. Watershed Management Area Analysis (WMAA)

The Regional MS4 Permit, through inclusion of the WMAA, provides an optional pathway for Copermittees to develop an integrated approach for their land development 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 comprises the following three components as indicated in the Regional MS4 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 potential areas of coarse sediment supply, present and anticipated future land uses, and locations of physical structures within receiving streams and upland areas that affect the watershed hydrology (such as bridges, culverts, and flood management basins).
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 storm water retention or treatment, or opportunities for regional BMPs, among others. Prior to implementing these candidate projects the Copermittees must demonstrate that implementing such a candidate project would provide greater overall benefit to the watershed than requiring implementation of the onsite structural BMPs. Note, compilation or evaluation of potential projects was not performed as part of this regional effort. Identification and listing of candidate projects will be performed for each WMA through the WQIP process for WMAs that elect to submit the optional WMAA as part of the WQIP.

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 Regional MS4 Permit for Priority Development Projects. The Copermittees shall identify such cases on a watershed basis and include them in the WMAA with supporting rationale to support claims for exemptions.

1.3. Scope of Work for Regional WMAA

In July 2013, the Copermittees elected to fund a regional effort to develop elements of the regional WMAA for the 9 San Diego-area WMAs within the County of San Diego that are currently subject to the Regional MS4 Permit, which include:

- Santa Margarita River (for portion in San Diego County)
- San Luis Rey River
- Carlsbad
- San Dieguito River
- Los Peñasquitos
- Mission Bay & La Jolla Watershed
- San Diego River
- San Diego Bay
- Tijuana River (for portion in San Diego County)

The regional-level information developed through this effort is intended to provide consistency across WMAs and serve as the foundation for developing watershed-specific information for each WMA to be developed through the WQIP process. The regional effort scope of work included:

1. Development of GIS map layers that characterize the WMAs using data previously collected, readily available, and provided by the Copermittees, including:
    a. Description of dominant hydrologic processes, such as areas where infiltration or overland flow likely dominates;
    b. Description of existing streams in the watershed, including bed material and composition, and if they are perennial or ephemeral;

   c. Current and anticipated future land uses;
   d. Potential coarse sediment yield areas; and
   e. Locations of existing flood control structures and channel structures, such as stream armoring, constrictions, grade control structures, and hydromodification or flood management basins.
2. Development of a Microsoft® Excel (Excel) template for use by Copermittees to compile lists of candidate projects for an optional alternative compliance program.
3. Development of additional criteria and analyses to support reinstating the following proposed exemptions that were originally developed in the approved 2011 Final Hydromodification Management Plan but not included in the Regional MS4 Permit unless provided by the Copermittees in the WMAA. In addition, development of the associated Hydromodification Applicability/Exemption Mapping.
   a. Exempt River Reaches including:
      i. San Diego River;
      ii. Otay River;
      iii. San Dieguito River;
      iv. San Luis Rey River; and
      v. Sweetwater River
   b. Stabilized Conveyance Systems Draining to Exempt Water Bodies
   c. Highly Impervious/Highly Urbanized Watersheds and Urban Infill, and
   d. Tidally Influenced Lagoons (where data/study provided)

The scope of work for the regional effort excluded performing analysis within the following areas unless data was readily available, as Copermittees do not have jurisdiction over these areas:

1. State Lands;
2. U.S. Departments of Defense land;
3. U.S. National Forest land;
4. U.S. Department of Interior land and
5. Tribal land

Additional description of excluded areas, for the purposes of the Regional WMAA, is indicated in Section 2.3 Land Uses.

1.4. Project Process

The process for developing the Regional WMAA included close coordination with the Land Development Workgroup (LDW) at key points during the project. The LDW is composed of the 21 San Diego-area Copermittees and serves to develop and implement regional land development plans and programs necessary to support the requirements of the Regional MS4 Permit. The consultant team (Geosyntec Consultants and Rick Engineering Company) presented preliminary project assumptions and methodologies proposed to be used to develop the Regional WMAA to meet the requirements of the Regional MS4 Permit in December 2013. The consultant team incorporated workgroup feedback from this meeting and subsequently presented the preliminary Regional WMAA project results to the LDW in March 2014, again to receive direction and incorporate input on the preliminary results. Subsequently, the draft report was released to the public in July 2014, by a public workshop that included Consultation Panel members from each of the WMAs on July 29, 2014. This version of the report including all of the input described above is being issued for optional inclusion into the respective WQIP Provision B.3 submittals to the SDRWQCB in December 2014.

1.5. Report Organization

This report is organized as follows:

- Chapter 1 provides the project background and purpose;
- Chapter 2 describes the technical basis for characterizing the WMA;
- Chapter 3 describes the template that can be used by Copermittees to compile the list of candidate projects;
- Chapter 4 summarizes the analyses performed to support reinstating select exemptions from hydromodification control requirements for PDPs;
- Chapter 5 presents the WMAA conclusions;
- Chapter 6 presents the references used for the WMAA;
- Attachment A presents the exhibits and additional supporting information for watershed management area characterization;
- Attachment B presents the exhibits and additional supporting information for hydromodification management applicability/exemptions;
- Attachment C expands on the structure of the geodatabase that hosts the GIS data developed by the WMAA; and
- Attachment D provides a crosswalk between the Regional MS4 Permit requirements for WMAA and this report.

1.6.Terms of Reference

The work described in this report was conducted by Geosyntec Consultants (Geosyntec) and Rick Engineering Company (RICK) on behalf of the County of San Diego and the regional Copermittees.

2. Watershed Management Area Characterization

Watershed health and function are strongly influenced by hydrological and geomorphological processes occurring in the watershed. Both hydrological response and geomorphological response of the watershed are dependent on a variety of physical characteristics of the watershed. To this end, the Regional MS4 Permit specifies a set of data that is required to adequately characterize overall watershed processes as a foundation to enhancing integration and effectiveness of watershed management and water quality programs. The following GIS map layers were developed to characterize the hydrological and geomorphological processes within the San Diego River WMA:

- Dominant Hydrologic Processes: A description of dominant hydrologic processes, such as areas where infiltration or overland flow likely dominates;
- Stream Characterization: A description of existing streams in the watershed, including bed material and composition, and if they are perennial or ephemeral;
- Land Uses: Current and anticipated future land uses;
- Potential Critical Coarse Sediment Yield Areas; and
- Physical Structures: Locations of existing flood control structures and channel structures, such as stream armoring, constrictions, grade control structures, and hydromodification or flood management basins.

These GIS layers can be used to:

- Identify the nature and distribution of key macro-scale watershed processes;
- Identify potential opportunities and constraints for regional and sub-regional storm water management facilities that can play a critical role in meeting water quality, hydromodification, water supply, and/or habitat goals within the watershed;
- Assist with determining the most appropriate management actions for specific portions of the watershed; and
- Suggest where further study is appropriate.

2.1.Dominant Hydrologic Processes

The Regional MS4 Permit identifies in the provisions related to the WMAA that a description of dominant hydrologic processes within the watershed must be developed, with GIS layers (maps) as output. The Permit specifically calls for processes "*such as areas where infiltration or overland flow likely dominates*." These particular aspects of the hydrological mechanics of watersheds are particularly important when attempting to understand the macro-scale opportunities for locating projects that take advantage of either capturing overland flow for treatment or for infiltration.

Investigation of the dominant hydrologic processes in the San Diego-area watersheds indicates that evapotranspiration (ET) is the most dominant hydrologic process for the region based on review of a published study (Sanford and Selnick, 2013). ET is the sum of evaporation and plant transpiration in the hydrologic cycle that transports water from land surfaces to the atmosphere. This is conclusion is supported by comparing the 30-year average annual rainfall for the study area (San Diego County east of the peninsular divide) of between 15 and 18 inches per year (San Diego County, 2005) to the average annual ET rates. According to the California Irrigation Management Information System (CIMIS) Reference Evapotranspiration Map (CIMIS, 1999), the study area (within Zones 4, 6, and 9) experiences annual reference ET of 46.6, 49.7 and 59.9 inches, respectively. Therefore, theoretically, if all of the annual precipitation for the San Diego-area watersheds remained stationary where it fell and did not either infiltrate or runoff to local waterbodies where it would be conveyed downstream ultimately to the ocean, it all would be consumed by ET. As such, the effect of ET on the overall hydrologic processes within the San Diego watersheds is a function of the temporal scale over which it acts. Precipitation events often produce runoff in these watersheds, particularly in the urbanized portions, based on the topography and land cover that tend to accelerate the conveyance of runoff downstream rather than collecting, storing, or spreading out that then would maximize the effect of ET.

Because this study is focused on developing information and mapping for the portion of the hydrologic process that informs watershed management decisions, i.e., locating beneficial projects in areas of greatest opportunity, the next tier of dominant hydrologic processes are studied and mapped by this project. As such, the study area was characterized, based on the methodology described in the following section, according to the predicted fate of runoff within the watersheds being either overland flow or infiltration after considering the effects of ET (as well as an intermediate category of interflow). Areas that were mapped as overland flow do not necessarily preclude infiltration but rather indicate the dominant expected process that runoff would experience if not intercepted for the express purpose of infiltrating storm water runoff. The Model BMP Design Manual will provide more detailed guidance and procedures for determining the potential for infiltrating captured storm water at the project level irrespective of the mapping produced in the WMAA. To reiterate, the WMAA mapping is to provide macro-scale processes for high-level analysis and to inform decisions affecting regional scales. Furthermore, the Model BMP Design Manual will indicate the degree to which site-scale BMPs can expect to benefit from ET or how ET is considered in the sizing of BMPs. In brief, typical storm water BMPs only store water for a few days and therefore are not really capable of significant volume disposal through ET. However, pervious area dispersion (i.e., directing storm water runoff to flat areas for spreading and infiltration) has appreciable benefits with regard to ET and is a practice promoted in the BMP Design Manual.

The processes of interest are further defined as follows:

Overland flow: This process can be thought of as the inverse of infiltration; precipitation reaching the ground surface that does not immediately soak in must run over the land surface (thus, "overland" flow). It reflects the relative rates of rainfall intensity and the soil's infiltration capacity: wherever and whenever the rainfall intensity exceeds the soil's infiltration capacity, some overland flow will occur. Most uncompacted, vegetated soils have infiltration capacities of one to several inches per hour at the ground surface, which exceeds the rainfall intensity of even unusually intense storms. In contrast, pavement and hard surfaces reduce the effective infiltration capacity of the ground surface to zero, ensuring overland flow regardless of the meteorological attributes of a storm, together with a much faster rate of runoff relative to vegetated surfaces.

Infiltration and groundwater recharge: These closely linked hydrologic processes are most apparent near ephemeral and perennial conveyances in the San Diego region. Their widespread occurrence is expressed by the common absence of surface-water channels on even steep (undisturbed) hillslopes. Thus, on virtually any geologic material on all but the steepest slopes (or bare rock), infiltration of rainfall into the soil is inferred to be widespread, if not ubiquitous. With urbanization, changes to the process of infiltration are also quite simple to characterize: some (typically large) fraction of that once infiltrating water is now converted to overland flow.

Interflow: Interflow takes place following storm events as shallow subsurface flow (usually within 3 to 6 feet of the surface) occurring in a more permeable soil layer above a less permeable substrate. In the storm response of a stream, interflow provides a transition between the rapid response from surface runoff and much slower stream discharge from deeper groundwater. In some geologic settings, the distinction between "interflow" and "deep groundwater" is artificial and largely meaningless; in others, however, there is a strong physical discrimination between "shallow" and "deep" groundwater movement. Development reduces infiltration and thus interflow as discussed previously, as well as reducing the footprint of the area supporting interflow volume.

The datasets used, methodology for creating the dominant hydrologic processes maps, and the results are described in the sections below.

2.1.1. Datasets Used for identifying dominant hydrologic processes

The following datasets were used in the analysis:

Dataset	Source	Year	Description
Elevation	USGS	2013	1/3rd Arc Second (~10 meter cells) digital elevation model for San Diego County
Soils Data	SanGIS	2013	NRCS (SSURGO) Database for San Diego County downloaded from SanGIS
Land Cover	SanGIS	2013	Ecology-Vegetation layer for San Diego County downloaded from SanGIS

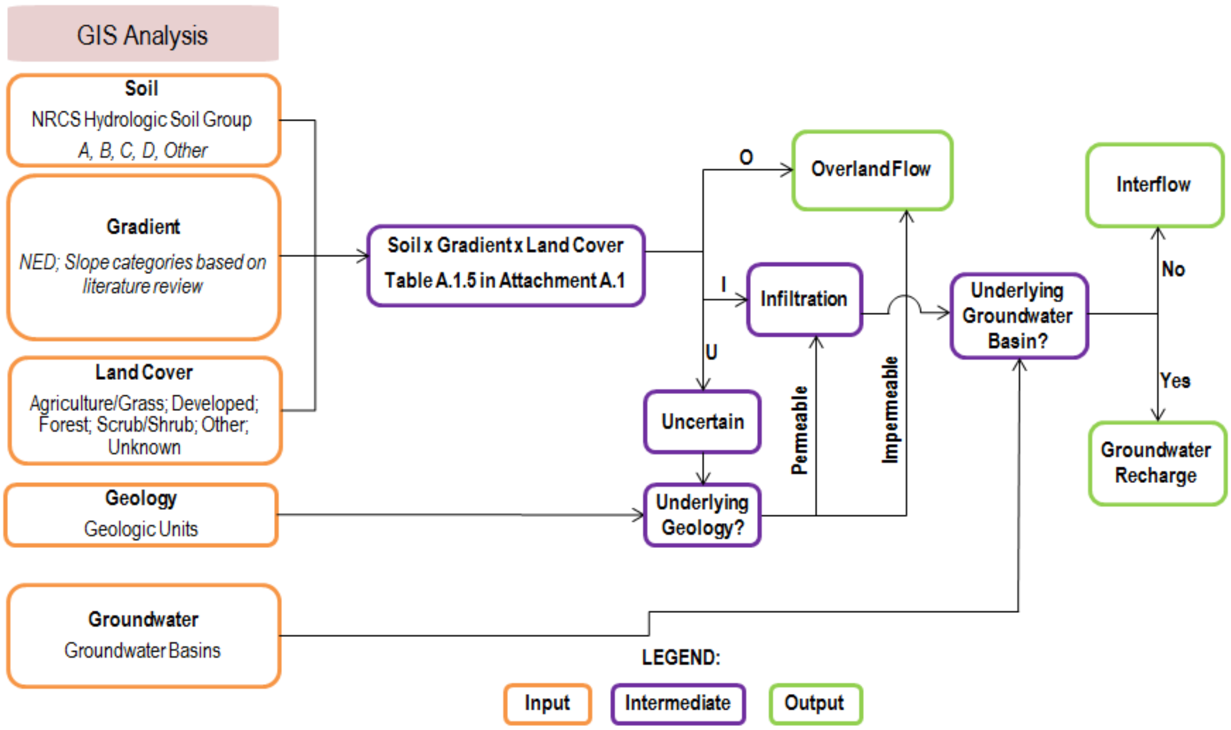
Dataset	Source	Year	Description
Geology	Kennedy, M.P., and Tan, S.S.	2002	Geologic Map of the Oceanside 30’x60’ Quadrangle, California, California Geological Survey, Regional Geologic Map No. 2, 1:100,000 scale.
	Kennedy, M.P., and Tan, S.S.	2008	Geologic Map of the San Diego 30’x60’ Quadrangle, California, California Geological Survey, Regional Geologic Map No. 3, 1:100,000 scale.
	Todd, V.R.	2004	Preliminary Geologic Map of the El Cajon 30’x60’ Quadrangle, Southern California, United States Geological Survey, Southern California Aerial Mapping Project (SCAMP), Open File Report 2004-1361, 1:100,000 scale.
	Jennings et al.	2010	“Geologic Map of California,” California Geological Survey, Map No. 2 – Geologic Map of California, 1:750,000 scale
Groundwater Basins	SanGIS	2013	Groundwater Basins in San Diego County downloaded from SanGIS

2.1.2. Methodology/Assumptions/Criteria for identifying dominant hydrologic processes

The methodology used to describe dominant hydrologic processes is based on recommendations included in the Southern California Coastal Water Research Project’s (SCCWRP) Technical Report 605 titled “Hydromodification Screening Tools: GIS-Based Catchment Analyses of Potential Changes in Runoff and Sediment Discharge” (SCCWRP, 2010). The foundation for this analysis was to incorporate the Report’s concept of grouping common hydrologic attributes into Hydrologic Response Units (HRUs). The report states the following:

> *“Grouping common hydrologic attributes across a watershed into a tractable number of Hydrologic Response Units (HRUs: a term first used by England and Holtan 1969) has become a well-established approach for condensing the near-infinite variability of a natural watershed into a tractable number of different elements. The normal procedure for developing HRUs is to identify presumptively similar rainfall–runoff characteristics across a watershed by combining spatially distributed climate, geology, soils, land use, and topographic data into areas that are approximately homogeneous in their hydrologic properties (Green and Cruise 1995, Becker and Braun 1999, Beven 2001, Haverkamp et al. 2005). As noted by Beighley et al (2005), this process of merging the landscape into discrete HRUs is a common and effective method for reducing model complexity and data requirements. Using watershed characteristics to predict runoff is the explicit task of hydrologic models, and there is a host of such models available for application to hydromodification evaluation. For purposes of “screening,” however, the goal is simplicity and ease of application even if the precision of the resulting analysis is crude.”*

The following process describes the methodology used to define Hydrologic Response Units (HRUs) and then relate the HRUs to the dominant hydrologic processes (i.e., overland flow, interflow, and groundwater recharge) in the San Diego River WMA.



The first step is to define the HRUs. Once these are defined, the remaining steps determine the dominant hydrologic process.

1. **Integrate data sets used to determine HRU**: Categories for soil type, gradient, and land cover were defined based on readily available GIS datasets for the region and classifications found in relevant literature, as indicated below. The different combinations of these three categories comprise the distinct HRUs.

   - **Soil Categories**: based on National Resource Conservation Service (NRCS) Hydrologic Soil Group (HSG) classifications, which are commonly used to describe runoff/infiltration potential of soils on a regional scale. These categories include: A, B, C, and D. HSG A soils have the lowest runoff potential, while HSG D soils have the highest runoff potential.

   - **Gradient Categories**: based on slope ranges found in a review of relevant literature identified in Chapter 6. The spatial processing of the slope categories utilized the United States Geologic Survey (USGS) National Elevation Dataset (NED). Slopes were grouped (bins) into the following ranges: 0% to 2%; 2% to 6%; 6% to 10%; and greater than 10%. The 2% and 6% slope thresholds were based on slope ranges included in Table A.1.1 (McCuen, 2005) presented in Attachment A.1. This table provides runoff coefficients as a function of slope, soil group, land cover, and return period and was used for subsequent steps in the mapping effort. The 10% slope threshold was used in SCCWRP's Technical

Report 605 (SCCWRP, 2010) and is a logical cutoff since slopes steeper than 10% are assumed to be dominated by overland flow.

- **Land Cover Categories**: were defined using the Ecology Vegetation GIS map layer developed by the City of San Diego, the County of San Diego and SANDAG and downloaded from SanGIS (2013). The vegetation categories in the GIS layer were grouped (Table A.1.2 in Attachment A.1) to match the following categories used in SCCWRP's Technical Report 605 (SCCWRP, 2010): Agriculture/Grass; Developed; Forest; Scrub/Shrub, Other (Water), and Unknown.

2. **Evaluate Land Cover**: Land cover categories for Agriculture/Grass, Forest, Scrub/Shrub and Other were related to land use categories defined in Table A.1.1 as shown in Table A.1.3 in Attachment A.1. Relating a land use category for the Developed land cover category was not necessary because all Developed cover was assumed to have overland flow as its dominant hydrologic process.

3. **Determine Hydrology Characteristics for Land Covers**: For each of the land cover/land use categories listed in Table A.1.3, the ratio of precipitation lost to evapotranspiration (i.e. an evapotranspiration coefficient) was estimated using Table A.1.1 using the process described below. Since precipitation is considered to be the sum of the resulting runoff, infiltration, and evapotranspiration, the coefficients for these three hydrologic pathways sum to one, as indicated below.

   Runoff Coefficient + Infiltration Coefficient + Evapotranspiration Coefficient = 1

   i) **Estimate Evapotranspiration**: To estimate the evapotranspiration (ET) coefficient for each land cover, first the runoff coefficient was identified in Table A.1.1 for the highest runoff potential (i.e., Group D soil and 6%+ slope) and most common storm conditions (i.e., storm recurrence intervals less than 25 years). The infiltration for these high runoff conditions was assumed to be negligible, resulting in an infiltration coefficient of zero. Since the sum of the three coefficients should sum to one, the ET coefficient was assumed to be the remaining difference (i.e., ET Coefficient = 1 – Runoff Coefficient). The ET coefficient calculated for the highest runoff potential was then applied to all soil types and slopes within that land use category. The calculated ET coefficient for each applicable HRU is provided in Table A.1.4 in Attachment A.1. The ET coefficient for HRUs that have a Developed land cover or a gradient greater than 10% were not calculated since these HRUs were assumed to have overland flow as the dominant hydrologic process.

   ii) **Estimate Infiltration**: The infiltration coefficient for each applicable HRU (i.e., combination of soil, gradient, and land cover) was estimated by subtracting both the runoff coefficient, provided in Table A.1.1, and the ET coefficient, calculated in step 3(i), from one (i.e., Infiltration Coefficient = 1 – Runoff Coefficient – ET Coefficient). The calculated infiltration coefficient for each applicable HRU is provided in Table A.1.4 in Attachment A.1.

   iii) **Estimate Runoff**: For each applicable HRU, the runoff coefficient was divided by the infiltration coefficient to obtain a ratio representing the potential for runoff or infiltration. The higher the ratio, the greater the potential for runoff to be a more dominant hydrologic process than infiltration. Similarly, the lower the ratio, the greater the potential for infiltration to be a more dominant hydrologic process than runoff. The calculated runoff to infiltration ratios are provided in Table A.1.4 in Attachment A.1.

4. **Associate Runoff and Infiltration to HRUs**: The following designations were assigned to each applicable HRU based on the runoff to infiltration ratio (i.e., runoff coefficient/infiltration coefficient). These designations were based on best engineering judgment with the underlying assumption that if a runoff or infiltration coefficient is more than 50% greater than its counterpart, then the prevailing process is considered dominant.

    - HRUs with runoff to infiltration ratios greater than 1.5 (3:2 ratio) were assumed to have relatively high runoff and overland flow was considered its dominant hydrologic process. These HRUs are designated by the letter “O” (Overland flow is dominant process) in Tables A.1.4 and A.1.5 in Attachment A.1.

    - HRUs with runoff to infiltration ratios less than 0.67 (2:3 ratio) were assumed to have relatively high infiltration and its dominant hydrologic process was either interflow or groundwater recharge, based on analysis described in subsequent steps. These HRUs are designated by the letter “I” (Interflow is dominant process) in Tables A.1.4 and A.1.5.

    - For HRUs with runoff to infiltration ratios between, and including, 1.5 and 0.67 it was uncertain whether it was dominated by overland flow or infiltration. These HRUs are designated by the letter “U” (Dominant process is uncertain) in Tables A.1.4 and A.1.5.

    - For HRUs that have a Developed land cover or a gradient greater than 10%, the runoff to infiltration ratios were not calculated because these HRUs were assumed to have overland flow as the dominant hydrologic process. These HRUs are designated by the letter “O” (Overland flow is dominant process) in Table A.1.5.

5. **Uncertain HRUs Assignment**: For HRUs with an uncertain designation (“U”) in Table A.1.5 in Attachment A.1, the underlying regional geology (Kennedy and Tan, 2002 & 2008; Todd, 2004 and Jennings et al., 2010) was used to evaluate whether overland flow or infiltration were dominant. If the underlying geology was considered impermeable, then these uncertain areas were considered to have overland flow as its dominant hydrologic process. If the underlying geology was considered permeable, then these uncertain areas were considered to be dominated by infiltration. The determination of whether a geologic unit is impermeable or permeable was based on desktop evaluation and the best professional judgment of a Certified Engineering Geologist (CEG). This analysis was performed in GIS and is illustrated in the flowchart above.

6. **Associate Infiltration HRUs with Known Groundwater Basins**: For HRUs with relatively high infiltration and have a designation of "I" in Table A.1.5 in Attachment A.1, the presence or absence of a regional groundwater basin (SanGIS, 2013) underlying these areas determined whether the dominant hydrologic process was designated as interflow or groundwater recharge. The groundwater recharge hydrologic process was assigned as dominant for those applicable areas which had an underlying groundwater basin. The interflow hydrologic process was assigned as dominant for those applicable areas which did not have an underlying groundwater basin directly below it. This analysis was performed in GIS and is illustrated in the flowchart above.
7. **Resulting HRU Data:** The resulting GIS map of dominant hydrologic processes was reviewed by engineering professionals familiar with the hydrology in the County of San Diego to confirm that the mapping is consistent with their experience working in the region.

2.1.3. Results for identifying dominant hydrologic processes

The resulting GIS map showing the spatial distribution of dominant hydrologic processes (i.e., overland flow, interflow, and groundwater recharge) within the San Diego River WMA is provided in Attachment A.1. An ArcMap document which presents the results from each step of the methodology is included in Attachment C, as well as Google Earth KMZ file. Based on this analysis, overland flow is the predominant hydrologic process in this WMA, which is consistent with the experience of engineering professionals familiar with the hydrology of the County of San Diego.

Summary of Deliverables for Dominant Hydrologic Processes

Format	Item	Description	Location
Report	Figure	"Dominant Hydrologic Processes"	Attachment A.1
GIS	Map Group Title	Hydrologic Processes	Attachment C
	Map Layer Title	Soil Land Cover Slope Hydrologic Response Unit Initial Rating Permeability Groundwater Basin Dominant Hydrologic Processes	
	Geodatabase Feature Dataset	HydrologicProcesses	
	Geodatabase Feature Class	HRUAnalysis	
	Geodatabase Geometry Type	Polygon	
KMZ [1]	KMZ File Name	Dominant Hydrologic Processes	Attachment C

[1] To enhance the utilization of this data, the Dominant Hydrological Processes map is provided in both traditional GIS file format (ESRI software license purchase required) and as a Google Earth KMZ (Keyhole Markup Language/Zipped) file that can be viewed with the free download version of Google Earth (http://www.google.com/earth/).

2.1.4. Limitations for identifying dominant hydrologic processes

The resulting GIS map layer only lists the dominant hydrological process (i.e., an HRU assigned a dominant process of overland flow can also experience small amounts of infiltration) and provides a useful, rapid framework to perform screening-level analysis that is appropriate for watershed-scale planning studies. When more precise estimates are required for a particular site and subarea it is recommended that this analysis be augmented with site-specific analysis.

2.2.Stream Characterization

For the purpose of WMAA, the Regional MS4 Permit requires a description of existing streams in the watershed, including bed material and composition, and if they are perennial or ephemeral. Under the Regional WMAA, this analysis was prepared for 27 streams throughout the San Diego Region agreed upon by the consultant team and Copermittees. Within the San Diego River WMA, stream characterization and detailed mapping is provided for San Diego River, Sycamore Creek, Woodglen Vista Creek, San Vicente Creek, and Forester Creek as shown on the exhibit titled "Watershed Management Area Streams" located in Attachment A.2.

2.2.1. Datasets Used for stream characterization

The following data were referenced for the purpose of stream characterization:

- USGS National Hydrography Dataset, downloaded from USGS November 2013
- USGS 7.5-minute quadrangles, compiled image of quadrangles covering San Diego County, various dates
- Floodplains: "National Flood Hazard Layer," provided by Federal Emergency Management Agency October 2012
- Various datasets provided by Copermittees depicting existing storm water conveyance infrastructure within their jurisdictions.
- Aerial photography by Digital Globe dated 2012

2.2.2. Methodology/Assumptions/Criteria for stream characterization

The analysis was prepared by digitizing each of the 27 streams based on review of data listed above. Within the pre-existing datasets depicting streams, floodplains, or infrastructure, no single dataset included a complete, accurate alignment of each stream. Digitizing the streams based on review of all of the data listed above allowed creation of GIS linework with a continuous corrected alignment for each stream. The following data were recorded as GIS attributes for each stream as the stream was digitized:

- River name
- Reach type (engineered or natural, constrained or un-constrained)
- Bed material
- Bank material
- Hydrographic category (perennial or intermittent)

The attributes listed above were collected manually based on interpretation of the reference data. Assumptions used in making the interpretations are listed below. The ***Hydrographic Category*** section below will provide the rationale as to why perennial and intermittent were the hydrographic categories chosen for this WMAA and not perennial and ephemeral.

Note that stream classification was not prepared within areas of Federal/State/Indian lands unless data was readily available. Stream lines were prepared within these areas for continuity, but some data fields were not populated within these areas.

Reach Type

Streams were classified as either engineered or natural, and either constrained or un-constrained. See the exhibit titled, “Watershed Management Area Streams by Reach Type" in Attachment A.2. The purpose of this exercise was to identify whether the stream has been modified by human activity within the stream itself, which may include addition of crossing structures, stabilization of banks, dredging, or any other human activity. This aids the identification of physical structures including stream armoring, constrictions, grade control, and other modifications as required by the Regional MS4 Permit.

Classification of the streams as either “**engineered”** or **“natural”** was based on the following criteria:

Engineered

- A classification of "engineered" was assigned where the stream itself has been modified by human activity.
- All culvert/bridge/pipe crossings either provided in the Copermittes’ storm water conveyance system data or clearly visible on the aerial photo have been assigned as engineered within the limits of the crossing.
- If the Copermittees did not provide storm water conveyance system data for the dirt road crossings/dip sections the streams have been assigned as engineered within the limits of the crossing. These crossings may or may not have culverts.
- If the Copermittees’ storm water conveyance system data stated the facility is a detention or desilting basin, they were assigned as engineered.
- Golf courses have been assigned as engineered.
- If aerial photography showed large water bodies (lake, pond, irrigation pond, etc.) they were assigned as engineered.
- If the storm water conveyance system data provided by the Copermittees has identified the stream as “rockbs”, the assumption has been made that these streams have rocks on their bottom and the sides (“bs”), and have been assigned as engineered.
- Sand mining operations have been assigned as engineered. Sand mining is an operation that is in continuous flux and does not typically result in a discrete, engineered geometry in any given channel cross section until restoration is implemented at the conclusion of the sand mining operation. It is assigned as engineered to acknowledge human alteration of the stream.

Natural

- Streams that have no apparent alteration within the stream itself by human activity have been assigned as natural.

Classification of the streams as either **“constrained”** or **“un-constrained”** was based on the following criteria:

Constrained

- All culvers/bridge/pipe crossings either provided in the Copermittes' storm water conveyance system data or clearly visible on the aerial photo have been assigned as constrained.
- If the Copermittees did not provide storm water conveyance system data for the dirt road crossings/dip sections the streams have been assigned as constrained. These crossings may or may not have culverts.
- If the Copermittees' storm water conveyance system data stated the facility is a detention or desilting basin, they were assigned as constrained.
- Golf courses have been assigned as constrained if located within the Federal Emergency Management Agency (FEMA) floodway based on the "National Flood Hazard Layer" data.
- The USGS National Hydrographic Dataset in their hydrographic category had assigned some reaches as artificial paths. In these situations and if the aerial photography shows large water bodies (lake, pond, irrigation pond, etc.) these streams have been assigned as constrained.
- Sand mining operations located within the FEMA floodway based on the "National Flood Hazard Layer" have been assigned as constrained.

<u>Un-constrained</u>

- Golf courses have been assigned as un-constrained if not located within the FEMA floodway based on the "National Flood Hazard Layer" data.
- Sand mining operations not located within the FEMA floodway based on the "National Flood Hazard Layer" data have been assigned un-constrained.
- If the stream is located within the FEMA floodway based on the "National Flood Hazard Layer" and there is available land in the floodway fringe (the area between the floodway and the 100-yeaer floodplain) the area has been assigned un-constrained. Note that there may be only one side or both sides of the stream with available land in the floodway fringe therefore a note was added as to which side of the stream is constrained and un-constrained.
- If the stream is located within a FEMA 100-year floodplain based on the "National Flood Hazard Layer" data with no floodway and the FEMA floodplain width is not within an existing development or bordered by roads have been assigned as un-constrained.

Bed Material and Bank Material

The following bed and bank materials were identified:

- Concrete
- Riprap
- Pipe / culvert
- Earth

The assumptions made to identify the streams bed and bank materials were based on the following criteria:

- If the data provided by the Copermittees provided information about the stream bed and bank material, the provided data was used for the bed and bank material.
- Generally the data provided by the Copermittees did not identify the crossing type (pipe, box culvert, bridge with or without piers, etc.) or the material (RCP, RCB, earth, riprap, concrete, etc.). In that case, all culvert/bridge/pipe crossings were assigned as pipe/culvert for the bed and bank material.
- If the Copermittees did not provide data for the dirt road crossings/dip sections the bed and bank material have been assigned as pipe/culvert. These crossings may or may not have culverts.
- If the Copermittees' storm water conveyance system data stated the facility is a detention or desilting basin, the bed and bank material have been assigned as earth.
- If aerial photography showed large water bodies (lake, pond, irrigation pond, etc.) they were assigned as earth bed and bank material. The USGS National Hydrographic Dataset in their hydrographic category had assigned some of these types of reaches as artificial paths.
- Sand mining operations within the stream have been assigned as earth for bed and bank material.
- If the Copermittees did not provide data for the stream material the bed and bank material have been assigned based on the aerial photography.

See exhibits titled, "Watershed Management Area Streams by Bed Material" in Attachment A.2.

After stream bed and bank material was classified, earthen reaches were further classified by geologic group. This was accomplished by intersecting the streams with the geologic group layer that had been prepared for use in the dominant hydrologic process and potential coarse sediment yield analyses. The result is displayed in exhibits titled, "Watershed Management Area Streams by Geologic Group" in Attachment A.2.

Hydrographic Category

Streams were classified as "perennial" or "intermittent." See exhibits titled, "Watershed Management Area Streams by Hydrographic Category" in Attachment A.2. Classification was obtained from the USGS National Hydrography Dataset (NHD). The definitions of these categories in the USGS National Hydrography Dataset are:

- **Perennial**: Contains water throughout the year, except for infrequent periods of severe drought.
- **Intermittent**: Contains water for only part of the year, but more than just after rainstorms and at snowmelt.

While the specific Regional MS4 Permit language requested classification of perennial or ephemeral, rather than perennial or intermittent, the data that was referenced in order to classify streams did not include "ephemeral" streams. For reference, the USGS National Hydrography Dataset definition of "ephemeral" is: "contains water only during or after a local rainstorm or heavy snowmelt." None of the stream reaches in the study were classified as ephemeral in the NHD dataset, therefore none are classified as ephemeral in the WMAA product. The City of San Diego provided a map titled “City of San Diego Stream Survey” dated April 3, 2013 prepared by AMEC that shows streams that are “dry” and streams that are “flowing”. This information in conjunction with the other parameters listed in this section was used to determine if a stream was perennial or intermittent.

USGS NHD includes hydrographic category classification for many of the streams. However data was not available for all reaches of all streams. In order to classify reaches of streams that did not already contain this data in NHD, these assumptions were made:

- The USGS NHD information for the stream hydrographic category has been used when available.
- When USGS NHD has “artificial paths” for portions of the stream, the hydrographic category of the upstream portion of the stream have been assigned to the stream unless other assumptions took precedence.
- If aerial photography shows large waterbody (lake, pond, irrigation pond, etc.) perennial has been assumed for the hydrographic category.
- For ponded areas shown on the aerial photography and if the USGS 7.5-minute quadrangles shows cross hatching for the area, intermittent has been assigned unless the upstream portion of the stream was assigned as perennial pursuant to the USGS National Hydrography Dataset then assigned perennial for the ponded area.
- USGS has a dashed line for intermittent streams. USGS has a solid line for perennial streams. In some situations this information was used to assist in the determination of assigning perennial or intermittent to a stream.

2.2.3. Results for stream characterization

The 27 streams and data are contained in a GIS file titled "SD_Regional_WMAA_Streams" located in Attachment C. The streams are shown in watershed maps included in Attachment A.2.

Summary of Deliverables for Stream Characterization

Format	Item	Description	Location
Report	Title of Figures	• "Watershed Management Area Streams" • "Watershed Management Area Streams by Hydrographic Category" • "Watershed Management Area Streams by Bed Material" • "Watershed Management Area Streams by Geologic Group" • "Watershed Management Area Streams by Reach	Attachment A.2

		Type"	
GIS	Map Group Title	Not Grouped	Attachment C
	Map Layer Title	SD_Regional_WMAA_Streams	
	Geodatabase Feature Dataset	Streams	
	Geodatabase Feature Class	SD_Regional_WMAA_Streams	
	Geodatabase Geometry Type	Line	
KMZ [1]	KMZ File Name	SD_Regional_WMAA_Streams	Attachment C
[1] To enhance the utilization of this data, the Stream Characterization map is provided in both traditional GIS file format (ESRI software license purchase required) and as a Google Earth KMZ (Keyhole Markup Language/Zipped) file that can be viewed with the free download version of Google Earth (http://www.google.com/earth/).			

In addition to the 27 streams that were subject of detailed analysis, NHD streams have been included on maps and within the geodatabase for reference. The NHD stream alignments have not been corrected and in some cases may be inconsistent with the existing infrastructure. The NHD streams are contained in a GIS file titled, "SD_NHD_Streams."

2.2.4. Limitations for stream characterization

- Only a desktop analysis was performed and no field verification was conducted.
- Infrastructure is only based on storm water conveyance system data provided by Copermittees or clearly visible on aerial photography. If the Copermittee used a numbering or lettering system for describing bed and bank material for example, since the metadata was not provided the bed and bank material could not be verified.
- In some instances concrete channels cannot be identified on aerial photography if it is filled with sediment and/ or vegetation.

2.3.Land Uses

For the purpose of the WMAA, the Regional MS4 Permit requires a description of current and anticipated future land uses. This is presented in the final GIS deliverable as "Land Use Planning" and includes the following representations of land uses in the watersheds: existing land uses, planned land uses, developable lands, redevelopment and infill areas, floodplains, Multiple Species Conservation Program (MSCP) designated areas, and areas not within the Copermittees' jurisdictions (tribal lands, state lands, and federal lands).

2.3.1. Datasets Used for land uses

The following existing regional datasets were referenced to meet this requirement:

- Municipal boundaries: "Municipal_Boundaries" dated August 2012, available from SanGIS/SANDAG
- Ownership: "Parcels" dated December 2013, available from SanGIS/SANDAG
- Existing land use: "SANGIS.LANDUSE_CURRENT" dated December 2012, available from SanGIS/SANDAG (existing land use)
- Planned land use: "PLANLU" (Planned Land Use for the Series 12 Regional Growth Forecast (2050)), dated December 2010, available from SanGIS/SANDAG
- Developable land: "DEVABLE" (Land available for potential development for the Series 12 Regional Growth Forecast), dated December 2010, available from SanGIS/SANDAG
- Redevelopment and infill areas: "REDEVINF" (Redevelopment and infill areas for the Series 12 Regional Growth Forecast), dated December 2010, available from SanGIS/SANDAG
- Floodplains: "National Flood Hazard Layer" provided by Federal Emergency Management Agency October 2012
- Multiple Species Conservation Program (MSCP), total of four datasets available from SanGIS/SANDAG: "MHPA_SD," dated 2012, (Multiple Habitat Planning Areas for City of San Diego); "MSCP_CN," dated 2009 (designations of the County of San Diego's Multiple Species Conservation Program South County Subregional Plan); "MSCP_EAST_DRAFT_CN," dated 2009 (draft East County MSCP Plan); and "Draft_North_County_MSCP_Version_8.0_Categories," dated 2008 (draft North County MSCP Plan)

2.3.2. Methodology/Assumptions/Criteria for land uses

The existing regional datasets for existing land use, planned land use, developable land, redevelopment and infill areas, floodplains, and MSCP designated areas were referenced with no modifications. Areas not within the Copermittees' jurisdictions (tribal lands, state lands, and federal lands) were compiled from SanGIS parcel data (December 2013) based on the "ownership" value. The owners listed below were excluded from the Copermittees jurisdictions and represent the "Federal/State/Indian" layer, which is displayed on various maps included in Attachment A.2.

- Bureau of Land Management
- California Department of Fish and Game
- Indian Reservations
- Military Reservations

- Other Federal
- State
- State of California Land Commission
- State Parks
- U.S. Fish and Wildlife Service
- U.S. Forest Service

When available, relevant data from these areas was included in analyses (e.g., developable land areas within Federal/State/Indian areas). Stream lines were prepared within these areas for continuity. However, stream classification (e.g., bed and bank material) was not prepared within these areas unless data was readily available (e.g., hydrographic category data available from NHD)

2.3.3. Results for land uses

The existing regional datasets are compiled into the Geodatabase in a group titled, "Land Use Planning." Current and anticipated future land uses are depicted in watershed maps included in Attachment C. Federal/State/Indian Lands are also referenced on all other map exhibits included in Attachment A.2.

Summary of Deliverables for Land Uses

Format	Item	Description	Location
Report	Title of Figures	• "Existing Land Use" • "Planned Land Use" • "Developable Land" • "Redevelopment and Infill Areas"	Attachment A.3
GIS	Map Group Title	Land Use Planning	Attachment C
	Map Layer Title	Municipal Boundaries Federal/State/Indian Lands SanGIS_ExistingLandUse SanGIS_PlannedLandUse SanGIS_DevelopableLand SanGIS_RedevelopmentandInfill FEMA Floodplain MHPA_SD MSCP_CN MSCP_EAST_DRAFT_CN Draft_North_County_MSCP_Version_8_Categories	
	Geodatabase Feature Dataset	LandUsePlanning	
	Geodatabase Feature Class	SanGIS_MunicipalBoundaries Federal_State_Indian_Lands SanGIS_ExistingLandUse SanGIS_PlannedLandUse	

		SanGIS_DevelopableLand SanGIS_RedevelopmentandInfill FEMA_NFHL SanGIS_MHPA_SD SanGIS_MSCP_CN SanGIS_MSCP_EAST_DRAFT_CN SanGIS_Draft_North_County_MSCP_Version_8_Categories	
	Geodatabase Geometry Type	Polygon	
KMZ [1]	KMZ File Name	Municipal Boundaries Federal/State/Indian Lands Floodplains Due to file size limitations, SanGIS land use datasets were not converted to KMZ.	Attachment C
[1] To enhance the utilization of this data, the Land Uses map is provided in both traditional GIS file format (ESRI software license purchase required) and as a Google Earth KMZ (Keyhole Markup Language/Zipped) file that can be viewed with the free download version of Google Earth (http://www.google.com/earth/).			

2.3.4. Limitations

Some jurisdictions may have compiled GIS land use layers that include more detailed or more current information than the regional datasets available from SanGIS. SanGIS layers were selected for the Regional WMAA to provide consistent land use characterization region-wide, and to provide for repeatability of GIS analyses when a land use layer is required for input data. The definition of non-Copermittee areas identified in this document as "Federal/State/Indian Lands" is for the Regional WMAA. Some WQIPs may define non-Copermittee areas differently.

2.4. Potential Critical Coarse Sediment Yield Areas

The Regional MS4 Permit identifies in the provisions related to the WMAA that potential coarse sediment yield areas within the watershed be identified, with GIS layers (maps) as output. With regard to the function and importance of coarse sediment, SCCWRP Technical Report 667 titled "Hydromodification Assessment and Management in California" states the following:

"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."

This report identifies the potential critical coarse sediment yield areas for the San Diego River WMA in compliance with this permit provision. The applied datasets and methodologies for identifying the coarse sediment yield areas, along with their respective results, are described in the sections below.

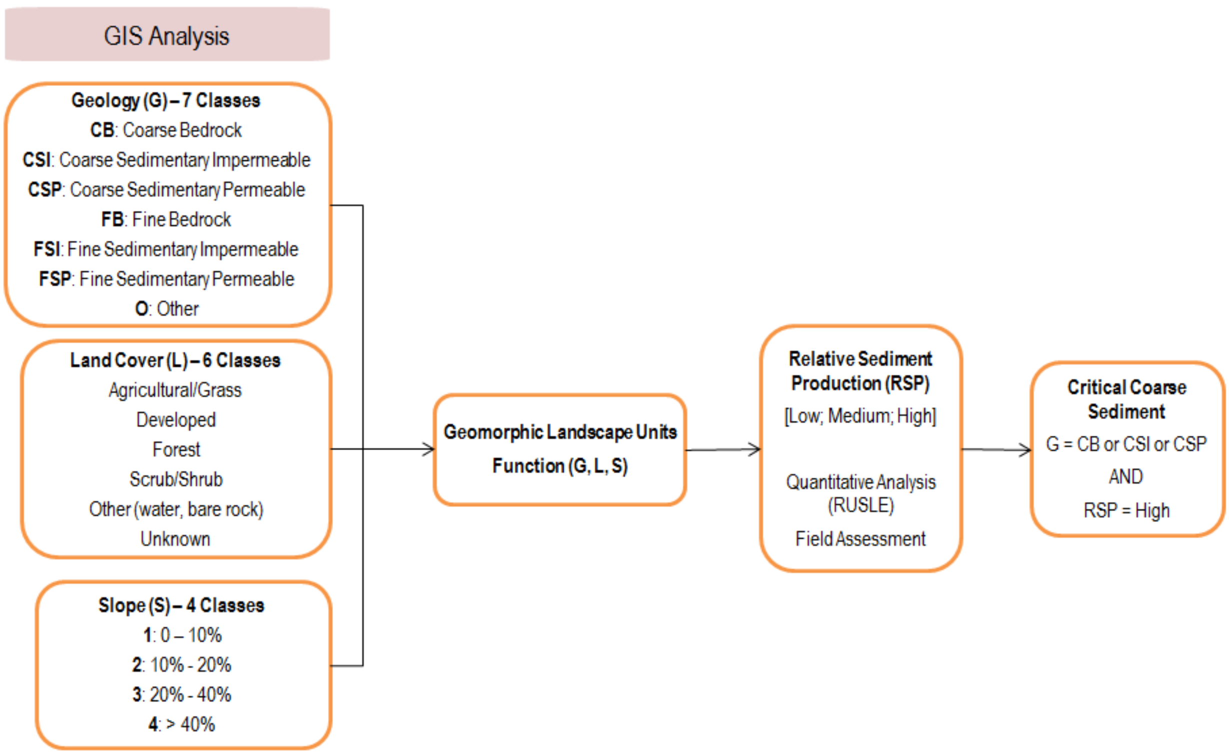
2.4.1. Datasets Used for identifying potential critical coarse sediment yield areas

The following datasets were used in the analysis

Dataset	Source	Year	Description
Elevation	USGS	2013	1/3rd Arc Second (~10 meter cells) digital elevation model for San Diego County
Land Cover	SanGIS	2013	Ecology-Vegetation layer for San Diego County downloaded from SanGIS
Geology	Kennedy, M.P., and Tan, S.S.	2002	Geologic Map of the Oceanside 30'x60' Quadrangle, California, California Geological Survey, Regional Geologic Map No. 2, 1:100,000 scale.
	Kennedy, M.P., and Tan, S.S.	2008	Geologic Map of the San Diego 30'x60' Quadrangle, California, California Geological Survey, Regional Geologic Map No. 3, 1:100,000 scale.
	Todd, V.R.	2004	Preliminary Geologic Map of the El Cajon 30'x60' Quadrangle, Southern California, United States Geological Survey, Southern California Areal Mapping Project (SCAMP), Open File Report 2004-1361, 1:100,000 scale.
	Jennings et al.	2010	"Geologic Map of California," California Geological Survey, Map No. 2 – Geologic Map of California, 1:750,000 scale

2.4.2. Methodology/Assumptions/Criteria for identifying potential critical coarse sediment yield areas

The methodology used to identify coarse sediment yield areas is based on 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 the flow chart below.



The following steps were used to define Geomorphic Landscape Units (GLUs), which were then related to the coarse sediment and critical coarse sediment yield areas in the San Diego River WMA.

1. **Integrate data sets used to determine GLU:** Categories for geology, gradient, and land cover were defined based on readily available GIS datasets for the region and classifications found in relevant literature listed in Chapter 6. The different combinations of these categories make up distinct GLUs.

    - **Geologic Categories**: based on methodology listed in Attachment A.4.1 of Attachment A.4. Resulting geologic categories from this analysis are: 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 regional geology groupings is presented in Attachment A.4.

- **Land cover categories**: defined using the Ecology Vegetation GIS map layer developed by the City of San Diego, the County of San Diego and SANDAG which were downloaded from SanGIS (2013). The vegetation categories in the GIS layer were grouped (Table A.1.2 in Attachment A.1) to match the following categories used in SCCWRP's Technical Report 605 (SCCWRP, 2010): Agriculture/Grass; Developed; Forest; Scrub/Shrub, Other (Water) and Unknown.

- **Gradient Categories**: based on slope ranges found in a review of relevant literature (GLU methodology applied in California) listed in Chapter 6. The spatial processing of the slope categories utilized the USGS National Elevation Dataset (NED). Slope ranges used include: 0% to 10%, 10% to 20%, 20% to 40%, and greater than 40%.

2. **GLU Union Results**: GIS mapping exercise for the study area resulted in 166 GLUs within the 9 WMAs in San Diego County. Table A.4.2 in Attachment A.4 provides the list of the 166 GLUs.

For implementing hydromodification management performance standards in the Regional MS4 Permit, the Copermittees need to identify Critical Coarse Sediment Yield areas in the study region. To provide information on the identification of Critical Coarse Sediment yield, the study assumed that critical coarse sediment would be generated from GLUs that are composed of geologic units likely to generate coarse sediment (based on the methodology listed in Step 3) and have the potential for high relative sediment production (as estimated using the methodology listed in Step 4).

3. **Define Pertinent Geologic groups**: the geologic groups (Attachment A.4.1) 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). An exhibit showing the regional geologic grouping is presented in Attachment A.4.

4. **Relate GLU to Sediment Production**: For assigning GLUs with a relative sediment production, the following methodology was utilized:

    - Conducted quantitative analysis to assign relative sediment production. Analysis was performed based on the assumption that sediment production from an area is proportional to the soil loss from the area, as evaluated using standard soil loss equation. Detailed analysis steps are documented in Attachment A.4.2;

    - To validate the quantitative assignment above, a qualitative field assessment was conducted for 40 sites. Site selection and findings from the field assessment is documented in Attachment A.4.3.

    - The result of the field assessment indicated a 65% match between field conditions and the quantitative assignments. The mismatches are attributed to differences in percent land cover as assumed for the quantitative analysis and those observed in the field. As such, the quantitative assignments were considered to be valid for the purposes of assigning relative sediment production.

2.4.3. Results for identifying potential coarse sediment yield areas

The resulting GIS maps showing the spatial distribution of geologic grouping and critical coarse sediment yield areas within the San Diego River WMA are provided in Attachment A.4. An ArcMap document which presents the results from each step of the methodology is included in Attachment C. Based on this analysis it was estimated that 22.8% of the study area is a potential critical coarse sediment yield area.

As a result of the regional-scale datasets, and commensurate data resolution, used to map the potential critical coarse sediment yield areas, some areas may have been mapped that in reality do not produce critical coarse sediment as they are existing developed areas. As such, an opportunity for jurisdictions to incorporate more refined data into the preliminary WMAA GIS dataset based on local knowledge and review of current aerial images was provided. The County of San Diego provided augmented data in the San Diego River WMA within the unincorporated jurisdictional area.

Summary of Deliverables for Potential Coarse Sediment Yield Areas

Format	Item	Description	Location
Report	Figures	"Geologic Grouping" "Potential Critical Coarse Sediment Yield Areas"	Attachment A.4
GIS	Map Group Layer Name	Potential Coarse Sediment Yield	Attachment C
	Map Layer Title	Geologic Grouping Land Cover Slope Category Geomorphic Landscape Unit Potential Coarse Sediment Yield Area Relative Sediment Production Potential Critical Coarse Sediment Yield Area	
	Geodatabase Feature Dataset	PotentialCoarseSedimentYield	
	Geodatabase Feature Class	GLUAnalysis PotentialCoarseSedimentYieldAreas PotentialCriticalCoarseSedimentYieldAreas	
	Geodatabase Geometry Type	Polygon	
KMZ [1]	KMZ File Name	Potential Critical Coarse Sediment Yield Areas	Attachment C

[1] To enhance the utilization of this data, the Geomorphic Landscape Unit Analysis is provided in both traditional GIS file format (ESRI software license purchase required) and as a Google Earth KMZ (Keyhole Markup Language/Zipped) file that can be viewed with the free download version of Google Earth (http://www.google.com/earth/).

2.4.4. Limitations for identifying potential critical coarse sediment yield areas

The resulting GIS layers 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 WMAA data for the potential critical coarse sediment yield areas should be verified in the field according to the procedures outlined in the Model BMP Design Manual and/or jurisdiction specific BMP Design Manual.

2.5. Physical Structures

The Regional MS4 Permit requires the Copermittees to identify information regarding locations of existing flood control structures and channel structures, such as stream armoring, constrictions, grade control structures, and hydromodification or flood management basins with GIS layers (maps) as output, for each WMA being analyzed for the purpose of developing watershed-specific requirements for structural BMP implementation. This study identified the physical structures using a desktop-level analysis for the stream(s) identified in Section 2.2 in compliance with this permit provision.

2.5.1. Approach for identifying physical structures

The intent of this portion of the WMAA project was to provide an initial assessment of the structures of interest for the stream(s) identified in Section 2.2. This desktop-level analysis was conducted primarily as a visual survey of aerial imagery and FEMA flood insurance study (FIS) profiles where available. The collected information was entered into a GIS layer for inclusion into the overall WMAA geodatabase containing the characterization layers required by the Regional MS4 Permit. To support overall WMA characterization, the information derived in this task provides insight into water and sediment movement through the watershed (SCCWRP, 2012), the opportunities and limitations for infrastructure retrofits and also informs efforts to identify appropriate locations for habitat or riparian area rehabilitation in relation to proximate infrastructure. Specific information regarding how the survey was performed and the attributes of the generated data is presented in Attachment A.5. Note that concrete channels, pipes/culverts, riprap or other artificial stream armoring, and basins have also been identified in the linework generated for the streams (see Section 2.2).

2.5.2. Results for identifying physical structures

The resulting GIS mapping provided in Attachment A.5 shows the spatial locations of the physical structures within the mapped stream(s).

Summary of Deliverables for Physical Structures

Format	Item	Description	Location
Report	Figure	Watershed Management Area Streams by Reach Type with Channel Structures	Attachment A.5
GIS	Map Group Layer Name	Channel Structures	Attachment C.1
	Map Layer Title	Channel Structures	
	Geodatabase Feature Dataset	ChannelStructures	
	Geodatabase Feature Class	ChannelStructures	
	Geodatabase Geometry Type	Point	
KMZ [1]	Kmz File Name	ChannelStructures	Attachment C.2

[1] To enhance the utilization of this data, the Physical Structures map is provided in both traditional GIS file format (ESRI software license purchase required) and as a Google Earth KMZ (Keyhole Markup Language/Zipped) file that can be viewed with the free download version of Google Earth (http://www.google.com/earth/).

3. Template for Candidate Project List

The Regional MS4 Permit requires each WMA to use the results from the WMA characterization to compile a list of 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. Copermittees 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.

The Copermittees elected to identify potential candidate projects as a separate effort from this regional project, and therefore the process for identifying candidate projects is not documented in this report. Instead, this project only developed a template, in a spreadsheet format, for use by the Copermittees to compile lists of potential candidate projects. The template is intended to enhance regional consistency of the information that is gathered for candidate projects. The template spreadsheet file was distributed to the Copermittees on January 28, 2014. A table of the template components is indicated below:

Column	Primary Heading	Secondary Heading	Guidance for Completing the Project List
A	Project Identifier	-	Unique identifier for the project.
B	Watershed Management Area	-	Dropdown menu to select the watershed management area the project is located in
C	Hydrologic Area (HA)	-	Dropdown menu to select the hydrologic area the project is located in Select a WMA in column B for HA (Column C) dropdown menu to activate.
D	Hydrologic Subarea (HSA)	-	Dropdown menu to select the hydrologic subarea the project is located in. Select a HA in column C for HSA (Column D) dropdown menu to activate.
E	Jurisdiction	-	Dropdown menu to select the jurisdiction the project is located in. Select a HSA in column D for Jurisdiction (Column E) dropdown menu to activate.
F	Project Name	-	Indicate the name of the project.
G	Ownership	Type	Dropdown menu to select if the project is a public project, private project, or public-private partnership.
H	Ownership	Ownership Information	List the details for the owner.
I	Project Location	Address	List the address of the project site.
J	Project Location	APN	List the APN of the parcel.
K	Project Location	Latitude	List the latitude of the project site.
L	Project Location	Longitude	List the longitude of the project site.

Column	Primary Heading	Secondary Heading	Guidance for Completing the Project List
M	Project Origination/ Originator	Name	List the name of the report/organization/individual that provided the idea for the project. Potential origination sources: WQIP, WMAA, JURMPs, WURMPs, CLRPs, IRWM, MSCP, MHPA, Other.
N	Project Origination/ Originator	Contact Information	Link or report title if the proposed project is from a report [or] contact information if from an organization/individual.
O	Project Category	-	Drop Down menu to select the project category; In addition to the 6 project categories explicitly listed in the Regional MS4 Permit, the drop down menu also has a category "Other project types allowed by the MS4 Permit". Example for "Other" project types are agency CIP programs such as Green Streets, LID conversions (medians, parks), agency filter installation, etc.
P	Specific Project Type	-	List the subcategory of the project; for example, list Regional BMP type (i.e. infiltration basin, wetland, etc.).
Q	Potential Pollutant	-	Identify the potential pollutant(s) that can be treated by the proposed project.
R	Project Size & Parameters	Contributing Drainage Area (acres)	List the contributing drainage area to the project.
S	Project Size & Parameters	Parcel Size (acres)	List the size of the parcel the project is located on.
T	Project Size & Parameters	Project Footprint (acres)	List the size of the project footprint.
U	Project Size & Parameters	Parameters (with units as necessary)	Parameters needed to quantify benefits from the project; i.e. for an infiltration basin, list the water quality volume, long-term infiltration rate, depth of the basin, etc.
V	Regulatory Requirement	-	Indicate if the project is proposed to meet particular regulatory requirement such as TMDL, etc.
W	Project Timeline	-	Indicate if a project must be implemented by certain date to meet a grant deadline or other time commitment.
X	Other Notes	-	List any other relevant notes; for example, when retrofitting existing infrastructure project category is selected, input parameters needed to quantify benefits from existing infrastructure into this column as these will be needed to estimate additional benefits that can be used for alternative compliance. If N/A is selected in any dropdown menus, add additional explanation in here

4. Hydromodification Management Applicability/Exemptions

Hydromodification, which is caused by both altered storm water flow and altered sediment flow regimes, is largely responsible for degradation of creeks, streams, and associated habitats in the San Diego Region. The purpose of the hydromodification management requirements in the Regional MS4 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.

The March 2011 Final Hydromodification Management Plan (HMP) identified certain exemptions from hydromodification management requirements by presenting "HMP applicability criteria." The Regional MS4 Permit maintains some of these HMP applicability criteria. However, some of the applicability criteria are not included under the Regional MS4 Permit unless the area or receiving water is mapped in the WMAA. The intent of this Section is to provide mapping of areas exempt from hydromodification management requirements, and provide supporting technical analyses for exemptions that are recommended by the WMAA.

4.1. Additional Analysis for Hydromodification Management Exemptions

This section documents additional analysis performed to further evaluate the following exemptions that were already approved by the San Diego Regional Board with the 2011 Final HMP. This study only provides additional analysis, data, and rationale for supporting or eliminating the following existing exemptions and does not propose or study any new exemptions.

- Exempt River Reaches
- Stabilized Conveyance Systems Draining to Exempt Water Bodies
- Highly Impervious Watersheds and Urban Infill and
- Tidally Influenced Lagoons

4.1.1. Exempt River Reaches

4.1.1.1. History

The March 2011 Final HMP, approved by the SDRWQCB under the 2007 MS4 Permit, provides the following exemption from hydromodification management requirements under Section 6.1, HMP Applicability Requirements:

- *Figure 6-1, Node 5 – Potential exemptions may be granted for projects discharging runoff directly to an exempt receiving water, such as the Pacific Ocean, San Diego Bay, an exempt river system (detailed in Table 6-1), or an exempt reservoir system (detailed in Table 6-2).*

Exempt river system/reach from the 2011 Final HMP:

River	Downstream Limit	Upstream Limit
San Diego River	Outfall to Pacific Ocean	Confluence with San Vicente Creek

Exemptions related to runoff discharging directly to the above river reach was based on the flow duration analysis performed for the San Diego River in the Final HMP and the Technical Advisory Committee (formed to provide input on the development of the Final HMP) members' opinion (based on field observations and years of historical perspective) that the above river reach have very low gradients, were depositional (aggrading), have very wide floodplain areas when in the natural condition and that the effects of cumulative watershed impacts to this reach is minimal provided that properly sized energy dissipation is provided at outfalls to the river.

4.1.1.2. Status under 2013 Regional MS4 Permit

Under the Regional MS4 Permit, exempt river reaches would not qualify for exemption from hydromodification management controls unless the optional WMAA is developed with additional rationale/analyses to support reinstating exemptions to these river reaches. Additional analysis performed as part of the WMAA to evaluate hydromodification management control exemptions to the previously exempt reaches is presented below.

4.1.1.3. Research, Approach and Results

Hydromodification impacts can be caused due to increase in flows, changes in sediment transport capacity and changes in sediment supply to the streams (SCCWRP, 2012). In order to evaluate the cumulative impacts due to development and determine if hydromodification management exemption can be reinstated for the river reach that was exempt in the previous permit term erosion potential (Ep) analysis was used to evaluate the increase in flows and changes in sediment transport capacity. In addition, sediment supply potential (Sp) analysis was used to evaluate the changes in sediment supply in this study. In regards to Ep analysis SCCWRP Technical Report 667 "Hydromodification Assessment and Management in California" states:

> *"The underlying premise of the erosion potential approach advances the concept of flow duration control by addressing in-stream processes related to sediment transport. An erosion potential calculation combines flow parameters with stream geometry to assess long term (decadal) changes in the sediment transport capacity. The cumulative distribution of shear stress, specific stream power and sediment transport capacity across*

the entire range of relevant flows can be calculated and expressed using an erosion potential metric, Ep (e.g., Bledsoe, 2002).”

The approach used in this study is explained in detail in Attachment B.1.1.1. The following WMA characterization maps developed in Section 2 were used to select inputs for the exempt river reach analysis:

- Planning land use layers from Section 2.3 were used to estimate the existing impervious area and identify the developable parcels in each watershed. A GIS exercise was performed to identify the developable parcels in each watershed that will be exempt from hydromodification management requirements if the exemption is granted.
- Stream type classification analysis from Section 2.2 was used to select a conservative cross section (segments that are assigned naturally constrained) to be used in analysis for each watershed
- GLU analysis and its associated quantitative analysis described in Section 2.4 were used to determine Sp metric for each watershed. In this study coarse sediment supply changes were limited to changes in hill slope erosion between existing condition and future condition (for parcels that are proposed to be exempt from hydromodification management) of the watershed. It was assumed that the changes in instream sediment supply between existing and future condition for these large depositional river systems are very minimal.

Selection of inputs for the analysis is explained in detail in Attachment B.1.1.2 and results from the analysis are presented in Attachment B.1.1.3 in tabular format. The Ep analysis performed in this study does not account for the following Regional MS4 permit requirements as a conservative assumption. If accounted for, it will result in a smaller Ep than what is currently reported in Attachment B.1.1.3:

- New development priority development projects including projects that are proposed to be exempt from hydromodification management requirements through this WMAA study must implement retention BMPs to the extent feasible if alternative compliance option is not selected or not available.
- Redevelopment priority development projects must mitigate to the pre-developed condition

4.1.1.4. Recommendation

Based on the results from this study reported in Attachment B.1.1.3, the flow duration analysis performed in the Final HMP, and the Technical Advisory Committee (TAC) recommendations provided during the Final HMP development, it is recommended that hydromodification management exemption be reinstated for projects discharging runoff directly to the following exempt river reach:

River	Downstream Limit	Upstream Limit
San Diego River	Outfall to Pacific Ocean	Confluence with San Vicente Creek

Each municipality must define/approve “direct discharge” based on the project site conditions. To qualify for the potential exemption, the outlet elevation must be between the river bottom elevation and the 100-year floodplain elevation and properly designed energy dissipation must be provided. Mapping of these exempt river reaches is presented in Attachment B.2.

4.1.1.5. Limitations

The analysis and associated recommendations as presented above were based on instream erosion as the primary consideration to support reinstatement of exemptions from hydromodification management controls for discharges directly to these river reaches. While it is recognized that other factors contribute to adverse impacts (e.g., salinity imbalance, pollutants) to instream habitat and resulting biotic integrity, hydromodification management control has traditionally been considered an “umbrella process” that encompasses most of the highest risk stressors (percent sands and fines present, channel alteration, and riparian disturbance) to physical habitat. Beyond demonstrating that instream erosion is not anticipated as a result of reinstating hydromodification management control exemptions for discharges to these river reaches, a focused method for correlating physical and biotic integrity to modified hydrological conditions has not been performed in this analysis, as an assessment method has not yet been developed.

The current assessment methods may yield inconclusive results when attempting to identify causal relationships between degraded instream habitat solely due to increased flows and erosive force from hydromodification. A causal assessment recently conducted in the lower reaches of the San Diego River, conducted as a partnership between the Southern California Coastal Water Research Project (SCCWRP), the City of San Diego, the County of San Diego, and the San Diego RWQCB, focused on stressors potentially responsible for known biological impairment of the river. Once the data of the causal assessment become available, it may be useful in classifying the potential stressors such as altered physical habitat as likely, unlikely, or an uncertain cause to biological impairment.

With respect to adverse impacts to habitat as a result of pollutants entrained in storm water discharges, these areas will still be subject over time to the pollutant control requirements of the Regional MS4 Permit as areas develop or redevelop. The current requirements obligate development to maximize retention of the design storm volume which will mitigate a portion of the volume that would otherwise be controlled with hydromodification management BMPs. In some cases, this offsetting of volume reduction through pollutant control BMPs may exceed the HMP volumes. In addition, the development that occurs within the exempted watershed areas is still required to provide any applicable flood control measures. Risk of flooding as a result of exemption from hydromodification controls is unlikely as the control thresholds are significantly lower (order of magnitude) than flood control requirements implemented to protect life and property.

4.1.2. Stabilized Conveyance Systems Draining to Exempt Water Bodies

4.1.2.1. History

The March 2011 Final HMP, approved by the SDRWQCB under the 2007 MS4 Permit, provides the following exemption from hydromodification management requirements under Section 6.1, HMP Applicability Requirements:

- "Figure 6-1, Nodes 7 and 8 – For projects discharging runoff directly to a hardened conveyance or rehabilitated stream system that extends to exempt receiving waters detailed in Node 5, potential exemptions from hydromodification criteria may be granted. Such hardened or rehabilitated systems could include existing storm drain systems, existing concrete channels, or stable engineered unlined channels. To qualify for this exemption, the existing hardened or rehabilitated conveyance system must continue uninterrupted to the exempt system. In other words, the hardened or rehabilitated conveyance system cannot discharge to an unlined, non-engineered channel segment prior to discharge to the exempt system. Additionally, the project proponent must demonstrate that the hardened or rehabilitated conveyance system has capacity to convey the 10-year ultimate condition flow through the conveyance system. The 10-year flow should be calculated based upon single-event hydrologic criteria as detailed in the San Diego County Hydrology Manual.

This exemption was consistent with 2007 MS4 Permit language allowing exemption for discharges into "channels that are concrete-lined or significantly hardened (e.g., with rip-rap, sackrete, etc.) downstream to their outfall in bays or the ocean." The HMP language also allowed for channels stabilized by soft methods such as turf reinforcement mat or vegetation to be considered for exemption. Under these criteria, an engineered channel that is stabilized with riprap, turf reinforcement mat, vegetation, or other materials other than concrete could be determined to be exempt from hydromodification management requirements, pending demonstrating that it has capacity to convey the 10-year ultimate condition flow.

4.1.2.2. Status under 2013 Regional MS4 Permit

A significant change under the Regional MS4 Permit is the requirement that exempt systems draining to exempt water bodies either be "existing underground storm drain systems," or "conveyance channels whose bed and banks are concrete lined" all the way to exempt water bodies. The Regional MS4 Permit language does not include engineered channels that are stabilized with materials other than concrete, such as riprap, turf reinforcement mat, or vegetation. However, areas identified by Copermittees as appropriate for an exemption may be identified in the optional WMAA incorporated into the WQIP.

4.1.2.3. Research and Results

To provide a process for engineered channels that are stabilized with materials other than concrete, such as riprap, turf reinforcement mat, or vegetation to be identified in the WMAAs, an example study was prepared for an existing engineered channel stabilized with vegetation. The study demonstrates that a channel stabilized with materials other than concrete can be stable or have minimal potential for erosion. In order to allow for other channels that are stabilized with materials other than concrete to be identified in each WMAA, criteria for defining what is "stable" or "minimal potential for erosion" was determined.

Forester Creek in the City of Santee was selected for the sample channel analysis. Forester Creek is stabilized with vegetation from its confluence with the San Diego River downstream to Prospect Avenue upstream. For the purpose of this discussion, the confluence is the location where the floodplain of Forester Creek meets the San Diego River floodplain, just west of Gorge Avenue and Willowgrove Avenue, at the eastern side of the Carlton Oaks Golf Course. Stabilization occurred in two separate projects. The reach from the San Diego River confluence downstream to Mission Gorge Road upstream was constructed in 1990. The reach from Mission Gorge Road downstream to Prospect Avenue upstream is known as the Forester Creek Improvement Project and was constructed in 2006-2007. Forester Creek includes energy dissipators stabilized with riprap, concrete, and articulated concrete block at Mission Gorge Road undercrossing and Prospect Avenue undercrossing. Other than at bridge crossings, the engineered un-lined reach of Forester Creek is stabilized with native vegetation. There is dense growth of trees in the channel.

Vegetation in Forester Creek Downstream of Mission Gorge Road

Vegetation in Forester Creek Upstream of Mission Gorge Road between Mission Gorge Road and State Route 52

Vegetation in Forester Creek between State Route 52 and Olive Lane

Upstream of Prospect Avenue, Forester Creek is a concrete-lined channel serving an urban area that is almost fully built out and served by existing underground storm drain systems and concrete-lined channels. Because of the vegetated reaches of Forester Creek extending to the San Diego River, the concrete-lined portion of Forester Creek and tributary underground storm drain systems and concrete-lined channels are not exempt from hydromodification management requirements unless the vegetated reaches of Forester Creek are identified in the optional WMAA incorporated into the WQIP.

An erosion potential analysis was prepared for the vegetated reaches of Forester Creek. An erosion potential analysis compares cumulative excess shear stress over all flows capable of transporting the channel-bed material from post-development to pre-development condition. The analysis used the same methods for determining erosion potential as presented in Section 4.1.1 and Attachment B.1.1 for the major river reaches.

For the purpose of determining flow rates and durations (hydrologic analysis), a regional scaling procedure developed by Hawley & Bledsoe in 2011 was used, the same method as presented in Section 4.1.1 and Attachment B.1.1 for the major river reaches. The method uses Duration Density Functions (DDFs) presented in the 2011 paper, "How do flow peaks and durations change in suburbanizing semi-arid watersheds? A southern California case study, “to estimate cumulative durations for geomorphically-effective flows in a logarithmically-binned histogram format. Using these flows, long-term sediment transport can be subsequently estimated. The analysis requires the following data, summarized below.

Summary of Input Data for Hydrologic Calculations for Forester Creek Erosion Potential Analysis

Data	Units	Forester Creek Watershed Existing Condition	Forester Creek Watershed Future Condition
Tributary Area, A	square miles (mi^2)	23.36	23.36
Mean Annual Precipitation, MAP	inches	14	14
Length of Daily Flow Record	Years	30	30
Minimum Flow Rate	cubic feet per second	0.01	0.01
Number of Flow Bins	--	25	25
Impervious Cover	mi^2/ mi^2	0.4634	0.4792

Impervious cover for the Forester Creek watershed was determined by assigning land-use specific imperviousness values to the land use categories presented in the SanGIS land use data sets (existing land use in 2012 and planned land use, described in Chapter 2.3). The composite imperviousness of the watershed was then calculated based on the existing condition and future condition land use distribution within the watershed. The Forester Creek watershed is nearly fully built out therefore there is little change in imperviousness from existing to future condition. Impervious area calculations for the Forester Creek watershed are provided in Attachment B.1.2.

For the purpose of determining shear stress in the channel (hydraulic analysis), normal depth calculations for the binned flow rates determined from the DDF analysis were prepared for two channel cross sections. One cross section was taken in the reach constructed in 1990, and one cross section in the Forester Creek Improvement Project reach. For each reach, the cross section expected to experience the greatest shear stress was selected, based on channel width and slope. The analysis requires the following data, summarized below.

Summary of Input Data for Hydraulic Calculations for Forester Creek Erosion Potential Analysis

Data	Units	Forester Creek Watershed Cross Section 1300	Forester Creek Watershed Cross Section 2475
Channel Bottom Width, b	feet	84	155
Channel Side Slopes, z1 and z2	Horizontal:Vertical	z1 = 1.5:1 z2 = 2:1	z1 = z2 = 2:1
Channel Slope	foot/foot	0.006	0.003
Channel Roughness (Manning's n)	--	0.100	0.100
Critical Shear Stress	pounds per square foot (lb/ft^2)	2.1	2.1

Critical shear stress for the reaches was estimated to be greater than or equal to 2.1 pounds per square foot (lb/ft2), based on review of permissible shear stress values presented in "Stability Thresholds for Stream Restoration Materials" (Fischenich 2001) and "Streambank Soil Bioengineering Considerations for Semi-Arid Climates" (Hoag and Fripp 2005). Based on Fischenich 2001, permissible shear stress for "live willow stakes" is approximately 2.10 to 3.10 lb/ft2.

The analysis results, presented in Attachment B.1.2, show that for both the existing and future condition, the shear stress for all geomorphically-effective flows based on the DDF analysis is less than the estimated critical shear stress of 2.1 lb/ft2. This means that no excess shear stress or "work" occurs in the channel in either the existing or future condition. Therefore, there is no increase in the duration of "work" (cumulative work), in the future condition, and erosion potential is 1.0.

Note that while the flow rates are the same in both the existing and future condition analyses, the duration of each flow rate is increased in the future condition. The flow rates in the flow bins are based on the watershed area, mean annual precipitation, and length of the synthetic record. These do not change from existing to future condition. The duration for each flow bin is related to the watershed area, mean annual precipitation, length of the synthetic record, and the impervious area. The duration increases in the future condition based on the increased impervious area. The increase in duration would result in increased cumulative work in the future condition if any of the flow rates resulted in shear stress greater than the estimated critical shear stress (excess shear stress, or "work"), because cumulative work is the product of work times duration.

The scenario that occurred in the Forester Creek analysis, in which no work occurred in the expected range of geomorphically-effective flow rates, is a potential scenario for engineered channels because engineered conveyance systems are typically engineered for flood flows much greater and less frequent than the geomorphically-effective flows. For example, Forester Creek is engineered to convey a 100-year single-storm event flow rate of approximately 12,450 to 13,840 cubic feet per second (cfs) within the channel. The 10-year single-storm event flow rate for Forester Creek is approximately 6,000 to 6,800 cfs. The maximum geomorphically-effective flow rate for Forester Creek based on the DDF analysis is 836 cfs.

4.1.2.4. Recommendation

Based on the study that was prepared under the Regional WMAA and described above, the vegetated reaches of Forester Creek from its confluence with the San Diego River downstream to Prospect Avenue upstream are recommended to be exempt from hydromodification management requirements. The analysis has shown that future increases in impervious area within the watershed are not expected to increase the erosion potential in Forester Creek. The concrete-lined portion of Forester Creek and existing storm drain systems draining directly to the concrete-lined portion of Forester Creek should also be exempt. Storm drain systems draining directly to the vegetated reaches of Forester Creek would also be exempt if there is no evidence of localized erosion issues at the storm drain outfall.

Because engineered conveyance systems are typically engineered to convey flood flows much greater than the geomorphically-effective flows typically determined using continuous simulation modeling or DDF analysis, some engineered conveyance systems may be capable of conveying all geomorphically-effective flows at very low depths with shear stress less than critical shear stress, as was the case for Forester Creek. Based on this, other engineered conveyance systems that are stabilized with materials other than concrete, such as riprap, turf reinforcement mat, or vegetation, including rehabilitated stream systems, may be studied. Those systems that meet criteria presented in the Regional WMAA for stabilized conveyance systems draining to exempt water bodies may be recommended as exempt systems in the optional WMAA incorporated into the WQIP. However, any future proposed HMP exemptions would need to be approved through the WQIP Annual Update process (Regional MS4 Permit Section F.1.2.c.).

4.1.3. Highly Impervious/Highly Urbanized Watersheds and Urban Infill

Based on evaluation of the highly impervious/highly urbanized watershed and urban infill exemptions presented in the March 2011 Final HMP, and comparison with more recent research prepared for the Ventura County Hydromodification Control Plan (Ventura County HCP) (Final Draft dated September 2013), resurrection of these exemptions from the March 2011 Final HMP was not recommended by the Regional WMAA. The research prepared in support of the Ventura County HCP determined lower thresholds of additional impervious area (ranging from 0.44% to 1.65%) than the limit presented in the San Diego County Final HMP dated March 2011 (3%). No areas within the San Diego River WMA are currently recommended for highly impervious/highly urbanized watershed or urban infill exemption.

4.1.4. Tidally Influenced Lagoons

There are no tidally influenced lagoons recommended for exemption from hydromodification management requirements in the San Diego River WMA. Refer to the Regional WMAA for further information regarding this exemption.

5. Conclusions

5.1. Watershed Management Area Characterization

The WMA Characterization data was developed using available regional data to further understand the macro-scale watershed characteristics and processes in the San Diego River WMA. The Regional MS4 Permit allows for flexibility in complying with land development requirements when using the information developed in the WMAA to improve water quality planning and implementation associated with land development. This dataset will assist with identifying the opportunities and constraints for projects and management decisions based on a watershed-scale (rather than piecemeal project identification without context within the watershed) and provides Copermittees the ability to exercise the option to create an alternative compliance program that offers the opportunity to develop watershed-specific alternatives to universal onsite structural BMP implementation. The characterization data includes:

Characterization Data	Utilization Potential
Dominant Hydrologic Process: • Overland flow • Infiltration • Interflow	• Identify areas for enhanced infiltration or collection of storm water for treatment • Implement management measures that correspond to pre-development conditions – promotes long-term channel stability and health • Increases understanding of the natural functioning of the watershed and what has been (or is at risk of being) altered by urbanization.
Stream Characterization: • Reach type • Bed material • Bank material • Hydrographic category • Channel infrastructure	• Preliminary dataset that can be used to conduct stream power evaluations • Identify channel systems for preservation or restoration • Identification of appropriate space for channel processes to occur (e.g., flood plain connectivity) • Insight to sensitivity of receiving stream reach • Indicates the features within channels that affect water and sediment movement through the watershed

Characterization Data	Utilization Potential
Land Use: • Existing • Future	• Foresight (identifies relative risks, opportunities, or constraints) in comparing future to existing land uses, i.e., areas that may be more/less vulnerable to adverse impacts to changes in storm water runoff associated with development • Encourage infill development
Potential Critical Coarse Sediment Yield Areas	• Preservation of areas or function that contributes critical sediment within the watershed to stream armoring/stability • Assist with identifying potentially susceptible stream reaches that require uninterrupted coarse sediment supplies to remain stable • Dual goal of open space conservation

Regarding the identification of the potential critical coarse sediment yield areas in the WMAA using readily available regional datasets, it is anticipated that when more precise estimates for potential critical coarse sediment yield areas are required for a particular site or subarea that this regional study will be augmented with site-specific analysis. Development projects must avoid critical sediment yield areas 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 to meet the requirements of the Regional MS4 permit. As such, projects should consult the Model BMP Design Manual and/or jurisdiction specific BMP Design manual for options to meet the Regional MS4 permit requirements. It is anticipated that the data will not be static but will be enhanced over time through future studies or field assessments that will refine what is currently a macro-level data set.

5.2. Template for Candidate Project List

It is anticipated the Copermittees that elect to develop alternative compliance programs will conduct a separate exercise to nominate potential candidate projects for inclusion into the WQIPs using the template developed for this project.

5.3. Hydromodification Management Exemptions

Attachment B.2 presents hydromodification management applicability/exemption mapping for the San Diego River WMA. The mapping includes receiving waters that are exempt based on the Regional MS4 Permit or recommended exempt based on studies.

Receiving waters that are **exempt** based on the Regional MS4 Permit include:

- The Pacific Ocean
- Lakes and Reservoirs
- Existing underground storm drains or concrete-lined channels draining directly to the ocean

Receiving waters or conveyance systems that are **recommended exempt** in the San Diego River WMA based on studies that were prepared as part of the Regional WMAA include:

- San Diego River from Pacific Ocean to confluence with San Vicente Creek
- Forester Creek stabilized reach from the confluence with the San Diego River to Prospect Avenue
- Existing underground storm drains or concrete-lined channels discharging directly to the above receiving waters. These systems were identified based on MS4 data provided by the Copermittees via the data call. These systems may not represent all discharges to the above receiving waters. Additional systems may be considered exempt if there is no evidence of erosion at the outfall of the conveyance system, and any other criteria determined by the local jurisdiction.

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San Diego River
Watershed Management Area Analysis
ATTACHMENTS

Lake Henshaw

October 3, 2014

Prepared for:
San Diego County Copermittees

Prepared by:

Geosyntec consultants
engineers | scientists | innovators

RICK ENGINEERING COMPANY

ATTACHMENT A

WATERSHED MANAGEMENT AREA CHARACTERIZATION

ATTACHMENT A.1

DOMINANT HYDROLOGICAL PROCESS

A.1 Dominant Hydrological Process

Table A.1.1: Runoff Coefficients versus Land Use, Hydrologic Soil Group (A, B, C, D), and Slope Range

	A			B			C			D		
Land Use	0–2%	2–6%	6%+	0–2%	2–6%	6%+	0–2%	2–6%	6%+	0–2%	2–6%	6%+
Cultivated land	0.08[a]	0.13	0.16	0.11	0.15	0.21	0.14	0.19	0.26	0.18	0.23	0.31
	0.14[b]	0.18	0.22	0.16	0.21	0.28	0.20	0.25	0.34	0.24	0.29	0.41
Pasture	0.12	0.20	0.30	0.18	0.28	0.37	0.24	0.34	0.44	0.30	0.40	0.50
	0.15	0.25	0.37	0.23	0.34	0.45	0.30	0.42	0.52	0.37	0.50	0.62
Meadow	0.10	0.16	0.25	0.14	0.22	0.30	0.20	0.28	0.36	0.24	0.30	0.40
	0.14	0.22	0.30	0.20	0.28	0.37	0.26	0.35	0.44	0.30	0.40	0.50
Forest	0.05	0.08	0.11	0.08	0.11	0.14	0.10	0.13	0.16	0.12	0.16	0.20
	0.08	0.11	0.14	0.10	0.14	0.18	0.12	0.16	0.20	0.15	0.20	0.25
Residential lot	0.25	0.28	0.31	0.27	0.30	0.35	0.30	0.33	0.38	0.33	0.36	0.42
size 1/8 acre	0.33	0.37	0.40	0.35	0.39	0.44	0.38	0.42	0.49	0.41	0.45	0.54
Residential lot	0.22	0.26	0.29	0.24	0.29	0.33	0.27	0.31	0.36	0.30	0.34	0.40
size 1/4 acre	0.30	0.34	0.37	0.33	0.37	0.42	0.36	0.40	0.47	0.38	0.42	0.52
Residential lot	0.19	0.23	0.26	0.22	0.26	0.30	0.25	0.29	0.34	0.28	0.32	0.39
size 1/3 acre	0.28	0.32	0.35	0.30	0.35	0.39	0.33	0.38	0.45	0.36	0.40	0.50
Residential lot	0.16	0.20	0.24	0.19	0.23	0.28	0.22	0.27	0.32	0.26	0.30	0.37
size 1/2 acre	0.25	0.29	0.32	0.28	0.32	0.36	0.31	0.35	0.42	0.34	0.38	0.48
Residential lot	0.14	0.19	0.22	0.17	0.21	0.26	0.20	0.25	0.31	0.24	0.29	0.35
size 1 acre	0.22	0.26	0.29	0.24	0.28	0.34	0.28	0.32	0.40	0.31	0.35	0.46
Industrial	0.67	0.68	0.68	0.68	0.68	0.69	0.68	0.69	0.69	0.69	0.69	0.70
	0.85	0.85	0.86	0.85	0.86	0.86	0.86	0.86	0.87	0.86	0.86	0.88
Commercial	0.71	0.71	0.72	0.71	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
	0.88	0.88	0.89	0.89	0.89	0.89	0.89	0.89	0.90	0.89	0.89	0.90
Streets	0.70	0.71	0.72	0.71	0.72	0.74	0.72	0.73	0.76	0.73	0.75	0.78
	0.76	0.77	0.79	0.80	0.82	0.84	0.84	0.85	0.89	0.89	0.91	0.95
Open space	0.05	0.10	0.14	0.08	0.13	0.19	0.12	0.17	0.24	0.16	0.21	0.28
	0.11	0.16	0.20	0.14	0.19	0.26	0.18	0.23	0.32	0.22	0.27	0.39
Parking	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87
	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97

[a] Runoff coefficients for storm recurrence intervals less than 25 years.

[b] Runoff coefficients for storm recurrence intervals of 25 years or longer.

Source: Table 7-9 in *Hydrologic Analysis and Design* (McCuen, 2005)

Table A.1.2: Land Cover Grouping

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
1	42000 Valley and Foothill Grassland	Grasslands, Vernal Pools, Meadows, and Other Herb Communities	Agricultural/Grass
2	42100 Native Grassland		Agricultural/Grass
3	42110 Valley Needlegrass Grassland		Agricultural/Grass
4	42120 Valley Sacaton Grassland		Agricultural/Grass

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
5	42200 Non-Native Grassland	Grasslands, Vernal Pools, Meadows, and Other Herb Communities	Agricultural/Grass
6	42300 Wildflower Field		Agriculture/Grass
7	42400 Foothill/Mountain Perennial Grassland		Agriculture/Grass
8	42470 Transmontane Dropseed Grassland		Agriculture/Grass
9	45000 Meadow and Seep		Agriculture/Grass
10	45100 Montane Meadow		Agriculture/Grass
11	45110 Wet Montane Meadow		Agriculture/Grass
12	45120 Dry Montane Meadows		Agriculture/Grass
13	45300 Alkali Meadows and Seeps		Agriculture/Grass
14	45320 Alkali Seep		Agriculture/Grass
15	45400 Freshwater Seep		Agriculture/Grass
16	46000 Alkali Playa Community		Agriculture/Grass
17	46100 Badlands/Mudhill Forbs		Agriculture/Grass
18	Non-Native Grassland		Agriculture/Grass
19	18000 General Agriculture	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Agriculture/Grass
20	18100 Orchards and Vineyards		Agriculture/Grass
21	18200 Intensive Agriculture		Agriculture/Grass
22	18200 Intensive Agriculture - Dairies, Nurseries, Chicken Ranches		Agriculture/Grass
23	18300 Extensive Agriculture - Field/Pasture, Row Crops		Agriculture/Grass
24	18310 Field/Pasture		Agriculture/Grass
25	18310 Pasture		Agriculture/Grass
26	18320 Row Crops		Agriculture/Grass
27	12000 Urban/Developed		Developed
28	12000 Urban/Develpoed		Developed
29	81100 Mixed Evergreen Forest	Forest	Forest
30	81300 Oak Forest		Forest
31	81310 Coast Live Oak Forest		Forest
32	81320 Canyon Live Oak Forest		Forest
33	81340 Black Oak Forest		Forest
34	83140 Torrey Pine Forest		Forest
35	83230 Southern Interior Cypress Forest		Forest
36	84000 Lower Montane Coniferous Forest		Forest
37	84100 Coast Range, Klamath and Peninsular Coniferous Forest		Forest

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
38	84140 Coulter Pine Forest	Forest	Forest
39	84150 Bigcone Spruce (Bigcone Douglas Fir)-Canyon Oak Forest		Forest
40	84230 Sierran Mixed Coniferous Forest		Forest
41	84500 Mixed Oak/Coniferous/Bigcone/Coulter		Forest
42	85100 Jeffrey Pine Forest		Forest
43	11100 Eucalyptus Woodland	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Forest
44	60000 RIPARIAN AND BOTTOMLAND HABITAT	Riparian and Bottomland Habitat	Forest
45	61000 Riparian Forests		Forest
46	61300 Southern Riparian Forest		Forest
47	61310 Southern Coast Live Oak Riparian Forest		Forest
48	61320 Southern Arroyo Willow Riparian Forest		Forest
49	61330 Southern Cottonwood-willow Riparian Forest		Forest
50	61510 White Alder Riparian Forest		Forest
51	61810 Sonoran Cottonwood-willow Riparian Forest		Forest
52	61820 Mesquite Bosque		Forest
53	62000 Riparian Woodlands		Forest
54	62200 Desert Dry Wash Woodland		Forest
55	62300 Desert Fan Palm Oasis Woodland		Forest
56	62400 Southern Sycamore-alder Riparian Woodland		Forest
57	70000 WOODLAND	Woodland	Forest
58	71000 Cismontane Woodland		Forest
59	71100 Oak Woodland		Forest
60	71120 Black Oak Woodland		Forest
61	71160 Coast Live Oak Woodland		Forest
62	71161 Open Coast Live Oak Woodland		Forest
63	71162 Dense Coast Live Oak Woodland		Forest
64	71162 Dense Coast Love Oak Woodland		Forest

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
65	71180 Engelmann Oak Woodland	Woodland	Forest
66	71181 Open Engelmann Oak Woodland		Forest
67	71182 Dense Engelmann Oak Woodland		Forest
68	72300 Peninsular Pinon and Juniper Woodlands		Forest
69	72310 Peninsular Pinon Woodland		Forest
70	72320 Peninsular Juniper Woodland and Scrub		Forest
71	75100 Elephant Tree Woodland		Forest
72	77000 Mixed Oak Woodland		Forest
73	78000 Undifferentiated Open Woodland		Forest
74	79000 Undifferentiated Dense Woodland		Forest
75	Engelmann Oak Woodland		Forest
76	52120 Southern Coastal Salt Marsh	Bog and Marsh	Other
77	52300 Alkali Marsh		Other
78	52310 Cismontane Alkali Marsh		Other
79	52400 Freshwater Marsh		Other
80	52410 Coastal and Valley Freshwater Marsh		Other
81	52420 Transmontane Freshwater Marsh		Other
82	52440 Emergent Wetland		Other
83	44000 Vernal Pool	Grasslands, Vernal Pools, Meadows, and Other Herb Communities	Other
84	44320 San Diego Mesa Vernal Pool		Other
85	44322 San Diego Mesa Claypan Vernal Pool (southern mesas)		Other
86	13100 Open Water	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Other
87	13110 Marine		Other
88	13111 Subtidal		Other
89	13112 Intertidal		Other
90	13121 Deep Bay		Other
91	13122 Intermediate Bay		Other
92	13123 Shallow Bay		Other
93	13130 Estuarine		Other
94	13131 Subtidal		Other
95	13133 Brackishwater		Other

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
96	13140 Freshwater	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Other
97	13200 Non-Vegetated Channel, Floodway, Lakeshore Fringe		Other
98	13300 Saltpan/Mudflats		Other
99	13400 Beach		Other
100	21230 Southern Foredunes	Dune Community	Scrub/Shrub
101	22100 Active Desert Dunes		Scrub/Shrub
102	22300 Stabilized and Partially-Stabilized Desert Sand Field		Scrub/Shrub
103	24000 Stabilized Alkaline Dunes		Scrub/Shrub
104	29000 ACACIA SCRUB		Scrub/Shrub
105	63000 Riparian Scrubs	Riparian and Bottomland Habitat	Scrub/Shrub
106	63300 Southern Riparian Scrub		Scrub/Shrub
107	63310 Mule Fat Scrub		Scrub/Shrub
108	63310 Mulefat Scrub		Scrub/Shrub
109	63320 Southern Willow Scrub		Scrub/Shrub
110	63321 Arundo donnax Dominant/Southern Willow Scrub		Scrub/Shrub
111	63330 Southern Riparian Scrub		Scrub/Shrub
112	63400 Great Valley Scrub		Scrub/Shrub
113	63410 Great Valley Willow Scrub		Scrub/Shrub
114	63800 Colorado Riparian Scrub		Scrub/Shrub
115	63810 Tamarisk Scrub		Scrub/Shrub
116	63820 Arrowweed Scrub		Scrub/Shrub
117	31200 Southern Coastal Bluff Scrub	Scrub and Chaparral	Scrub/Shrub
118	32000 Coastal Scrub		Scrub/Shrub
119	32400 Maritime Succulent Scrub		Scrub/Shrub
120	32500 Diegan Coastal Sage Scrub		Scrub/Shrub
121	32510 Coastal form		Scrub/Shrub
122	32520 Inland form (> 1,000 ft. elevation)		Scrub/Shrub
123	32700 Riversidian Sage Scrub		Scrub/Shrub
124	32710 Riversidian Upland Sage Scrub		Scrub/Shrub
125	32720 Alluvial Fan Scrub		Scrub/Shrub
126	33000 Sonoran Desert Scrub		Scrub/Shrub
127	33100 Sonoran Creosote Bush Scrub		Scrub/Shrub
128	33200 Sonoran Desert Mixed Scrub		Scrub/Shrub
129	33210 Sonoran Mixed Woody Scrub		Scrub/Shrub

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
130	33220 Sonoran Mixed Woody and Succulent Scrub	Scrub and Chaparral	Scrub/Shrub
131	33230 Sonoran Wash Scrub		Scrub/Shrub
132	33300 Colorado Desert Wash Scrub		Scrub/Shrub
133	33600 Encelia Scrub		Scrub/Shrub
134	34000 Mojavean Desert Scrub		Scrub/Shrub
135	34300 Blackbush Scrub		Scrub/Shrub
136	35000 Great Basin Scrub		Scrub/Shrub
137	35200 Sagebrush Scrub		Scrub/Shrub
138	35210 Big Sagebrush Scrub		Scrub/Shrub
139	35210 Sagebrush Scrub		Scrub/Shrub
140	36110 Desert Saltbush Scrub		Scrub/Shrub
141	36120 Desert Sink Scrub		Scrub/Shrub
142	37000 Chaparral		Scrub/Shrub
143	37120 Southern Mixed Chaparral		Scrub/Shrub
144	37120 Southern Mixed Chapparal		Scrub/Shrub
145	37121 Granitic Southern Mixed Chaparral		Scrub/Shrub
146	37121 Southern Mixed Chaparral		Scrub/Shrub
147	37122 Mafic Southern Mixed Chaparral		Scrub/Shrub
148	37130 Northern Mixed Chaparral		Scrub/Shrub
149	37131 Granitic Northern Mixed Chaparral		Scrub/Shrub
150	37132 Mafic Northern Mixed Chaparral		Scrub/Shrub
151	37200 Chamise Chaparral		Scrub/Shrub
152	37210 Granitic Chamise Chaparral		Scrub/Shrub
153	37220 Mafic Chamise Chaparral		Scrub/Shrub
154	37300 Red Shank Chaparral		Scrub/Shrub
155	37400 Semi-Desert Chaparral		Scrub/Shrub
156	37500 Montane Chaparral		Scrub/Shrub
157	37510 Mixed Montane Chaparral		Scrub/Shrub
158	37520 Montane Manzanita Chaparral		Scrub/Shrub
159	37530 Montane Ceanothus Chaparral		Scrub/Shrub
160	37540 Montane Scrub Oak Chaparral		Scrub/Shrub
161	37800 Upper Sonoran Ceanothus Chaparral		Scrub/Shrub
162	37830 Ceanothus crassifolius Chaparral		Scrub/Shrub
163	37900 Scrub Oak Chaparral		Scrub/Shrub
164	37A00 Interior Live Oak Chaparral		Scrub/Shrub

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
165	37C30 Southern Maritime Chaparral	Scrub and Chaparral	Scrub/Shrub
166	37G00 Coastal Sage-Chaparral Scrub		Scrub/Shrub
167	37K00 Flat-topped Buckwheat		Scrub/Shrub
168	39000 Upper Sonoran Subshrub Scrub		Scrub/Shrub
169	Diegan Coastal Sage Scrub		Scrub/Shrub
170	Granitic Northern Mixed Chaparral		Scrub/Shrub
171	Southern Mixed Chaparral		Scrub/Shrub
172	11000 Non-Native Vegetation	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Unknown
173	11000 Non-Native VegetionVegetation		Unknown
174	11200 Disturbed Wetland		Unknown
175	11300 Disturbed Habitat		Unknown
176	13000 Unvegetated Habitat		Unknown
177	Disturbed Habitat		Unknown

Table A.1.3: Related Land Cover and Land Use Categories

Land Cover per San Diego County	Land Use per Table A.1.1
Agriculture/Grass	Meadow
Forest	Forest
Scrub/Shrub	Average (Meadow, Forest)
Unknown/Other	Meadow

Table A.1.4: Applicable Hydrologic Response Unit Calculations

Land Cover	Soil	Gradient	Runoff Coeff.	ET Coeff.	Infiltration Coeff.	Runoff/ Infiltration Ratio	Hydrologic Process Designation
Agriculture/Grass	A	0-2%	0.10	0.60	0.30	0.33	I
Agriculture/Grass	A	2-6%	0.16	0.60	0.24	0.67	U
Agriculture/Grass	A	6-10%	0.25	0.60	0.15	1.67	O
Agriculture/Grass	B	0-2%	0.14	0.60	0.26	0.54	I
Agriculture/Grass	B	2-6%	0.22	0.60	0.18	1.22	U
Agriculture/Grass	B	6-10%	0.30	0.60	0.10	3.00	O
Agriculture/Grass	C	0-2%	0.20	0.60	0.20	1.00	U
Agriculture/Grass	C	2-6%	0.28	0.60	0.12	2.33	O
Agriculture/Grass	C	6-10%	0.36	0.60	0.04	9.00	O
Agriculture/Grass	D	0-2%	0.24	0.60	0.16	1.50	U
Agriculture/Grass	D	2-6%	0.30	0.60	0.10	3.00	O
Agriculture/Grass	D	6-10%	0.40	0.60	0.00	infinite	O

Land Cover	Soil	Gradient	Runoff Coeff.	ET Coeff.	Infiltration Coeff.	Runoff/ Infiltration Ratio	Hydrologic Process Designation
Forest	A	0-2%	0.05	0.80	0.15	0.33	I
Forest	A	2-6%	0.08	0.80	0.12	0.67	U
Forest	A	6-10%	0.11	0.80	0.09	1.22	U
Forest	B	0-2%	0.08	0.80	0.12	0.67	U
Forest	B	2-6%	0.11	0.80	0.09	1.22	U
Forest	B	6-10%	0.14	0.80	0.06	2.33	O
Forest	C	0-2%	0.10	0.80	0.10	1.00	U
Forest	C	2-6%	0.13	0.80	0.07	1.86	O
Forest	C	6-10%	0.16	0.80	0.04	4.00	O
Forest	D	0-2%	0.12	0.80	0.08	1.50	U
Forest	D	2-6%	0.16	0.80	0.04	4.00	O
Forest	D	6-10%	0.20	0.80	0.00	infinite	O
Scrub/Shrub	A	0-2%	0.08	0.70	0.23	0.33	I
Scrub/Shrub	A	2-6%	0.12	0.70	0.18	0.67	U
Scrub/Shrub	A	6-10%	0.18	0.70	0.12	1.50	U
Scrub/Shrub	B	0-2%	0.11	0.70	0.19	0.58	I
Scrub/Shrub	B	2-6%	0.17	0.70	0.14	1.22	U
Scrub/Shrub	B	6-10%	0.22	0.70	0.08	2.75	O
Scrub/Shrub	C	0-2%	0.15	0.70	0.15	1.00	U
Scrub/Shrub	C	2-6%	0.21	0.70	0.10	2.16	O
Scrub/Shrub	C	6-10%	0.26	0.70	0.04	6.50	O
Scrub/Shrub	D	0-2%	0.19	0.70	0.12	1.50	U
Scrub/Shrub	D	2-6%	0.23	0.70	0.07	3.29	O
Scrub/Shrub	D	6-10%	0.30	0.70	0.00	infinite	O

Hydrologic Process Designation: I = Interflow; O = Overland Flow; U = Uncertain

Table A.1.5: Hydrologic Response Unit Designations

Land Cover	Slope	Soil Type				
		A	B	C	D	Other (fill/water)
Agriculture/ Grass/Unknown/ Other	0-2%	I	I	U	U	U
	2-6%	U	U	O	O	U
	6-10%	O	O	O	O	O
	>10%	O	O	O	O	O
Developed	0-2%	O	O	O	O	O
	2-6%	O	O	O	O	O
	6-10%	O	O	O	O	O
	>10%	O	O	O	O	O
Forest	0-2%	I	U	U	U	U
	2-6%	U	U	O	O	U
	6-10%	U	O	O	O	U
	>10%	O	O	O	O	O
Scrub/Shrub	0-2%	I	I	U	U	U
	2-6%	U	U	O	O	U
	6-10%	U	O	O	O	U
	>10%	O	O	O	O	O

Hydrologic Process Designation: I = Interflow; O = Overland Flow; U = Uncertain

Exhibit Showing Dominant Hydrologic Processes

San Diego River Watershed - HU 907.00, 436 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

ATTACHMENT A.2

STREAM CHARACTERIZATION

Watershed Management Area Streams

San Diego River Watershed - HU 907.00, 436 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

Watershed Management Area Streams by Hydrographic Category

San Diego River Watershed - HU 907.00, 436 mi2

Exhibit Date: Sept. 8, 2014

Miles 0 25 50 100 150

NORTH

Watershed Management Area Streams by Bed Material

San Diego River Watershed - HU 907.00, 436 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

Watershed Management Area Streams by Geologic Group

San Diego River Watershed - HU 907.00, 436 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

Watershed Management Area Streams by Reach Type

San Diego River Watershed - HU 907.00, 436 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

ATTACHMENT A.3

LAND USES

Existing Land Use

San Diego River Watershed - HU 907.00, 436 mi2

Exhibit Date: Sept. 8, 2014

Planned Land Use

San Diego River Watershed - HU 907.00, 436 mi2

Exhibit Date: Sept. 8, 2014

Developable Land

San Diego River Watershed - HU 907.00, 436 mi2

Exhibit Date: Sept. 8, 2014

Redevelopment and Infill Areas

San Diego River Watershed - HU 907.00, 436 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

ATTACHMENT A.4

POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS

A.4.1 Geology Grouping

Geologic grouping was based on the mapped geologic unit as determined by published geologic mapping information. The following describes the methodology utilized to determine bedrock or sedimentary characteristics, anticipated grain size, and suitability for infiltration. A complete list of the various geologic maps used in this evaluation is listed in Chapter 6.

Due to the various mapped scales of the published data and differing mapped unit names, the geologic units were initially compiled into similar categories where possible. For example, the Lindavista Formation is mapped as unit Ql on geologic maps at a scale of 1:24,000 but correlates to the same unit Qvop8 on geologic maps at a scale of 1:100,000. Following the compilation of geologic unit names, the units were differentiated between crystalline bedrock and sedimentary formations based on geologic characterization and material behavior. The Point Loma Formation for example, is a Cretaceous-age sandstone, but it was classified as a “coarse bedrock” unit due to its indurated and resistant nature.

For each site location, the predominant geologic units were then described as “coarse” or “fine” based on typical weathering characteristics of the bedrock units, or primary grain size of the sedimentary units. For example, granodiorite or tonalite crystalline rock typically weathers to a coarse material such as a silty sand and therefore was classified as “coarse,” compared to a gabbro which generally weathers to a sandy clay and was characterized as “fine.” Sedimentary formations can be more variable, such as the Mission Valley Formation. In this case, the Mission Valley Formation was characterized as “coarse” since the unit is predominantly comprised of sandstone even if it does contain localities of siltstone and claystone within the unit.

To further characterize the sedimentary formations, these units were evaluated for suitability of infiltration. Since no field investigations were performed for this evaluation to determine permeability, the differentiation between impermeable and permeable were based on the age of the geologic unit with the assumption that relatively younger sedimentary units of Pleistocene-age or younger (<1.6 mya) would be more susceptible to surface water infiltration. Geology grouping of different map units is presented in Table A.4.1

Table A.4.1 Geologic grouping for different map units

Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
gr-m	Jennings; CA	Coarse	Bedrock	Impermeable	CB
grMz	Jennings; CA	Coarse	Bedrock	Impermeable	CB
Jcr	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Jhc	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Jsp	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Ka	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kbm	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kbp	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kcc	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kcg	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kcm	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kcp	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kd	San Diego & Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kdl	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kg	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgbf	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgd	San Diego & Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgdf	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgh	San Diego 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgm	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgm1	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgm2	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgm3	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgm4	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgp	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgr	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgu	San Diego 30' x 60'	Coarse	Bedrock	Impermeable	CB
Khg	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Ki	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kis	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kjd	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
KJem	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
KJld	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kjv	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB

Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
Klb	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Klh	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Klp	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Km	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kmg	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kmgp	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kmm	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kpa	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kpv	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kqbd	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kr	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Krm	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Krr	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kt	San Diego & Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Ktr	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kvc	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kwm	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kwp	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kwsr	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
m	Jennings; CA	Coarse	Bedrock	Impermeable	CB
Mzd	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Mzg	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Mzq	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Mzs	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
sch	Jennings; CA	Coarse	Bedrock	Impermeable	CB
Kp	San Diego & Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Ql	El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
QTf	El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Ec	Jennings; CA	Coarse	Sedimentary	Impermeable	CSI
K	Jennings; CA	Coarse	Sedimentary	Impermeable	CSI
Kccg	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Kcs	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Kl	San Diego, Oceanside & El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Ku	Jennings; CA	Coarse	Sedimentary	Impermeable	CSI

Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
Qvof	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop8a	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop9a	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tmsc	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tmss	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tp	San Diego & El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tpm	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsc	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tscu	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsd	San Diego & El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsdcg	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsdss	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsm	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tso	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tst	San Diego, Oceanside & El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tt	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tta	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tmv	San Diego, Oceanside & El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsi	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvoa	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvoa11	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvoa12	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvoa13	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvoc	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop1	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop10	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop10a	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop11	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI

Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
Qvop11a	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop12	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop13	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop2	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop3	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop4	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop5	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop6	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop7	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop8	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop9	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsa	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qof	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qof1	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qof2	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Q	Jennings; CA	Coarse	Sedimentary	Permeable	CSP
Qa	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qd	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qf	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qmb	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qw	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qyf	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qt	El Cajon 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa1-2	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa2-6	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa5	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa6	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa7	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP

Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
Qoc	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop1	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qc	El Cajon 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qu	El Cajon 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa	San Diego, Oceanside & El Cajon 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop2-4	San Diego 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop3	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop4	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop6	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop7	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qya	San Diego, Oceanside & El Cajon 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qyc	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Mzu	San Diego & Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
gb	Jennings; CA	Fine	Bedrock	Impermeable	FB
JTRm	El Cajon 30' x 60'	Fine	Bedrock	Impermeable	FB
Kat	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Kc	El Cajon 30' x 60'	Fine	Bedrock	Impermeable	FB
Kgb	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
KJvs	El Cajon 30' x 60'	Fine	Bedrock	Impermeable	FB
Kmv	El Cajon 30' x 60'	Fine	Bedrock	Impermeable	FB
Ksp	El Cajon 30' x 60'	Fine	Bedrock	Impermeable	FB
Kvsp	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Kwmt	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Qv	Jennings; CA	Fine	Bedrock	Impermeable	FB
Tba	San Diego 30' x 60'	Fine	Bedrock	Impermeable	FB
Tda	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Tv	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Tvsr	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Kgdfg	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Ta	San Diego 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Tcs	Oceanside 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Td	San Diego & Oceanside	Fine	Sedimentary	Impermeable	FSI

Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
	30' x 60'				
Td+Tf	San Diego 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Qls	San Diego, Oceanside & El Cajon 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Tm	Oceanside 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Tf	San Diego, Oceanside & El Cajon 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Tfr	El Cajon 30' x 60'	Fine	Sedimentary	Impermeable	FSI
To	San Diego & El Cajon 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Qpe	San Diego & Oceanside 30' x 60'	Fine	Sedimentary	Permeable	FSP
Mexico	San Diego 30' x 60'	NA	NA	Permeable	Other
Kuo	San Diego 30' x 60'	NA (Offshore)	NA	Permeable	Other
Teo	San Diego & Oceanside 30' x 60'	NA (Offshore)	Sedimentary	Permeable	Other
Tmo	Oceanside 30' x 60'	NA (Offshore)	Sedimentary	Permeable	Other
Qmo	San Diego 30' x 60'	NA (Offshore)	Sedimentary	Permeable	Other
QTso	San Diego 30' x 60'	NA (Offshore)	Sedimentary	Permeable	Other
af	San Diego & Oceanside 30' x 60'	Variable, dependent on source material	Sedimentary		Other

A.4.2 Quantitative Analysis

Soil loss estimates for each Geomorphic Landscape Unit were estimated using the Revised Universal Soil Loss Equation (RUSLE; Renard et al. 1997) listed below:

$$A = R \times K \times LS \times C \times P$$

Where

A = estimated average soil loss in tons/acre/year

R = rainfall-runoff erosivity factor

K = soil erodibility factor

LS = slope length and steepness factor

C = cover-management factor

P = support practice factor; assumed 1 for this analysis

Regional datasets used to estimate the inputs required to estimate the soil loss from each GLU are listed in table below:

Dataset	Source	Download year	Description
RUSLE – R Factor	SWRCB	2014	Regional R factor map was downloaded from ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwq/cgp/Risk/RUSLE/RUSLE_R_Factor/
RUSLE – K Factor	SWRCB	2014	Regional K factor map was downloaded from ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwq/cgp/Risk/RUSLE/RUSLE_K_Factor/
RUSLE – LS Factor	SWRCB	2014	Regional LS factor map was downloaded from ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwq/cgp/Risk/RUSLE/RUSLE_LS_Factor/
RUSLE – C Factor	USEPA	2014	Regional C factor map was downloaded from http://www.epa.gov/esd/land-sci/emap_west_browser/pages/wemap_mm_sl_rusle_c_qt.htm#mapnav

GIS analysis was used to calculate the area weighted estimate of R, K, LS and C factors using the regional datasets listed in the table above. For the developed land cover the C factor was then adjusted to 0 from the regional estimate to account for management actions implemented on developed sites (e.g. impervious surfaces). Soil loss estimates ranged from 0 to 15.2 tons/acre/year.

For evaluating the degree of relative risk to a stream solely arising from changes in sediment and/or water delivery SCCWRP Technical Report 605, 2010 states:

> *"The challenge in implementing this step is that presently we have insufficient basis to defensibly identify either low-risk or high-risk conditions using these metrics. For example, channels that are close to a threshold for geomorphic change may display significant morphological changes under nothing more than natural year-to-year variability in flow or sediment load.*

- *Acknowledging this caveat, we nonetheless anticipate that changes of less than 10% in either driver are unlikely to instigate, on their own, significant channel changes. This value is a conservative estimate of the year-to-year variability in either discharge or sediment flux that can be accommodated by a channel system in a state of dynamic equilibrium. It does not "guarantee," however, that channel change may not occur—either in response to yet modest alterations in water or sediment delivery, or because of other urbanization impacts (e.g., point discharge of runoff or the trapping of the upstream sediment flux; see Booth 1990) that are not represented with this analysis.*
- *In contrast, recognizing a condition of undisputed "high risk" must await broader collection of regionally relevant data. We note that >60% reductions in predicted sediment production have resulted in both minimal (McGonigle) and dramatic (Agua Hedionda) channel changes, indicating that "more data" may never provide absolute guidance. At present, we suggest using predicted watershed changes of 50% or more in either runoff (as indexed by change in impervious area) or sediment production as provisional criteria for requiring a more detailed evaluation of both the drivers and the resisting factors for channel change, regardless of other screening-level assessments. Clearly, however, only more experience with the application of such "thresholds," and the actual channel conditions that accompany them, will provide a defensible basis for setting numeric standards."*

The following criterion was developed using the suggestions listed above and then used to assign relative sediment production rating to each GLU:

- Low: Soil Loss < 5.6 tons/acre/year [GLUs that have a soil loss of 0 to 5.6 tons/acre/year produces around 10% of the total coarse sediment soil loss from the study area]
- Medium: 5.6 tons/acre/year < Soil Loss < 8.4 tons/acre/year
- High: > 8.4 tons/acre/year [GLUs that have a soil loss greater than 8.4 tons/acre/year produces around 42% of the total coarse sediment soil loss from the study area]

Results from the quantitative analysis are summarized in Table A.4.2.

Table A.4.2 Relative Sediment Production for different Geomorphic Landscape Units

Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
CB-Agricultural/Grass-1	52883	0.20	4.67	0.14	50	6.5	Medium	No
CB-Agricultural/Grass-2	40633	0.21	5.19	0.14	56	8.3	Medium	No
CB-Agricultural/Grass-3	32617	0.22	6.04	0.14	57	10.6	High	Yes
CB-Agricultural/Grass-4	11066	0.23	7.38	0.14	57	13.5	High	Yes
CB-Developed-1	39746	0.22	3.77	0	49	0	Low	No
CB-Developed-2	32614	0.22	4.28	0	50	0	Low	No
CB-Developed-3	15841	0.22	4.86	0	49	0	Low	No
CB-Developed-4	1805	0.22	5.63	0	48	0	Low	No
CB-Forest-1	32231	0.20	6.38	0.14	39	6.8	Medium	No
CB-Forest-2	38507	0.20	7.20	0.13	45	8.8	High	Yes
CB-Forest-3	55303	0.20	8.14	0.13	48	10.6	High	Yes
CB-Forest-4	38217	0.20	9.95	0.14	50	13.6	High	Yes
CB-Other-1	1036	0.20	5.52	0.13	45	6.5	Medium	No
CB-Other-2	317	0.20	6.46	0.13	45	7.9	Medium	No
CB-Other-3	296	0.20	6.96	0.14	43	8.3	Medium	No
CB-Other-4	111	0.21	6.84	0.14	41	8.2	Medium	No
CB-Scrub/Shrub-1	88135	0.20	5.66	0.14	33	5.3	Low	No
CB-Scrub/Shrub-2	143694	0.20	6.51	0.14	37	6.8	Medium	No
CB-Scrub/Shrub-3	246703	0.21	7.33	0.14	41	8.4	Medium	No
CB-Scrub/Shrub-4	191150	0.21	8.28	0.14	42	9.8	High	No
CB-Unknown-1	1727	0.21	5.32	0.13	44	6.3	Medium	No
CB-Unknown-2	1935	0.21	5.95	0.13	44	7.1	Medium	No

Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
CB-Unknown-3	1539	0.22	6.21	0.13	44	7.7	Medium	No
CB-Unknown-4	278	0.22	6.61	0.13	44	8.4	High	Yes
CSI-Agricultural/Grass-1	14609	0.34	2.72	0.14	39	4.8	Low	No
CSI-Agricultural/Grass-2	9059	0.37	3.61	0.14	47	8.7	High	Yes
CSI-Agricultural/Grass-3	10096	0.38	3.99	0.14	47	9.8	High	Yes
CSI-Agricultural/Grass-4	2498	0.37	4.33	0.14	47	10.5	High	Yes
CSI-Developed-1	82371	0.28	2.51	0	39	0	Low	No
CSI-Developed-2	22570	0.30	2.66	0	41	0	Low	No
CSI-Developed-3	13675	0.30	2.89	0	40	0	Low	No
CSI-Developed-4	3064	0.27	3.20	0	39	0	Low	No
CSI-Forest-1	449	0.27	4.26	0.13	43	6.6	Medium	No
CSI-Forest-2	611	0.25	5.11	0.13	44	7.5	Medium	No
CSI-Forest-3	716	0.29	4.43	0.13	44	7.4	Medium	No
CSI-Forest-4	348	0.30	4.49	0.13	43	7.6	Medium	No
CSI-Other-1	319	0.31	2.50	0.13	32	3.2	Low	No
CSI-Other-2	83	0.27	3.01	0.13	39	4.3	Low	No
CSI-Other-3	45	0.28	3.03	0.13	39	4.5	Low	No
CSI-Other-4	13	0.24	4.01	0.14	39	5.2	Low	No
CSI-Scrub/Shrub-1	9051	0.26	3.53	0.13	39	4.7	Low	No
CSI-Scrub/Shrub-2	10802	0.27	4.36	0.13	41	6.3	Medium	No
CSI-Scrub/Shrub-3	28220	0.26	4.82	0.13	41	6.7	Medium	No
CSI-Scrub/Shrub-4	20510	0.26	5.52	0.13	41	7.8	Medium	No
CSI-Unknown-1	5292	0.28	2.38	0.13	36	3.1	Low	No

Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
CSI-Unknown-2	2074	0.29	2.98	0.13	40	4.5	Low	No
CSI-Unknown-3	2171	0.27	3.04	0.13	39	4.2	Low	No
CSI-Unknown-4	676	0.26	3.04	0.13	38	3.8	Low	No
CSP-Agricultural/Grass-1	59327	0.22	3.01	0.14	44	4.0	Low	No
CSP-Agricultural/Grass-2	8426	0.23	3.81	0.14	42	5.2	Low	No
CSP-Agricultural/Grass-3	2377	0.24	4.05	0.14	41	5.6	Low	No
CSP-Agricultural/Grass-4	291	0.22	6.28	0.14	52	10.1	High	Yes
CSP-Developed-1	85283	0.27	2.10	0	42	0	Low	No
CSP-Developed-2	7513	0.26	2.77	0	42	0	Low	No
CSP-Developed-3	2317	0.27	2.70	0	40	0	Low	No
CSP-Developed-4	272	0.27	2.76	0	38	0	Low	No
CSP-Forest-1	14738	0.22	4.52	0.14	44	6.0	Medium	No
CSP-Forest-2	3737	0.22	5.99	0.14	45	8.2	Medium	No
CSP-Forest-3	1858	0.21	6.42	0.14	45	8.5	High	Yes
CSP-Forest-4	484	0.21	7.62	0.14	48	10.2	High	Yes
CSP-Other-1	7404	0.23	2.61	0.14	39	3.2	Low	No
CSP-Other-2	343	0.24	3.68	0.13	40	4.8	Low	No
CSP-Other-3	126	0.24	3.76	0.13	40	4.9	Low	No
CSP-Other-4	17	0.24	4.19	0.13	39	5.3	Low	No
CSP-Scrub/Shrub-1	22583	0.23	3.75	0.14	41	4.8	Low	No
CSP-Scrub/Shrub-2	8938	0.24	5.63	0.14	40	7.1	Medium	No
CSP-Scrub/Shrub-3	7186	0.23	6.15	0.13	39	7.5	Medium	No
CSP-Scrub/Shrub-4	2609	0.22	7.16	0.14	43	9.3	High	Yes

Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
CSP-Unknown-1	6186	0.25	2.63	0.13	40	3.4	Low	No
CSP-Unknown-2	744	0.27	3.49	0.13	39	4.8	Low	No
CSP-Unknown-3	350	0.28	3.32	0.13	38	4.5	Low	No
CSP-Unknown-4	78	0.28	3.26	0.13	40	4.5	Low	No
FB-Agricultural/Grass-1	6103	0.25	5.49	0.14	49	9.2	High	No
FB-Agricultural/Grass-2	7205	0.25	5.87	0.14	51	10.1	High	No
FB-Agricultural/Grass-3	6730	0.24	6.43	0.14	53	11.3	High	No
FB-Agricultural/Grass-4	2586	0.22	8.62	0.14	57	15.2	High	No
FB-Developed-1	10116	0.28	3.94	0	46	0	Low	No
FB-Developed-2	9075	0.28	4.41	0	45	0	Low	No
FB-Developed-3	5499	0.27	4.72	0	44	0	Low	No
FB-Developed-4	785	0.27	5.08	0	43	0	Low	No
FB-Forest-1	3780	0.21	7.24	0.13	39	8.0	Medium	No
FB-Forest-2	7059	0.21	7.53	0.13	43	8.8	High	No
FB-Forest-3	13753	0.22	8.02	0.13	43	9.7	High	No
FB-Forest-4	8899	0.26	9.63	0.13	35	11.5	High	No
FB-Other-1	172	0.26	5.72	0.13	44	8.6	High	No
FB-Other-2	75	0.26	5.97	0.13	38	7.7	Medium	No
FB-Other-3	76	0.28	6.27	0.13	34	7.6	Medium	No
FB-Other-4	36	0.31	6.70	0.13	33	8.6	High	No
FB-Scrub/Shrub-1	10297	0.24	6.94	0.14	36	8.3	Medium	No
FB-Scrub/Shrub-2	25150	0.25	7.24	0.14	38	9.0	High	No
FB-Scrub/Shrub-3	70895	0.25	7.89	0.13	38	10.0	High	No

Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
FB-Scrub/Shrub-4	70679	0.26	9.05	0.14	39	12.1	High	No
FB-Unknown-1	654	0.30	5.33	0.13	37	7.6	Medium	No
FB-Unknown-2	829	0.29	5.26	0.13	40	7.9	Medium	No
FB-Unknown-3	1062	0.29	5.54	0.13	39	8.2	Medium	No
FB-Unknown-4	299	0.28	6.02	0.13	38	8.4	High	No
FSI-Agricultural/Grass-1	8462	0.32	3.91	0.13	24	3.9	Low	No
FSI-Agricultural/Grass-2	4979	0.33	4.29	0.13	31	5.7	Medium	No
FSI-Agricultural/Grass-3	4808	0.34	4.26	0.13	34	6.3	Medium	No
FSI-Agricultural/Grass-4	1055	0.35	4.11	0.13	36	6.7	Medium	No
FSI-Developed-1	9953	0.29	3.09	0	34	0	Low	No
FSI-Developed-2	4972	0.31	3.22	0	37	0	Low	No
FSI-Developed-3	3350	0.29	3.30	0	36	0	Low	No
FSI-Developed-4	763	0.28	3.31	0	37	0	Low	No
FSI-Forest-1	186	0.33	4.62	0.13	37	7.2	Medium	No
FSI-Forest-2	217	0.35	4.47	0.13	39	7.9	Medium	No
FSI-Forest-3	262	0.37	4.71	0.13	40	9.2	High	No
FSI-Forest-4	111	0.36	4.73	0.13	40	9.2	High	No
FSI-Other-1	266	0.31	3.11	0.13	24	2.9	Low	No
FSI-Other-2	81	0.30	3.29	0.13	25	3.1	Low	No
FSI-Other-3	56	0.31	3.04	0.13	27	3.2	Low	No
FSI-Other-4	15	0.29	3.57	0.13	33	4.4	Low	No
FSI-Scrub/Shrub-1	2241	0.27	4.46	0.13	29	4.5	Low	No
FSI-Scrub/Shrub-2	3911	0.28	4.96	0.13	31	5.7	Medium	No

Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
FSI-Scrub/Shrub-3	7590	0.29	5.05	0.13	34	6.3	Medium	No
FSI-Scrub/Shrub-4	3502	0.30	5.14	0.13	37	7.5	Medium	No
FSI-Unknown-1	1117	0.29	2.83	0.13	27	3.0	Low	No
FSI-Unknown-2	780	0.30	3.44	0.13	32	4.3	Low	No
FSI-Unknown-3	855	0.29	3.41	0.13	31	4.0	Low	No
FSI-Unknown-4	285	0.28	3.21	0.13	32	3.7	Low	No
FSP-Agricultural/Grass-1	13	0.22	2.22	0.13	40	2.5	Low	No
FSP-Agricultural/Grass-2	3	0.22	2.59	0.13	40	3.0	Low	No
FSP-Agricultural/Grass-3	2	0.22	2.69	0.13	40	3.2	Low	No
FSP-Agricultural/Grass-4	0	0.20	2.94	0.12	40	2.9	Low	No
FSP-Developed-1	180	0.26	2.85	0	40	0	Low	No
FSP-Developed-2	13	0.25	2.69	0	40	0	Low	No
FSP-Developed-3	8	0.21	2.25	0	40	0	Low	No
FSP-Developed-4	0	0.21	2.29	0	40	0	Low	No
FSP-Forest-1	8	0.22	2.29	0.14	40	2.9	Low	No
FSP-Forest-2	5	0.20	2.22	0.14	40	2.5	Low	No
FSP-Forest-3	0	0.20	2.22	0.14	40	2.5	Low	No
FSP-Other-1	1307	0.20	2.38	0.14	40	2.7	Low	No
FSP-Other-2	34	0.21	2.36	0.14	40	2.7	Low	No
FSP-Other-3	8	0.22	2.56	0.13	40	3.0	Low	No
FSP-Other-4	0	0.43	4.35	0.12	40	9.3	High	No
FSP-Scrub/Shrub-1	147	0.23	2.68	0.14	40	3.3	Low	No
FSP-Scrub/Shrub-2	18	0.23	2.55	0.14	40	3.3	Low	No

Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
FSP-Scrub/Shrub-3	4	0.20	2.23	0.14	40	2.6	Low	No
FSP-Scrub/Shrub-4	0	0.20	1.70	0.12	40	1.7	Low	No
FSP-Unknown-1	40	0.20	1.87	0.13	40	1.9	Low	No
FSP-Unknown-2	5	0.20	1.99	0.12	40	2.0	Low	No
FSP-Unknown-3	1	0.20	2.39	0.12	40	2.4	Low	No
O-Agricultural/Grass-1	2433	0.20	2.93	0.14	34	2.8	Low	No
O-Agricultural/Grass-2	112	0.21	3.44	0.14	32	3.2	Low	No
O-Agricultural/Grass-3	30	0.23	3.89	0.13	32	3.8	Low	No
O-Agricultural/Grass-4	1	0.26	6.47	0.13	37	7.9	Medium	No
O-Developed-1	8327	0.27	1.37	0	39	0	Low	No
O-Developed-2	474	0.25	2.12	0	40	0	Low	No
O-Developed-3	157	0.26	3.07	0	41	0	Low	No
O-Developed-4	26	0.24	3.89	0	41	0	Low	No
O-Forest-1	235	0.22	6.15	0.13	43	7.6	Medium	No
O-Forest-2	67	0.21	5.07	0.13	45	6.6	Medium	No
O-Forest-3	45	0.21	5.43	0.13	47	7.3	Medium	No
O-Forest-4	20	0.20	5.95	0.13	59	9.0	High	No
O-Other-1	9362	0.25	3.86	0.13	36	4.3	Low	No
O-Other-2	344	0.24	3.32	0.13	35	3.5	Low	No
O-Other-3	120	0.23	4.86	0.13	35	5.0	Low	No
O-Other-4	37	0.22	5.64	0.13	39	6.6	Medium	No
O-Scrub/Shrub-1	688	0.22	4.83	0.13	40	5.7	Medium	No
O-Scrub/Shrub-2	224	0.22	5.80	0.13	36	6.3	Medium	No

Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
O-Scrub/Shrub-3	209	0.22	6.47	0.13	41	7.5	Medium	No
O-Scrub/Shrub-4	96	0.22	6.62	0.13	44	8.2	Medium	No
O-Unknown-1	1236	0.28	1.60	0.12	26	1.5	Low	No
O-Unknown-2	62	0.27	1.48	0.13	36	1.8	Low	No
O-Unknown-3	15	0.29	3.52	0.13	38	4.9	Low	No
O-Unknown-4	7	0.34	3.87	0.12	40	6.6	Medium	No

GLU Nomenclature: Geology – Land Cover – Slope Category

Geology Categories:

CB Coarse Bedrock

CSI Coarse Sedimentary Impermeable

CSP Coarse Sedimentary Permeable

FB Fine Bedrock

FSI Fine Sedimentary Impermeable

FSP Fine Sedimentary Permeable

O Other

Slope Categories:

1 0%-10%

2 10% - 20%

3 20% - 40%

4 > 40%

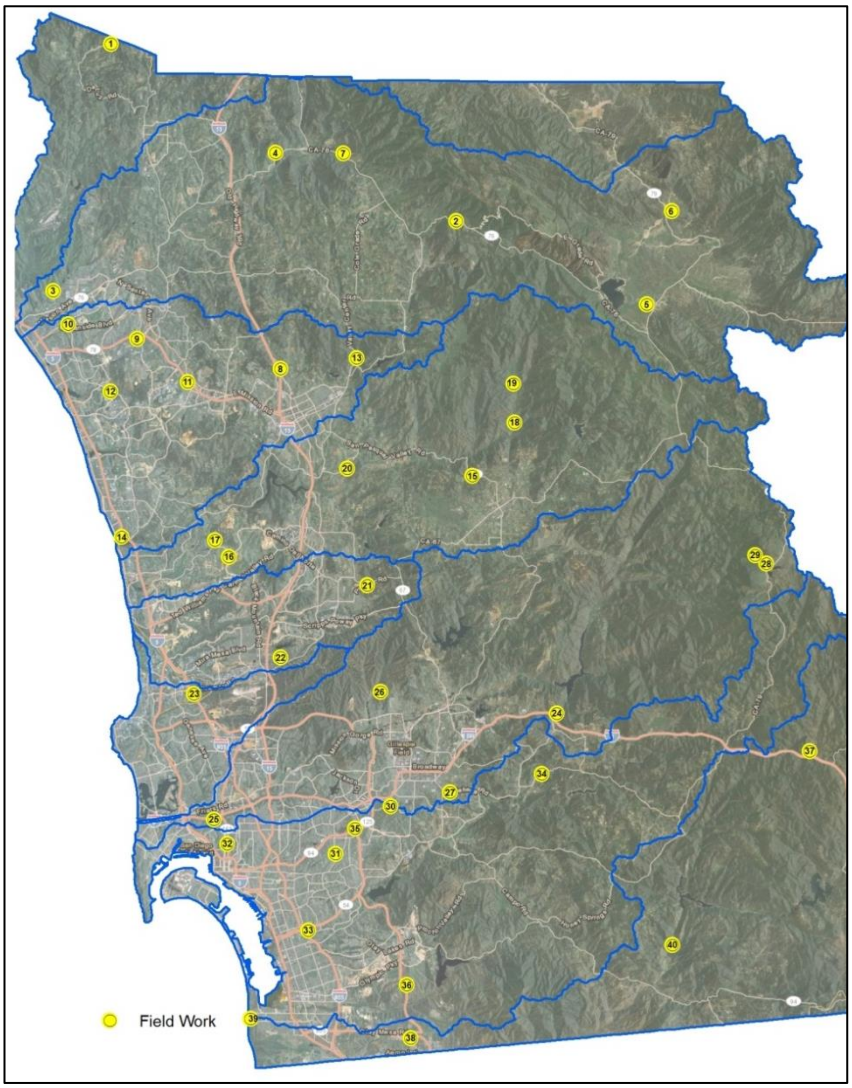
A4.3 Field Assessment

Site Selection:

Forty locations were selected from the study region for field assessment. Sites were selected such that they are accessible by existing road network based on review of satellite imagery and are uniformly distributed considering the following criteria:

- Geologic grouping
- Land cover
- Slope category
- WMA
- Jurisdiction

Yellow circles in the figure below shows the 40 locations for which field assessment was performed.



Pre-Field Activities

Prior to conducting field activities, the consultant team reviewed available published geologic information at each site location and prepared satellite imagery of each site using Google Earth™. Pre-field activities consisted of evaluating site access at each location using aerial imagery and logistics were coordinated based on regional site location to maximize field efficiency.

Site Reconnaissance

Site reconnaissance was performed at forty locations between 22 January and 7 February 2014 by a team of geologists. The reconnaissance consisted of:

- Visual soil classification,
- Assessing existing vegetative cover (0-100%),
- Qualitative assignment of existing sediment production (low, medium, and high) [based on existing vegetative cover],
- Qualitative assignment of potential sediment production (low, medium, and high)[assuming there is 0% vegetative cover], and
- Identifying existing erosional features.

Descriptions and visual classifications of the surficial materials were based on the Unified Soil Classification System (USCS). Underlying geologic units were confirmed where exposed formations were observed within the individual site limits.

SITE AND GEOLOGIC CONDTIONS

Our knowledge of the site conditions has been developed from a review of available geologic literature, previous geologic and geotechnical investigations by the consultant team in the study region, professional experience, site reconnaissance, and field investigations performed for this study.

Surface Conditions

Site locations were sited in open space with the exception of sites ID-27, -30, and -31 which were situated within developed areas with paved streets and sidewalks. The surface conditions at the site locations were characterized by sloping terrain varying from relatively flat (< 5%) to very steep slopes (> 40%). At the time of our reconnaissance the natural hillsides along the areas of interest were covered by varying degrees of moderate to dense growth scrub brush, low grasses, and scattered trees.

Existing erosional and geomorphic features at each site location were identified where possible. The observed erosional features included notable drainages, rilling, scour, and sediment accumulation. Observed geomorphic features included areas of minor slope instability and surficial slumping. Several sources of ground disturbance were identified during the site reconnaissance included active grading operations and bioturbation.

An evaluation of the existing and potential sediment production for each site was determined based on surface conditions. Sediment production was assigned as “high, medium, or low” based on the existing conditions and consultant team’s professional experience.

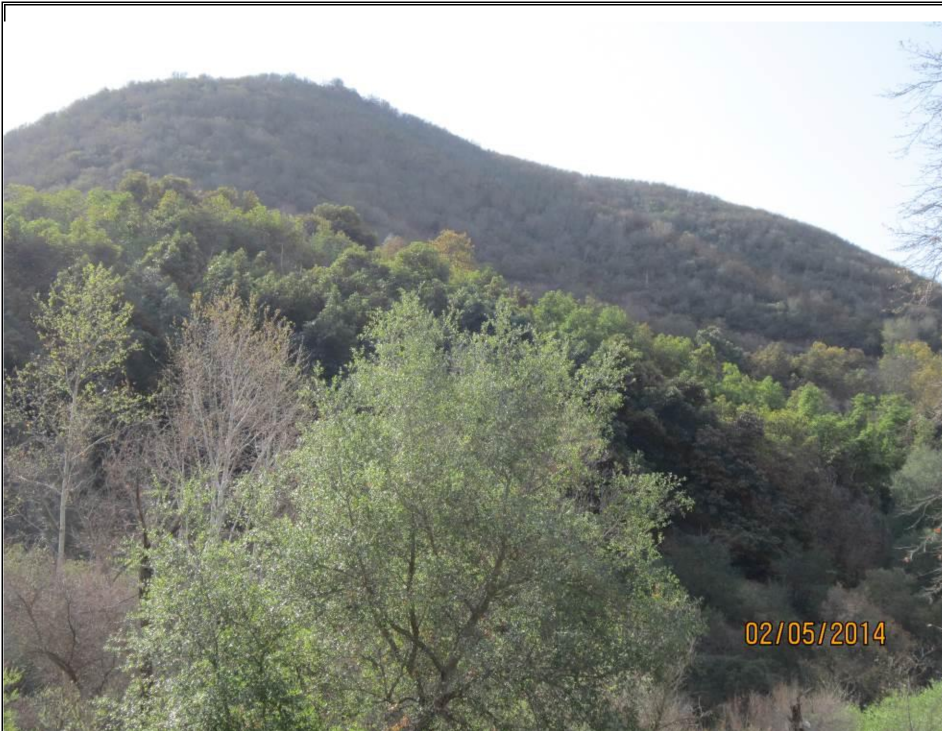
Surficial Deposits

Surficial deposits, including topsoil, alluvium, colluvium, slopewash, and residual soils are present in portions of the study area within the natural drainages and mantling the slope areas. The composition and grain size of these materials are variable depending on the age, parent sources, and mode of deposition.

Geologic Conditions

Our knowledge of the subsurface conditions at the site locations is based on a review of available published geologic information, professional experience, site reconnaissance, previous explorations and geotechnical investigations performed by the consultant team in the study region.

Field Assessment Photo Log



Field Visit ID-1

GLU: CB-Scrub/Shrub-4

View: Looking southwest

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 90%

Field Visit ID-2

GLU: CB-Forest-4

View: Looking north

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 95%

<table>
<tr><td>
</td><td>Field Visit ID-3
GLU: CSI-Agricultural/ Grass-3

View: Looking southwest

Existing sediment production: Low to Med

Potential sediment production:
Med to High

Existing veg. cover:
95-100%</td></tr>
</table>

<table>
<tr><td>
</td><td>Field Visit ID-4
GLU: CSI-Scrub/Shrub-2

View: Looking north

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 70%</td></tr>
</table>

	**Field Visit ID-5** **GLU: CSP-Agricultural/ Grass-1** View: Looking southwest Existing sediment production: Low to Med Potential sediment production: Med Existing veg. cover: 90%

	**Field Visit ID-6** **GLU: CSP-Agricultural/ Grass-3** View: Looking east Existing sediment production: Low to Med Potential sediment production: Low to Med Existing veg. cover: Southeast slope ~50% Northeast slope ~70%

	**Field Visit ID-7** **GLU: CSP-Forest-3** View: Looking east Existing sediment production: Med to High Potential sediment production: High Existing veg. cover: 75-80%

	**Field Visit ID-8** **GLU: CB-Scrub/Shrub-3** View: Looking southeast Existing sediment production: Low to Med Potential sediment production: Med to High Existing veg. cover: 90-95%

<table>
<tr><td>
</td><td>Field Visit ID-9
GLU: CB-Agricultural/ Grass-2

View: Looking northwest

Existing sediment production: Low to Med

Potential sediment production: Med

Existing veg. cover: 70%</td></tr>
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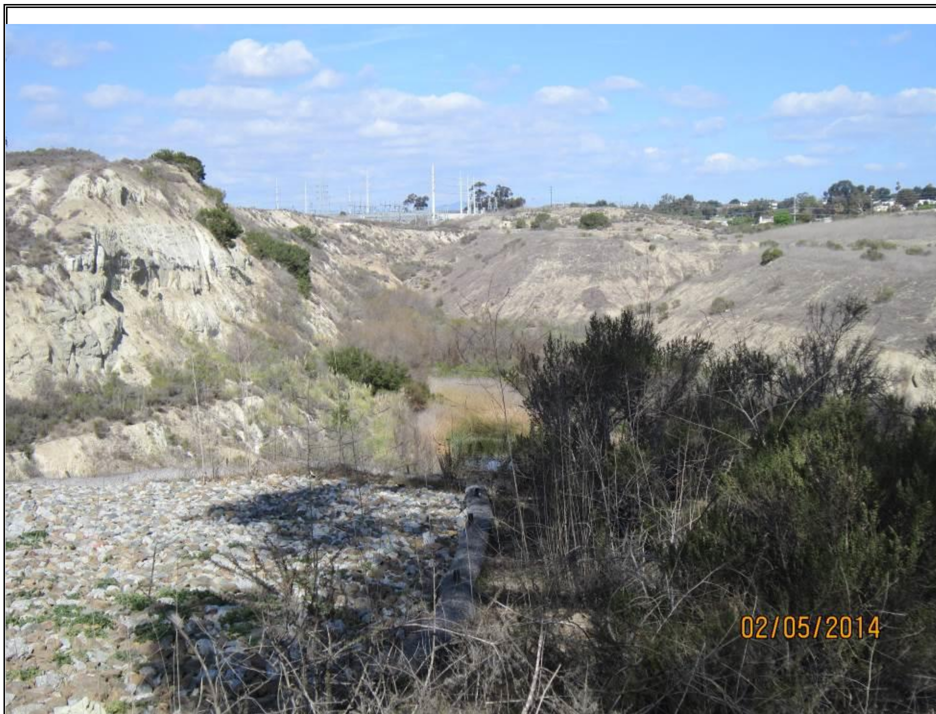
<tr><td>
</td><td>Field Visit ID-10
GLU: CSI-Unknown-2

View: Looking north

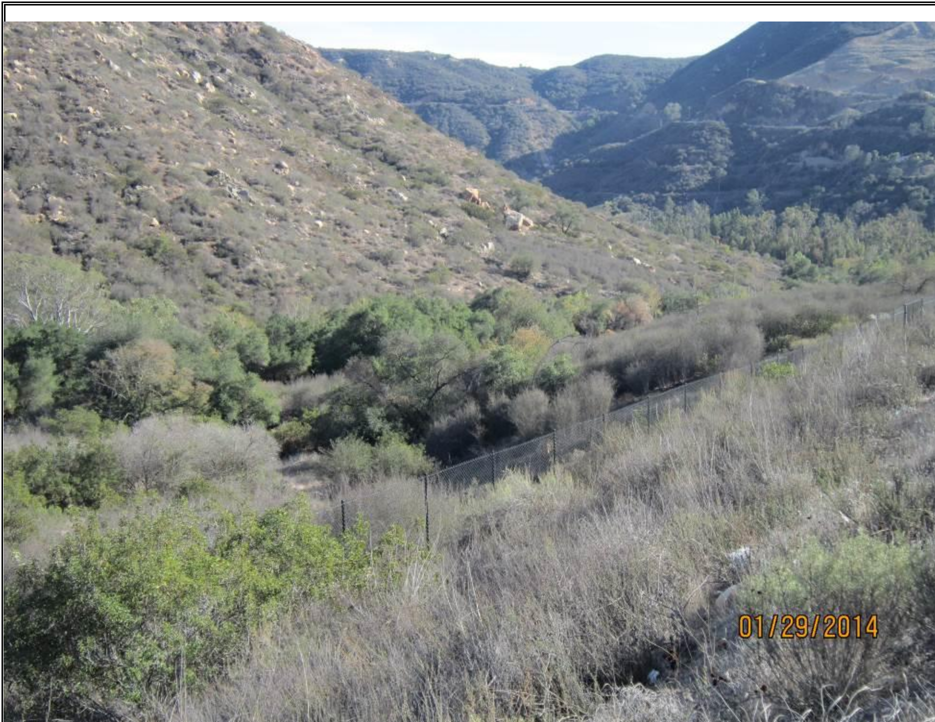
Existing sediment production: Med to High

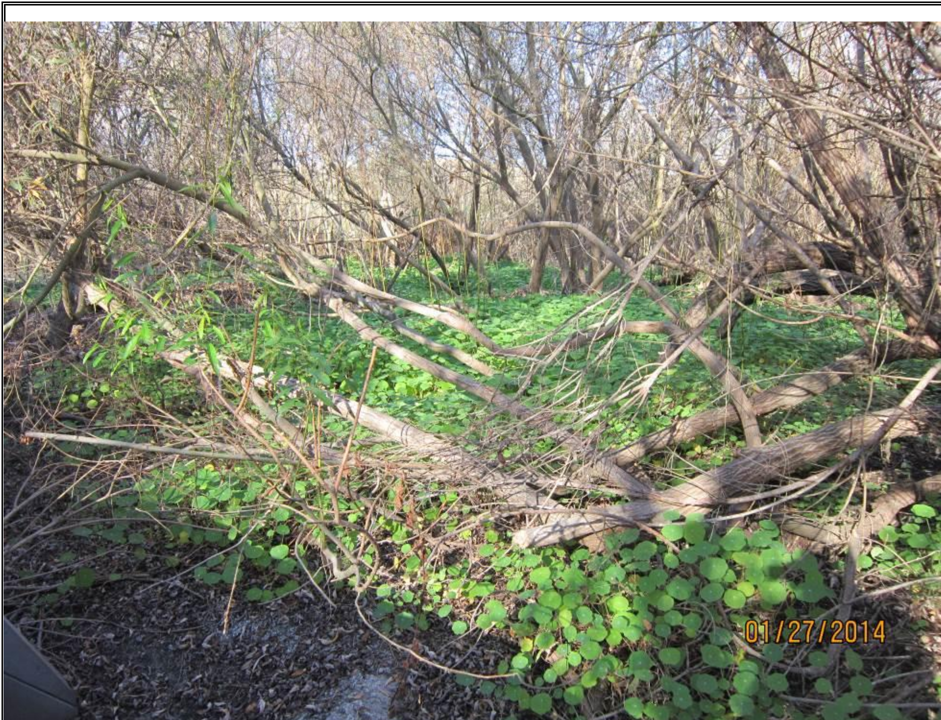
Potential sediment production: High

Existing veg. cover: 75%</td></tr>
</table>

	**Field Visit ID-11** **GLU: CSI-Agricultural/ Grass-2** View: Looking east Existing sediment production: Low Potential sediment production: Med Existing veg. cover: 85%

	**Field Visit ID-12** **GLU: CSP-Unknown-2** View: Looking southwest Existing sediment production: Low Potential sediment production: Low to Med Existing veg. cover: 50%

	**Field Visit ID-13** **GLU: CSP-Scrub/Shrub-2** View: Looking southeast Existing sediment production: Med Potential sediment production: Med to High Existing veg. cover: 80-85%

	Field Visit ID-14 GLU: FSP-Scrub/Shrub-1 View: Looking northeast Existing sediment production: Low Potential sediment production: Low to Med Existing veg. cover: 95-100%

Field Visit ID-15

GLU: CB-Agricultural/ Grass-4

View: Looking west

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 95%

.

Field Visit ID-16

GLU: CB-Agricultural/ Grass-3

View: Looking south

Existing sediment production: High*

Potential sediment production: High

Existing veg. cover: 90-95%

* Area was burned in 2014 fires after the field assessment so existing sediment production was adjusted to High (based on potential sediment production) from Medium

Field Visit ID-17

GLU: CSI-Scrub/Shrub-4

View: Looking west

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 95%

Field Visit ID-18

GLU: CSP-Forest-1

View: Looking southwest

Existing sediment production: Low to Med

Potential sediment production: Med

Existing veg. cover: 80%

Field Visit ID-19

GLU: CSP-Scrub/Shrub-3

View: Looking southwest

Existing sediment production: Low to Med

Potential sediment production:

Med to High

Existing veg. cover: 60%

Field Visit ID-20

GLU: CSP-Unknown-1

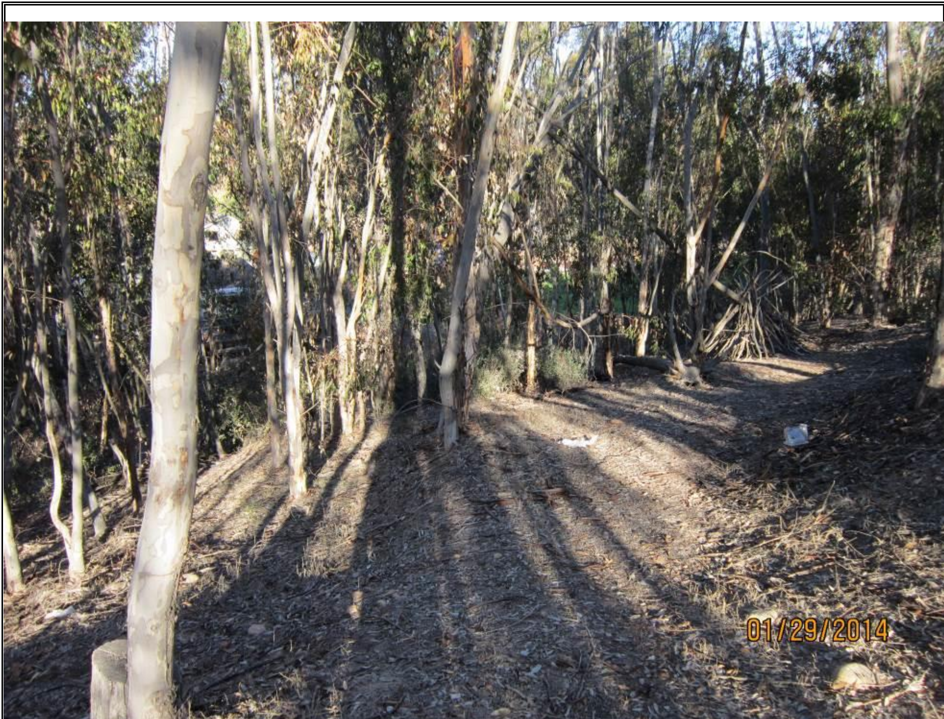
View: Looking southeast

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 95%

	**Field Visit ID-21** **GLU: CB-Unknown-3** View: Looking northwest Existing sediment production: Low to Med Potential sediment production: Med to High Existing veg. cover: 50-60%

	**Field Visit ID-22** **GLU: CSI-Forest-3** View: Looking east Existing sediment production: Low Potential sediment production: Med Existing veg. cover: 60%

	**Field Visit ID-23** **GLU: CSI-Scrub/Shrub-1** View: Looking north Existing sediment production: Low Potential sediment production: Low Existing veg. cover: 80%

	**Field Visit ID-24** **GLU: CB-Unknown-4** View: Looking northeast Existing sediment production: Low to Med Potential sediment production: High Existing veg. cover: 80%

<table>
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Field Visit ID-25

GLU: CSI-Agricultural/ Grass-4

View: Looking east

Existing sediment production: Low

Potential sediment production: Med-High

Existing veg. cover: 95%

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</table>

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Field Visit ID-26

GLU: CSI-Scrub/Shrub-3

View: Looking east

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 100%

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</td></tr>
</table>

Field Visit ID-27

GLU: CSP-Developed-2

View: Looking north

Existing sediment production: Low

Potential sediment production: Low

Existing veg. cover: 30-35%

.

Field Visit ID-28

GLU: CSP-Agricultural/ Grass-2

View: Looking north

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 90-95%

.

Field Visit ID-29

GLU: FB-Forest-3

View: Looking northwest

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 80-85%

Field Visit ID-30

GLU: CB-Developed-4

View: Looking northeast

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 70%

.

	**Field Visit ID-31** **GLU: CSI-Developed-3** View: Looking north Existing sediment production: Low Potential sediment production: Low Existing veg. cover: 30-35%

	**Field Visit ID-32** **GLU: CSI-Unknown-3** View: Looking west Existing sediment production: Low to Med Potential sediment production: Med Existing veg. cover: 70-75%

Field Visit ID-33

GLU: CSP-Scrub/Shrub-1

View: Looking northeast

Existing sediment production: Low to Med

Potential sediment production:

Med to High

Existing veg. cover: 70%

Field Visit ID-34

GLU: CSP-Developed-2

View: Looking south

Existing sediment production: Low

Potential sediment production: Low

Existing veg. cover: 95%

	**Field Visit ID-35** **GLU: FB-Scrub/Shrub-3** View: Looking northeast Existing sediment production: Low Potential sediment production: Med Existing veg. cover: 90-95%

	**Field Visit ID-36** **GLU: FSI-Agricultural/ Grass-2** View: Looking northeast Existing sediment production: Low Potential sediment production: Med Existing veg. cover: 95%

Field Visit ID-37

GLU: CB-Forest-3

View: Looking southeast

Existing sediment production: Med-High

Potential sediment production: High

Existing veg. cover: 75-80%

Field Visit ID-38

GLU: CSI-Agricultural/ Grass-1

View: Looking northeast

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 85%

	**Field Visit ID-39** **GLU: CSP-Developed-1** View: Looking west Existing sediment production: Low Potential sediment production: Low Existing veg. cover: 30-35%

	**Field Visit ID-40** **GLU: CSP-Scrub/Shrub-4** View: Looking south Existing sediment production: Med Potential sediment production: High Existing veg. cover: 90-95%

Miles 0 25 50 100 150

Geologic Group

San Diego River Watershed - HU 907.00, 436 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

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Potential Critical Coarse Sediment Yield Areas

San Diego River Watershed - HU 907.00, 436 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

ATTACHMENT A.5

PHYSICAL STRUCTURES

A.5 Physical Structures

The desktop-level analysis to identify existing physical structures within the nine watershed management areas within the San Diego region utilized the following GIS data sources:

- ESRI ArcMap, Google Earth, and Google Maps products
- Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) Flood Profiles and FEMA Flood Insurance Rate Map (FIRM)
- National Flood Hazard Layer (NFHL)
- Municipal master drainage plans (as provided)
- San Diego Geographic Information Source (SanGIS) Municipal Boundaries and Hydrologic Basins
- United States Geological Survey (USGS) National Hydrography Dataset (NHD) California data
- Stream data generated as indicated in Section 2.2

The following documents the process used to identify the physical structures along the reaches and the resulting GIS data:

- The process began by importing the data sources indicated above into a single ArcMap document that served as a master map file from which all further analysis proceeded.
- The data were screened and selected for inclusion as appropriate to the project scope.
- Point features were placed along river reach line segments to coincide with visually identified structures, utilizing different feature symbols according to the type of infrastructure.
- In the case of levees, the point was placed at the downstream-most end of the FEMA NFHL Shapefile. All point features generated in this task appear in the GIS shapefile.
- Municipal boundaries intersecting river reaches were identified to identify the applicable municipal drainage plan data.
- Point feature attributes and associated information for Physical Structures GIS shapefile is indicated in Table A.5.1 below.

Table A.5.1: Structure Identification Point Feature Attribute Development and Information

Attribute	Description
Struct_ID	The Structure ID field provides a six-digit identification number based upon the structure's specific location within a watershed. The first three digits in the code reflect the structure's Hydrologic Unit (HU) Basin number (ranging between 902-911 for Region 9, as defined in the Water Quality Control Plan for the San Diego Basin). The subsequent three digits reflect the structure's location along the reach, ascending along the channel from the headwaters to tailwaters (ranging between 001-999, beginning at the confluence and increasing in the upstream direction).

Attribute	Description
WMA	The Watershed Management Area field provides the name of the watershed in which the structure exists. The WMA corresponds with the HU identified in the first three digits in the Struct_ID (e.g., 911, Tijuana Watershed).
Channel_ID	The Channel ID field provides the name of the channel in which the structure exists.
Struct_Typ	The Structure Type field classifies known structures as one of the following types:, Bridge, Culvert, Dam, Energy Dissipater, Flood Management Basin, Flood Wall, Grade Control, Levee, Pipeline, Weir.
Struct_Dtl	The Structure Detail field provides known quantitative information for multi-section culverts.
Struct_Mtl	The Structure Material field provides known qualitative information for structure material composition.
Struct_Shp	The Structure Shape field provides known geometric information for culvert shapes, and is classified as one of the following types: Arch, Box, Pipe.
Jurisd_ID	The Jurisdiction ID field, when applicable, provides the known separate structure identification number developed and utilized by the jurisdiction or entity responsible for creating and distributing the coinciding structure Shapefile data used for this analysis. This number was copied from the coinciding external Shapefile data attribute field best representing a unique jurisdiction or entity-based identification number (external Shapefile data received from regional WMAA data call; for jurisdictional information, see "Other" attribute field). Coinciding external Shapefile data was used to determine various structure attributes.
Plan_ID	The Plan ID field, when applicable, provides the known structure plan number corresponding with the Jurisdiction ID. This number was copied from the coinciding external Shapefile data attribute field best representing a unique plan number received from the regional WMAA data call (external Shapefile data received from regional WMAA data call; for jurisdictional information, see "Other" field). Coinciding external Shapefile data was used to determine various structure attributes.
Diameter	The Diameter field, when applicable, provides the known diameter (in US feet) for culverts.
Length	The Length field, when applicable, provides the known length (in US feet) for select structure types. When lengths were determined using FEMA FIS Flood Profiles, the scaled horizontal distances along the indicated roadway or channel slope were used.
Width	The Width field, when applicable, provides the known width (in US feet) for select structure types.
Height	The Height field, when applicable, provides the known height (in US feet) for select structure types. When heights were determined using FEMA FIS Flood Profiles, the scaled vertical distances from channel bed to indicated roadway bottom were used.
US_Invert	The Upstream Invert field, when applicable, provides the known upstream invert elevation (in US feet) for select structure types.
DS_Invert	The Downstream Invert field, when applicable, provides the known downstream invert elevation (in US feet) for select structure types.

Attribute	Description
RD_EL_NAVD	The Roadway Elevation (NAVD) field, when applicable, provides the known roadway elevation (in US feet, NAVD) for select structure types. When roadway elevations were determined using FEMA FIS Flood Profiles, the horizontal projection onto the vertical grid scales were used.
Loc_Descr	The Location Description field, when applicable, provides information for structures crossing a known roadway. In nearly all cases, Google Earth imagery was used to determine the roadway name.
Other	The Other field is used to convey any information not present within the preceding fields. Typically, "other" information includes jurisdictional, plan, and supplemental dimensions for a given structure.

Example Structure Identification

The following example demonstrates the structure identification process for a discrete structure (ID 907029) along the San Diego River. The San Diego River is located in the San Diego River watershed (WMA 907). Scanning the river from lower to higher reached, a new point feature was placed at the road crossing over the San Diego River as indicated in Figure A.5.1. Select attributes of this particular structure were available from the FEMA NFHL as displayed in the highlighted boxes in Figure A.5.1. Additional attributes such as the culvert height, length, roadway elevation, and name were also determined from the FIS Flood Profile as indicated in Figure A.5.2. Satellite imagery (e.g., Google) was used to verify the existence of structure. In this case, the most current Google Map data indicated that the culvert still exists and that the roadway name has been changed to Qualcomm Way. When structures could not be verified with satellite imagery, the structure identification was based solely upon the information provided or readily available and was not physically verified in the field. Figure A.5.3 displays an example of imagery used to identify structures.

Figure A.5.1: Typical ArcMap Window

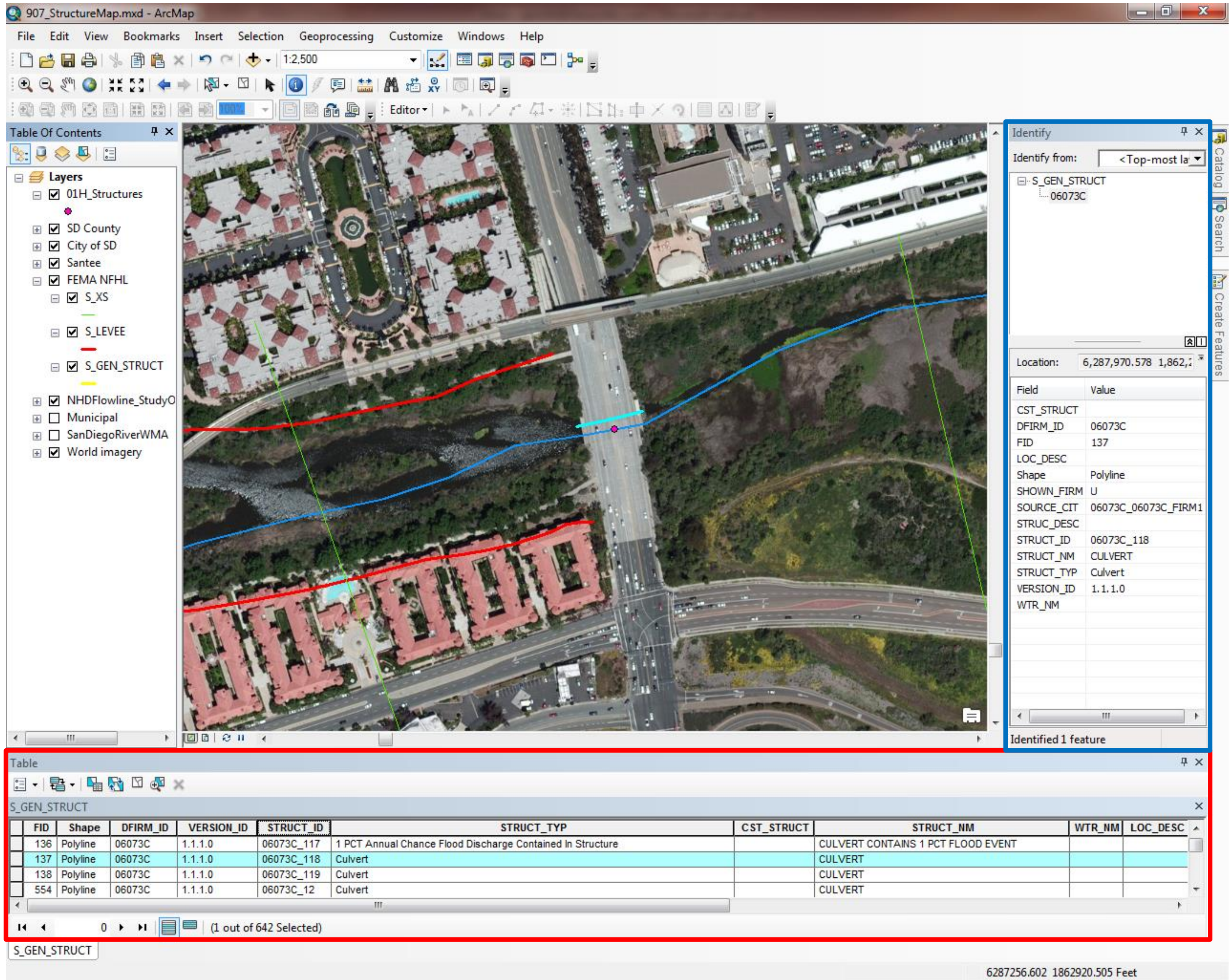
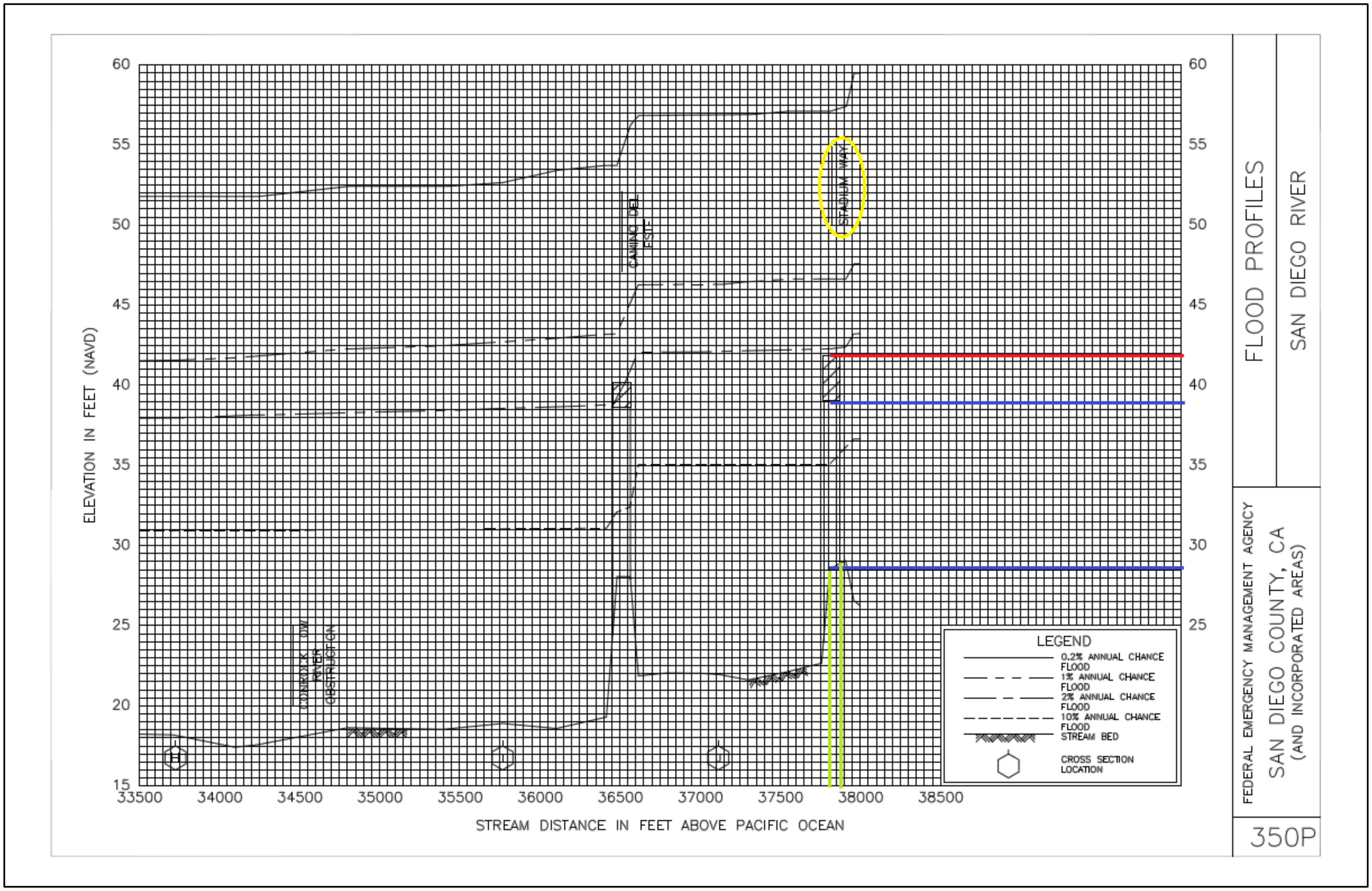


Figure A.5.2: Typical FEMA FIS Flood Profile



Legend: roadway elevation (red), roadway name (yellow), culvert height (blue), culvert width (green)

Figure A.5.3: Google Map Imagery for Structure Identification

The following bridge structure dimensional attributes were included in the point feature attributes:

- length 110 feet
- height 10 feet
- roadway elevation 41.9 feet

The attribute table associated with the identified structure included in the GIS shapefile is indicated in Table A.5.2.

Table A.5.2: Structure 907029 Attribute Table

Attribute	Description
Struct_ID	907029
WMA	San Diego
Channel_ID	San Diego River
Struct_Typ	Culvert
Struct_Dtl	
Struct_Mtl	
Struct_Shp	
Jurisd_ID	06073C_118
Plan_ID	06073C_06073C_FIRM1
Diameter	0
Length	110
Width	0
Height	10
US_Invert	0
DS_Invert	0
RD_EL_NAVD	41.9
Loc_Descr	Qualcomm Way
Other	Info from FEMA NFHL shapefile data/FIS FP V.9-350P

Miles 0 25 50 100 150

Watershed Management Area Streams with Channel Structures

San Diego River Watershed - HU 907.00, 436 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

ATTACHMENT B

HYDROMODIFICATION MANAGEMENT APPLICABILITY/EXEMPTIONS

ATTACHMENT B.1

EXEMPT RIVER REACH

B.1.1 Exempt River Reaches

B.1.1.1 Approach for Exempt River Reach Analysis

The approach selected in this cumulative hydromodification impacts study accounts for: (1) hydrology, (2) channel geometry, (3) bed and bank material, and (4) sediment supply. The selected approach compares long-term changes in sediment transport capacity, or in-stream work, and sediment supply for the existing and future development conditions. The ratio of future/existing condition transport capacity, or work, is termed Erosion Potential (Ep). The ratio of future/existing condition bed sediment supply is termed Sediment Supply Potential (Sp). To calculate Ep, the hydrology, channel geometry, and bed/bank materials are characterized for the existing and future conditions. To calculate Sp, the sediment supply factor is characterized for the existing and future conditions.

The findings in this study propose exemption for a given river reach if the analysis satisfies the following criteria:

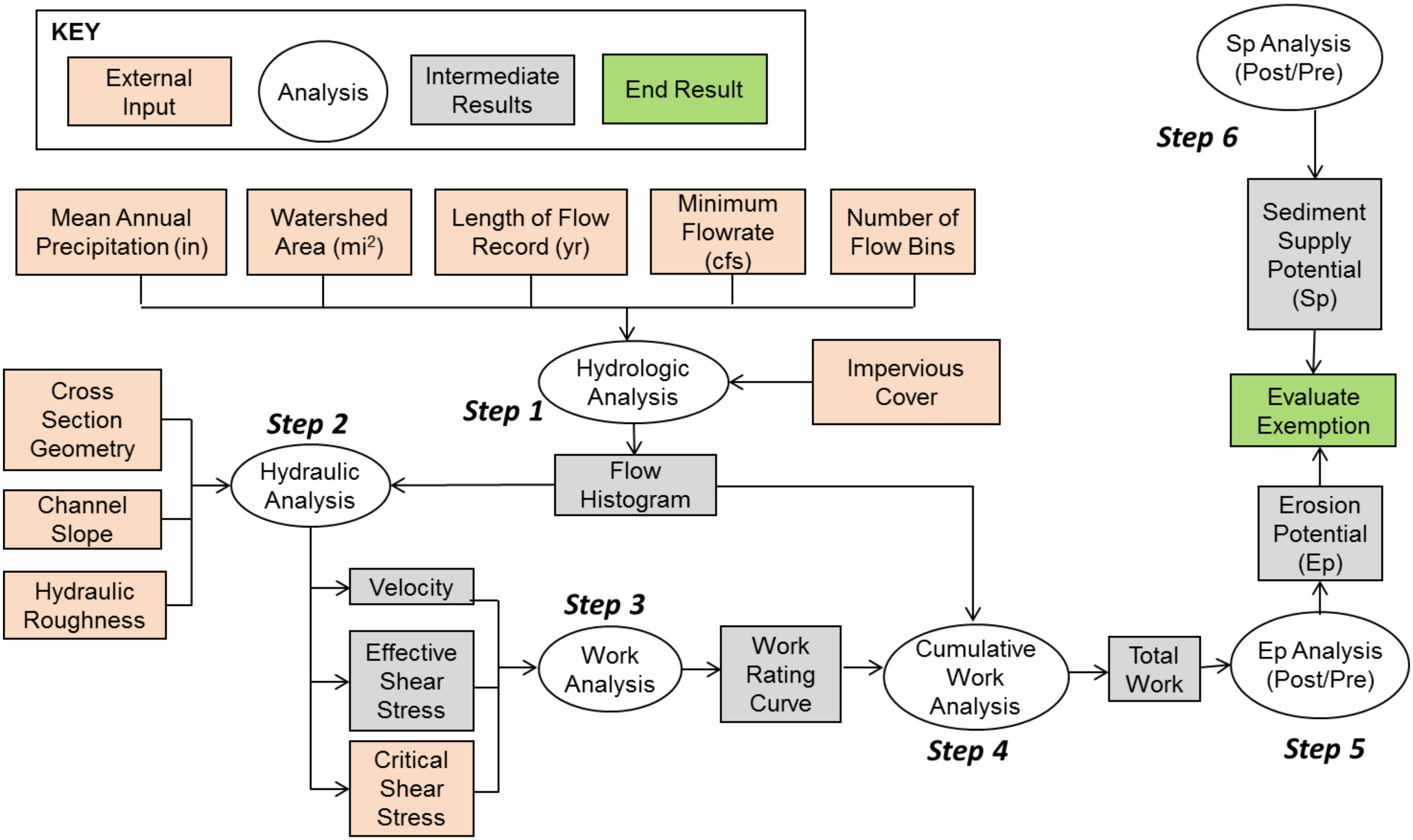
- Ep < 1.05 when d50 < 16 mm or Ep < 1.20 when d50 > 16 mm, and;
- Sp > 0.90

The following bullet points provide basis for the criteria listed above:

- For Ep
  - According to the Journal of Hydrology article titled Channel Enlargement in Semiarid Suburbanizing Watersheds: A Southern California Case Study (Hawley and Bledsoe, 2013): "*The threshold corresponding to the presence/absence of headcutting varied based on substrate type, and was roughly quantified as a sediment-transport ratio greater than ~1.20 in systems with a median grain size > 16mm, and [Ep] ~ 1.05 when* d_{50} *< 16 mm*"
- For Sp
  - Soar and Thorne (2001) indicate that a greater than 10% reduction in sediment supply can have potentially significant effects on stream stability.
  - SCCWRP Technical Report 605, 2010 states that changes of less than 10% in either driver (Water delivery and sediment are the drivers in this report) are unlikely to instigate, on their own, significant channel changes.

The flow chart summarizing the analysis procedure is presented below.

Flowchart for Exempt River Reach Analysis



B.1.1.2 Selection of Inputs for Exempt River Reach Analysis

The following steps were implemented for each river reach:

- Step 1 – Hydrologic Analysis:
  - Due to limited flow data, a flow duration equation developed for Southern California (Hawley and Bledsoe, 2011) was used to estimate existing and future flow histograms for each watershed.
  - The change in impervious cover between existing and future development conditions was estimated using the developable land use layer from Section 2.3.
  - A desktop-level GIS exercise was performed to manually assign land use classifications if the parcel in the developable land use layer directly discharges into the analyzed reach. Results are summarized in Section B.1.13.
  - Assumptions for percent imperviousness for each land use type were based on the information provided in the San Diego County Imperviousness Study (County of San Diego, 2010).
  - The table below presents the input parameters used to construct flow histograms, as well as the estimated channel slope at the critical cross section.

Exempt River Reach	Area (sq. miles)	Mean Annual Precipitation (in)	Length of Daily Flow Record (Years)	Channel Slope (ft/ft)
San Diego River	173	14.5	30	0.0012

- Step 2 – Hydraulic Analysis: The reach type classification from Section 2.2 was used to identify the critical cross section along the reach for Ep analysis. A critical flow rate of $0.5Q_2$ was assigned to estimate the critical shear stress for the analyzed cross section. Flow rates below $0.5Q_2$ were assumed to perform no work on the reach.
- Step 3 – Work Analysis: The simplified effective work equation shown below is used to calculate the work done for each flow bin.

  $$W = (\tau - \tau_c)^{1.5} V$$

  Where

  W = Work (dimensionless)
  τ = effective Shear Stress [lb/ft^2]
  τ_c = Critical Shear Stress [lb/ft^2]
  V = Flow Velocity [ft/s]
- Step 4 – Cumulative Work Analysis: Cumulative work is a measure of the long-term total work or sediment transport capacity performed at a given stream location. Cumulative work incorporates both discharge magnitude and flow duration distributions for the full range of simulated flow rates. Cumulative work is calculated by multiplying work and duration for each bin. Total work is calculated through summation of work from all flow bins.
- Step 5 – Ep Analysis: Ep is calculated by dividing the total work of the future condition by that of the existing condition. The existing river reaches analyzed appear relatively stable and have not experienced excessive geomorphic instability due to the alteration of

the drainage areas. Given the stable condition of the existing channels, the existing condition was used as the baseline condition instead of natural. Results from the Ep analysis are presented in Section B.1.1.3.

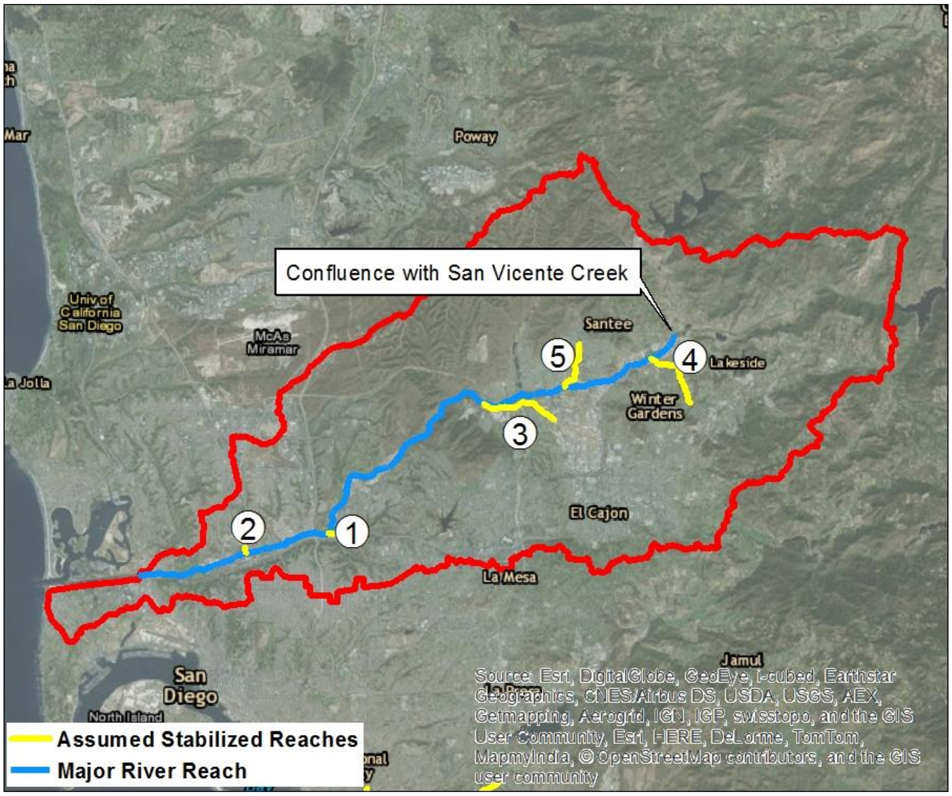
- Step 6 – Sp Analysis: Coarse Sediment Supply Potential for each watershed was estimated using the quantitative results from Section 2.4. First, the watershed coarse sediment soil loss was estimated for all GLUs producing coarse sediment. Then, the future-condition coarse sediment soil loss was estimated by subtracting the approximate exempt parcel soil loss from the existing soil loss. Sp is ultimately calculated by dividing the future coarse sediment soil loss by the existing coarse sediment soil loss. Results from Sp analysis are presented in Section B.1.1.3.

Steps 1 to 5 were performed in Excel and Steps 1 and 6 were executed in GIS. Ep estimates for the exempt river reaches are included in this attachment.

Exempt river reach extents are shown in the figure below. Figure also indicate the tributaries assumed to be stable for performing the erosion potential analysis as a conservative approach to approximate potential HMP exempt flows that may enter the river reach being analyzed.

For a PDP draining to one of the assumed stable tributaries shown in the following exempt reach figure, the PDP applicant shall verify and document that the assumed stable tributary is a stabilized conveyance system by using the methodology presented in section 4.1.2 prior to claiming exemption from hydromodification management requirements.

For a PDP draining to a tributary not shown in the figure below to be considered for exemption, a stability analysis using the section 4.1.2 methodology is to be conducted for the given tributary. If the stability analysis determines the tributary is stable, then the exempt river reach analysis indicated in section 4.1.1 shall be performed by adding the additional stabilized tributary to the current list of tributaries shown in the figure below to confirm that the reach satisfies the Ep and Sp criteria.



Extents of San Diego River and extents of assumed Stabilized Reaches: 1) Alvarado Creek; 2) Civita Channel; 3) Forester Creek; 4) Los Coches Creek and 5) Woodglen Vista Creek

The table below presents the summary of the developable land in each of the five watersheds with the exempt river reach and the estimated developable area that will be exempted from hydromodification management area requirements if the exempt river reach exemption is reinstated. This area will still be subject to the pollutant control requirements from the regional MS4 permit.

Exempt River Reach	Developable Land		
	Total (acres)	Area exempt (acres)	Exempt (%)
San Diego River	13,667	1,196	9%

B.1.1.3 Results from Exempt River Reach Analysis

Results from Erosion potential analysis are presented below:

Exempt River Reach	Area (acres)	Impervious Area (acres) [%]			Ep (Post/Pre) [Criteria<1.05]
		Pre	Post	Increase	
San Diego River	111,006	32,106[28.9]	32,777[29.5]	671 [0.6]	1.03

Results from coarse sediment supply potential analysis are presented below:

Exempt River Reach	Soil Loss (tons/yr.)			Sp (Post/Pre) [Criteria>0.90]
	Pre	Exempt Parcels	Post [Pre – Exempt Parcels]	
San Diego River	354,619	2,575	352,044	0.99

Based on the results from the analysis it is recommended that exemption be reinstated for San Diego River.

Erosion Potential Analysis for San Diego River

Erosion Potential (Ep)	1.03

Channel Slope	0.0012	ft/ft
Estimated Q_2	436	cfs
$0.5Q_2$	218	cfs
Critical Shear	0.109	lb/sq. ft
γ	62.4	lb/ft^3

			Existing Condition	Future Condition
Tributary Area	*A*	sq mi	173	173
Mean Annual Precip	*MAP*	in/yr	14.5	14.5
Length of Daily Flow Record	*Yr*	yr	30	30
Imperviousness	*Impav*	mi^2/mi^2	0.2892	0.2953
Maximum Flow of Record	*Qmax*	cfs	6336.8	6336.8
Minimum Flow of Record	*Qmin*	cfs	0.01	0.01
10-year peak flow	*Q10*	cfs	12411.4	12411.4
Coefficient of DDF	*day1*	days & cfs	48535.40	52754.33
Exponent of DDF	*day2*	days & cfs	-0.88	-0.88
Number of Bins	N_B	--	25	25
Bin Size	$H_{B\text{-}log}$	--	0.557	0.557

Bin Number	Lower Bound of Bin Number	Upper Bound of Bin Number	Flow	Hydraulic Radius	Flow Velocity	Shear Stress	Work	Duration	Cumulative Work	Duration	Cumulative Work
B	$B_{lwr\text{-}log\ (cfs)}$	$B_{upr\text{-}log\ (cfs)}$	*Q (cfs)*	*R (ft)*	*v (ft/s)*	τ (psf)	*W*		*W*duration*		*W*duration*
1	0.006	0.010	0.01	0.00	0.02	0.000	0.000	3404271	0.00	3830691	0.00
2	0.010	0.017	0.01	0.00	0.02	0.000	0.000	2089074	0.00	2341409	0.00
3	0.017	0.030	0.02	0.00	0.03	0.000	0.000	1281986	0.00	1431125	0.00
4	0.030	0.053	0.04	0.01	0.04	0.001	0.000	786707	0.00	874737	0.00
5	0.053	0.093	0.07	0.01	0.05	0.001	0.000	482773	0.00	534660	0.00
6	0.093	0.162	0.13	0.01	0.07	0.001	0.000	296259	0.00	326797	0.00
7	0.162	0.282	0.22	0.02	0.08	0.001	0.000	181803	0.00	199746	0.00
8	0.282	0.492	0.39	0.02	0.10	0.001	0.000	111566	0.00	122090	0.00
9	0.492	0.859	0.68	0.03	0.13	0.002	0.000	68464	0.00	74624	0.00
10	0.859	1.499	1.18	0.04	0.16	0.003	0.000	42014	0.00	45612	0.00
11	1.499	2.615	2.06	0.06	0.20	0.004	0.000	25782	0.00	27879	0.00
12	2.615	4.562	3.59	0.09	0.25	0.007	0.000	15822	0.00	17040	0.00
13	4.562	7.960	6.26	0.12	0.31	0.009	0.000	9709	0.00	10415	0.00
14	7.960	13.889	10.92	0.17	0.39	0.013	0.000	5958	0.00	6366	0.00
15	13.889	24.234	19.06	0.23	0.49	0.017	0.000	3656	0.00	3891	0.00
16	24.234	42.283	33.26	0.33	0.61	0.025	0.000	2244	0.00	2378	0.00
17	42.283	73.776	58.03	0.45	0.76	0.034	0.000	1377	0.00	1454	0.00
18	73.776	128.724	101.25	0.63	0.94	0.047	0.000	845	0.00	889	0.00
19	128.724	224.597	176.66	0.87	1.17	0.065	0.000	519	0.00	543	0.00
20	224.597	391.875	308.24	1.20	1.45	0.090	0.000	318	0.00	332	0.00
21	391.875	683.742	537.81	1.65	1.80	0.124	0.003	195	0.60	203	0.62
22	683.742	1192.991	938.37	2.25	2.21	0.168	0.032	120	3.81	124	3.94
23	1192.991	2081.525	1637.26	3.00	2.68	0.225	0.105	74	7.72	76	7.96
24	2081.525	3631.836	2856.68	3.80	3.13	0.285	0.230	45	10.36	46	10.64
25	3631.836	6336.812	4984.32	4.06	3.28	0.304	0.282	28	7.80	28	7.98

ATTACHMENT B.2

HYDROMODIFICATION MANAGEMENT EXEMPTION MAPPING

Receiving Waters and Conveyance Systems Exempt from Hydromodification Management Requirements

Exhibit Date: Sept. 8, 2014

ATTACHMENT C
ELECTRONIC FILES

Electronic Folder titled "San Diego River_WMAA_Attachment C Electronic_Data.zip" Contents:

1. ArcMap 10.0 and 10.1 map files created for purpose of viewing Regional WMAA data
   - WMAA_07_SanDiegoRiver_Data_2014_0908_v10 .mxd
   - WMAA_07_SanDiegoRiver_Data_2014_0908_v101.mxd
2. ESRI Geodatabase titled "WMAA_07_SanDiegoRiver_Data_2014_0908_v10.gdb" containing the following data:
   - WatershedBoundaries
     - Watershed_Boundaries
   - HydrologicProcesses
     - HRUAnalysis
   - Streams – description of existing streams in the watershed
     - SD_Regional_WMAA_Streams (streams selected for detailed analysis)
     - SD_NHD_Streams (portion of NHD dataset included for reference)
   - LandUsePlanning
     - SanGIS_ExistingLandUse
     - SanGIS_PlannedLandUse
     - SanGIS_DevelopableLands
     - SanGIS_RedevelopmentandInfill
     - SanGIS_MunicipalBoundaries
     - Federal_State_Indian_Lands
     - SanGIS_MHPA_SD
     - SanGIS_MSCP_CN
     - SanGIS_MSCP_EAST_DRAFT_CN
     - SanGIS_Draft_North_County_MSCP_Version_8_Categories
   - PotentialCoarseSedimentYield
     - GLUAnalysis
     - PotentialCoarseSedimentYieldAreas
     - MacroLevelPotentialCriticalAreas
     - PotentialCriticalCoarseSedimentYieldAreas
   - ChannelStructures
     - ChannelStructures
   - HydromodExemptions
     - Exempt_Systems
     - Exempt_Bodies
   - Floodplains: included for reference
     - FEMA_NFHL
   - Baselayers: included for reference
     - SanGIS_Lakes
     - link to ESRI World Imagery (internet connection is required to access ESRI World Imagery basemap)

Electronic Folder titled "San Diego River_WMAA_Attachment C Electronic_Data.zip" Contents, continued:

3. Google Earth – KMZ file titled: "WMAA_07_SanDiegoRiver_Data_2014_0908_GoogleEarth", containing the following data:
   - WatershedBoundaries
   - Streams
     - SD Regional WMAA Streams (streams selected for detailed analysis)
     - SD NHD Streams (portion of NHD dataset included for reference)
   - LandUsePlanning
     - Municipal Boundaries
     - Federal/State/Indian Lands
   - ChannelStructures
   - HydromodExemptions
     - Exempt_Systems
     - Exempt_Bodies
   - Floodplains: included for reference
     - FEMA Floodplain
   - Dominant Hydrologic Processes
   - Potential Critical Coarse Sediment Yield Areas

Notes:

- Open a map file (with extension .mxd) using ArcMap to view the data.
- All data contained in the geodatabase is loaded into the map.

ATTACHMENT D

REGIONAL MS4 PERMIT CROSSWALK

Table below provides a linkage between the Regional MS4 Permit requirements for WMAA and this report.

Regional MS4 Permit Provision	Regional WMAA Report
B.3.b.(4)(a)	Chapter 2; Section 5.1; Attachment A and Attachment C
B.3.b.(4)(a)(i)	Section 2.1; Attachment A.1 and Attachment C
B.3.b.(4)(a)(ii)	Section 2.2; Attachment A.2 and Attachment C
B.3.b.(4)(a)(iii)	Section 2.3; Attachment A.3 and Attachment C
B.3.b.(4)(a)(iv)	Section 2.4; Attachment A.4 and Attachment C
B.3.b.(4)(a)(v)	Section 2.5; Attachment A.5 and Attachment C
B.3.b.(4)(b)	Chapter 3 and Section 5.2
B.3.b.(4)(c)	Chapter 4; Section 5.3; Attachment B and Attachment C