Ventura Countywide Stormwater Quality Management Program

2014-2015 Permit Year

Ventura Countywide Stormwater Quality Management Program Annual Report

Attachment E12

Indicator Bacteria Total Maximum Daily Load Draft Implementation Plan for the Lower Santa Clara River Watershed

Camarillo
County of Ventura
Fillmore
Moorpark
Ojai
Oxnard
Port Hueneme
Santa Paula
Simi Valley
Thousand Oaks
Ventura
Ventura County Watershed Protection District

December 14, 2015

INDICATOR BACTERIA TOTAL MAXIMUM DAILY LOAD DRAFT IMPLEMENTATION PLAN FOR THE LOWER SANTA CLARA RIVER WATERSHED

PREPARED FOR THE CITIES OF VENTURA, SANTA PAULA, FILLMORE, AND OXNARD AND THE COUNTY OF VENTURA • 21 MARCH 2015

TABLE OF CONTENTS

List of Tables

List of Figures

Appendices

Appendix A – Outfall Monitoring Plan

Appendix B – Modeling Inputs

Appendix C – IGP Sites and Modeled Existing/Planned BMPs

Appendix D – Jurisdiction-Specific Analysis

EXECUTIVE SUMMARY

INTRODUCTION

The Total Maximum Daily Load for Indicator Bacteria[1] in Santa Clara River Estuary and Reaches 3, 5, 6, and 7 adopted by the Los Angeles Regional Water Quality Control Board (Resolution No. R10-006) requires Participating Agencies in the Lower Santa Clara River (LSCR) Watershed (Cities of Ventura, Santa Paula, Fillmore, and Oxnard, and the County of Ventura) to prepare an Implementation Plan (IP) outlining a proposed program of activities that will be capable of achieving the Municipal Separate Storm Sewer System (MS4) Waste Load Allocations (WLAs). The purpose of the Bacteria TMDL is to protect the health of those who recreate in the LSCR by reducing the amount of bacteria discharged to the River through dry and wet weather[2] runoff from urban and other land uses. The TMDL requires Participating Agencies to attain required load reductions during both dry weather and wet weather[3] conditions within an 11-year and 17-year compliance timeline, respectively. Compliance with TMDL requirements will be evaluated through monitoring at two Compliance Monitoring Locations (CMLs) within the receiving waters, as well as at Jurisdictional Outfalls described in the Outfall Monitoring section of this IP.

TECHNICAL APPROACH

To identify a program of activities that will be capable of achieving TMDL WLAs for wet weather, the Participating Agencies used the Structural BMP Prioritization and Analysis Tool (SBPAT), a GIS- and USEPA SWMM-based water quality model, with the ability to simulate hydrologic and pollutant loadings and to evaluate various best management practice (BMP) implementation scenarios. SBPAT was used to estimate the bacteria load reductions predicted to achieve compliance under various BMP implementation scenarios. As required by the Bacteria TMDL, analyses were based on the 90th percentile wet year (i.e., water year 1995, or October 1, 1994 – September 30, 1995). BMPs were sited and selected based on cost-benefit considerations.

BMP IMPLEMENTATION

The IP is a compliance plan that identifies a suite of potential non-structural and structural BMPs. Non-structural BMPs were prioritized first, because they are a cost-effective way of reducing pollutant loading.

Structural BMPs considered as part of this IP included existing and planned BMPs, distributed green streets, and proposed regional projects. Locations and concepts for proposed regional structural BMPs were determined based on load reduction potential, feasibility of implementation, agency preferences, cost effectiveness, and best professional judgment.

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[1] Indicator bacteria are types of bacteria used to signal the presence of fecal contamination. The Santa Clara River TMDL specifically addresses levels of fecal coliform, enterococcus, *E. coli*, and total coliform.
[2] For the purposes of this implementation plan, "urban runoff" is defined as non-stormwater, dry weather flows, and "stormwater" is defined as rainfall-generated, wet weather flows.
[3] The Bacteria TMDL defines wet weather as days having greater than or equal to 0.1 inches of rain plus the following three days after the rain event.

Participating Agencies will implement identified BMPs as resources are available. Implementation of activities and BMPs will be prioritized along with all other essential Participating Agency obligations such as, but not limited to, public infrastructure rehabilitation and maintenance, compliance with other government-mandated regulations, and public safety. Implementation of BMPs will need to consider the economic impacts on the community and the perceived holistic benefit to taxpayers and residents.

The initial affordability analysis indicates that the implementation costs could present a widespread economic impact on the communities in the watershed. While the Participating Agencies are committed to implementation of affordable control measures to improve water quality, implementation of the plan is subject to the availability of funds to avoid undue economic burdens on the communities in the Lower Santa Clara River watershed.

Non-structural BMPs

Non-structural BMPs are management programs or activities designed to reduce or eliminate pollutant loading by addressing its source. These BMPs were prioritized first due to their low cost relative to structural BMPs. This IP included quantitative estimates of load reductions for the following individual non-structural programs: redevelopment (i.e. implementation of the County's post-construction BMP requirements), Low Impact Development (LID) incentives, and inspection of permitted industrial sites as they comply with new statewide Industrial General Permit requirements. The Participating Agencies also selected a suite of enhanced (i.e. beyond the Permit minimum) non-structural programs that they will implement but that were quantified in this IP using an assumed bulk load reduction credit. These other programs include the following:

- Identify and address sewer discharge to the MS4
- Trash cleanups
- Good landscaping practices
- Smart controller and turfgrass replacement rebates
- Water waste/conservation ordinances
- Car washing runoff ordinances
- Commercial/industrial good housekeeping
- Pet waste controls
- Animal facilities management
- Street sweeping
- Homeless Programs
- MS4 cleaning
- Education and outreach

Structural BMPs

Structural BMPs are engineered systems designed to remove pollutants by: simple gravity settling of particulate pollutants, filtration, biological uptake, media absorption, or any other physical, biological, or chemical process. The modeling analysis for this IP included existing or planned structural BMPs (mostly associated with private development), distributed green streets[4], and regional BMPs. Infiltration-type regional BMPs were emphasized since these are the most cost effective for reducing bacteria loads. Proposed regional BMPs consisted of subsurface infiltration systems, and infiltration basins, in total these proposed regional BMPs will provide 79 acre-ft of storage volume. The total area of distributed green streets proposed was approximately 121 acres.

Locations of proposed regional structural BMPs in the IP are shown in Figure ES-1 below:

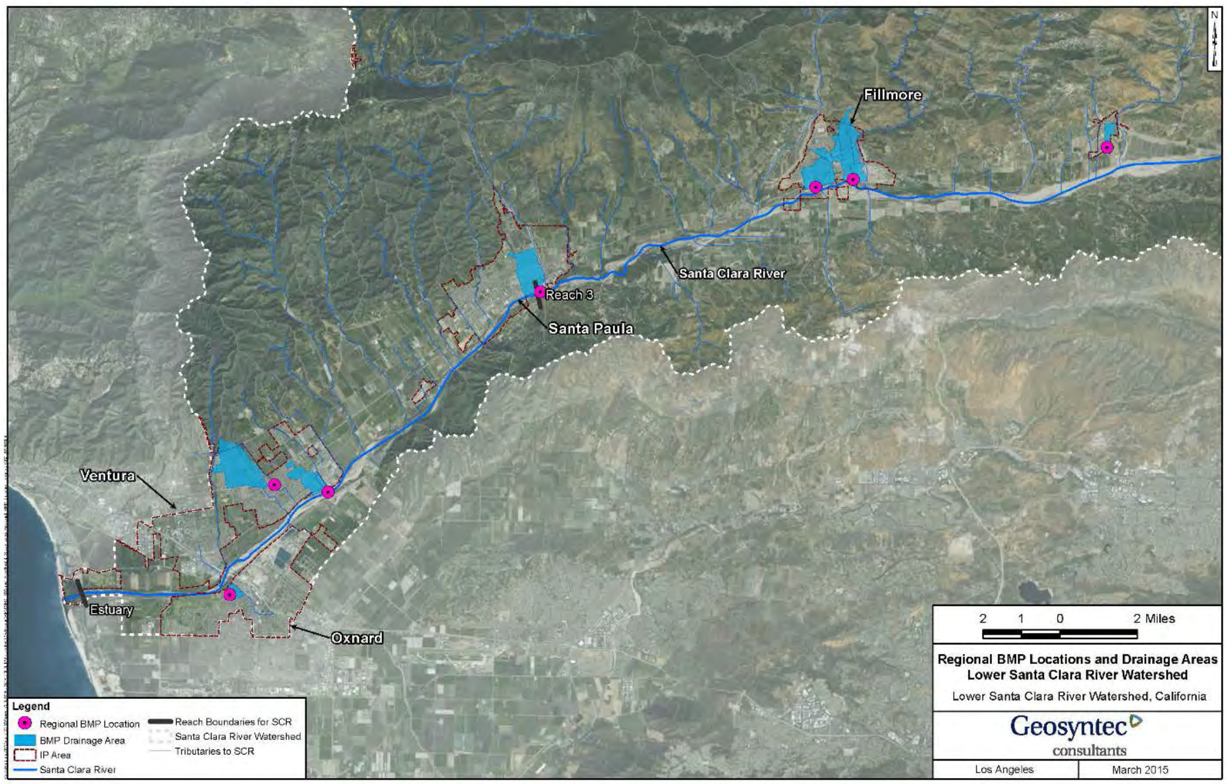

Figure ES- 1. Proposed Regional BMP Locations

DEMONSTRATION OF REASONABLE ASSURANCE

The TMDL defines interim and final numeric targets based on applicable Water Quality Objectives (WQOs) and WLAs in the form of Allowable Exceedance Days (AEDs). Separate WLAs are identified for wet and dry weather, as well as for the Estuary and Reach 3. The TMDL uses a reference system and antidegradation approach (RSAA), such that AEDs are set to ensure that bacteriological water quality is at least as good as that of a reference system, and that no degradation of existing bacteriological water quality is permitted, particularly where existing bacteriological water quality

[4] Green streets projects integrate green infrastructure elements, such as porous pavement, bioswales, or bioretention into urban transportation right-of-ways in order to treat stormwater and dry weather runoff.

is better than that of the reference system. The Bacteria TMDL also provides an option for the Participating Agencies to propose a load-based compliance pathway. Therefore, it is proposed that final compliance with TMDL requirements can be demonstrated in any one of the following ways, including option #4 as a load-based compliance determination for wet weather:

1. No exceedances of the WLAs are found in samples collected from the Participating Agencies' MS4 outfall(s); or
2. No exceedances of the WLAs are found in samples collected from the receiving waters at the Participating Agencies' receiving water monitoring station; or
3. No direct or indirect discharge from the Participating Agencies' MS4 to the receiving water has occurred during the subject monitoring period; or
4. The measured wet weather pollutant load reductions for discharges from the Responsible Copermittees' MS4 outfalls are greater than or equal to the final wet weather target load reductions reported in the LSCR IP.

A TMDL reopener was included in the implementation plan to be conducted by March 2016, but the TMDL could be reopened at any time if changes are warranted. The statewide bacteria objectives are scheduled to be adopted in Spring 2016. The statewide bacteria objectives would trigger the reopener, so there is potential for the TMDL WLAs to change as well.

Interim WLAs become effective in March 2016, however because the interim WLAs are based on current exceedance frequencies, the Participating Agencies have proposed no new BMPs to address them. The BMPs described in this IP are designed to meet the TMDL-specified final WLAs for dry and wet weather, which become effective in 2023 and 2029, respectively.

For dry weather, the Participating Agencies are proposing a suite of non-structural BMPs that will aim to eliminate 100 percent of non-exempt dry weather discharges from the MS4. By eliminating all non-exempt flows, all associated loads will also be eliminated, resulting in compliance with the dry weather WLAs. If necessary, structural BMPs (e.g., low flow diversions to sewers) will be used as a backstop to achieve this goal if it is determined that non-structural BMPs alone are insufficient.

Wet-Weather Load Reduction Summary

Figure ES- 2 and Table ES- 1 summarize expected wet weather load reductions resulting from the implementation of the structural and non-structural BMPs described in this IP for Reach 3 and the Estuary, respectively. Table ES- 1 presents the total calculated load reductions for each portion of the watershed and the estimated mean target load reduction necessary to meet TMDL requirements. As shown in Table ES- 1, the predicted load reductions for the proposed suite of BMPs meet the target load reductions required in both portions of the watershed, therefore demonstrating "reasonable assurance" of complying with the TMDL WLAs.

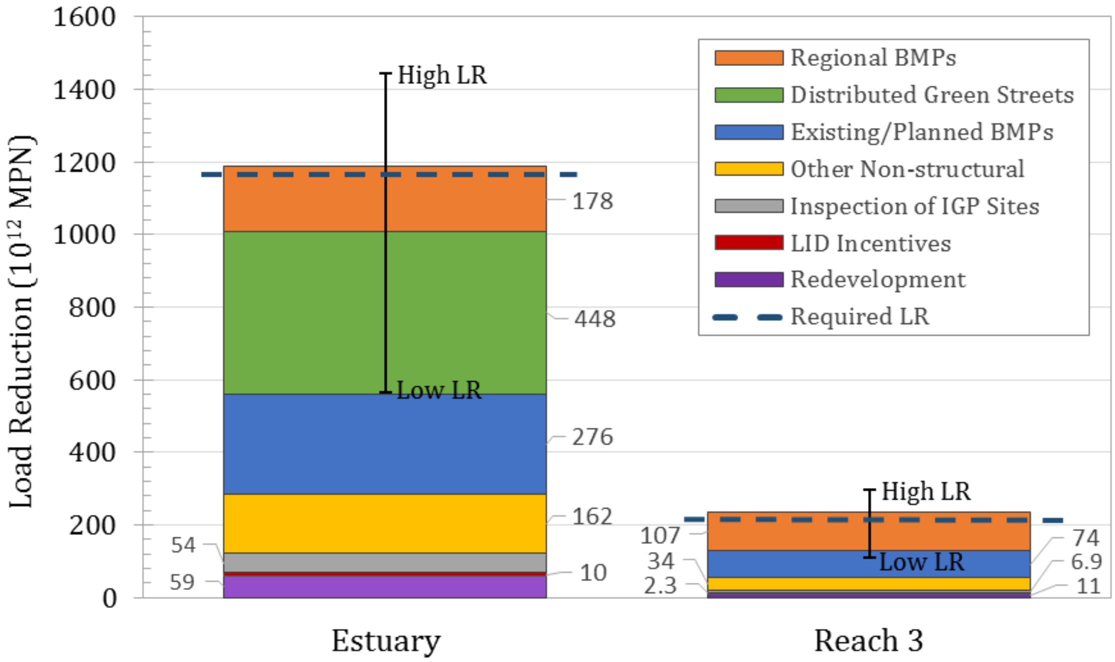

Figure ES- 2. Fecal Coliform Load Reductions by BMP Type for Water Year 1995; Whiskers indicate 25th (low) and 75th (high) percentile estimates of BMP load reductions

Table ES- 1. Modeled Fecal Coliform Load Reductions Compared to Target Load Reductions for Water Year 1995

SCR Reach	*Total Modeled Load Reduction [25th – 75th percentile estimate] (10^{12} MPN)*	*Target Load Reduction (10^{12} MPN)*	*Target Load Reduction Met?[1]*
Reach 3	236 [109-299]	213	Yes
Estuary	1,187 [568-1,442]	1,165	Yes

[1] Based on average modeled load reduction

IMPLEMENTATION SCHEDULE

Figure ES- 3 describes the proposed schedule for implementation of the control measures described in this IP, as well as key regulatory dates.

The timing and detailed plans for each BMP will be determined by the Participating Agency responsible for implementation.

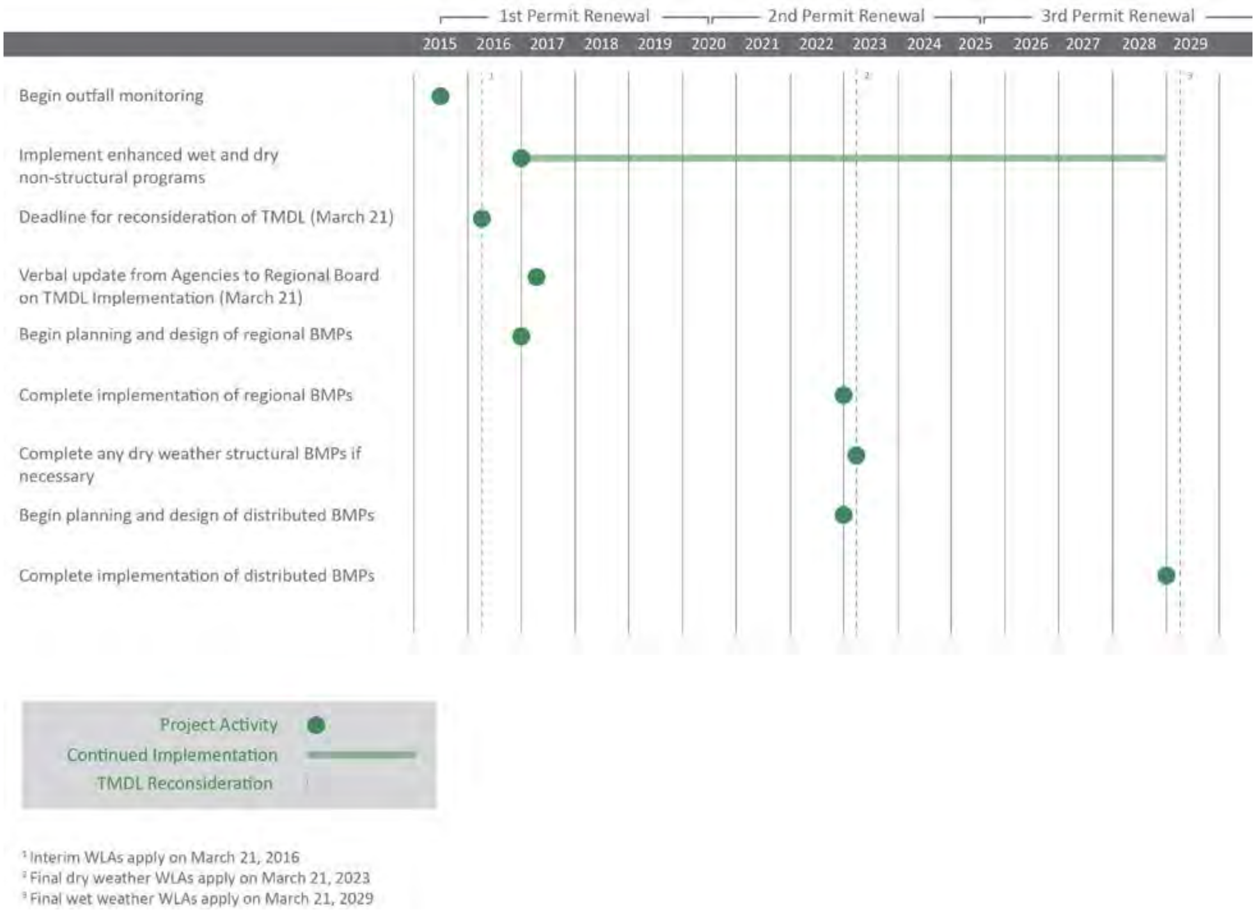

Figure ES- 3. LSCR TMDL Implementation Plan Phasing Schedule

Outfall Monitoring Plan

As required by the TMDL, this IP includes an Outfall Monitoring Plan which details the outfall monitoring to be conducted for SCR Reaches 1, 2, and 3 by the Participating Agencies. The Outfall Monitoring Plan was designed to work in conjunction with receiving water monitoring to meet the requirements of the TMDL. The strategy for conducting monitoring during dry and wet weather is to monitor one outfall per jurisdiction that is representative of the dry and wet weather discharges from the Participating Agencies' MS4s. The strategy for enhanced monitoring to assess outfall discharges in the event of an in-stream exceedance of the interim or final WLAs utilizes data assessment and source identification to investigate contributions of bacteria from the MS4 system to the exceedance.

Adaptive Management Process

The IP outlines an adaptive management approach that provides a framework for evaluating progress toward meeting the compliance requirements of the TMDL and modifying the IP in response to the evaluation. The Participating Agencies will use receiving water and outfall water quality data to evaluate whether modifications to targets, schedules, and/or BMPs are necessary to achieve compliance with the interim and final TMDL compliance requirements. Additionally, the

Participating Agencies will evaluate any TMDL modifications and revise targets, schedules, and/or BMPs as needed to achieve compliance with revised interim and final TMDL compliance requirements.

MULTI-BENEFITS OF PROPOSED BMPS

In addition to the modeled water quality benefits of the proposed BMPs (thus achieving compliance with the TMDL requirements), they are expected to provide other benefits that include the public education/awareness, neighborhood greening, and water supply benefits. The cumulative groundwater recharge quantity is estimated at 3,300 acre-feet for the 1995 water year (WY), or enough water to supply approximately 8,100 families per year (Aquacraft 2011). This capture volume represents approximately 15 percent of the total LSCR MS4 area runoff volume for the 1995 WY. This is considered a very significant benefit given the ongoing drought and falling groundwater levels in local groundwater basins.

ESTIMATED IP PROGRAM COSTS

Planning-level estimates of costs associated with implementation of the proposed regional and distributed structural BMPs were developed. Costs associated with implementation of non-structural programs were not quantified. A range of costs was developed to account for various BMP design alternatives, BMP configurations, site-specific constraints and the uncertainty of available BMP unit cost data.

Table ES- 2. Estimated 20-Year Life-Cycle Costs for Proposed Structural BMPs

BMP	*Low Cost*	*High Cost*
City of Ventura Regional Subsurface Infiltration System - Chumash Park	$12,000,000	$15,000,000
Oxnard Regional Infiltration Basin - South Bank Park	$2,000,000	$3,300,000
County Maintenance Yard Regional Infiltration Basin	$4,300,000	$6,900,000
County of Ventura Regional Infiltration BMP - Piru Telegraph Rd Site	$2,900,000	$4,700,000
Santa Paula Regional Infiltration Basin - Santa Paula Airport Site	$4,000,000	$6,600,000
Fillmore Regional Infiltration Basin - WWTP Ponds Site	$5,800,000	$9,200,000
Fillmore Regional Infiltration Basin - HVP Park and Wetlands Site	$4,600,000	$7,300,000
Total Distributed Green Streets (all agencies)	$330,000,000	$700,000,000
Total Structural BMP Cost	***$370,000,000***	***$750,000,000***

[1] Life-cycle costs for all structural BMPs assume a 20-year life

1 INTRODUCTION

This Implementation Plan (IP) for the Lower Santa Clara River (LSCR) Watershed[5] has been prepared to address the requirements of Resolution No. R10-006, "Total Maximum Daily Load for Indicator Bacteria in Santa Clara River Estuary and Reaches 3, 5, 6, and 7" (Bacteria TMDL) which became effective on March 21, 2012 (LARWQCB 2012). The Bacteria TMDL requires that municipal separate storm sewer systems (MS4) agencies and jurisdictions in the SCR Watershed develop an IP which outlines how they will cooperatively or individually achieve compliance with Waste Load Allocations (WLAs), by describing implementation methods and schedule, proposed milestones, and outfall monitoring. The Draft Implementation Plan must be submitted three years after the effective date of the TMDL or by March 21, 2015. In order to most efficiently use planning resources, the responsible MS4 agencies and jurisdictions in the LSCR Watershed (the Cities of Ventura, Santa Paula, Fillmore, and Oxnard, and the County of Ventura; forthwith known as the LSCR Participating Agencies) have opted to collaboratively develop this IP.

1.1 PURPOSE

The LSCR IP will guide the Participating Agencies as they plan and implement structural and non-structural best management practices (BMPs) in order to achieve the MS4 WLAs specified in the TMDL. For purposes of this IP, loads from agricultural land uses, as well as open space located outside of the Participating Agencies' jurisdictional boundaries, and federal lands and state parks, are not considered to be the responsibility of the Participating Agencies.

The approach of this IP is to prioritize non-structural BMPs first for implementation, because they are assumed to be a cost-effective way of reducing pollutant loading. The non-structural BMPs included in the IP were selected based on their ability to target fecal and anthropogenic sources first, potential effectiveness, agency preferences, and feasibility of implementation.

Structural BMPs are capital projects that by their nature are more complex, costly, and time-consuming to implement. Structural BMPs were considered after the cumulative effectiveness of non-structural BMPs was deemed insufficient to meet WLAs. Selection and location of structural BMPs identified in the IP were chosen based on load reduction need, BMP effectiveness, cost, and feasibility of implementation using agency input, the SBPAT computer modeling tool, and best professional judgment.

1.2 TERMS OF REFERENCE

This work is conducted by Geosyntec for the LSCR Permittees. This IP serves as the draft deliverable for the Consultant Services Contract between the Ventura County Public Works Agency and Geosyntec dated October 15, 2014. This work is directed by Brandon Steets, PE, and conducted by Stacey Schal, Adam Questad, PE, Venkat Gummadi, PE, Sean McKnight, MESM, Megan Otto, PE, and Rita Kampalath, PhD, PE of Geosyntec. Peer review was provided by Julie Larson and Megan

[5] For the purposes of this Implementation Plan, the LSCR Watershed encompasses Reach 3 to the Estuary, all of which is in Ventura County.

Otto, and senior review was provided by Brandon Steets in accordance with Geosyntec's quality assurance policies.

1.3 Contents of Implementation Plan

The Basin Plan Amendment requires the IP to include implementation methods, an implementation schedule, proposed milestones, and proposed outfall monitoring to determine compliance. Implementation methods are met through the identification of BMPs in section 3, including a technically defensible quantitative linkage to WLAs through the use of a Reasonable Assurance Analysis model for wet weather (section 3.1) and narrative RAA approach for dry weather (section 3.2). Quantitative estimates of the water quality benefits provided by the proposed implementation approach are shown in section 3.1.4. The implementation schedule is met through the BMP phasing schedule included in section 5. Proposed milestones are met through proposed implementation milestones, or potential permit conditions shown in section 5, and proposed permit compliance language. Outfall monitoring is met with the draft outfall monitoring plan included in Appendix A.

2 Background

2.1 Physical Setting

The SCR covers approximately 1600 square miles, with the River passing through portions of Los Angeles and Ventura Counties before flowing into the Pacific Ocean. The portion of the LSCR Watershed that this IP covers (IP Area) consists of the jurisdictions of the Cities of Ventura, Oxnard, Santa Paula, and Fillmore, and the County of Ventura unincorporated urban area, which cover approximately 25 square miles. Figure 1 depicts a map of the land uses and MS4 jurisdictions of the LSCR Watershed. The River is divided into several reaches. The Bacteria TMDL covers the Estuary, and Reaches 3, 5, 6, and 7. Of these, the IP Area drains to the Estuary and Reach 3 (i.e., the Reaches located in Ventura County).

The primary land uses in the SCR watershed as a whole are agriculture, open space, and residential, with residential acreage increasing in recent years relative to other land uses in both the upper and lower watersheds. In contrast, within the IP Area, the primary land use is residential (48 percent), predominantly comprised of single family residential. The land uses within the IP Area are also shown in Figure 1.

DRAFT - Lower Santa Clara River Implementation Plan
March 2015
Page 3

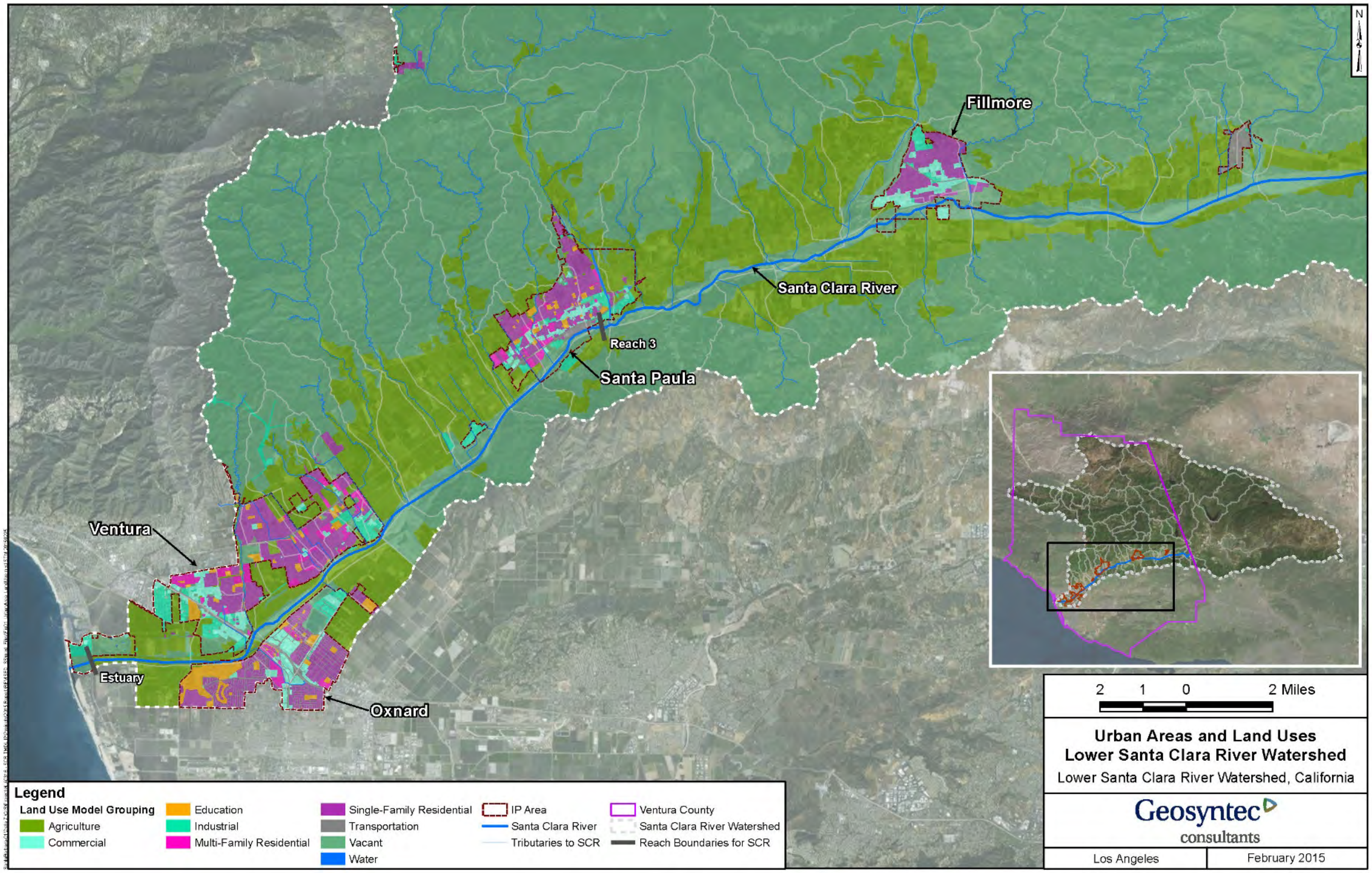

Figure 1. Urban Areas within the Lower SCR Watershed

2.2 Regulatory Context

The SCR Estuary and Reaches 3, 5, 6, and 7 were placed on the United States Environmental Protection Agency's (USEPA) Clean Water Act (CWA) Section 303(d) list in 1996 and 1998 because levels of bacteria exceeded the water quality objectives (WQOs) for Water Contact (REC-1) and Non-contact Recreation (REC-2) beneficial use designations. In response to the 303(d) listings, a TMDL for Indicator Bacteria was developed and adopted by the Los Angeles Regional Water Quality Control Board (Regional Board). As part of the TMDL analysis, urban stormwater, agriculture, and open space were identified as sources of indicator bacteria to the SCR.

The TMDL uses a reference system and antidegradation approach (RSAA). This approach recognizes that there are natural and uncontrollable sources of bacteria that can cause exceedances of the WQOs. As a result of the RSAA, a certain frequency of exceedance of the WQOs, expressed as allowable exceedance days (AEDs), is permitted based on the observed exceedance frequency in a reference water system. The exceedance frequency ensures that bacteriological water quality is at least as good as that of a reference system, and that no degradation of existing bacteriological water quality is permitted, particularly where existing bacteriological water quality is better than that of the reference system.

The Bacteria TMDL establishes numeric targets, which consist of REC-1 WQOs[6], and WLAs in the form of AEDs. Separate numeric targets are set for the Estuary, and the upper Reaches (Reaches 3, 5, 6, and 7). Estuary WQOs are based on Marine REC-1 standards and apply to fecal coliform, enterococcus, and total coliform, while WQOs for the Reaches are based on Freshwater REC-1 standards, and apply only to *E. coli*. Numeric targets are set in terms of single sample limits and geometric mean limits. WLAs are season- and weather-dependent and were determined using the RSAA. As described in the Bacteria TMDL, these AEDs were based on the more stringent of two criteria, either 1) exceedance days in the designated reference system, or 2) site-specific historical exceedance days.

Interim and final numeric targets are described in Table 1 and Table 2 for the Estuary and Reach 3, respectively. The interim WLAs become effective four years after the effective date of the Bacteria TMDL, or March 21, 2016. These interim targets are based on the historical exceedance probability at existing monitoring locations and are intended to ensure that water quality does not degrade further from the current condition. Because these targets are reflective of current conditions, no implementation actions will be required to meet these interim targets. The final dry weather WLAs become effective 11 years after the effective date of the Bacteria TMDL (March 21, 2023), and the final wet weather WLAs become effective 17 years after the effective date of the Bacteria TMDL (March 21, 2029).

[6] REC-1 WQOs are currently being reconsidered by the State Water Resources Control Board, with potential changes that include consistency with 2012 USEPA recommended REC criteria, as well as High Flow Suspension designations.

Table 1. TMDL Final MS4 WLAs for SCR Estuary

Sample Type	Fecal Coliform (#/100 mL)	Enterococcus (#/100 mL)	Total Coliform (#/100 mL)	Interim Allowable Exceedance Days[1]	Final Allowable Exceedance Days[1]
Single Sample	400	104	10,000	Wet Weather: 62 Summer Dry Weather: 150 Winter Dry Weather: 49	Wet Weather: 25 Summer Dry Weather: 10 Winter Dry Weather: 12
Geometric Mean	200	35	1,000	0	0

[1] Summer Dry Weather: April 1 – October 31; Winter Dry Weather: November 1 – March 31; Wet weather is defined as days with 0.1" of rain or greater plus the following three days

Table 2. TMDL Final MS4 WLAs for SCR Reach 3

Sample Type	E. Coli (#/100 mL)	Interim Allowable Exceedance Days[1]	Final Allowable Exceedance Days[1]
Single Sample	235	Wet Weather: 61 Dry Weather: 17	Wet Weather: 16 Dry Weather: 5
Geometric Mean	126	0	0

[1] Wet weather is defined as days with 0.1" of rain or greater plus the following three days

Compliance with these WLAs will be measured at the two receiving water Compliance Monitoring Locations (CMLs) in the LSCR IP Area, which are shown in Figure 2. These sites were proposed as CMLs in the In-Stream Compliance Monitoring Plan for Santa Clara River Estuary and Reach 3 Bacteria Total Maximum Daily Load (VCWPD 2013), which was submitted to the Regional Board in 2013. Details of the proposed in-stream water quality monitoring will be conducted when submitted Monitoring Plan is approved by the Regional Board EO as required by the Bacteria TMDL.

The Bacteria TMDL also provides an option for the Participating Agencies to propose a load-based compliance pathway. Therefore, it is proposed that final compliance with TMDL requirements can be demonstrated in any one of the following ways, with option #4 developed here as load-based compliance determination language for wet weather. For an example of similar TMDL compliance language, readers are referred to the current San Diego MS4 Permit (SDRWQCB 2013).

1. No exceedances of the WLAs are found in samples collected from the Participating Agencies' MS4 outfall(s); or
2. No exceedances of the WLAs are found in samples collected from the receiving waters at the Participating Agencies' receiving water monitoring station; or
3. No direct or indirect discharge from the Participating Agencies' MS4 to the receiving water has occurred during the time period subject to the targets; or
4. The measured wet weather pollutant load reductions for discharges from the Responsible Copermittees' MS4 outfalls are greater than or equal to the final wet weather target load reductions reported in the LSCR IP.

Additionally, the Bacteria TMDL provides the option for reconsideration if the Participating Agencies conduct special studies or if regulatory changes occur that modify the objectives, the applicability of the objectives, and/or allowable exceedance frequencies. Specifically, the Bacteria TMDL shall be reconsidered if:

1. Monitoring and any voluntary local reference system studies justify a revision;
2. USEPA publishes revised recommended bacteria criteria; or
3. The Regional Board adopts a separate Basin Plan amendment, suspending recreational uses during high flows.

To support meeting the interim and final WLAs, the Bacteria TMDL requires the development of an implementation plan. The implementation plan must include the following elements (corresponding sections of this IP are included in parentheses):

1. Implementation methods (Section 7)
2. Implementation schedule (Section 4)
3. Proposed milestones (Section 4)
4. Proposed outfall monitoring to determine compliance (Appendix A)
5. Quantitative estimates of the water quality benefits provided by the implementation approach (Section 3)
6. For MS4s proposing to utilize the wet-weather load-based compliance option, include an estimate of existing load and allowable load from the MS4 outfalls to attain the allowable number of exceedance days in-stream and a quantitative linkage between the proposed load reduction and the WLAs (Section 3)

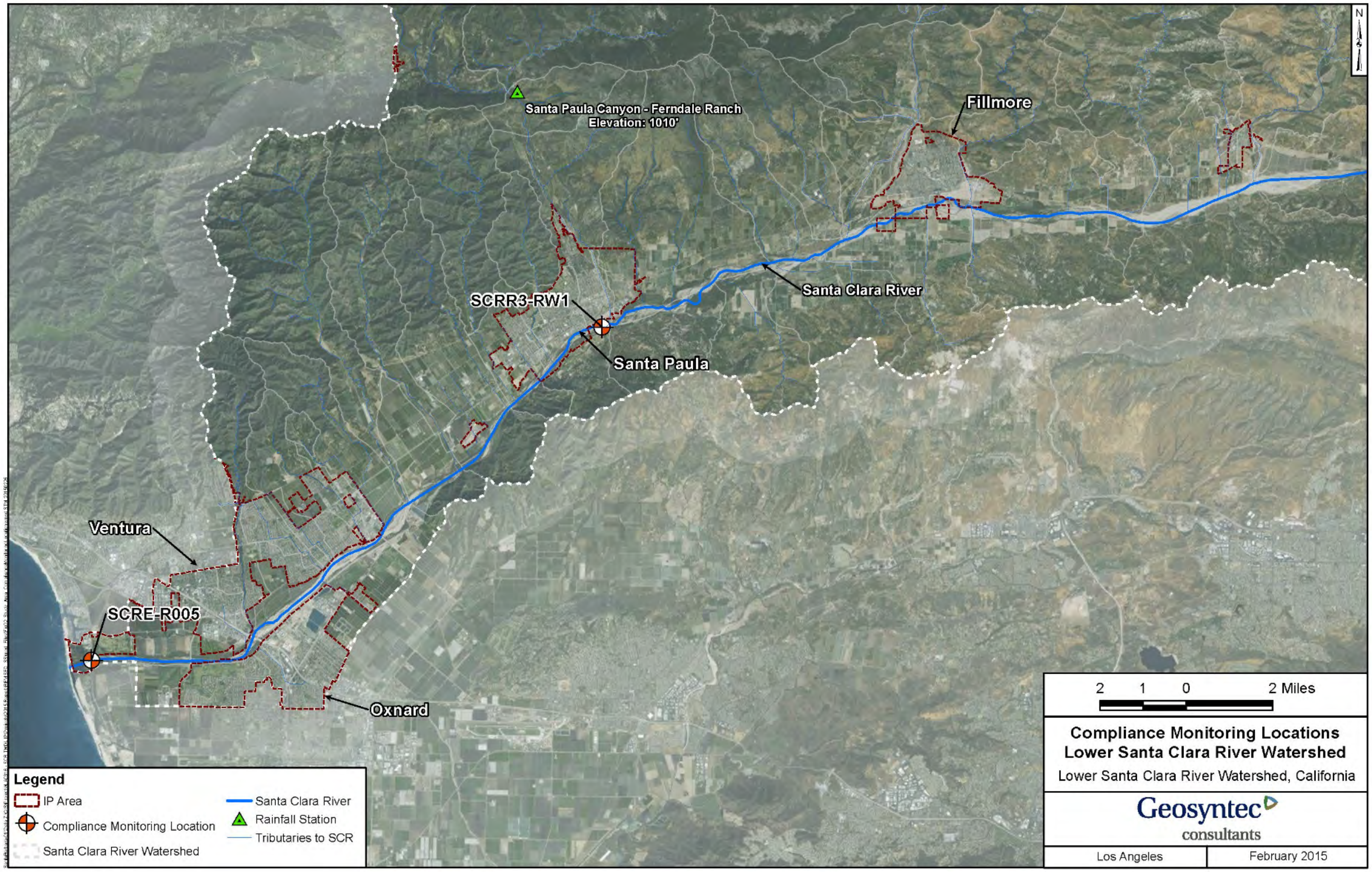

Figure 2. Lower SCR IP Area Compliance Monitoring Locations

2.3 WATER QUALITY

Sampling has been conducted in the LSCR Watershed in accordance with the requirements of the Ventura National Pollution Discharge Elimination System (NPDES) MS4 Permit (Permit) since the first was issued in 1994. Recent sampling, which has occurred since the Bacteria TMDL was adopted by the Regional Board in 2010 has focused on the mass emission station, ME-SCR (located within Reach 3), as well as major outfalls[7] which are located in the Cities of Ventura (MO-VEN), Oxnard (MO-OXN), Santa Paula (MO-SPA), and Fillmore (MO-FIL). Major outfalls, including their locations, are discussed further in Section 5.

Data taken from these locations starting in the 2010/11 sampling season during wet and dry weather are summarized below in Table 3 through Table 6. As shown in these tables, exceedances of single sample WQOs (i.e. freshwater WQOs for fecal coliform) are frequent during wet weather at both the outfalls and within receiving waters. Dry weather exceedances are less frequent, and none of the recent (i.e., starting in the 2010/11 sampling season) receiving water samples have exceeded single sample WQOs. The sampling frequency is not sufficient to evaluate results in comparison to geometric mean WQOs.

[7] A "major outfall" is defined in the Ventura County MS4 Permit as an MS4 outfall "that discharges from a single pipe with an inside diameter of 36 inches or more or its equivalent (discharge from a single conveyance other than circular pipe which is associated with a drainage area of more than 50 acres); or for municipal separate storm sewers that receive storm water from lands zoned for industrial activity (based on comprehensive zoning plans or the equivalent), an outfall that discharges from a single pipe with an inside diameter of 12 inches or more or from its equivalent (discharge from other than a circular pipe associated with a drainage area of 2 acres or more), as defined in 40 CFR122.26 (b)(5). "

Table 3. Wet Weather NPDES Major Outfall Sampling Results

	MO-OXN		MO-VEN		MO-SPA		MO-FIL	
Sampling Event	*E. Coli (MPN/100 mL)*	*FC (MPN/ 100 mL)*	*E. Coli (MPN/100 mL)*	*FC (MPN/ 100 mL)*	*E. Coli (MPN/ 100 mL)*	*FC (MPN/ 100 mL)*	*E. Coli (MPN/100 mL)*	*FC (MPN/ 100 mL)*
2,010/11-1	19,863	24,000	24,192	30,000	17,329	50,000	5,717	30,000
2,010/11-2	11,199	11,000	17,329	24,000	17,329	50,000	19,863	24,000
2,010/11-4	2,014	3,000	1,616	1,100	850	900	2,613	3,000
2,011/12-1	19,863	22,000	24,192	2,400	20,460	50,000	4,611	17,000
2,011/12-2	3,448	1,700	17,329	16,000	959	1,600	146	130
2,011/12-3	860	3,000	4,352	14,000	4,106	9,000	2,755	5,000
2,012/13-2	17,329	24,000	24,192	24,000	24,192	30,000	10,462	30,000
2,012/13-3	738	500	9,208	22,000	6,131	16,000	41	80
2,012/13-4	5,172	9,000	3,448	9,000	12,033	16,000	17,329	30,000
2,013/14-1	7,701	2,400	8,164	30,000	10	3,000	10	17,000
2,013/14-2	369	460	10,462	170,000	4,352	170,000	4,352	50,000
2,013/14-3	5,475	30,000	3,448	3,000	5,794	30,000	7,270	17,000
25th percentile	*1,726*	*2,225*	*4,126*	*7,500*	*3,319*	*7,500*	*1,996*	*4,500*
50th percentile	*5,324*	*6,000*	*9,835*	*19,000*	*5,963*	*23,000*	*4,482*	*17,000*
75th percentile	*12,732*	*22,500*	*19,045*	*25,500*	*17,329*	*50,000*	*8,068*	*30,000*

Table 4. Wet Weather NPDES Mass Emission Station Sampling

	ME-SCR	
Sampling Event	*E. Coli (MPN/100 mL)*	*FC (MPN/100 mL)*
2,010/11-1	359	300
2,010/11-2	512	500
2,010/11-4	1,658	1,700
2,011/12-1	2,014	2,400
2,011/12-2	171	140
2,011/12-3	292	300
2,012/13-2	472	700
2,012/13-3	31	50
2,012/13-4	30	30
2,013/14-1	20	50
2,013/14-2	275	1,700
2,013/14-3	426	5,000
25th percentile	*136*	*118*
50th percentile	*326*	*400*
75th percentile	*482*	*1,700*

Table 5. Dry Weather NPDES Major Outfall Sampling[1]

Sampling Event	MO-OXN		MO-VEN		MO-SPA		MO-FIL	
	E. Coli (MPN/100 mL)	FC (MPN/ 100 mL)	E. Coli (MPN/100 mL)	FC (MPN/ 100 mL)	E. Coli (MPN/ 100 mL)	FC (MPN/ 100 mL)	E. Coli (MPN/100 mL)	FC (MPN/ 100 mL)
2,010/11-5	213	310	10	2	631	2,400	1,259	3,000
2,011/12-4	10	2	31	70	NS	NS	529	500
2,012/13-5	301	130	51	80	NS	NS	253	300
2,013/14-4	NS	NS	1,012	5,000	NS	NS	2,723	2,200
2,010-DRY	341	NS	161	NS	NS	NS	644	NS
2,011-DRY	6,867	NS	226	NS	NS	NS	512	NS
2,012-DRY	2,142	NS	10	NS	NS	NS	1,850	NS
2,013-DRY	31	NS	364	NS	31	NS	2,613	NS
2,014-DRY	2,909	NS	1,829	NS	NS	NS	2,247	NS
25th percentile	*167.5*	*66*	*31*	*53*	*181*	*2,400*	*529*	*450*
50th percentile	*321*	*130*	*161*	*75*	*331*	*2,400*	*1,259*	*1,350*
75th percentile	*2,333.75*	*220*	*364*	*1,310*	*481*	*2,400*	*2,247*	*2,400*

NS = not sampled

[1] Sampling events with 'DRY' in the name were part of dry weather, dry season sampling prescribed by the NPDES Permit. Other samples were taken during a dry weather event that occurred within the wet season

Table 6. Dry Weather NPDES Mass Emission Station Sampling

Sampling Event	ME-SCR	
	E. Coli (MPN/100 mL)	FC (MPN/100 mL)
2,010/11-5	10	30
2,011/12-4	31	50
2,012/13-5	110	300
2,013/14-4	31	20
25th percentile	26	28
50th percentile	31	40
75th percentile	51	113

3 TECHNICAL APPROACH

The technical approach used to calculate required load reductions for the Participating Agencies to achieve compliance with the requirements of the Bacteria TMDL, as well as to evaluate whether the suite of BMPs selected would meet these load reductions is described below. In general, the approach for wet weather consisted of calculating baseline loads within the IP Area, and allowable loads based on the numeric targets, with the difference between these two loads being the target load reduction (TLR).

The suite of BMPs selected to meet these TLRs included non-structural BMPs and structural BMPs. Non-structural BMPs considered included low impact development (LID) incentives, LID redevelopment, and other program enhancements which are detailed in the following sections. Load reductions resulting from MS4 agencies' programs to inspect industrial sites covered by the Industrial General Permit (IGP) were also considered. Structural BMPs included existing and planned BMPs (mostly on private property, resulting from the MS4 post-construction program), proposed distributed retrofit BMPs, and proposed regional retrofit BMPs.

Load reductions were not quantified for dry weather, since the compliance approach will be to eliminate 100 percent of non-exempt dry weather flows, which will result in elimination of all unallowable dry weather loads. This is consistent with the Permit compliance pathway of eliminating discharges (LARWQCB 2009, Part 1.A).

3.1 Wet Weather

3.1.1 Baseline Loads

Baseline wet weather fecal coliform[8] loads in the LSCR Watershed were determined using the Structural BMP Prioritization and Analysis Tool (SBPAT[9]), which uses a stochastic Monte Carlo method[10] to model water quality, and is one of the models approved for use for the Los Angeles region Enhanced Watershed Management Plans (EWMPs). Calculated annual loads are based on land use Event Mean Concentrations (EMCs) coupled with continuous hydrologic simulations (using the USEPA Storm Water Management Model [SWMM] model). In order to maintain consistency with the TMDL, baseline or existing loads for this analysis were calculated using rainfall from the 1995 WY, which, consistent with the Bacteria TMDL, was identified as the 90th percentile rainfall year based on analysis of rainfall data from the Santa Paula Canyon-Ferndale Ranch Station (#173A). This Station was selected based on its available Period of Record (POR), its geographic and orographic representativeness of the LSCR Watershed, as well as because it was a rain gage that was referenced in the Bacteria TMDL. Land use datasets for the IP Area were provided by the Participating Agencies if available. In areas where Agency-specific data were not available, Southern California Association of Governments (SCAG) land use datasets were used. Land use EMCs for fecal coliform consisted of a combination of SBPAT Los Angeles region default database values and County of Ventura monitoring. This methodology is discussed further in Section 3.1.3 as well as in Appendix B, which contains key input datasets used for the model (also see SBPAT Users'

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[8] Fecal coliforms (FC) are used as a surrogate for the FIB used in the TMDL since there is an acceptable database of both land use-based stormwater runoff concentrations and structural BMP performance for this pollutant.

[9] SBPAT is approved for use as a BMP modeling tool by the LARWQCB's recent RAA Guidelines.

[10] The Monte Carlo method is a computational algorithm that utilizes repeated random sampling to compute results, i.e., input data are "polled" or sampled from defined statistical distributions, model calculations (in this case, pollutant load estimates) are made, and output results are tallied; this process is then repeated thousands of times to produce output distributions.

Manual [Geosyntec 2012] for additional information), such as EMC values, BMP effluent concentrations, and GIS data sources. Model data flow is provided below in Figure 3.

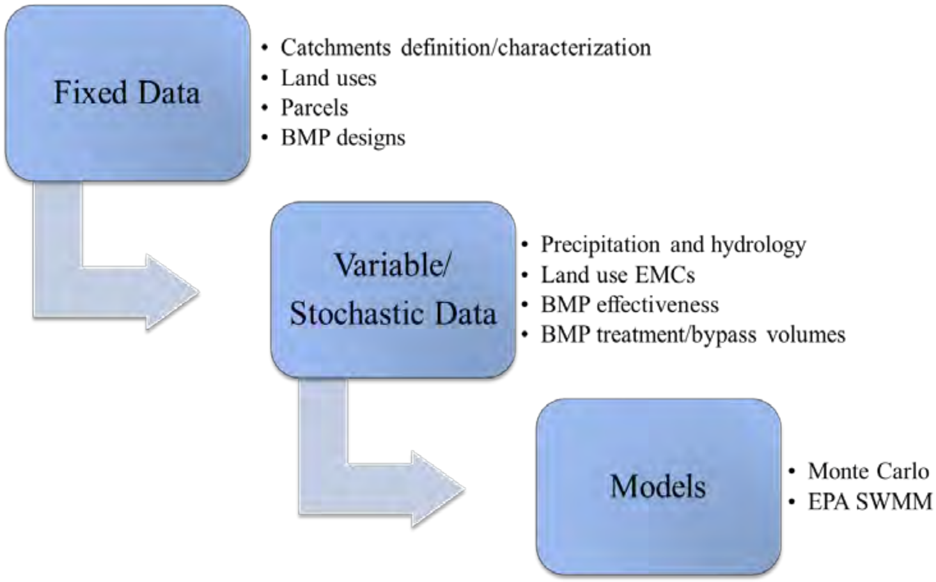

Figure 3. SBPAT Model Data Flow

A schematic of SBPAT's Monte Carlo process is provided in Figure 4.

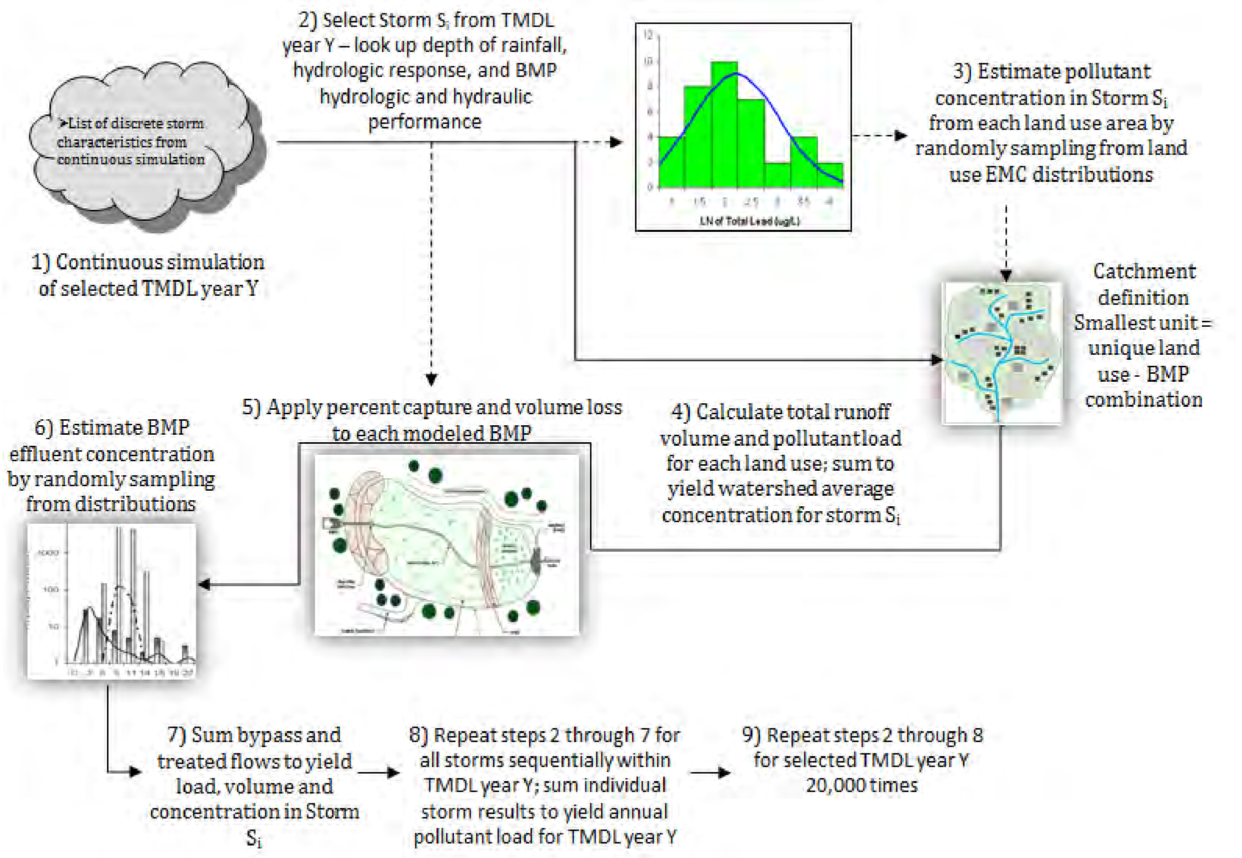

Figure 4. SBPAT Monte Carlo Method Components

Figure 5 and Figure 6 show the estimated modeled breakdown of LSCR wet weather watershed loads (excluding loads from the upper watershed) to the Reach 3 and Estuary CMLs respectively by jurisdiction in terms of percent of total tributary area loading (the Cities of Oxnard and Ventura only drain to the Estuary). Non-IP Areas (i.e., agricultural and open space land uses) are included in the total but presented as a separate contribution since they are not addressed by this IP. Additionally, for the purposes of the target load reduction analysis, loads from state and federal lands are not considered part of the Participating Agency baseline load since the Participating Agencies do not have jurisdiction over these areas. These figures illustrate the relatively minor load contribution from the Participating Agencies, which is the portion that this IP will address.

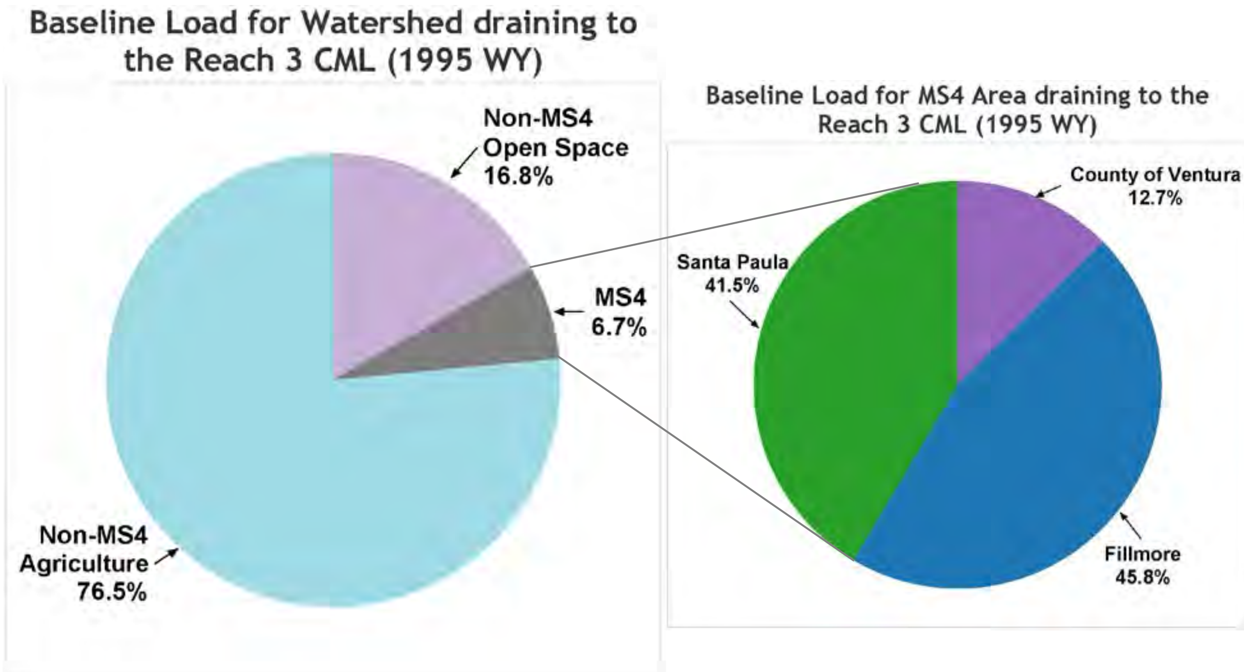

Figure 5. Estimated sources of wet weather FC loads in the LSCR Watershed draining to the Reach 3 CML[11]

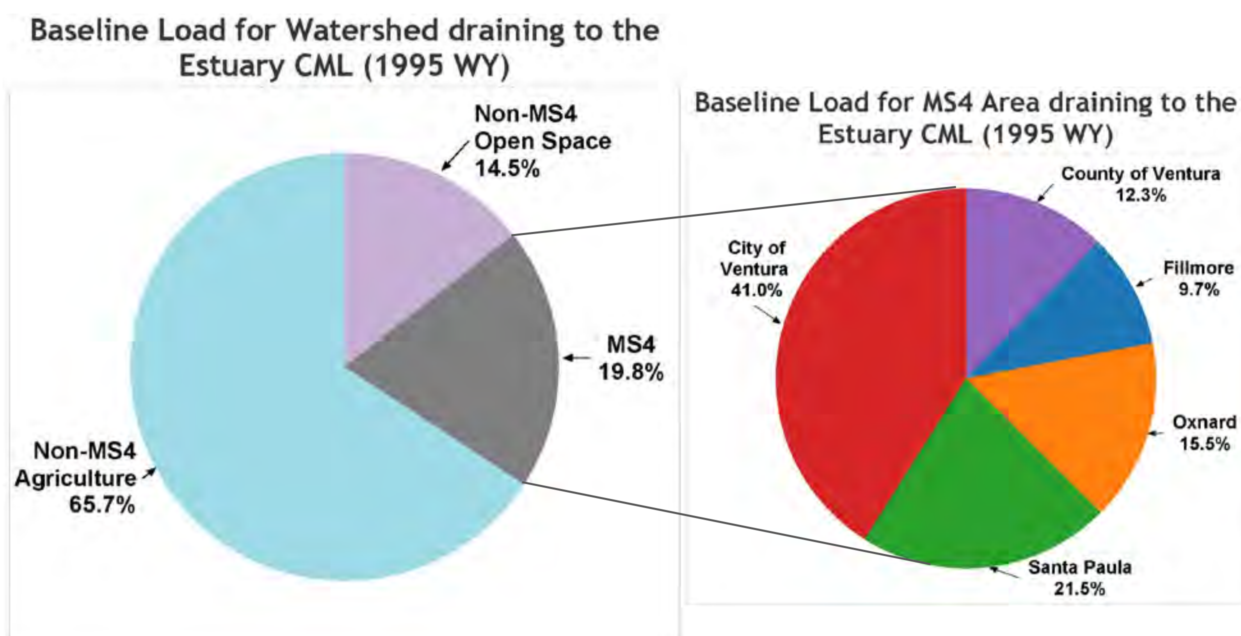

Figure 6. Estimated sources of wet weather FC loads in the LSCR Watershed draining to the Estuary CML[12]

[11] Non-MS4 area includes agricultural, state and federal, and other open space area that is outside incorporated jurisdictional and unincorporated urban area boundaries.

3.1.2 *TARGET LOAD REDUCTIONS*

This IP uses TLRs to assess compliance with Bacteria TMDL WLAs. TLRs represent the modeled MS4 load reduction that is estimated to achieve Bacteria TMDL WLAs (see Table 1 and Table 2) during the 90th percentile critical year, and were calculated for the LSCR Watershed using an approach that was presented to the Regional Board on April 9, 2014 for use in the four Santa Monica Bay EWMPs.

This approach relates the number of days with discharge (or “discharge days”, i.e., calendar days with modeled runoff), as modeled using SWMM, to Bacteria TMDL Allowable Exceedance Days (AEDs) (as shown in Table 1 and Table 2). First, the watershed was modeled using SWMM to determine the total number of discharge days during the baseline condition in the 90th percentile year (i.e., 1995 WY).

The allowable number of discharge days was then determined according to the following formula:

TMDL Allowable Exceedance Days = Allowable Discharge Days x Historical Exceedance Frequency

Since the area of analysis was limited to the MS4 urban area, the historical exceedance frequency for MS4stormwater discharges was conservatively assumed to be 100 percent, and the number of allowable discharge days was set equal to the number of Bacteria TMDL AEDs. Based on the high frequency of WQO exceedance in the wet weather outfall monitoring results shown in Table 3, this assumed exceedance frequency is considered reasonable and appropriate.

The IP Area was then modeled again using SWMM, with a hypothetical retention basin placed at the modeled area outlet. The diversion flowrate for this off-line basin was then iteratively sized until the number of modeled discharge days (resulting from bypass of the diversion structure) was reduced to the number of allowable discharge days. This hypothetical basin was then modeled using SBPAT to determine the fecal coliform load reductions that would result from such a basin, and these load reductions were set as the TLR.

For the Lower SCR Watershed, TLRs were calculated for the MS4 urban areas draining to Reach 3 and to the Estuary since these points have different numeric targets associated with them (see Table 1 and Table 2). The calculated TLRs are shown in Table 7.

Table 7. Lower SCR Baseline Loads and Target Load Reductions

	Baseline MS4 Loads (10^{12} MPN)	*TLR [25th to 75th percentile range] (as % of baseline MS4 load)*	*Absolute MS4 TLR (10^{12} MPN; based on average)*[1]
Reach 3	687	31 [25-37]	213
Estuary (Whole Watershed)	3,235	36 [30-42]	1,165

[1] Loads from non-MS4 areas have been removed from absolute TLR values

Based on the possibility that the State Water Resources Control Board may revise the existing statewide bacteria objectives (as discussed in Section 2.2), including establishing new high-flow suspension (HFS) guidance, alternative TLRs were calculated assuming a possible future HFS designation for the LSCR. These TLRs were 12.8 percent and 0 percent for Reach 3 and the Estuary, respectively.[12] These are not the TLRs used for evaluating compliance with the TMDL, rather these are just possible future TLR values that could be used if a HFS becomes designated for the LSCR reaches and Estuary.

3.1.3 BMP Evaluation Methodology

SBPAT was used to evaluate wet weather BMP performance. As described in Section 3.1.1, SBPAT links the long-term hydrologic output from a modified SWMM to a stochastic Monte Carlo water quality model to develop statistical descriptions of stormwater quantity and quality. Predicted runoff volumes (including volumes treated and bypassed by BMPs), land use EMCs, and BMP effluent concentrations are combined to determine the total pollutant loads and load reductions (i.e., the difference between existing and post-BMP load estimates). Through the Monte Carlo method, this procedure is repeated thousands of times, each time recording the volume, pollutant concentrations, loads, and load reductions for the designated water year using randomly sampled land use EMCs and BMP effluent EMCs. This produces numerical results describing the expected performance of a specific BMP configuration. The statistics of these recorded results are then used to characterize the low (25^{th} percentile), average (mean), and high (75^{th} percentile) values for the annual volume, pollutant loads, and pollutant concentrations in stormwater runoff from the modeled area, with and without BMPs implemented.

Estimated load reductions for the suite of BMPs included as part of this IP that were modeled with SBPAT were compared to the TLRs. For bacteria, this comparison will represent the exceedance day-based compliance demonstration. Expected pollutant reduction ranges were also produced, thereby capturing the variability inherent in land use runoff concentrations and BMP performance.

3.1.3.1 Non-Structural

3.1.3.1.1 LID Incentives

LID incentives are agency programs that encourage adoption of LID practices, such as rebates for downspout diverters and training workshops on building rain gardens. For this IP, quantification of new or enhanced LID incentives includes assessment of load reductions resulting from single family residential (SFR) implementation of downspout disconnects (modeled as swales). The average performance, during wet weather, of this program was modeled in SBPAT for the 1995 WY, consistent with the baseline load calculations. Performance was evaluated based on the following assumptions:

- 10 percent of SFR areas will implement a downspout disconnect program
- 38 percent of impervious SFR area is considered rooftop
- 50 percent of a rooftop area can be treated

[12] The HFS TLRs were based on 36 HFS days, 19 percent and 30 percent Allowable Exceedance Rates and 11 and 17 AEDs for Reach 3 and the Estuary, respectively, based on the Santa Paula Canyon-Ferndale Ranch rain station.

- Rooftop runoff was treated via swales sized for the Standard Urban Stormwater Management Plan (SUSMP) design storm intensity of 0.2 in/hr

The IP Area contains 6,061 acres of SFR land use, therefore 63 acres of SFR land in the LSCR watershed were assumed to implement disconnects.

3.1.3.1.2 LID Redevelopment

This IP analysis assumes that a portion of already developed area in the watershed will be redeveloped between Bacteria TMDL initiation and the end of the compliance period. A portion of this redevelopment is subject to the Ventura County MS4 Permit's post-construction LID requirements and therefore will result in load reduction benefits. The benefits associated with LID Redevelopment were accounted for by applying typical post-construction treatment requirements to a portion of the IP Area and modeling loading change in SBPAT.

The rate of redevelopment requiring LID implementation for each land use was taken from values derived for the Ballona Creek Bacteria TMDL IP (LA BOS 2009). During the 15 year compliance timeline (2014 – 2029), this rate will result in redevelopment of approximately 4 percent of the MS4 area. The annual land use-specific redevelopment rates assumed are as follows:

- Residential: 0.18 percent
- Commercial: 0.15 percent
- Industrial: 0.34 percent
- Education: 0.16 percent
- Transportation: 2.70 percent

A bioretention system (with underdrains) sized for retention of the 85th percentile design storm was modeled in SBPAT to represent load reductions resulting from this redevelopment. Bioretention was used because the Ventura County Technical Guidance Manual (TGM) (2011) requires onsite retention. Modeling was conducted utilizing a watershed-wide area weighted estimate of the 85th percentile design storm depth (1.4 inches), a BMP retention depth of 12 inches, and BMP infiltration rate of 0.3 in/hr.

3.1.3.1.3 Inspection of IGP Parcels

Participating Agencies implement industrial inspection programs, where they maintain active lists of IGP holders in their jurisdictions and inspect these sites for compliance with their Permit requirements. To credit the Agencies for this non-structural BMP and account for the expected water quality improvement under the new IGP (which requires more monitoring and BMP implementation), it was assumed that effluent from IGP parcels within the IP Area would meet the limit (i.e. 400 MPN/100 mL for fecal coliform). In order to model this scenario, a hypothetical treatment plant BMP was used on each IGP parcel, with effluent concentrations for the BMP set to the WQO. The BMP was modeled as online, so all flow from IGP parcels were treated by the treatment plant BMPs up to a design storm intensity of 0.2 in/hr (i.e., flowrates above this were untreated). This design storm is considered equivalent to the 85th percentile design storm, as required by the IGP. A total of 174 acres of IGP area, representing 38 different parcels, was modeled in the IP Area. The locations of IGP parcels in the IP Area are shown in Appendix C.

3.1.3.1.4 Other Non-Modeled Non-structural BMPs

The Participating Agencies have also committed to enhanced non-structural programs that are listed in Table 8. These programs were selected to target wet weather sources of bacteria to the MS4 (e.g., fertilizers, trash, homeless waste, pet waste, sewer leaks, and sediments).

Table 8. Non-modeled Non-structural BMPs that will be enhanced

Program	*County of Ventura*	*City of Ventura*	*City of Oxnard*	*City of Fillmore*	*City of Santa Paula*
Identification and control of sewage discharge to MS4s	•	•	•	•	•
Trash cleanups	•	•	•	•	•
Onsite wastewater treatment source reduction	•	n/a	n/a	n/a	n/a
Good landscaping practices	•	•	•	•	•
Commercial/industrial good housekeeping	•	•	•	•	•
Pet waste controls	•	•	•	•	•
Animal facilities management	•	•	•	•	•
Street and median sweeping	•	•	•	•	•
Homeless programs	•	•	•	•	•
MS4 cleaning	•	•	•	•	•
Education and outreach	•	•	•	•	•

*Programs should reflect enhancements relative to existing or historic programs and to minimum permit requirements

Because sufficient data do not exist to model pollutant load reductions from these programs separately, a cumulative five percent reduction of the baseline fecal coliform load was assumed for the average load reduction scenario based on best professional judgment, and consistent with assumptions made for the Los Angeles region EWMPs and WMPs. A range of zero percent to ten percent was assumed for the “low” and “high” load reduction scenarios, respectively. These and other non-structural BMPs and the assumed five percent reduction will be evaluated and updated as necessary throughout the interim compliance period through the adaptive management process as pollutant loading and BMP performance data are collected.

3.1.3.2 Structural

Estimated load reductions at the CMLs for structural BMPs during wet weather were calculated using SBPAT as described in Section 3.1.3. Details of the methodology for existing/planned, regional, and distributed BMPs are discussed in the following sections. The SBPAT User’s Guide contains additional information regarding how each BMP type was modeled (Geosyntec Consultants, 2012).

3.1.3.2.1 Existing and Planned BMPs

Numerous structural BMPs have been constructed or are planned, mostly through large private development projects that comply with the County’s TGM. Information on existing and planned structural BMPs were provided by the Agencies to support the necessary BMP modeling assumptions. Pollutant load reductions resulting from these BMPs were evaluated for wet weather using SBPAT, as described previously in this document.

First, SBPAT BMP types were identified based on information provided by the Agencies. In some cases, multiple BMP types were identified to represent different components of a project. BMP types modeled for existing and planned BMPs in the IP Area include bioretention, dry extended detention basins, cisterns, infiltration basins, media filters, porous pavement, and swales.

Next, the location of each identified BMP was investigated to determine the size and land uses of the BMP drainage area (i.e., the developed parcel in most cases). Each BMP was also classified as existing or planned to determine the appropriate sizing criteria. For modeling purposes, existing projects were sized to SUSMP criteria of a 0.75 inch design storm depth according to the previous Ventura County TGM, while all planned projects were sized to the 85th percentile design storm depth - or approximately 1.4 inches – according to the current Ventura County TGM (2011). A BMP infiltration rate of 0.3 in/hr was assumed. A 48 hour drain time was used for calculating depths when modeling infiltration basins and dry extended detention basins, consistent with the current Ventura County TGM.

All identified existing and planned BMPs in the IP Area were grouped by BMP type, land use treated, and sizing criteria. Each combination was modeled as a unit area in SBPAT, resulting in an expected pollutant load reduction that was extrapolated for all the existing and planned BMP treated areas across the entire IP Area.

There was one existing public retrofit BMP, the El Rio project, which was modeled using design information provided by the County (i.e., storage volume, drainage area, and a site-specific measured infiltration rate). Existing and planned BMPs modeled in the IP Area are tabulated in Appendix C.

3.1.3.2.2 Proposed Regional

As a first step for potential regional BMP opportunity siting, GIS screening was performed to identify large, undeveloped publically-owned parcels that are located adjacent to stormdrains and downgradient of large urban areas, with a preference for sites with hydrologic soil groups A or B (i.e., infiltrative soil types). These potential opportunity parcels were then screened by the agencies to select proposed regional BMP project sites. Regional BMP design concepts were then developed for each project site, including delineation of drainage areas, identification of BMP type (primarily above or below ground infiltration BMPs given their high cost effectiveness for bacteria load reduction), BMP sizing, and development of BMP footprints within the parcel boundaries. Where feasible, each regional BMP was sized to retain the 85th percentile storm; otherwise the maximum usable area (based on visual assessment of site specific constraints and existing infrastructure, or information provided by the agencies) was set to the BMP footprint and the BMP sizing criteria was backcalculated based on this BMP area and its drainage area. The locations of all regional BMPs and their drainage areas are shown in Figure 7.

For regional projects proposed on private-owned land, agencies will coordinate with the landowners and intend to secure agreements to allow for BMP construction. If agreements cannot be reached with landowners, alternative project sites that produce comparable load reductions will be identified.

In SBPAT, the catchments were modified to enable modeling of the drainage areas to each regional BMPs. Within each regional BMP footprint, side slopes and pre-treatment were assumed to occupy 15 percent of the available area. Once design parameters were established, each BMP was modeled in SBPAT to determine the expected bacteria load reductions. General BMP design parameters assumptions were as follows.

Infiltration Basins:

- Drawdown time: 48 hours (limited for vector control purposes)
- Infiltration rate: Based on the site-specific NRCS soil texture
- Area: Determined by space available for the BMP
- Depth: Governed by the drawdown time and infiltration rate

Subsurface Infiltration Systems:

- Porosity: 0.9 (to account for subsurface structures)
- Infiltration rate: Based on the site-specific NRCS soil texture
- Area: Determined by space available for the BMP
- Depth: Estimated based on construction feasibility and other site constraints

Information and conceptual design attributes of all proposed regional BMPs are summarized in the following subsections.

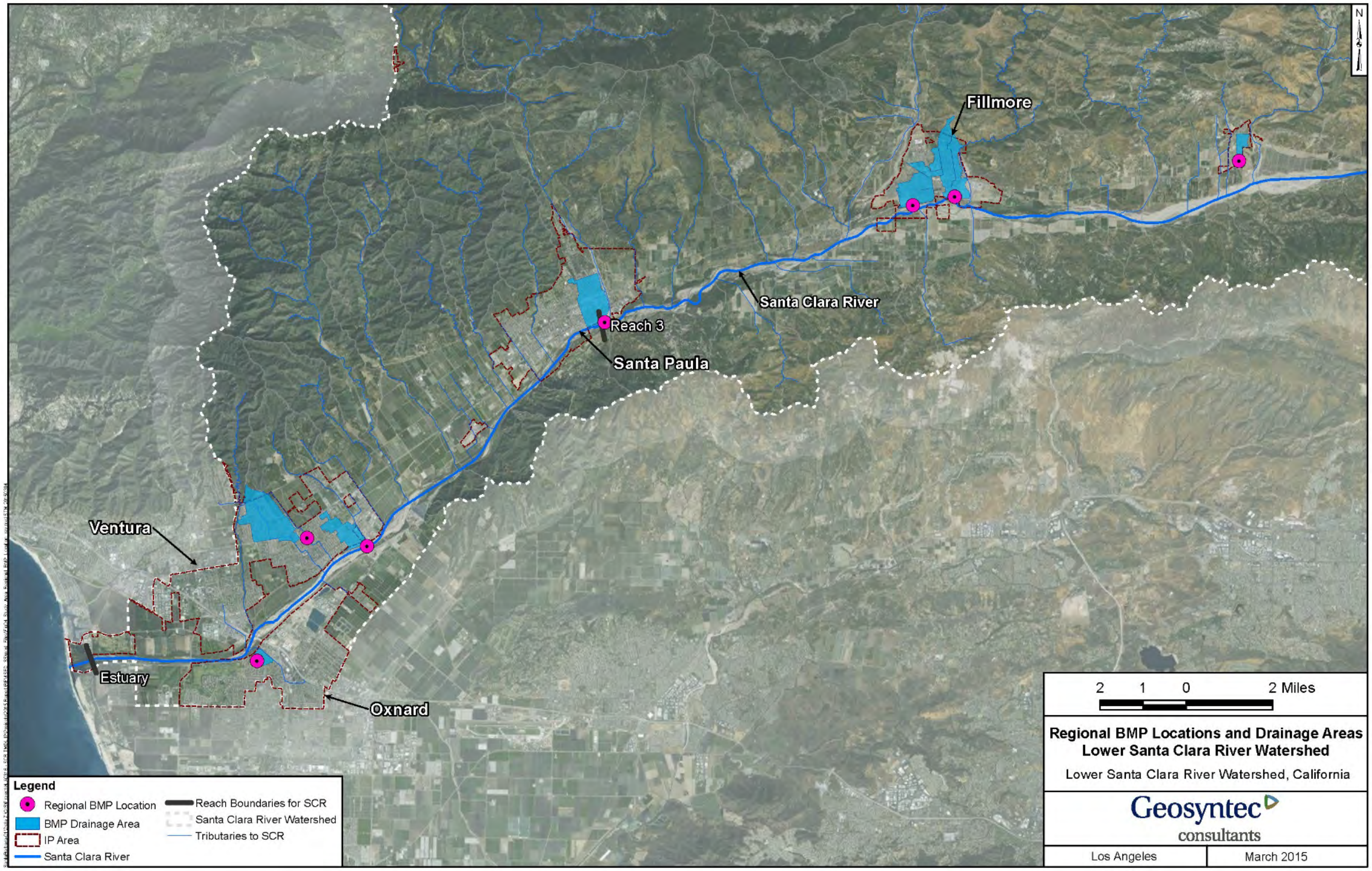

Figure 7. Proposed Regional BMP Locations and Drainage Areas

City of Ventura – Subsurface Infiltration Basin

Chumash Park along South Petit Avenue was identified as a proposed regional BMP site (see Figure 8). This City-owned site has adequate space, a large urban drainage area, infiltrative soil types, and is in close proximity to a storm drain. Implementation of a subsurface infiltration system will allow for the existing park surface to be rebuilt on top of it. This regional BMP was modeled in SBPAT using the following design parameters and assumptions:

- Approximate Footprint Area: 90,000 sq ft
- Drainage Area: 660 acres
- Porosity: 0.9
- Equalization Volume (porosity not applied): 720,000 cu ft
- Infiltration Rate: 0.5 in/hr
- Depth: 8 ft
- Backcalculated design storm depth: 0.52 inches
- Land Uses Treated: SFR (66 percent), Agriculture (20 percent), Education (6.9 percent), Transportation (2.5 percent), and others (3.9 percent)

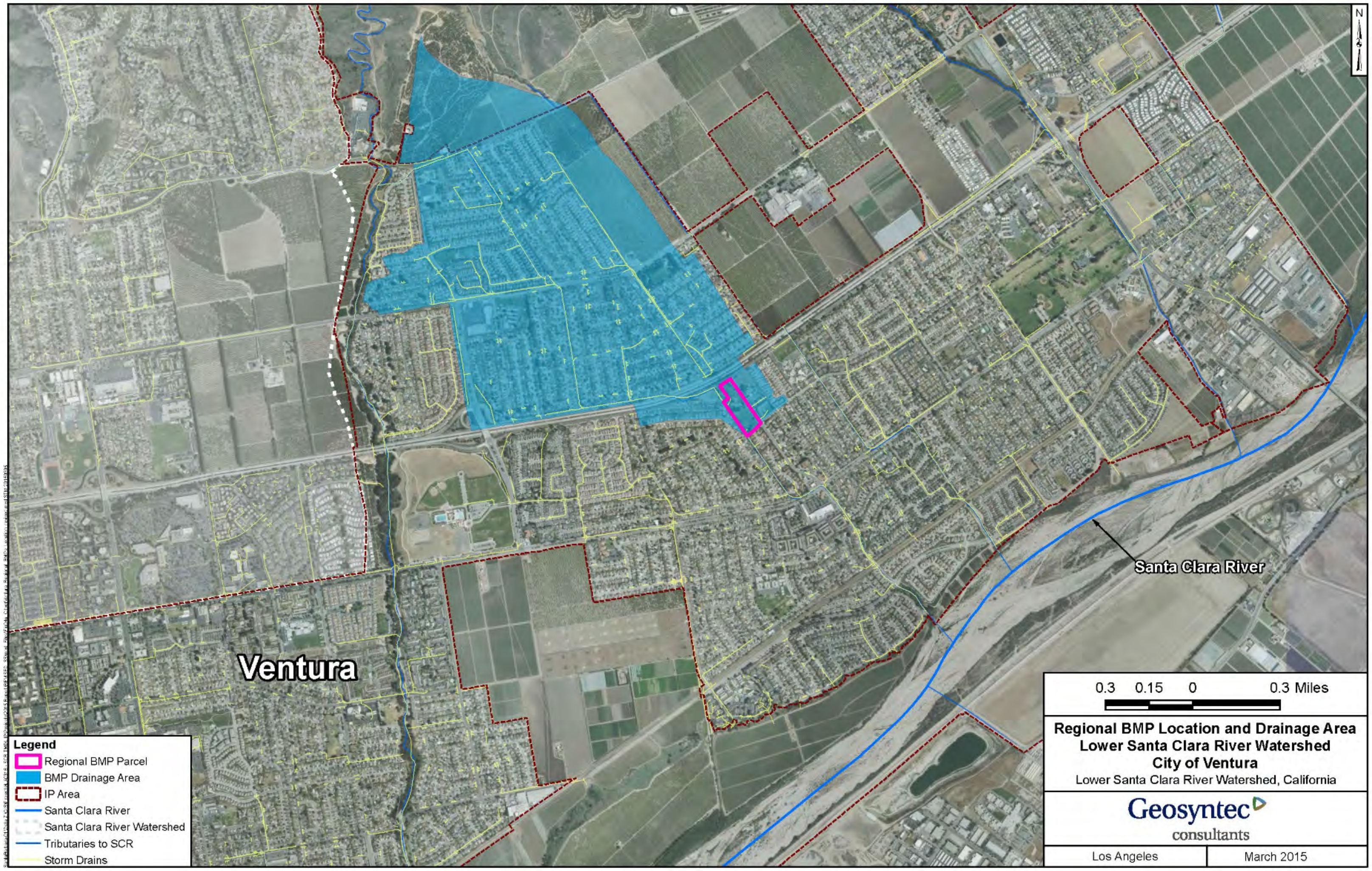

Figure 8. City of Ventura Proposed Regional BMP

City of Oxnard – Infiltration basin

A regional BMP opportunity was identified at South Bank Park, a large City-owned parcel (see Figure 9). The park has adequate space, infiltrative soil types, and is in close proximity to a 54-inch storm drain downstream of a residential neighborhood.

The proposed infiltration basin was sized to treat the 85th percentile volume from the drainage area. After adding 15 percent of the footprint area for side slopes and pretreatment, the required BMP footprint was determined to be approximately 85,000 square feet. The proposed basin will occupy approximately half of the South Bank Park area. This regional BMP was modeled in SBPAT using the following design parameters and assumptions:

- Approximate Footprint Area: 85,000 sq ft
- Drainage Area: 66 acres
- Equalization Volume (porosity not applied): 170,000 cu ft
- Infiltration Rate: 0.5 in /hr
- Depth: 2 ft
- Design storm depth: 1.4 inches
- Land Uses Treated: SFR (87 percent), Education (7.8 percent), MFR (4.4 percent), and others (0.5 percent)

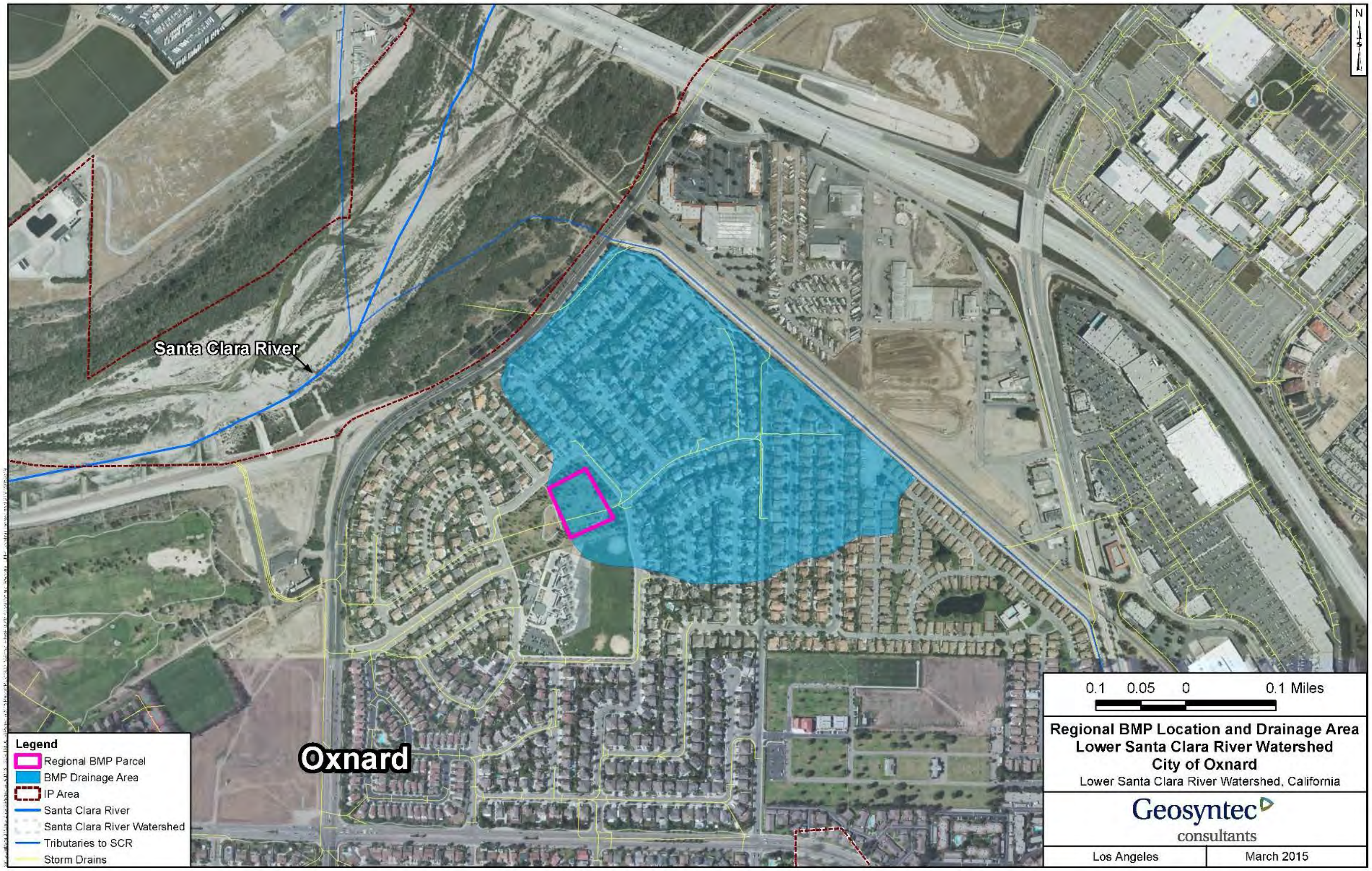

Figure 9. City of Oxnard Proposed Regional BMP

County of Ventura – County Maintenance Yard Infiltration Basin

A County maintenance yard was identified as a potential site for implementation of a regional BMP (see Figure 10). The site is located on infiltrative soils and is currently used for material storage and is located adjacent to Northbank Drive. There is an 84-inch storm drain line, owned by the City of Ventura, discharging to the Santa Clara River at the parcel. The entire drainage area, 261 acres, is located within the City of Ventura. An infiltration BMP was modeled in SBPAT using the following design parameters and assumptions:

- Approximate Footprint Area: 150,000 sq ft
- Drainage Area: 261 acres
- Equalization Volume: 600,000 cu ft
- Drawdown time: 48 hours
- Infiltration Rate: 1 in/hr
- Depth: 4 ft
- Backcalculated design storm depth: 0.97 inches
- Land Uses Treated: SFR (34 percent), MFR (20 percent), Agriculture (16 percent), Vacant, (11 percent), Education (9.4 percent), Industrial (6.8 percent), and Commercial (3.0 percent)

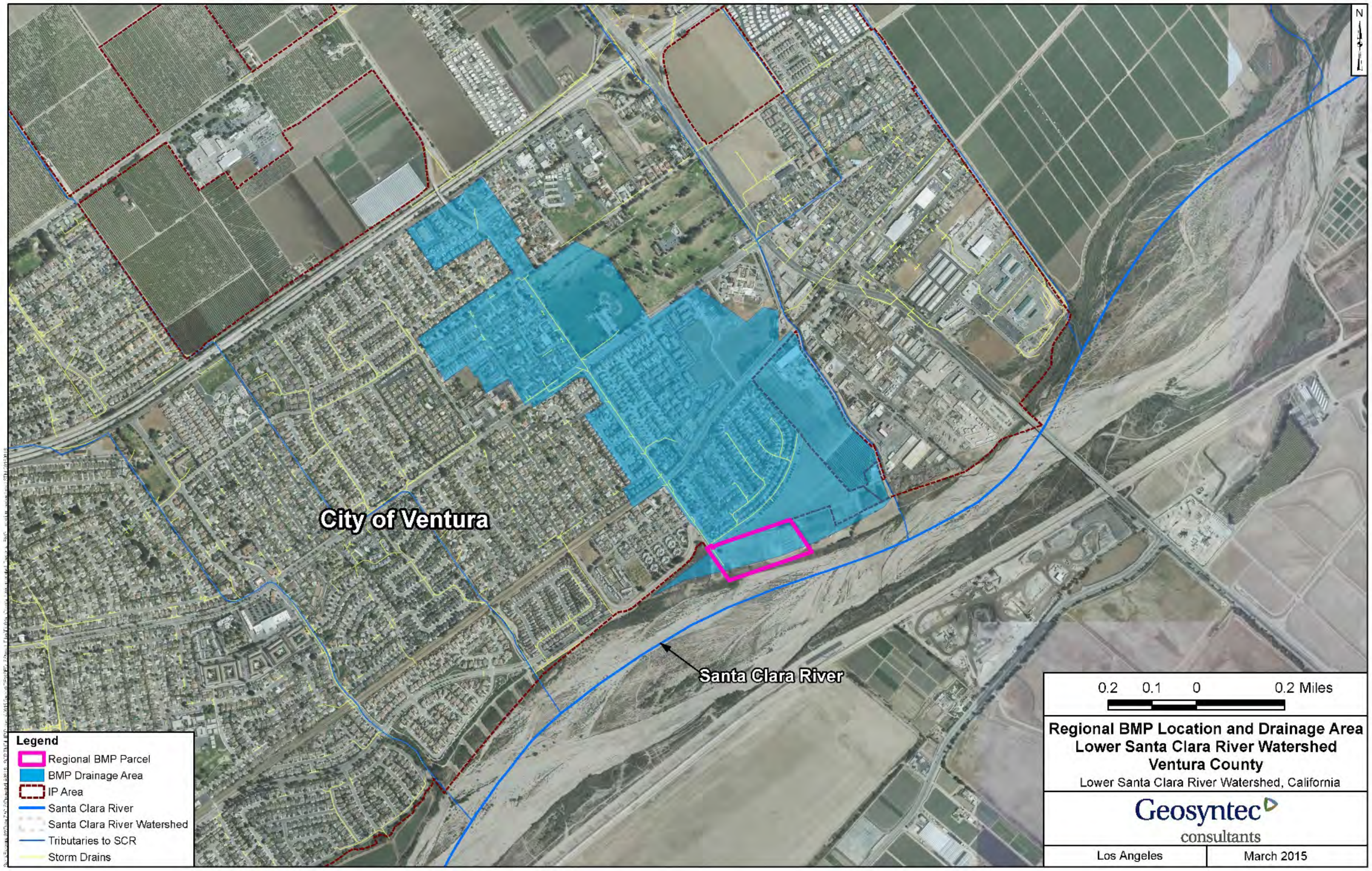

Figure 10. County Maintenance Yard Proposed Regional BMP

County of Ventura – Piru Infiltration Basin

A privately-owned parcel in the County area of Piru was identified as a proposed regional BMP site. The site is located on infiltrative soils and is downstream of a predominately residential area. The proposed site is located adjacent to E. Telegraph Road (see Figure 11). The proposed infiltration basin was sized to treat the 85th percentile volume from the drainage area. After adding 15 percent of the footprint area for side slopes and pretreatment, the required BMP footprint was determined to be approximately 120,000 square feet. An infiltration basin was modeled in SBPAT using the following design parameters and assumptions:

- Approximate Footprint Area: 120,000 sq ft
- Drainage Area: 81 acres
- Equalization Volume (porosity not applied): 240,000 cu ft
- Infiltration Rate: 0.5 in /hr
- Depth: 2 ft
- Design storm depth: 1.4 inches
- Land Uses Treated: SFR (60 percent), Agriculture (22 percent), Industrial (5.5 percent), MFR (4.9 percent), Transportation (4.9 percent), and others (2.7 percent)

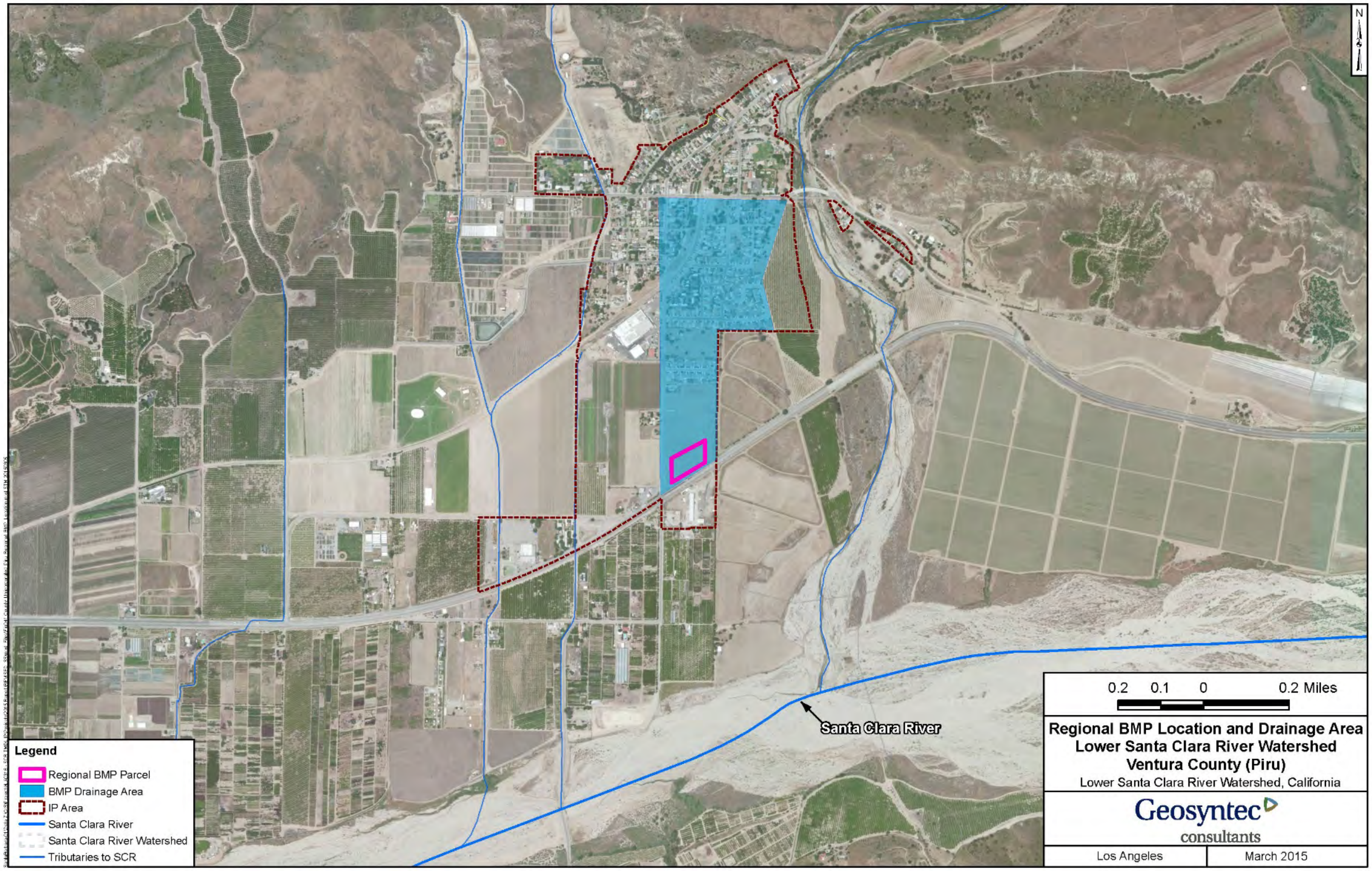

Figure 11. County of Ventura (Piru) Proposed Regional BMP

City of Santa Paula – Infiltration Basin

A privately-owned parcel, located on infiltrative soils, adjacent to a stormdrain, downstream of a large urban area was identified as a proposed regional BMP site. This site is located adjacent to the Santa Paula airport (see Figure 12). An infiltration basin was modeled in SBPAT using the following design parameters and assumptions:

- Approximate Footprint Area: 170,000 sq ft
- Drainage Area: 433 acres
- Equalization Volume: 340,000 cu ft
- Drawdown time: 48 hours
- Infiltration Rate: 0.5 in/hr
- Depth: 2 ft
- Backcalculated design storm depth: 0.24 inches
- Land Uses Treated: SFR (42 percent), Industrial (23 percent), Commercial (10 percent), Education (8.5 percent), Transportation (7.7 percent), Vacant (4.9 percent), and MFR (4.1 percent)

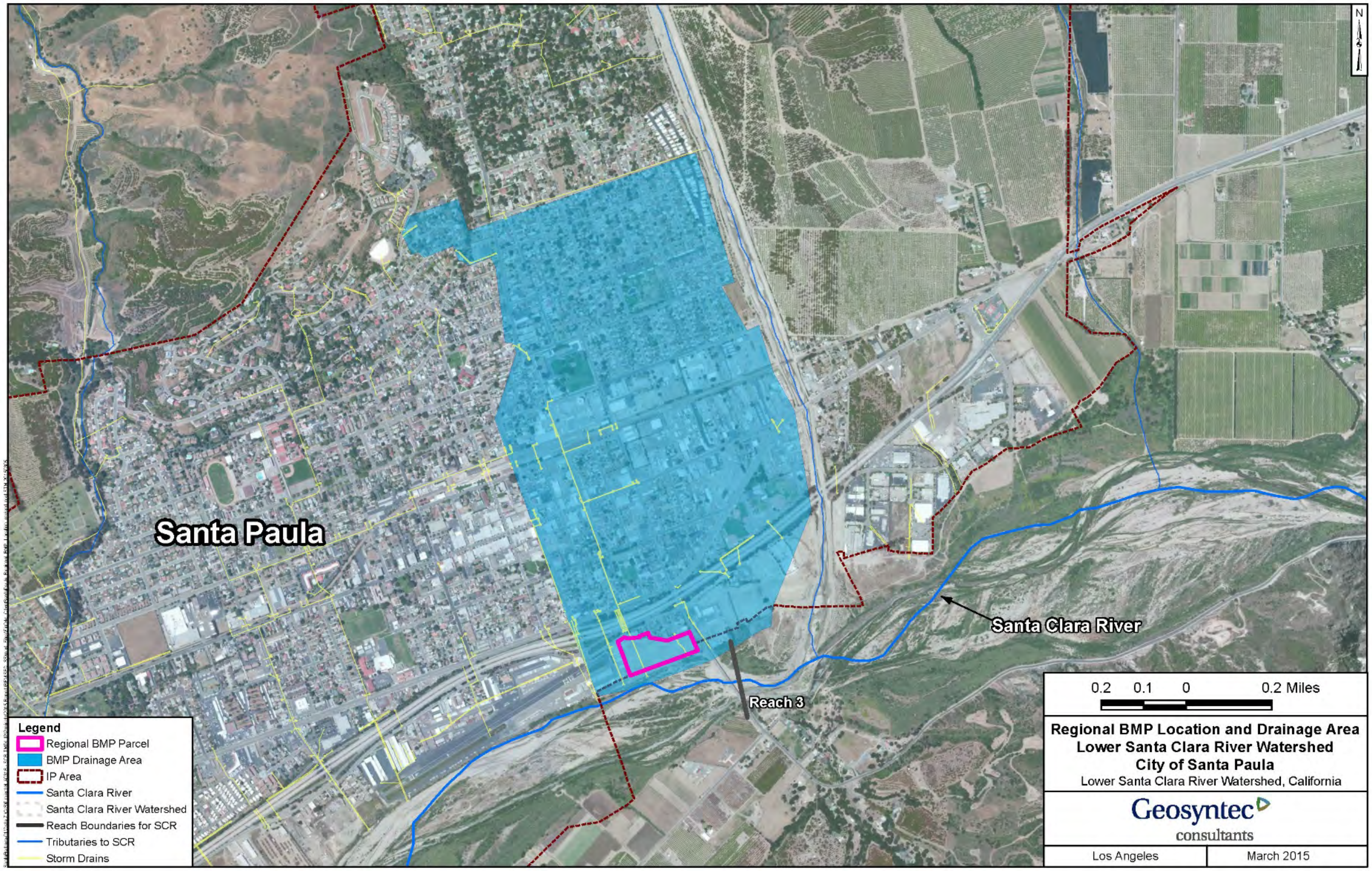

Figure 12. City of Santa Paula Proposed Regional BMP

City of Fillmore – Infiltration Basins

Several City-owned parcels located on infiltrative soils, adjacent to major stormdrains, downstream of large urban areas were identified as proposed regional BMP sites (see Figure 13). Planned Heritage Valley Park (HVP) Community Park (approximately 5.8 acres) is located at the southern end of Mountain View Street adjacent to the soil cement levee on the north bank of the Santa Clara River. Two adjacent parcels were combined and one contiguous infiltration BMP was assumed for modeling purposes. This proposed regional BMP was modeled with the following design parameters and assumptions:

- Approximate Footprint Area: 160,000 sq ft
- Drainage Area: 494 acres
- Equalization Volume: 640,000 cu ft
- Drawdown time: 48 hours
- Infiltration Rate: 1 in/hr
- Depth: 4 ft
- Backcalculated design storm depth: 0.81 inches
- Land Uses Treated: SFR (57 percent), Vacant (26 percent), Commercial (15 percent), and others (1.5 percent)

The second area is comprised of three adjacent City-owned parcels, previously occupied by percolation ponds #3, #4, and #5 of the former City wastewater treatment plant located on the north bank of the Santa Clara River. A future stormdrain is planned nearby to drain the western portion of the City. This regional BMP was modeled as an infiltration basin with the following design parameters and assumptions:

- Approximate Footprint Area: 200,000 sq ft
- Drainage Area: 466 acres
- Equalization Volume: 800,000 cu ft
- Drawdown time: 48 hours
- Infiltration Rate: 1 in/hr
- Depth: 4 ft
- Backcalculated design storm depth: 0.76 inches
- Land Uses Treated: SFR (54 percent), Commercial (39 percent), Industrial (5.1 percent), and others (2.6 percent)

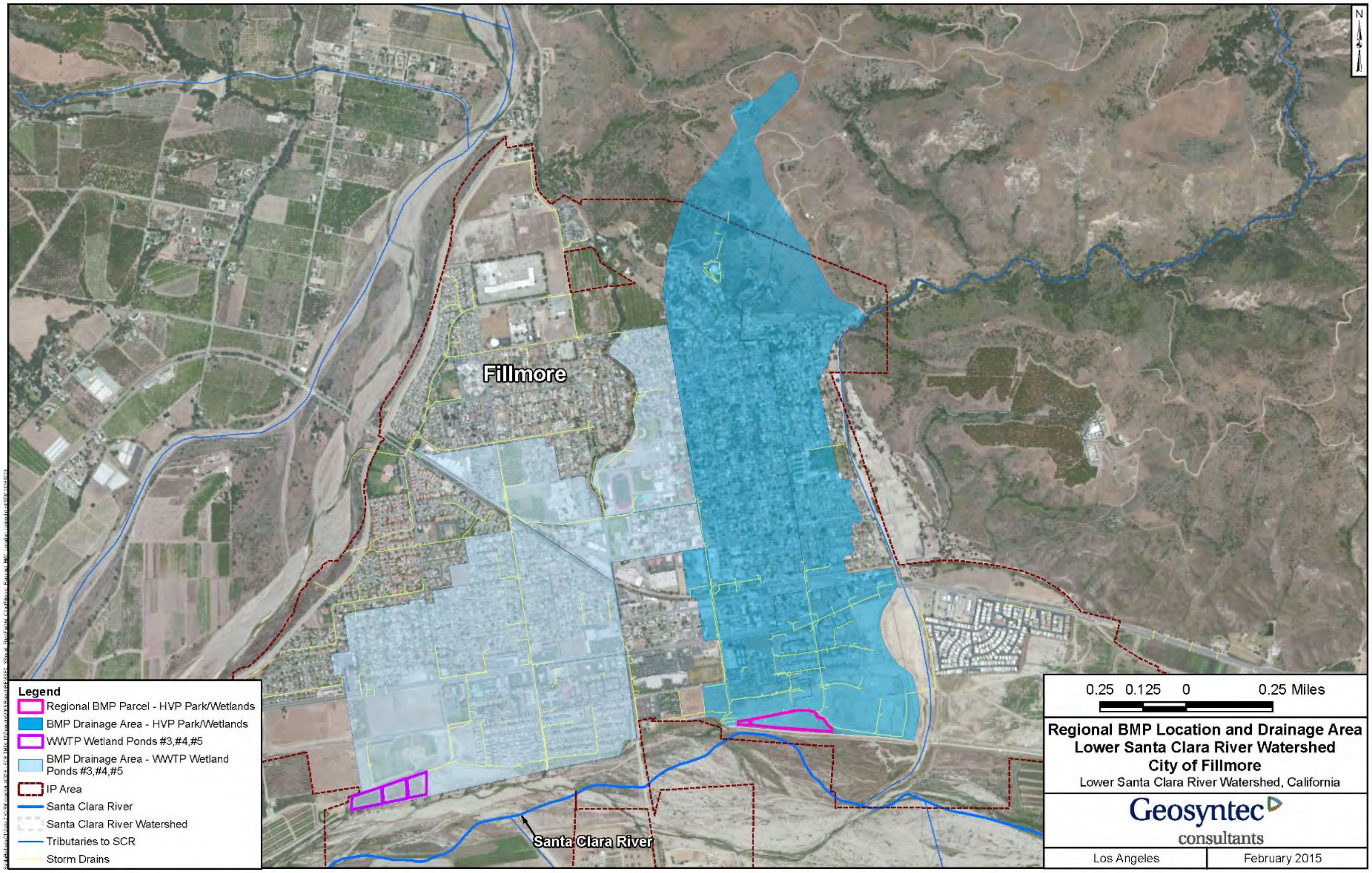

Figure 13. City of Fillmore Proposed Regional BMPs

3.1.3.2.3 Distributed Green Streets BMPs

After load reductions for existing/planned, non-structural, and regional BMPs were quantified, distributed green streets BMP implementation was used to supplement estimated load reductions in order to meet the calculated TLRs. Distributed green streets BMPs were modeled as bioretention (without underdrains), using the following assumptions:

- Distributed green streets BMPs were implemented on single-family residential and industrial land uses located in the MS4 area within a given catchment;
- Distributed green streets BMPs were implemented only on catchments that were not already treated by a proposed regional BMP;
- Other design criteria for bioretention:
  - Design storm depth: 85^{th} percentile depth (1.4 inches)
  - Retention Depth: 12 inches
  - Infiltration Rate: 0.5 in/hr

Green streets were applied to treat a watershed-wide net total of 45 percent of industrial and single-family residential land uses in catchments which were not tributary to a proposed regional BMP in the MS4 areas of the LSCR watershed. This percentage of area was iteratively determined based on meeting the TLR requirements. This equates to a total of 4,700 and 1,200 acres of SFR and industrial area treated by green streets, respectively. And this equates to a total of bioretention BMP area of approximately 121 acres.

3.1.4 Load Reduction Summary

Load reductions from the control measures described in Section 3.1.3 are shown in Figure 14 and Figure 15 for the drainage areas to Reach 3 and the Estuary, respectively. A summary of how the total load reductions from all BMPs compare to the calculated TLRs is contained in Table 9. A breakdown of BMP load reductions for each individual jurisdiction is provided in Appendix D.

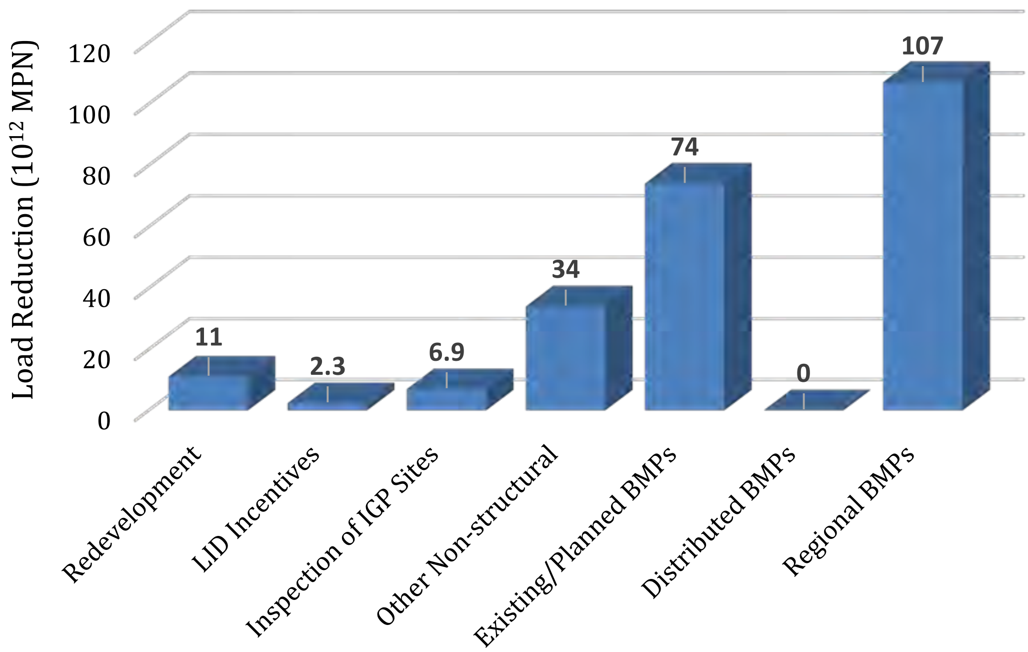

Figure 14. Load Reductions by BMP Type in Reach 3 Subwatershed

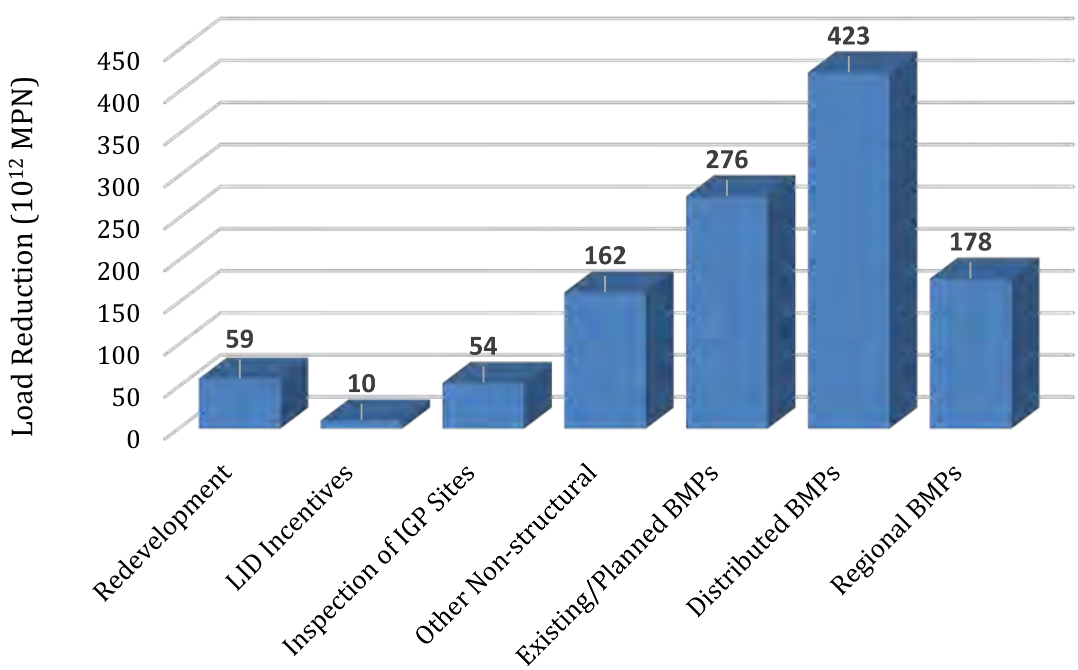

Figure 15. Load Reductions by BMP Type in Estuary Subwatershed (entire LSCR MS4 urban area)

Table 9. Modeled Load Reductions Compared to TLRs

SCR Reach	Total Modeled Load Reduction [25th – 75th percentile estimate] (10^{12} MPN)	Target Load Reduction (10^{12} MPN)	Target Load Reduction Met?[1]
Reach 3	236 [109-299]	213	Yes
Estuary	1,187 [568-1,442]	1,165	Yes

[1] Based on average modeled load reduction

As shown in Table 9, the total load reductions (both average and 75th percentile values) from the proposed suite of BMPs meet the calculated TLRs, thus demonstrating "reasonable assurance" of meeting the TMDL WLAs for wet weather.

3.2 DRY WEATHER

No quantitative assessment of BMP effectiveness for dry weather is presented here as the IP compliance approach is to eliminate 100 percent of non-exempt dry weather MS4 discharges using a robust suite of aggressive non-structural controls. Eliminating flows is equivalent to 100 percent load reduction for all pollutants, indicating that all applicable TMDL limitations during dry weather will be met. The enhanced dry weather non-structural BMPs that the Participating Agencies may implement include:

- Identify and address of sewage discharge to Participating Agency MS4s;
- Smart controller and turfgrass replacement rebates;
- Water waste/conservation ordinances;
- Car washing runoff ordinances;
- Water conservation outreach and education;
- Enhanced commercial (food outlet) inspection/enforcement; and
- Other non-storm water flow reduction strategies as needed.

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:

- Trash cleanups;
- Onsite wastewater treatment source reduction;
- Good landscaping practices;
- Commercial/industrial good housekeeping;
- Pet waste controls;
- Animal facilities management;
- Street and median sweeping;
- Homeless waste control programs;
- MS4 cleaning; and
- Education/outreach to target specific known sources of bacteria and fecal waste.

Structural controls may also be implemented as a backstop to achieve this 100 percent non-exempt non-storm water elimination endpoint. These dry weather structural BMPs may include but are not limited to: low flow diversions to sewers, catch basin dry wells, street gutter permeable pavement, bioretention swales, regional BMPs, etc. In combination, this phased strategy of non-structural BMPs followed by additional targeted structural BMPs only where necessary is expected to achieve compliance with the dry weather WLAs by definition, since the approach is to implement these BMPs until observed MS4 discharges to the LSCR are eliminated. This qualitative evaluation is provided to demonstrate "reasonable" assurance of meeting the TMDL WLAs for dry weather.

4 Multi-Benefits of Proposed BMPs

The proposed BMPs were selected not only for their capacity for improving water quality, but also in consideration of other benefits they may provide.

The proposed BMPs are expected to provide opportunities for education and public outreach, especially non-structural programs such as those encouraging good landscaping practices, water conservation, pet waste control, and animal facilities management. These programs 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.

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. Similarly, green streets can enhance the aesthetics and vitality of a commercial or residential avenue and improve the overall quality of life in a neighborhood.

Water that is captured and infiltrated in the proposed regional and distributed BMPs will recharge local alluvial groundwater basins, which is critical given the current drought and recently falling groundwater levels. In order to quantify the potential water supply benefit of the proposed projects, the cumulative recharge quantity was estimated using SBPAT. The total quantity is approximately 3,300 acre-feet per year (based on modeled year, or 1995 WY), or an amount equivalent to the annual potable water demand of approximately 8,100 families (Aquacraft 2011).

5 Phasing of Control Measures

As described earlier, this IP will prioritize implementation of non-structural BMPs described in Section 3.1.3.1, with a particular emphasis on those that will target dry weather discharges. Following this, planning and implementation of distributed and regional BMPs will begin along with continued implementation of non-structural programs as necessary based on the results of monitoring. Since interim WLAs are based on anti-degradation goals (i.e. they are consistent with current conditions), no reductions from baseline loads are required to meet them.

The proposed phasing schedule is shown in Figure 16.

Figure 16. LSCR Phasing Schedule

6 Adaptive Management Process

During implementation of the Bacteria TMDL, there is a need to provide clear structure to ensure that the Participating Agencies can modify this IP after gathering bacteria water quality data or if the Bacteria TMDL is modified in the future in response to local special studies or State Water Resources Control Board (State Water Board) or the Regional Board actions. This section outlines an adaptive management approach that addresses the relationship between monitoring, future water quality regulations and Bacteria TMDL modifications, scheduling, and BMP planning in Bacteria TMDL implementation.

This adaptive management section provides a framework for evaluating progress toward meeting the compliance requirements of the Bacteria TMDL and modifying the IP in response to the evaluation. The Participating Agencies will use receiving water and outfall water quality data to evaluate whether modifications to targets, schedules, and/or BMPs are necessary to achieve compliance with the interim and final Bacteria TMDL compliance requirements. Additionally, the Participating Agencies will evaluate any Bacteria TMDL modifications and revise targets, schedules, and/or BMPs as needed to achieve compliance with revised interim and final Bacteria TMDL compliance requirements.

6.1 Consideration of Potential Future TMDL Modifications

As noted in the regulatory context, the Bacteria TMDL includes a requirement to reconsider the Bacteria TMDL if new information that could change the water quality objectives or associated WLAs becomes available. Specifically, the Bacteria TMDL notes that the Bacteria TMDL will be reconsidered if USEPA proposes revised recommended bacteria criteria and/or a high flow suspension of recreational uses is approved. In November 2012, USEPA released new recommended Recreational Water Quality Criteria. The new criteria contains very similar recommended numeric criteria to those used in the Bacteria TMDL, but includes a number of different implementation procedures that could be considered when using the recommended criteria. As a result, the State Water Board has undertaken the development of statewide bacteria objectives to incorporate the new US EPA criteria into state policy in a consistent manner. In January 2015, the State Water Board released a public scoping document for the Proposed Statewide Water Contact Recreation Bacteria Objectives Amendments to Water Quality Control Plans for Inland Surface Waters, Enclosed Bays and Estuaries and the Ocean Waters of California (Proposed Amendments). The Proposed Amendments focus on the REC-1 beneficial use and may include revised indicator organisms and risk protection level as well as components for bacteria control such as reference beach and natural source exclusion approaches, high flow suspension, variances, seasonal suspensions, and designation of Limited Water Contract Recreation (LREC-1). If the State Water Board enacts any of the Proposed Amendments, reconsideration of the Bacteria TMDL to incorporate the new objectives and implementation procedures would be triggered.

The current schedule for adoption of the Proposed Amendments is Spring 2016. Given that the suggested schedule for adopting the Proposed Amendments is in the near future, consideration of the potential impacts of the amendments on the implementation plan need to be considered. As noted in the IP analysis, if a high flow suspension were to be adopted for the watershed, it would likely significantly reduce or eliminate the need to implement structural controls in the MS4 system. Therefore, the milestones and schedule for implementation (discussed in Section 4) and the adaptive management process have been designed to account for potential TMDL modifications in response to this Statewide Policy and its potential incorporation into the Bacteria TMDL or Permit.

6.2 Adaptive Management Process

The adaptive management process consists of an annual evaluation of progress towards meeting the proposed milestones combined with an approach to modifying the IP in response to the evaluation. The Participating Agencies will annually evaluate monitoring data in accordance with Figure 17 to determine if modifications to the IP are necessary.[13] Modifications that are warranted because final milestones are achieved more quickly than anticipated, can be done at any time (i.e., no more actions are needed if fewer control measures result in meeting numeric targets and WLAs). Modifications that are warranted because insufficient progress is being made, will be noted and implemented if possible, but updates to the IP and commitments to the modifications will only occur at the end of an implementation phase[14] (as described in the implementation schedule) to allow for resource planning.

The process outlined in Figure 17 applies during the implementation period for the Bacteria TMDL. If at any point during the implementation period the Bacteria TMDL is modified in response to the Proposed Amendments or local studies, the receiving water and outfall monitoring data will be compared to the new targets and allocations. The same procedure will be followed for evaluating the data and adapting the implementation plan, but the new targets and allocations will be used for the analysis. At any point, the Participating Agencies could choose to update the whole IP, schedule and milestones, but it is only proposed that consideration of a full update would occur when determined as needed.

For the purposes of developing Permit conditions based on this IP, only those milestones and implementation actions that are proposed to occur within the term of the Permit should be included in the Permit. Modifications to the schedule, milestones, allocations, and targets could occur prior to development of the next Permit. Therefore, future requirements may change and should not be included as Permit requirements until a future Permit term.

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[13] No exceedances at the Jurisdictional Outfalls, including when they are dry, indicates the MS4 did not contribute to any in-stream exceedances as it is assumed the discharges from the Jurisdictional Outfalls are representative of the discharges from the entire MS4.

[14] Implementation phases are shown in Figure 15, LSCR Phasing Schedule, and include: Implementation of Enhanced Non-Structural Programs, Begin Planning/Design of Distributed BMPs, Complete Implementation of Distributed BMPs, Begin Planning Design of Regional BMPs, and Complete Implementation of Regional BMPs.

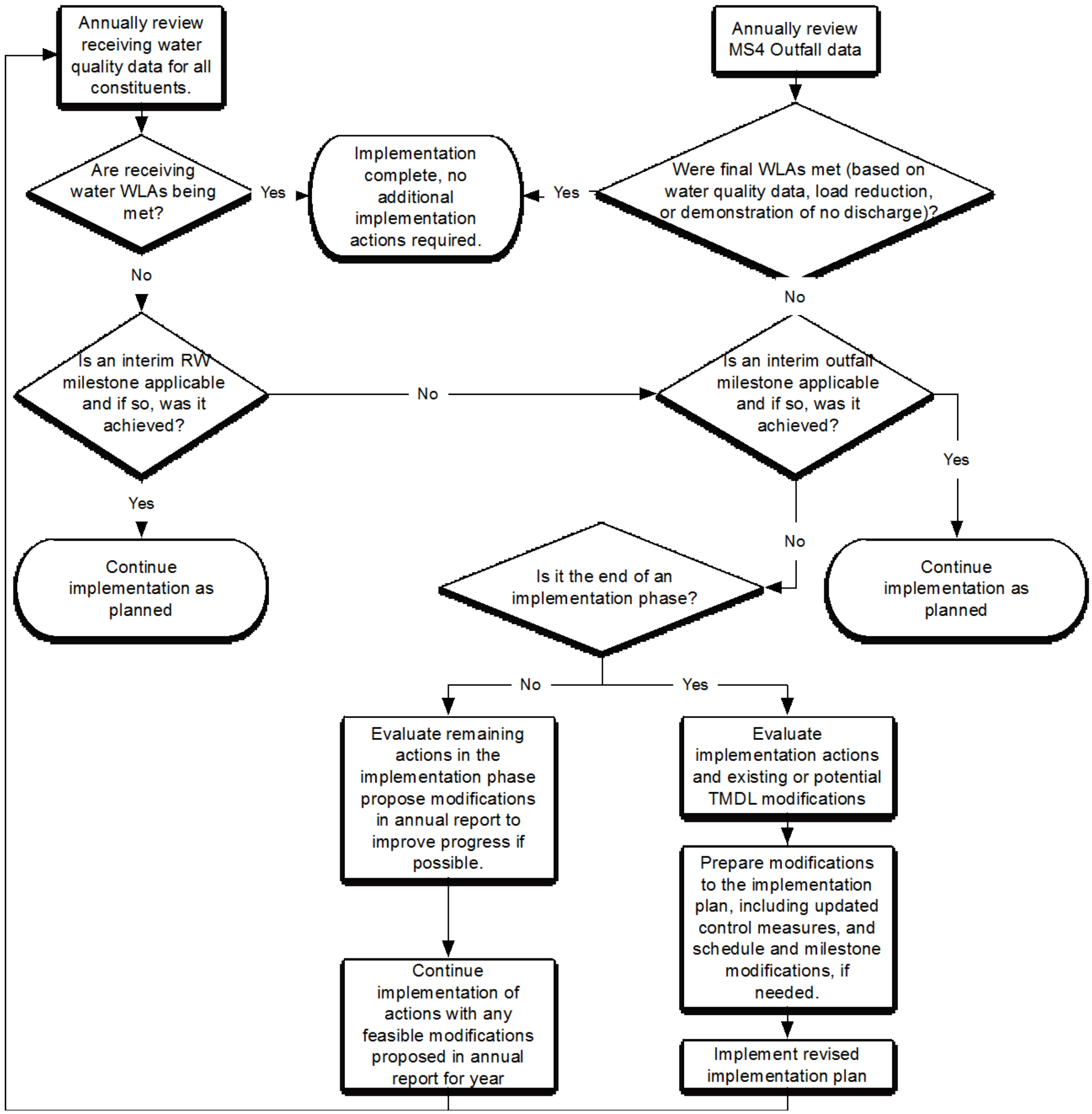

Figure 17. Water Quality Data-Based Adaptive Management Approach[15]

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[15] Implementation phases are shown in Figure 15, LSCR Phasing Schedule, and include: Implementation of Enhanced Non-Structural Programs, Begin Planning/Design of Distributed BMPs, Complete Implementation of Distributed BMPs, Begin Planning Design of Regional BMPs, and Complete Implementation of Regional BMPs.

7 Costs

In order to quantify the financial resources necessary to reach compliance with the Bacteria TMDL this IP includes planning-level estimates of costs associated with implementation of the proposed regional and distributed structural BMPs. Costs associated with implementation of non-structural programs are not quantified here.

Participating Agencies will implement identified activities and BMPs as resources are available. Implementation of activities and BMPs will be prioritized along with other essential Agency obligations such as, but not limited to, public infrastructure rehabilitation and maintenance, compliance with other government-mandated regulations, and public safety. BMPs may require individualized economic justifications as related to available funding and perceived holistic benefit to taxpayers and residents.

Cost opinions are presented as an aid for decision makers, and contain considerable uncertainties. Given the iterative and adaptive nature of the implementation plan and the many variables associated with the projects, the budget forecasts, especially for later phases, are order-of magnitude estimates, and are subject to change based on BMP effectiveness assessments.

7.1 Methodology

Costs estimated for structural BMPs include capital as well as “soft” costs, which include considerations such as contingency and permitting. Capital costs were determined using a line item unit cost approach. The line item approach, as opposed to empirical formulas based on cost data from implemented BMPs, separately accounts for each material cost element required for the installation of a given BMP. Quantities for each line item were calculated based on BMP storage volumes and typical design configurations. Unit costs were taken from RS Means, [16] past projects based in Southern California, and vendors. Land acquisition costs were not considered as part of this analysis.

Soft costs are project costs that cannot be calculated on a unit cost basis. For conceptual cost estimating, these costs are generally calculated as a percentage of total capital costs. The soft costs considered for each BMP were:

- Contingency – Costs intended to compensate for any estimating inaccuracy based on assumptions or measured values, unanticipated market conditions, scheduling delays and acceleration issues, lack of bidding competition, and subcontractor defaults.
- Construction – Line item costs that go into BMP construction, for example costs for demolition, excavation, hauling, and building materials such as aggregates, soil, concrete, pipes, pumps, and cisterns.
- Mobilization – The costs associated with activation of equipment and manpower resources for transfer to a construction site until completion of the contract.

[16] RS Means is a unit cost database that is updated annually (http://meanscostworks.com/). When costs from literature are not available project’s design criteria and unit costs from the database were used to estimate the project’s cost.

- Permitting – Cost, including permit fees and personnel hours, of obtaining required permits for BMP installation. Examples of permits needed may include erosion and sediment control, stormwater, construction, public space permits.
- Engineering and Planning – Costs associated with BMP and site design, as well as access for maintenance, environmental mitigation, buried objects, safety/security, traffic control, limited space, and site restoration.

The expected costs for each of these soft costs as percent of total project capital costs are presented in Table 10. These percentages were based on literature, best professional judgment, and data from past projects.

Table 10. Range of Soft Costs for Regional Projects

Cost	*Percent of Capital Costs (Low-High)*
Contingency	10-20%
Mobilization and demobilization	3-10%
Permitting	3-5%
Construction	20-50%
Construction management	8-15%
Engineering and planning	15-20%

7.2 Summary of Costs

Table 11 presents the estimated capital cost to construct or implement each structural BMP and associated annual O&M costs. In order to account for possible variations in BMP design, BMP configurations, and site-specific constraints, as well as for uncertainties in available BMP unit costs from literature or estimated BMP unit costs, a range of costs (low to high) is presented.

Annual O&M for infiltration basins includes cleaning and removal of debris after major storm events, mowing and maintenance of upland vegetated areas, and sediment cleanout. Annual O&M costs were assumed to be 2 percent of the capital cost for infiltration basins. Additional O&M is also recommended every 3 to 5 years, which includes removal of accumulated sediment from forebays/sediment storage areas and scarifying surfaces with light equipment. This O&M was estimated at 7.5 percent of capital costs on a 5-year cycle.

O&M necessary for maintaining green streets includes repairs to eroded areas, incremental landscape maintenance, and removal of trash and debris biannually. Annual maintenance for green streets includes removal of aged mulch and installation of a new layer. O&M for green streets was estimated at 6 percent of capital costs annually.

Table 11. Estimated Capital and O&M Costs for Proposed Structural BMPs[1]

	Capital Cost		*Annual O&M Cost*	
BMP	*Low*	*High*	*Low*	*High*
City of Ventura Regional Subsurface Infiltration System - Chumash Park[1]	$7,200,000	$8,600,000	$250,000	$300,000
Oxnard Regional Infiltration Basin - South Bank Park[2]	$1,200,000	$2,000,000	$42,000	$68,000
County Maintenance Yard Regional Infiltration Basin[3]	$2,600,000	$4,100,000	$89,000	$140,000
County of Ventura Regional Infiltration BMP - Piru Telegraph Rd Site[2]	$1,700,000	$2,800,000	$59,000	$97,000
Santa Paula Regional Infiltration Basin - Santa Paula Airport Site[2]	$2,400,000	$3,900,000	$83,000	$140,000
Fillmore Regional Infiltration Basin - WWTP Ponds Site[3]	$3,400,000	$5,400,000	$120,000	$190,000
Fillmore Regional Infiltration Basin - HVP Park and Wetlands Site[3]	$2,700,000	$4,300,000	$95,000	$150,000
Total Distributed Green Streets (all agencies)[4]	$150,000,000	$320,000,000	$8,900,000	$19,000,000
Total Structural BMP Cost	***$170,000,000***	***$350,000,000***	***$9,600,000***	***$20,000,000***

[1] Unit costs of $80 (low) and $95 (high) per square foot of BMP area
[2] Unit costs of $14 (low) and $23 (high) per square foot of BMP area
[3] Unit costs of $17 (low) and $27 (high) per square foot of BMP area
[4] Unit costs of $28 (low) and $60 (high) per square foot for BMP area

Table 12 shows the life-cycle costs (2015 dollars) to implement the strategies indicated in Table 11. All structural BMPs were assumed to have a life of 20 years.

Table 12. Estimated Life-Cycle Costs for Proposed Structural BMPs[1]

BMP	*Low Cost*	*High Cost*
City of Ventura Regional Subsurface Infiltration System - Chumash Park	$12,000,000	$15,000,000
Oxnard Regional Infiltration Basin - South Bank Park	$2,000,000	$3,300,000
County Maintenance Yard Regional Infiltration Basin	$4,300,000	$6,900,000
County of Ventura Regional Infiltration BMP - Piru Telegraph Rd Site	$2,900,000	$4,700,000
Santa Paula Regional Infiltration Basin - Santa Paula Airport Site	$4,000,000	$6,600,000
Fillmore Regional Infiltration Basin - WWTP Ponds Site	$5,800,000	$9,200,000
Fillmore Regional Infiltration Basin - HVP Park and Wetlands Site	$4,600,000	$7,300,000
Total Distributed Green Streets (all agencies)	$330,000,000	$700,000,000
Total Structural BMP Cost	***$370,000,000***	***$750,000,000***

[1] Life-cycle costs for all structural BMPs assume a 20-year life

7.3 Affordability Assessment

The cumulative capital and operation and maintenance costs estimated to be needed to meet the WLAs in the Santa Clara River Bacteria TMDL represent a significant burden to the Participating Agencies. Most of the cost burden of implementing the implementation plan will fall on the residents of the Lower Santa Clara River. Therefore, there is a need to evaluate whether implementation of the plan will result in widespread economic harm.

In accordance with USEPA Guidance on assessing the economic impacts of Clean Water Act programs (EPA 2014) and the Affordability Assessment Tool (United Council of Mayors, 2013), a preliminary assessment of the affordability of the implementation plan was conducted. The intent of this section is not to provide a full economic analysis, but rather to demonstrate the potential economic impacts of implementation of the plan. EPA guidance provides a two-step process for assessing affordability.

1. Compare the cost of compliance to the median household income (MHI) for the area. If the cost of compliance is less than 1 percent of the MHI, then the cost is considered to not have an impact. If the cost is greater than 2 percent of the MHI, then the cost is considered to have potential widespread economic impacts. Between 1 and 2 percent requires further evaluation to determine if widespread economic impacts will occur.
2. Evaluate six economic factors to determine the financial capability of the community.

Only step 1 was conducted for this analysis. In addition, alternative measures of affordability outlined in the Affordability Assessment Tool were evaluated to show the disproportionate impact of the costs on lower income residents. The analysis was conducted for the watershed area, using information from the US Census Fact Finder website as recommended in the Affordability Assessment Tool and the worksheets provided by that tool.

The assumptions used for the analysis were as follows (based on 2013 information):

1. Number of households is 36,422 (based on scaling the total number of households in the City of Oxnard and City of Ventura by the approximate percentage of urban area within the Santa Clara River Watershed, 15 percent and 38 percent respectively).
2. Only costs for implementing the proposed plan were considered. A full affordability analysis would take into account the existing funding cost burden and costs of other water programs including wastewater and drinking water costs.
3. The annual cost per household for implementation of the plan is $622 per year for the low cost estimate and $1,300 per year for the high cost estimate (capital costs were assumed to be spread equally over the implementation period starting in 2016 (13-year period).[17]
4. The MHI is $54,341. This is the median of the median household incomes for the communities in the watershed (range of $36,925 to $65,137)

[17] In reality the costs will likely not be equally spread over the implementation period as more costs will be incurred in later phases of the project. The simplifying assumption was used to generate an average cost per year for the implementation plan for the analysis.

Based on these assumptions, the implementation costs equate to 1.1 percent of the MHI for the low costs and 2.3 percent of the MHI for the high cost range. The initial affordability analysis indicates that the implementation costs could present a widespread economic impact on the communities in the watershed. While the Participating Agencies are committed to implementation of affordable control measures to improve water quality, implementation of the plan is subject to the availability of funds to avoid undue economic burdens on the communities in the Lower Santa Clara River watershed.

8 REFERENCES

Aquacraft, 2011. California Single Family Water Use Efficiency Study. Sponsored by The California Department of Water Resources. June.

City of Los Angeles Bureau of Sanitation (LA BOS), 2009. Ballona Creek Metals TMDL Implementation Plan. November.

EPA, 2014. Guidelines for Preparing Economic Analyses. National Center for Environmental Economics Office of Policy U.S. Environmental Protection Agency. Published December 2010 and updated May 2014.

Geosyntec Consultants, 2012. A User's Guide for the Structural BMP Prioritization and Analysis Tool (SBPAT v1.1): Technical Appendices. December.

Green, Robert L. 2005. *Golf Course Management.* October. 73(10): p. 67-72.

Los Angeles Regional Water Quality Control Board (LARWQCB), 2009. Storm Water (Wet Weather) and Non-Storm Water (Dry Weather) Discharges from the Municipal Separate Storm Sewer Systems within the Ventura County Watershed Protection District, County of Ventura and the Incorporated Cities therein, Order 09-0057. May 7.

San Diego Regional Water Quality Control Board (SDRWQCB), 2013. 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, Order R9-2013-0001. May 8.

United Council of Mayors, American Water Works Association, Water Environmental Federation 2013. Affordability Assessment Tool. Prepared by Status Consulting. Boulder, Colorado.

Ventura County, Ventura County Technical Guidance Manual for Stormwater Quality Control Measures. Prepared by Geosyntec Consultants and Larry Walker Associates, July 2011.

Ventura County Watershed Protection District (VCWPD), 2013. In-Stream Compliance Monitoring Plan for Santa Clara River Estuary and Reach 3 Bacteria Total Maximum Daily Load. March.

APPENDIX A
OUTFALL MONITORING PLAN

Outfall Monitoring Plan

1 Overview

The Total Maximum Daily Load for Indicator Bacteria in Santa Clara River Estuary and Reaches 3, 5, 6, and 7 (Bacteria TMDL) requires the responsible agencies and jurisdictions to submit an Outfall Monitoring Plan as part of their Implementation Plan (IP) three years after the effective date of the Bacteria TMDL or by March 21, 2015. The Outfall Monitoring Plan must propose an adequate number of representative outfalls to be sampled, a sampling frequency, and protocol for enhanced monitoring as a result of an in-stream exceedance.

2 Monitoring Program

This Outfall Monitoring Plan was designed to work in conjunction with receiving water monitoring (described in the In-Stream Monitoring Plan submitted in 2013) to be conducted to meet the requirements of the Bacteria TMDL. The strategy for conducting monitoring during dry and wet weather is to monitor one outfall per jurisdiction (Jurisdictional Outfall) that is representative of the dry and wet weather discharges from the Participating Agencies' MS4s (the Cities of Ventura, Santa Paula, Fillmore, and Oxnard, and the County of Ventura). The strategy for enhanced monitoring to assess outfall discharges in the event of an in-stream exceedance of the interim or final Waste Load Allocations (WLAs) utilizes data assessment and source identification to investigate contributions of bacteria from the municipal separate storm sewer system (MS4) to the exceedance.

2.1 Monitoring Locations

One Jurisdictional Outfall was selected per agency as representative of the discharge from each individual jurisdiction as a whole (Figure 1). Three of the selected outfalls are existing monitoring locations under the County of Ventura MS4 Permit that were determined to be representative of discharges from the City of Fillmore, City of Santa Paula, and City of Ventura. For the City of Oxnard, the MS4 permit monitoring location contains discharges from the County of Ventura and therefore another site was selected to be representative solely of discharges from the City of Oxnard. The land use draining to the selected location is representative of the land uses within the portion of Oxnard that drains to the SCR. An MS4 Permit monitoring location was not available for the County of Ventura for the SCR and therefore a new location was selected based on a review of land use, outfall locations, and sampling feasibility. The land use within the drainage area to the selected County of Ventura monitoring location is considered representative of the urban unincorporated County of Ventura land uses within the SCR watershed. Taken as a whole, the five selected outfall monitoring locations provide an outfall monitoring network for the Lower Santa Clara River (LSCR) that is adequate to assess the contribution of MS4 discharges to the receiving waters. Table 1 provides a summary of each outfall's characteristics.

Table 1. Jurisdictional Outfall's Characteristics

Outfall	*Jurisdiction*	*Owner*	*Dimensions*	*Type*
MO-FIL	Fillmore	Fillmore	120" Diameter	Reinforced Concrete Box
MO-SPA	Santa Paula	Santa Paula	48" Diameter	Reinforced Concrete Pipe
MO-VEN	Ventura	Ventura	20'W x 7.5'H	Vertical Concrete-Walled Channel
MO-SRG	Oxnard	Oxnard	36"	Reinforced Concrete Box
MO-SAT	County of Ventura	Caltrans	36" Diameter	Double Corrugated Steel Pipe

DRAFT - Lower Santa Clara River Implementation Plan
March 2015
Page A-3

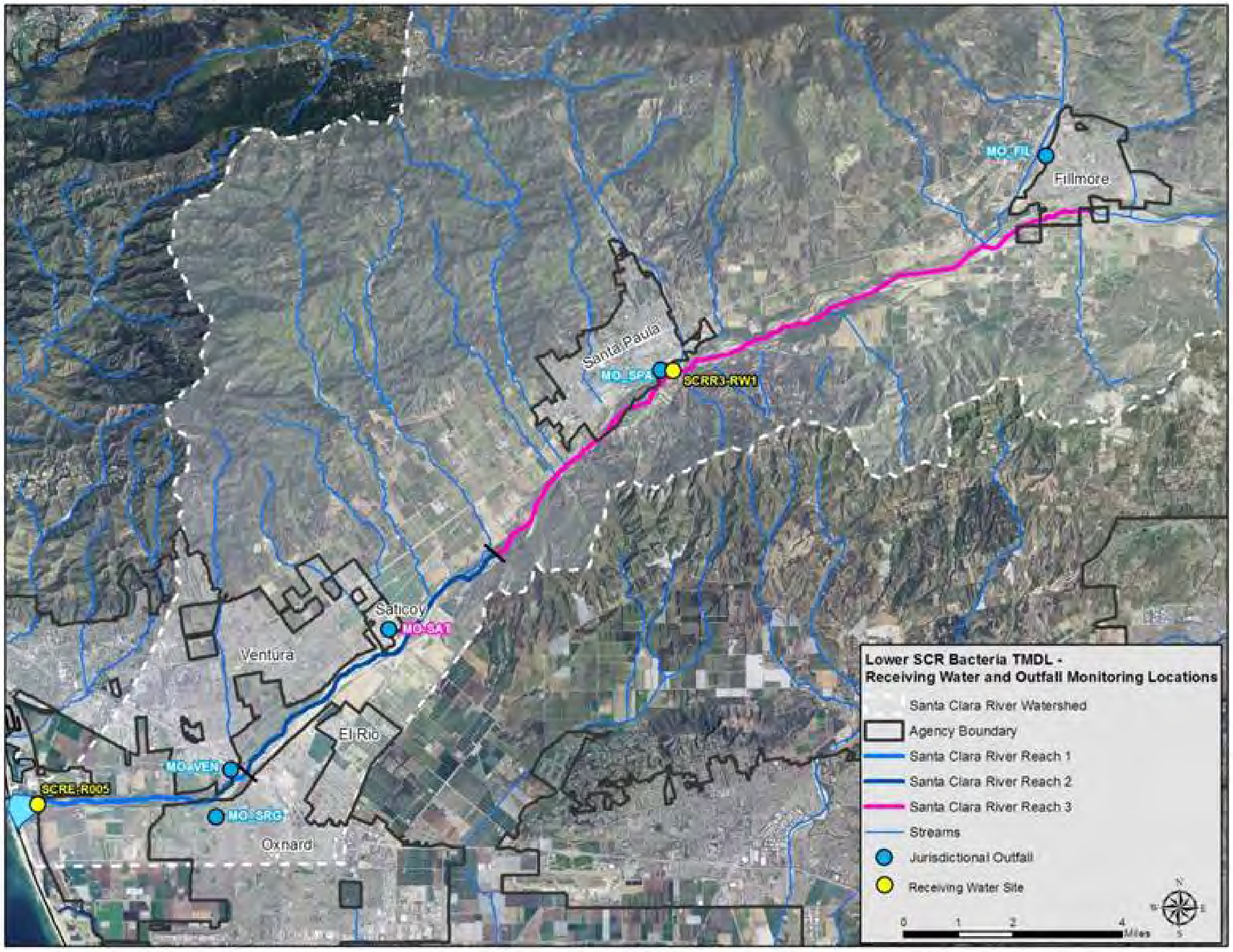

Figure 1. Lower SCR Bacteria TMDL Receiving Water and Jurisdictional Outfall Monitoring Locations

2.1.1 *CITY OF FILLMORE*

The select Jurisdictional Outfall for the City of Fillmore is the MO-FIL location currently monitored under the County of Ventura MS4 Permit. The outfall is for the North Fillmore Drain, which is tributary to Sespe Creek, located 75 yards southwest of Old Telegraph Road. The latitudinal and longitudinal coordinates are: 34°24'16.51"N, 118°55'50.47"W. Figure 2 provides an image of the MO-FIL monitoring location and Figure 3 shows the location of the MO-FIL monitoring location. Table 2 provides the land uses within the MO-FIL drainage area.

Figure 2. City of Fillmore MO-FIL Outfall

Table 2. MO-FIL Drainage Area Land Uses[1]

Land Use	*Acres*	*% of Total*
Residential	138.9	33%
Commercial/Industrial	59.5	14%
Parks and Recreation	1.2	0%
Agriculture	36.8	9%
Vacant/Undifferentiated	182.6	44%
Totals	***419***	***100%***

[1] The drainage area includes approximately 106 acres of non-city open space, which is north of the City's boundary.

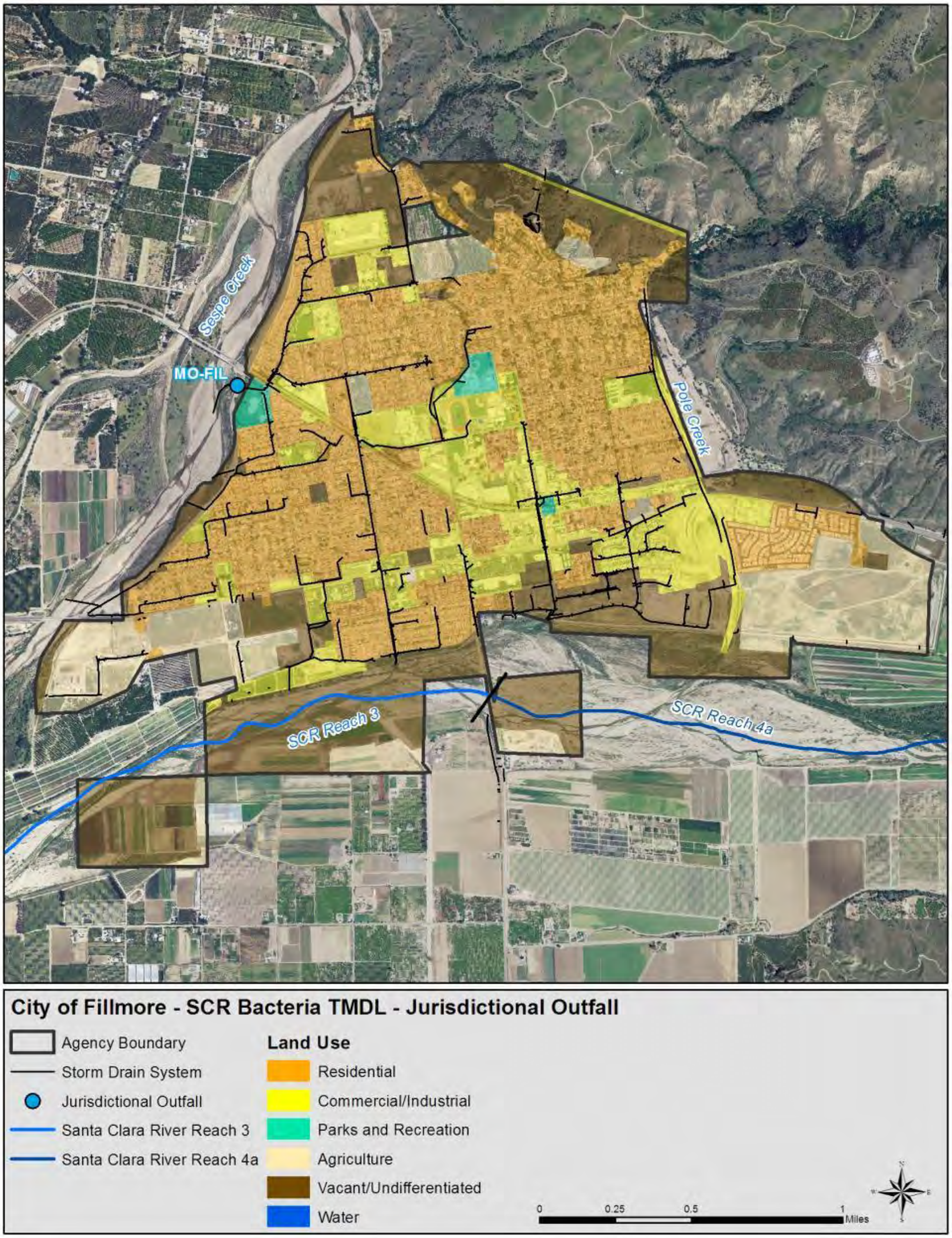

Figure 3. City of Fillmore MO-FIL Outfall Location

2.1.2 City of Santa Paula

The select Jurisdictional Outfall for the City of Santa Paula is the MO-SPA location currently monitored under the County of Ventura MS4 Permit. The outfall is for the 11th Street Drain, which is tributary to SCR Reach 3, located just upstream of the Airport. The latitudinal and longitudinal coordinates are: 34°20'54.99"N, 119°3'19.82"W. Figure 4 provides an image of the MO-SPA monitoring location and Figure 5 shows the location of the MO-SPA monitoring location. Table 3 provides the land uses within the MO-SPA drainage area.

Figure 4. City of Santa Paula MO-SPA Outfall

Table 3. MO-SPA Drainage Area Land Uses

Land Use	*Acres*	*% of Total*
Residential	33.3	52%
Commercial/Industrial	30.0	47%
Parks and Recreation	0.0	0%
Agriculture	0.0	0%
Vacant/Undifferentiated	0.8	1%
Totals	***64.1***	***100%***

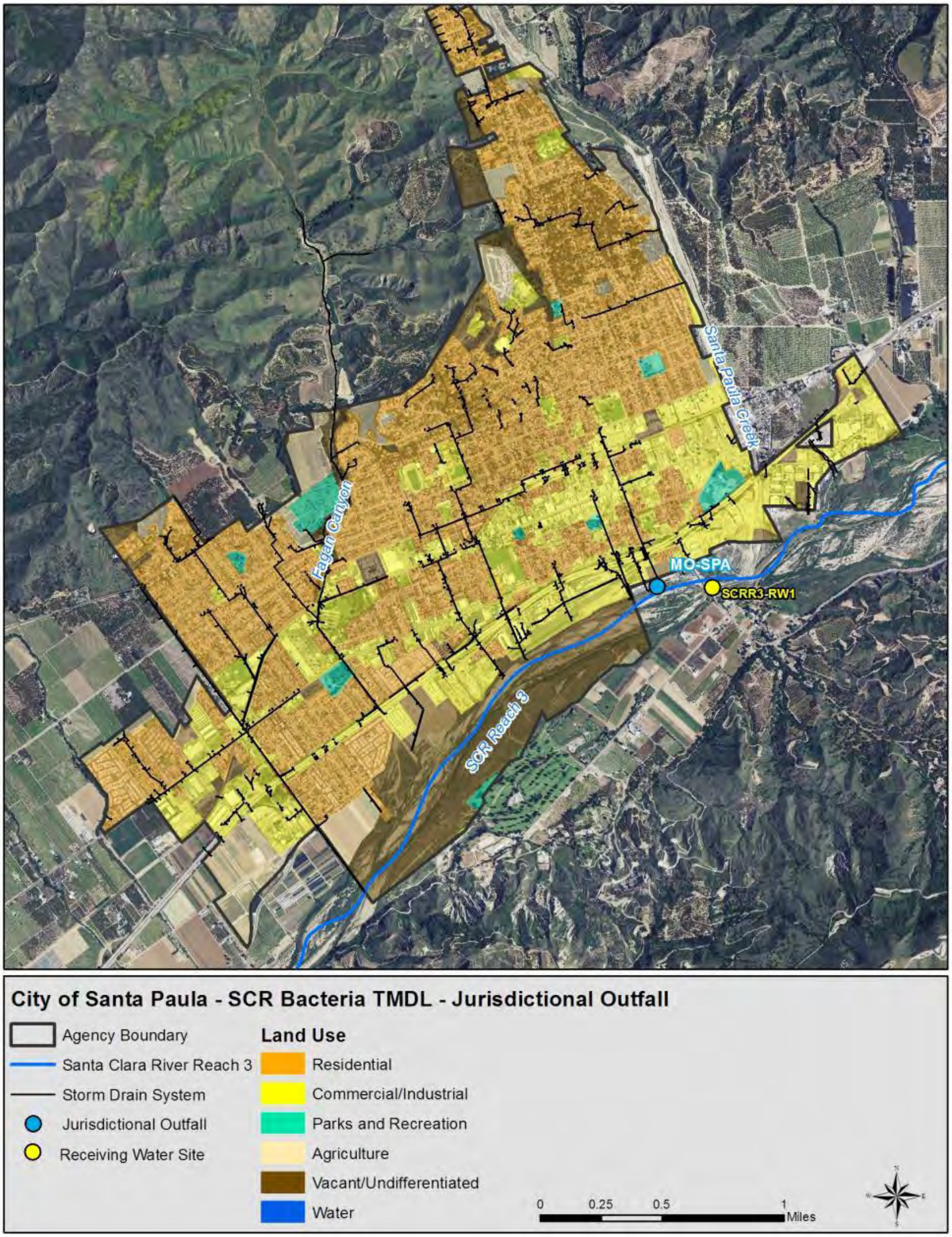

Figure 5. City of Santa Paula MO-SPA Outfall Location

2.1.3 *City of Ventura*

The select Jurisdictional Outfall for the City of Ventura is the MO-VEN location currently monitored under the County of Ventura MS4 Permit. The location is Moon Ditch, which is tributary to SCR Reach 1, located between Leland Street and US 101, north of Johnson Drive. The latitudinal and longitudinal coordinates are: 34°14’35.86”N, 119°11’40.86”W. Figure 6 provides an image of the MO-VEN monitoring location and Figure 7 shows the location of the MO-VEN monitoring location. Table 4 provides the land uses within the MO-VEN drainage area.

Figure 6. City of Ventura MO-VEN Outfall

Table 4. MO-VEN Drainage Area Land Uses

Land Use	*Acres*	*% of Total*
Residential	357.4	51%
Commercial/Industrial	322.1	46%
Parks and Recreation	0	1%
Agriculture	5.8	0%
Vacant/Undifferentiated	21.7	3%
Totals	***707.1***	***100%***

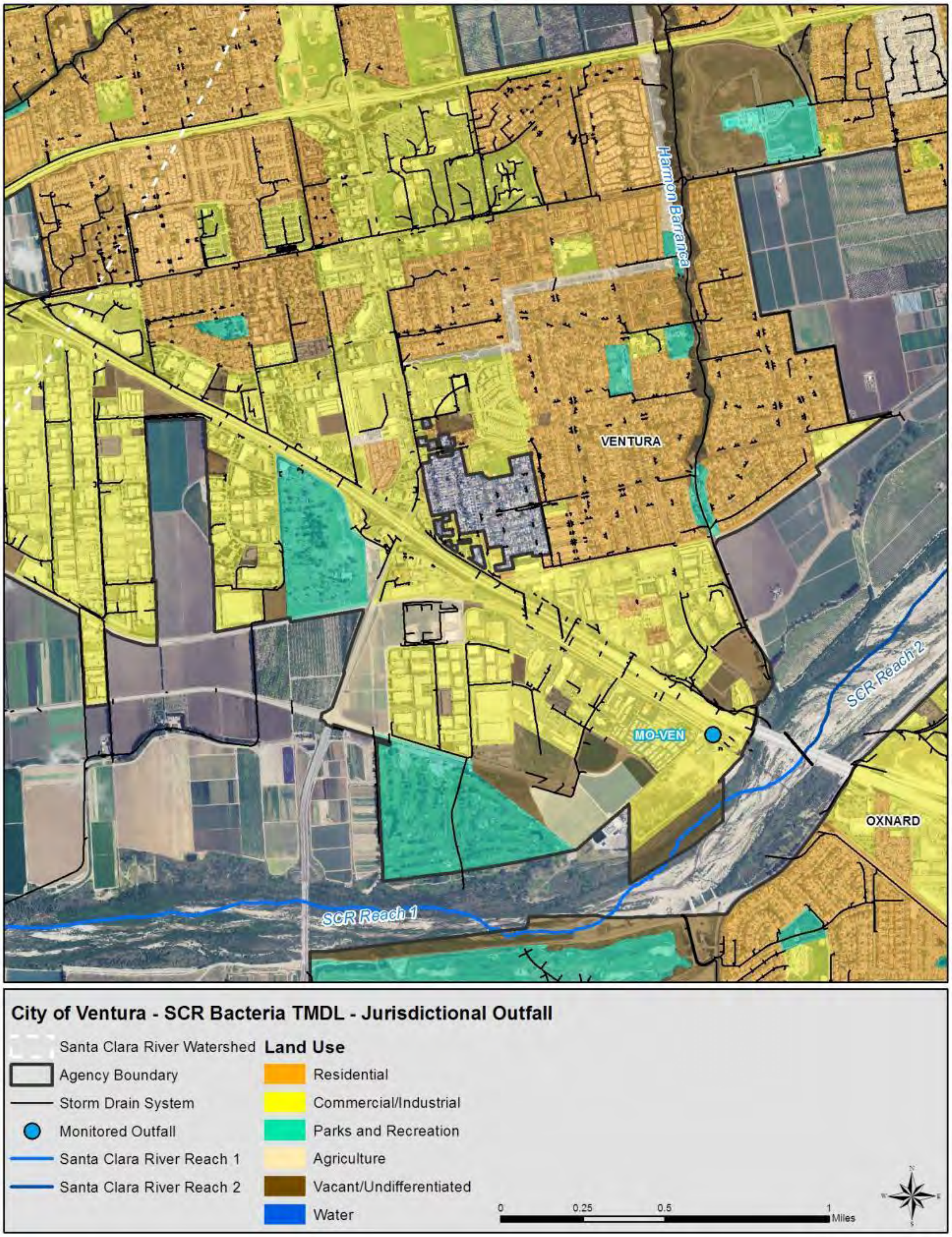

Figure 7. City of Ventura MO-VEN Outfall Location

2.1.4 *City of Oxnard*

The select Jurisdictional Outfall for the City of Oxnard, MO-SRG, is located just north of W Vineyard Avenue behind the Marriott Residence Inn. The MS4 related to the MO-SRG receives discharge from the Sea Ridge neighborhood in the City of Oxnard. This Jurisdictional Outfall does not discharge directly to the SCR. Rather, it discharges to an open channel that traverses through a golf course before it discharges to the SCR. This location was chosen as it is where the storm drain daylights so the discharge at this location is representative of residential and commercial MS4 land uses. The latitudinal and longitudinal coordinates are: 34°13’50.99”N, 119°11’57.87”W. Figure 8 provides an image of the MO-SRG monitoring location and Figure 9 shows the location of the MO-SRG monitoring location. The latitudinal and longitudinal coordinates are: 34°13’50.99”N, 119°11’57.87”W. Figure 8 provides an image of the MO-SRG monitoring location and Figure 9 shows the location of the MO-SRG monitoring location. Table 5 provides the land uses within the MO-SRG drainage area.

Figure 8. City of Oxnard MO-SRG Outfall

Table 5. MO-SRG Drainage Area Land Uses

Land Use	*Acres*	*% of Total*
Residential	49.9	76%
Commercial/Industrial	10.6	16%
Parks and Recreation	0	0%
Agriculture	0	0%
Vacant/Undifferentiated	4.8	8%
Totals	***65.4***	***100%***

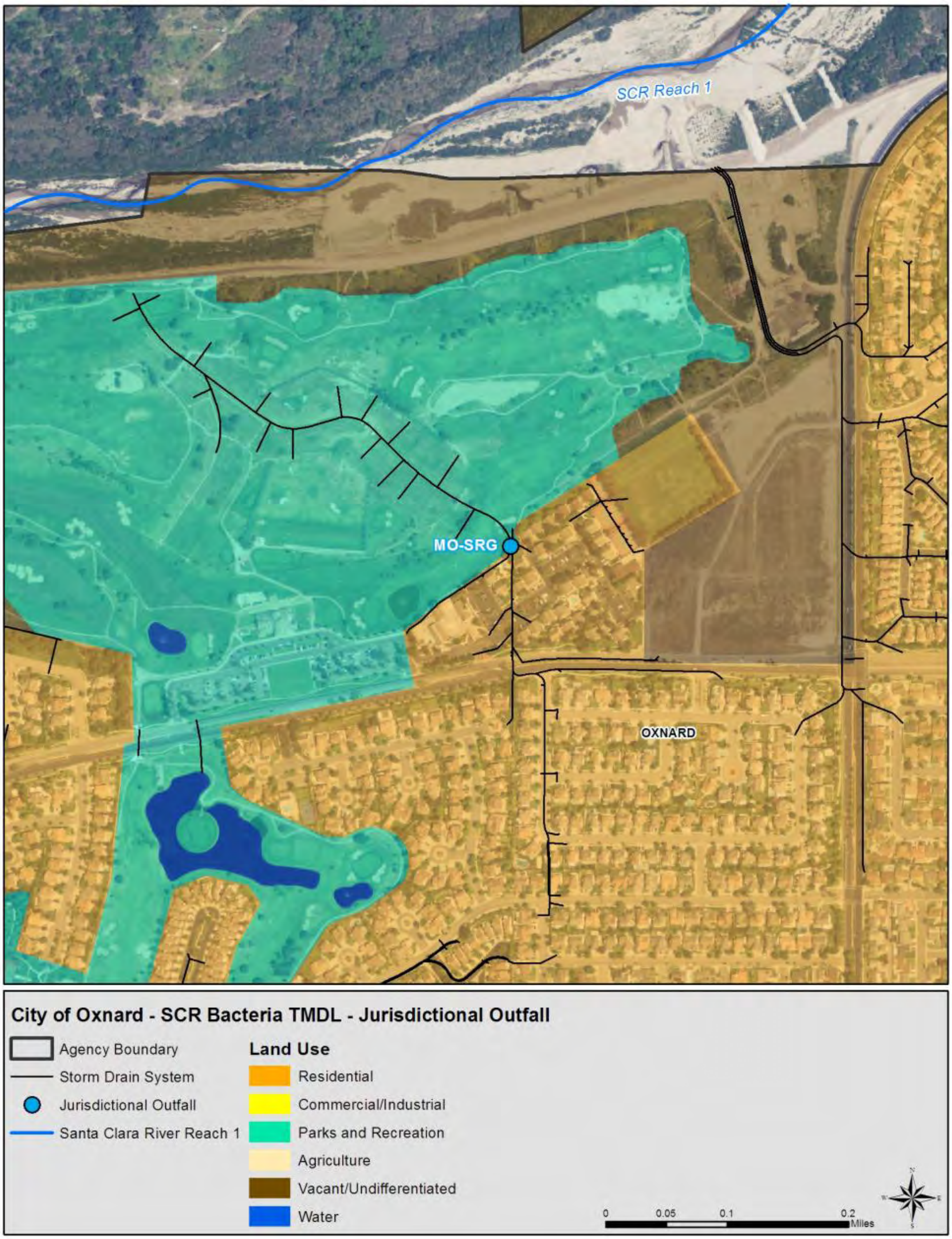

Figure 9. City of Oxnard MO-SRG Outfall Location

2.1.5 *County of Ventura*

The select Jurisdictional Outfall for the County of Ventura is located within the Saticoy area of Unincorporated County of Ventura. The monitoring location, MO-SAT, is an outfall tributary to SCR Reach 2, located at the bottom of a headwall approximately 30 feet from Los Angeles Ave south of County Drive. The latitudinal and longitudinal coordinates are: 34°16’48.82”N, 119°8’36.44”W. Figure 10 provides an image of the MO-SAT monitoring location and Figure 11 shows the location of the MO-SAT monitoring location. Table 6 provides the land uses within the MO-SAT drainage area.

Figure 10. County of Ventura MO-SAT Outfall

Table 6. MO-SAT Drainage Area Land Uses

Land Use	*Acres*	*% of Total*
Residential	5.4	15%
Commercial/Industrial	26.7	74%
Parks and Recreation	0	0%
Agriculture	0	0%
Vacant/Undifferentiated	3.9	11%
Totals	***36.0***	***100%***

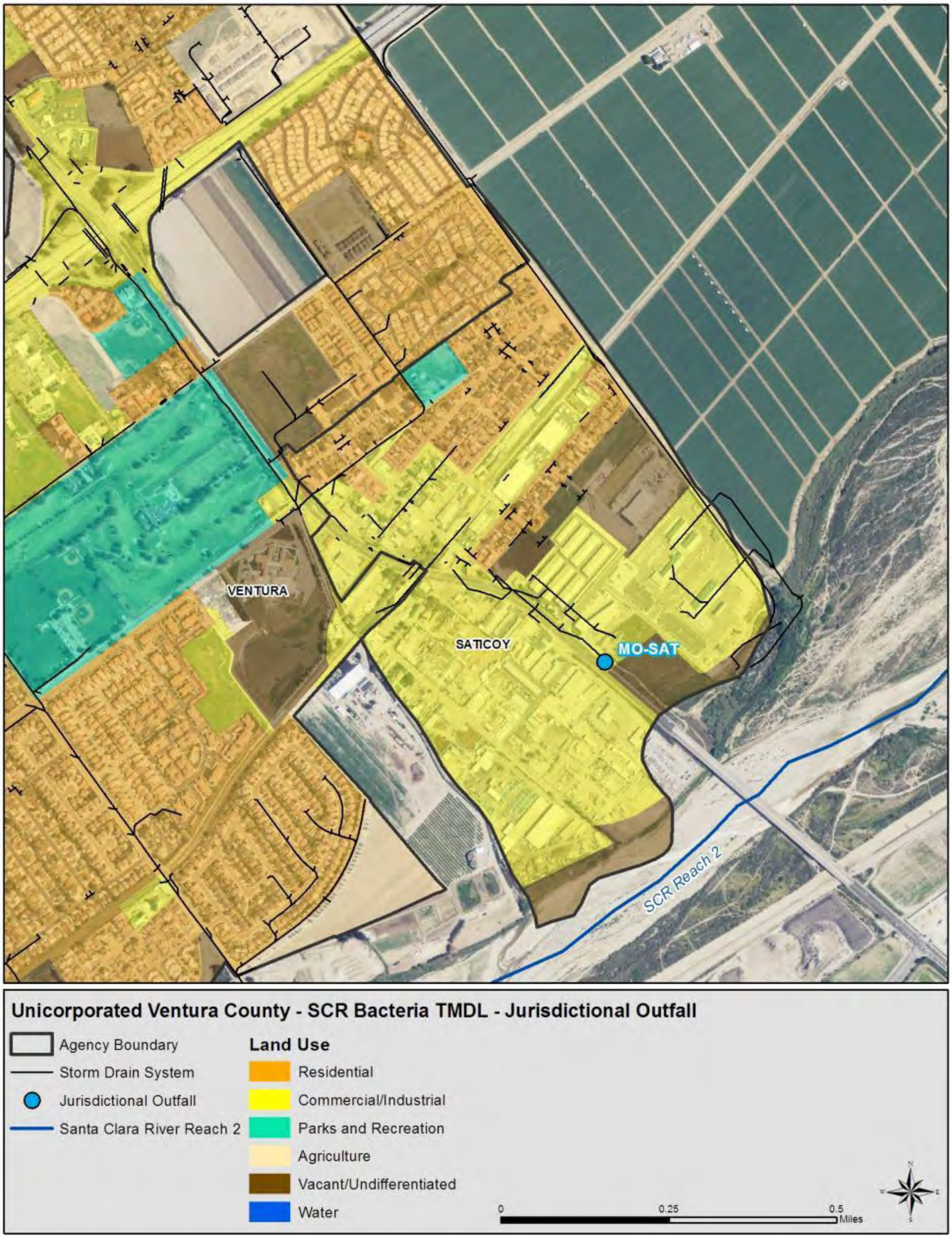

Figure 11. County of Ventura MO-SAT Outfall Location

2.2 CONSTITUENTS TO BE MONITORED

The interim dry and wet weather WLAs for the SCR Estuary are expressed as allowable exceedance days (AEDs) of the single sample objective for fecal coliform, enterococcus, and total coliform. The final dry and wet weather WLAs for the SCR Estuary are expressed as AEDs of the single sample objectives and the geometric mean objectives for fecal coliform, enterococcus, and total coliform.

The interim dry and wet weather WLAs for the SCR Reach 3 are expressed as AEDs of the single sample objective for *E. coli*. The final dry and wet weather WLAs are expressed as AEDs of the single sample objective and allowable exceedances of the geometric mean objectives for *E. coli*.

To gain a greater understanding of bacteria concentrations discharging from the MS4s as a whole in the watershed, the Participating Agencies will collect samples for fecal coliform, enterococcus, total coliform, and *E. coli* at each Jurisdictional Outfall monitoring location.

2.3 MONITORING FREQUENCY

The dry and wet weather final WLAs (single sample and geometric mean objectives) are not in effect until 11 (March 21, 2023) and 17 (March 21, 2029) years after the effective date of the Bacteria TMDL, respectively. Therefore, until the final WLAs are in effect, monitoring will be conducted in a manner adequate to characterize the discharges from the responsible jurisdictions' MS4s during the implementation period. This approach allows the Participating Agencies to efficiently comply with the Bacteria TMDL monitoring requirements and direct resources towards: 1) evaluating bacteria concentrations compared to the WLAs, 2) evaluating contributions to receiving water exceedances, 3) supporting BMP implementation, and 4) conducting source investigations. While the interim WLAs are in effect, samples will be collected monthly with monitoring to occur at the same time as receiving water monitoring. Starting in March 2023 when the dry weather final WLAs become effective, samples will be collected weekly, with sampling to occur at the same time as receiving water monitoring. Wet weather events will not specifically be targeted for monitoring. Rather, all monitoring will be conducted at the monthly and weekly frequencies detailed above and the determination of whether the monitoring event occurred during dry or wet weather will occur after the monitoring event utilizing precipitation data. This approach is further detailed in Section 2.9 Data Management.

2.4 ENHANCED OUTFALL MONITORING APPROACH

Enhanced outfall monitoring as a result of an in-stream exceedance will begin after the interim WLAs are in effect (March 21, 2016) and will occur after the determination of an in-stream exceedance of the WLAs (single sample or geometric mean). An in-stream exceedance under this Outfall Monitoring Plan is defined as: "an exceedance of the single sample or geometric mean numeric targets at an in-stream monitoring location occurring after the allowable number of exceedance days for that objective has been exhausted during a specific monitoring year." The collected monitoring data will continually be reviewed and when a sample exhibits an exceedance of the interim WLAs, after all of the allowable annual exceedance days are exhausted, enhanced outfall monitoring will commence. The steps for the enhanced outfall monitoring strategy are listed below:

- Upon determination of an in-stream exceedance – review bacteria data from the Jurisdictional Outfalls collected at the same time as the receiving water bacteria data that exhibited the exceedance(s). For exceedances observed at the Estuary receiving water monitoring location, all Jurisdictional Outfall data will be reviewed. For exceedances observed at the Reach 3 receiving water monitoring location, Jurisdictional Outfall data from sites MO-FIL and MO-SPA will be reviewed.
- If there were no exceedances of the single sample or geometric mean numeric targets at the Jurisdictional Outfall(s), then the Participating Agencies will not perform any further actions.[1]
- If there were exceedances of the single sample or geometric mean numeric targets at the Jurisdictional Outfall(s), then the Participating Agencies will conduct a source identification study in the MS4 upstream of the Jurisdictional Outfall(s) with exceedances. The source identification may include a visual assessment, collection of additional water quality data, microbial source tracking, and/or other viable investigative options.
- Additionally, the Participating Agencies may conduct optional monitoring at a receiving water site or utilize data collected by other monitoring programs upstream of the Participating Agencies' jurisdictional boundaries to support enhanced outfall monitoring. The purpose of conducting monitoring at this receiving water site or utilizing other data collected is to characterize water quality upstream of the Participating Agencies' jurisdictional boundaries to ascertain if upstream sources may have contributed to an exceedance at the receiving water monitoring sites utilized for in-stream compliance receiving water monitoring (described in the In-Stream Monitoring Plan submitted in 2013). Monitoring may be conducted at the EOM-NEW site, which is located near the Newhall Orchard off of CA-126 (34° 24' 12.0882"W, 118° 44' 20.364"N). The optional receiving water monitoring site may move if access to the site becomes an issue as the monitoring site is located on private property. An example of other monitoring programs from which data may be utilized includes the monitoring programs conducted to meet the requirements of the Newhall Land & Farming Company's Clean Water Act Section 401 Water Quality Certification and Waste Discharge Requirements (Order No. R4-2012-0139).

2.5 Summary of Monitoring Approach

A summary of the monitoring locations, constituents and frequency is shown in Table 7.

[1] No exceedances at the Jurisdictional Outfalls indicates the MS4 did not contribute to the in-stream exceedance as it is assumed the discharges from the representative outfalls are representative of the discharges from the entire MS4.

Table 7. Monitoring Approach Summary

Monitoring Location	Constituents	Monitoring Frequency until March 2023	Monitoring Frequency after March 2023	Location of receiving water exceedance triggering enhanced outfall monitoring investigation
MO-FIL (Fillmore)	Total coliform, fecal coliform, enterococcus, and E. coli	Monthly	Weekly	SCRE-R005, SCRR3-RW1
MO-SPA (Santa Paula)				SCRE-R005, SCRR3-RW1
MO-VEN (Ventura)				SCRE-R005
MO-SRG (Oxnard)				SCRE-R005
MO-SAT (County of Ventura)				SCRE-R005
EOM-NEW_(Optional RW site)		As needed	As needed	SCRE-R005, SCRR3-RW1

2.5.1 *Monitoring Event Preparation*

Monitoring event preparation includes preparation of field equipment, placing bottle orders, and contacting the necessary personnel regarding site access and schedule. The following steps should be completed prior to each sampling event:

1. Check weather reports;
2. Contact laboratories to order bottles and to coordinate sample pick-ups;
3. Confirm scheduled sampling date with field crews;
4. Set-up sampling day itinerary including sample drop-offs and pick-ups;
5. Compile field equipment;
6. Prepare field logs;
7. Prepare sample labels; and
8. Prepare chain-of-custody (COC) forms.

Prior to mobilization for each monitoring event, field personnel should prepare the equipment necessary to conduct the monitoring as listed in Table 8.

Table 8. Equipment Checklist

- ☐ First Aid Kit
- ☐ Cellular Telephone
- ☐ Copy of Monitoring Plan Document
- ☐ Field Logs
- ☐ Digital Camera
- ☐ Clipboard
- ☐ Timepiece
- ☐ Pens/Pencils and Permanent Marker
- ☐ New, Powder-Free Nitrile Gloves
- ☐ Paper Towels or Rags in a Box
- ☐ Sample Pole
- ☐ Plastic Trash Bags
- ☐ Distilled/DI Wash Bottles
- ☐ Wader Boots
- ☐ Ziploc Bags
- ☐ Hat/Sunglasses
- ☐ Maps and Aerial Photos
- ☐ Sunscreen Lotion
- ☐ Sample Bottles w/Pre-Printed Labels
- ☐ Antibacterial Hand Wash
- ☐ Coolers w/Ice

2.6 Monitoring Procedures

The following monitoring procedures will be followed for sample collection.

2.6.1 Sample Container Labeling

Samples will be identified such that the site, sampling location, matrix, sampling equipment, and sample type (i.e., environmental sample or quality control sample) can be distinguished by a data reviewer or user. All sample containers will be pre-labeled before each sampling event to the extent practicable. Pre-labeling sample containers simplifies field activities, leaving only sample collection time and date and field crew initials to be filled out in the field. Custom labels will be produced using water-proof labels. This approach will allow the site and analytical constituent information to be entered in advance and printed as needed prior to each monitoring event. Labels will be applied to the appropriate sample containers in a dry environment as labels usually do not adhere to wet containers. The labels will not be applied to container caps. Container labels will contain the following information:

• Project ID • Sample ID • Location ID	• Date • Time • Sampling Personnel	• Analytical Requirements • Preservative Requirements • Analytical Laboratory

2.6.2 Sampling Technique

All samples will be collected in a sterile 125 mL or greater glass or high-density polyethylene (HDPE) bottle containing sodium thiosulfate ($Na_2S_2O_3$) to neutralize up to 15 milligrams per liter (mg/L) of chlorine. Samples will be collected using techniques that minimize the possibility of sample contamination. These sampling techniques are summarized below:

- Samples are only collected into rigorously pre-cleaned, sterile sample containers;
- At least two persons are required on a sampling crew;
- Clean, powder-free nitrile gloves must be worn while collecting samples and must be changed whenever something not known to be clean has been touched; and
- To reduce the potential for contamination and to ensure crew safety, field crews must observe the following precautions while collecting samples:
  - Smoking is prohibited;
  - Collecting samples near a vehicle, running or otherwise, is prohibited;
  - Eating or drinking during sample collection is prohibited;
  - Sampling personnel should avoid breathing, sneezing, or coughing in the direction of an open sample container; and
  - Do not allow rain water to drip from rain gear or any other surface into sample containers.

Grab samples will be collected directly into the appropriate bottles with special care taken when filling bottles so as to not spill the preservative. Grab samples will be collected at approximately mid-stream, mid-depth at the location of greatest flow (where feasible) by direct submersion of the sample bottle. This is the preferred method for grab sample collection; however, due to monitoring location configurations, safety concerns, and flow regime, collecting samples at mid-stream, mid-depth may not always be feasible. In these cases, a sample pole or intermediate container such as a clean HDPE bottle or one gallon plastic zip-top bag may be used to collect samples. Use of a sampling pole allows the field personnel to access monitoring locations otherwise difficult or impossible to reach. A sampling pole consists of an extending rod with a bottle holder on the end that a sample bottle may be attached to using zip ties or similar measure. Monitoring location configuration will dictate grab sample collection technique. Standard operating procedures for collection of surface water samples are specified below.

Direct Submersion Technique

Where practical, all grab samples will be collected by direct submersion at mid-stream, mid-depth using the following procedures:

1. Wear clean powder-free nitrile gloves when handling containers and lids. Change gloves if soiled or if the potential for cross-contamination occurs from handling sampling materials or samples;
2. Use pre-labeled, sterile sample bottles;
3. Remove the lid, submerge the sample bottle to mid-stream/ mid-depth without spilling the preservative, let the bottle fill and secure the lid;
4. Place the sample on ice;
5. Collect quality control samples, if required, using the same protocols described above; and
6. Fill out the COC form, note sample collection time on the field log sheet, and deliver sample(s) to the appropriate laboratory.

Sampling Pole Technique

Samples may be collected with the use of a sample pole, if necessary, following the steps listed below:

1. Wear clean powder-free nitrile gloves when handling bottles and lids. Change gloves if soiled or if the potential for cross-contamination occurs from handling sampling materials or samples;
2. Use pre-labeled, sterile sample bottle;
3. Attach sample bottle to sample pole using zip ties or a similar, secure measure;
4. Remove cap and submerge the sample bottle as near to mid-stream/ mid-depth as possible without spilling the preservative, let the bottle fill and secure the lid;
5. Place the sample on ice;
6. Collect quality control samples, if required, using the same protocols described above; and
7. Fill out the COC form, note sample collection time on the field log sheet, and deliver the sample(s) to the appropriate laboratory.

Intermediate Container Technique

Samples may be collected with the use of an intermediate, sterile container, if necessary, following the steps listed below:

1. Wear clean powder-free nitrile gloves when handling bottles and lids. Change gloves if soiled or if the potential for cross-contamination occurs from handling sampling materials or samples;
2. Use pre-labeled sample bottle;
3. Collect sample using clean HDPE bottle or one gallon zip-top bag being sure not to disturb any bottom sediments/algae;
4. Transfer sample into pre-labeled, sterile sample bottle;
5. Place the sample on ice;
6. Collect quality control samples, if required, using the same protocols described above; and
7. Fill out the COC form, note sample collection time on the field log sheet, and deliver the sample(s) to the appropriate laboratory.

The potential exists for monitoring locations to lack discernible flow. The lack of discernible flow may generate unrepresentative data as standing puddles or extreme low flow will not appropriately characterize outfall discharge water quality. As a result, if the following conditions are found at a monitoring location, samples should not be collected:

- Pools of water with no flow or no visible connection to another surface water body should **NOT** be sampled. The field log should be completed for non-water quality data (including date and time of site visit) and the site condition should be photo-documented; and
- Flowing water where the flow rate is extremely low should not be monitored. Flows where it is infeasible to collect a sample without disturbing the benthic matrix whereby the sample may be contaminated by the benthic matrix, should not be monitored. The field log should be completed for non-water quality data (including date and time of site visit) and the site condition should be photo-documented.

In addition, the monitoring locations may be dry during a sampling event. Information regarding pools of water, insufficient flow for sampling, or dry conditions is extremely important in that it provides information that can support the evaluation of compliance with Bacteria TMDL requirements. The absence of flow at a monitoring location will be considered to be a demonstration of compliance with the numeric targets in the Bacteria TMDL during the associated monitoring period. The environmental conditions will be photo-documented and recorded on field log sheets.

It is the combined responsibility of all members of the sampling crew to determine if the performance requirements of the specific sampling method have been met, and to collect additional samples if required. If the performance requirements outlined above or documented in sampling protocols are not met, the sample will be re-collected. If contamination of the sample container is suspected, a fresh sample container will be used.

2.6.3 Field Observations

Field observations may be made at each monitoring location after all samples associated with the location are collected. Field observations may include weather, water color, water odor, algae presence, wildlife presence, floatables, etc. If conducted, all comments regarding location observations will be recorded on a field log sheet for each location and photos of the monitoring location will be taken. The following items may be recorded on the field log sheet for each sampling event:

- Monitoring Site location (Location ID);
- Date and time(s) of sample collection;
- Name(s) of sampling personnel ;
- Sample ID numbers and unique IDs for any replicate or blank samples;
- Requested analyses (specific parameters or method references);
- Qualitative descriptions of relevant water conditions (*e.g.*, no flow, low flow, water color, clarity, odor) or weather (*e.g.*, sunny/cloudy, windy, rainy) at the time of sample collection; and
- A description of any unusual occurrences associated with the sampling event, particularly those that may affect water quality or data quality.

2.6.4 Flow Measurements

Flow measurements are currently planned for collection during dry and wet weather outfall monitoring.

In the cases where the water is deep enough, a velocity meter will be used to measure flow. In the cases where the water is not deep enough to use a velocity meter, the “float” method will be used. In the cases where the outfall monitoring location is too small to use a velocity meter or the “float” method, the filling of a volumetric container will be used.

When water is deep enough, velocity will be measured at approximately equal increments across the width of the flowing water using a velocity meter. A “flow pole” will be used to measure the water depth at each measurement point and to properly align the sensor so that the depth of each velocity measurement is 0.6 * total depth (for electromagnetic meters), which is representative of the average velocity, or on the bottom (for Doppler velocity meters). The distance between velocity measurements taken across the stream is dependent on the total width. No more than 10 percent of the flow will pass through any one cross section.

For the “float” method, the width, depth, velocity, cross section, and corresponding flow rate will be estimated as follows:

Sheet flow width: The width (W) of the flowing water (not the entire part of the channel that is damp) is measured using a tape measure at the “top”, “middle”, and “bottom” of a marked-off distance – generally 10 feet (e.g., for a 10-foot marked-off section, W_{Top} is measured at 0-feet, W_{Mid} is measured at 5 feet, and W_{Bottom} is measured at 10 feet).

Sheet flow depth: The depth of the sheet flow is measured at the top, middle, and bottom of the marked-off distance. Specifically, the depth (D) of the sheet flow is measured at 25 percent, 50 percent, and 75 percent of the flowing width (e.g., $D^{Mid}_{50\%}$ is the depth of the water at middle of the section in the middle of the sheet flow) at each of width measurement locations. It is assumed that the depth at the edge of the sheet flow (i.e., at 0 percent and 100 percent of the flowing width) is zero.

Representative cross-section: Based on the collected depth and width measurements, the representative cross-sectional area across the marked-off sheet flow is approximated as follows:

$$\text{Representative Cross Section} =$$
$$Average\ \{[\frac{W_{Top}}{4}\times(\frac{D_{25\%}^{Top}}{2}+\frac{(D_{50\%}^{Top}+D_{25\%}^{Top})}{2}+\frac{(D_{75\%}^{Top}+D_{50\%}^{Top})}{2}+\frac{D_{75\%}^{Top}}{2})],$$
$$[\frac{W_{Mid}}{4}\times(\frac{D_{25\%}^{Mid}}{2}+\frac{(D_{50\%}^{Mid}+D_{25\%}^{Mid})}{2}+\frac{(D_{75\%}^{Mid}+D_{50\%}^{Mid})}{2}+\frac{D_{75\%}^{Mid}}{2})],$$
$$[\frac{W_{Bottom}}{4}\times(\frac{D_{25\%}^{Bottom}}{2}+\frac{(D_{50\%}^{Bottom}+D_{25\%}^{Bottom})}{2}+\frac{(D_{75\%}^{Bottom}+D_{50\%}^{Bottom})}{2}+\frac{D_{75\%}^{Bottom}}{2})]\}$$

Sheet flow velocity: Velocity is calculated based on the amount of time it took a float to travel the marked-off distance (typically 10-feet or more). Floats are normally pieces of leaves, litter, or floatables (suds, etc.). The time it takes the float to travel the marked-off distance is measured at least three times. Then average velocity is calculated as follows:

$$Average\ Surface\ Velocity = \frac{Distance\ Marked\ off\ \ for\ Float\ Measurement}{Average\ Time\ \ for\ Float\ to\ Travel\ Marked\ off\ \ Distance}$$

Flow Rate calculation: For sheet flows, based on the above measurements/estimates, the estimated flow rate, Q, is calculated by:

$$Q = f \times (\text{Representative Cross Section}) \times (\text{Average Surface Velocity})$$

The coefficient *f* is used to account for friction effects of the channel bottom. That is, the float travels on the water surface, which is the most rapidly-traveling portion of the water column. The average velocity, not the surface velocity, determines the flow rate, and thus *f* is used to “convert” surface velocity to average velocity. In general, the value of *f* typically ranges from 0.60 – 0.90. Based on flow rate measurements taken during the LA River Bacteria Source Identification Study[2] a value of 0.75 will be used for *f*.

The filling of the volumetric container method entails using a stop watch and a container from which a volume of water can easily be ascertained. One sample team member uses a stop watch to time how long it takes to fill the volumetric container to a specified volume or what volume of water is collected during a specified amount of time. This process is repeated three times and the average flow rate is calculated.

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[2] CREST. Los Angeles River Bacteria Source Identification Study: Final Report. November 2008.

2.7 Sample Handling, Chain-of-Custody, Transport, and Analysis

2.7.1 Sample Handling

The field crews will have custody of samples during each monitoring event. COC forms will accompany all samples during transport to contract laboratories to identify the contents. All water quality samples will be transported to the analytical laboratory by the field crew or by courier. The original COC form will accompany the shipment, and a signed PDF copy of the COC form will be sent, by the laboratory, to the field crew to be retained in the project file.

While in the field, samples will be stored on ice in an insulated container (*i.e.*, ice chest), so that sample temperature will be maintained at approximately 4˚C. All samples must be examined to ensure that container lids are tight and that containers do not leak. The ice packed with samples must be approximately two inches deep at the top and bottom of the cooler, and must contact each sample to maintain temperature. The original COC form(s) will be retained by the person(s) transporting the samples. The laboratory's sample receiving department will examine the samples and COC forms for correct documentation, proper preservation, and compliance with holding times.

The following procedures are used to prevent bottle breakage and cross-contamination:

- Bubble wrap or foam pouches are used to keep glass bottles from contacting one another to prevent breakage;
- All samples are transported inside hard plastic coolers or other contamination-free shipping containers; and
- Arrangements must be made in advance to notify the laboratory's sample receiving department prior to sample delivery.

All samples remaining after successful completion of analyses will be disposed of properly. It is the responsibility of each analytical laboratory to ensure that all applicable regulations are followed in the disposal of samples or related chemicals.

2.7.2 Chain-of-Custody

Sample custody procedures provide a mechanism for documenting information related to sample collection and handling. Sample custody must be traceable from the time of sample collection until results are reported. A sample is considered under custody if it is:

- In actual possession;
- In view after in physical possession; and
- Placed in a secure area (accessible by or under the scrutiny of authorized personnel only).

A COC form must be completed after sample collection and prior to sample transport or release. The COC form, sample labels, and field documentation will be cross-checked by the field crew prior to delivery to the laboratory to verify sample identification, types of analyses, number of containers, sample volume, preservatives, and types of containers. A completed COC form is to accompany the samples to the analyzing laboratory.

2.7.3 *SAMPLE TRANSPORT*

Samples will be stored in coolers with ice and delivered to a National Environmental Laboratory Accreditation Program-certified laboratory or an Environmental Laboratory Accreditation Program-certified laboratory. The exact laboratory will be determined prior to implementing the Monitoring Plan. The samples have an eight-hour hold time from collection to analysis, but must be received by the laboratory within six hours of sample collection. Therefore, prompt delivery to the lab after collection is essential and so all samples will be delivered to lab within the six-hour holding time.

2.7.4 *SAMPLE ANALYSIS*

Samples will be tested by certified laboratory for the applicable analytical method(s). All indicator groups will be quantified from a single sample collected at the designated monitoring site. Necessary dilutions or aliquot volumes will be processed to ensure that reportable values can be determined. Expected analytical methods are listed in Table 9. Other Ventura County Department of Public Health-approved microbiological methods may be substituted for those listed in Table 9, provided the laboratory holds ELAP accreditation for those methods.

Table 9. Analytical Methods and Holding Times

Constituent	*Method*	*MDL*	*Hold Time*	*Laboratory*
Total coliform (25 Tube Method – MPNX)	SM 9,221 B	TBD[1]	6 hours	TBD[2]
Fecal coliform (25 Tube Method – MPNX)	SM 9,221 C,E	2/100 mL	6 hours	TBD[2]
Enterococcus (Tray Method – WQ INDEXX)	SM 9,223	TBD[1]	6 hours	TBD[2]
Total Coliform (Tray Method – WQ INDEXX)	SM 9,223	TBD[1]	6 hours	TBD[2]
E. coli (Tray Method – WQ INDEXX)	SM 9,223	TBD[1]	6 hours	TBD[2]

[1] To be determined. Note: Method Detection Limits for WQ IDEXX methods depend on dilutions used for analysis

[2] To be determined. City of Ventura Wastewater Reclamation Plant Laboratory or other qualified laboratory

2.8 QUALITY ASSURANCE/ QUALITY CONTROL

Field quality assurance (QA)/quality control (QC) samples may be collected in conjunction with environmental samples to verify data quality. QA/QC samples include field blanks and field duplicates. Each QA/QC type is described below.

In addition, the selected laboratory or laboratories must employ a program that associates quality assurance with the laboratory facility, staff, instrumentation and equipment, materials and methods, media and reagents, and data validation. The quality assurance procedures shall be in accordance with Standard Methods for the Examination of Water and Wastewater, 18-20th Editions (APHA 1992-98). Laboratories must maintain their certifications.

2.8.1 *FIELD BLANKS*

The purpose of analyzing field blanks is to demonstrate that sampling procedures do not result in contamination of the environmental samples. Field blanks may be collected at a frequency of five percent of samples collected, which is more rigorous than the Quality Assurance Management Plan for SWAMP.[3] Blanks consist of laboratory-prepared blank water (certified to be contaminant-free by the laboratory) processed through the sampling equipment using the same procedures used for environmental samples. Field blank samples will be noted with -20 at the end of the sample ID.

2.8.2 Field Duplicates

The purpose of analyzing field duplicates is to demonstrate the precision of sampling and analytical processes. Field duplicates may be prepared at the rate of five percent of all samples, and analyzed along with the associated environmental samples. Field duplicates consist of two grab samples collected simultaneously, to the extent practicable. Field duplicate samples will be noted with a -22 at the end of the sample ID.

2.9 Data Management

Data collected as result of this monitoring program will be managed by the responsible jurisdictions, or their designee. Quantitative results will be stored in a spreadsheet. Data will be provided to the Regional Board no later than March 21, 2017, when the Participating Agencies are required to provide a verbal update on the progress of TMDL implementation. Data can be provided to the Regional Board earlier if requested.

To determine if samples occurred during dry or wet weather, precipitation data from rain gages within or near Estuary or Reach 3 of the SCR will be used. Two rain gages that may be used include: (1) H245 – Wilson Ranch and (2) H066 – Ventura City Hall found at http://www.vcwatershed.net/fws/gmap.html, for Reach 3 and the Estuary, respectively.

To calculate wet weather loads, for each sampled storm, measured discharge volumes will be multiplied by their corresponding EMC (or grab concentration) values. For each unsampled storm, discharge volumes will be estimated based on rainfall, and will be multiplied by the average measured concentrations from sampled storms from that year. Then loads for all storms will be summed by year to report a total annual bacteria load per *outfall*. These annual load results per outfall will then be extrapolated to each jurisdiction's area to produce an annual load per *jurisdiction*. These loads will then be compared with the baseline loads (for the critical year) from the IP model, to estimate a percent load reduction. The calculated percent load reduction for each year's annual load will be compared with the target load reduction values used in the IP, which were recommended for inclusion in the permit as an alternative compliance metric for the SCR bacteria TMDL.

2.10 Special Circumstances for Safety Consideration

Within the LSCR watershed, there are several potentially hazardous factors that exist including the potential to encounter homeless individuals; difficult location access due to vegetation, steep or impassible trails, and/or wildlife; weather conditions; and confined spaces. The potential for these special circumstances are discussed in more detail below. Monitoring will not occur in areas when

[3] State Water Resources Control Board (2008). Quality Assurance Program Plan, Version 1.0 – Final Technical Report. September 1, 2008.

the safety of field staff may be compromised. A health and safety plan will be developed and will accompany field personnel when conducting a monitoring event.

2.10.1 Encounters with Various Individuals

There is the potential for encounters and/ or interactions with various individuals during monitoring activities. If at any time field staff feel uncomfortable or in danger, activities must immediately cease and all staff must return to a safe location. If any situation escalates to a perceived dangerous level, field staff must immediately leave the area and contact the appropriate authorities.

2.10.2 Location Access Issues

Currently, all monitoring locations are accessible. However, at some point, location access may be hindered due to excessive vegetation, steep or impassible trails, and/ or wildlife. Field crews will ensure that all precautions are taken when sampling adjacent to environments exhibiting these conditions. Field crews should identify safe routes to the designated locations. In addition, if there are continued access issues at the monitoring locations, the monitoring location may be re-evaluated to remedy the issues.

2.10.3 Weather Conditions

As sampling is scheduled to occur year-round, field crews will ensure they take the necessary precautions to meet the potential challenges from weather conditions. This includes having the correct clothing, footwear, and gear to address various weather conditions.

2.10.4 Confined Spaces

At no time are field crews to enter any confined spaces located at or near a monitoring location. These confined spaces can include areas of dangerous gas buildup and other potential hazards that field crews will not be trained properly in addressing.

APPENDIX B
MODELING INPUTS

SBPAT, a public domain GIS-based water quality analysis tool, was used to evaluate BMP performance for the purposes of the LSCR Bacteria TMDL Implementation Plan. SBPAT links the hydrologic output from a modified USEPA Storm Water Management Model (SWMM) to a stochastic Monte Carlo water quality model to develop statistical descriptions of stormwater quantity and quality. Through this approach, SWMM is used to run a continuous rainfall-runoff simulation for the modeled year, resulting in volumes for each storm that are treated or bypassed Land use-based wet weather pollutant event mean concentration (EMC) values and BMP effluent EMC values are then randomly sampled from their lognormal statistical distributions. The individual storm runoff volumes (including volumes treated and bypassed by BMPs), land use EMCs, and BMP effluent EMCs are combined to determine the total pollutant loads and load reductions (i.e., difference between baseline and post-BMP load estimates) for the entire water year (WY). This procedure is then repeated ten thousand times, each time recording the volume, pollutant concentrations, loads, and load reductions for the specified WY and randomly sampled EMC values and BMP effluent EMC values. This produces numerical results describing the expected performance of a specific BMP configuration. The statistics of these recorded results are then used to characterize the low (25th percentile), average (mean), and high (75th percentile) values for the annual volume, pollutant loads, and pollutant concentrations in stormwater runoff from the modeled area, with and without BMPs implemented.

A number of spatial and non-spatial datasets are required for this SBPAT analysis, as well as other analyses completed for the LSCR IP, including:

- Watershed rainfall-runoff modeling to assist in determination of pollutant load reductions necessary to meet TMDL requirements.
- Strategic identification of structural BMP locations and types most appropriate for the watershed.
- Determination of the potential extent of non-structural BMP implementation.
- Quantification of expected water quality benefits resulting from both structural and non-structural BMP implementation.
- Structural BMP siting and design constraints and criteria.

To complete the above analyses for the LSCR Watershed, all spatial and non-spatial data needs were discussed with and requested from the Participating Agencies. Data were also obtained from third party sources or in some cases created by Geosyntec.

Key datasets used for the LSCR IP are described below.

1 SPATIAL DATASETS

Table 1 summarizes the spatial datasets used for the above analyses and the sources from which data of these types were obtained for the LSCR Watershed.

Table 1. LSCR Spatial Datasets

Dataset	*Source*	*Format*	*Required Attributes*
Catchments	Geosyntec	Vector (poly)	
Land Use	County of Ventura, Fillmore, Oxnard, and Ventura	Vector (poly)	Land use type, imperviousness
Impairments (303d) & TMDLs	U.S. Environmental Protection Agency	Vector (line & poly)	
Digital Elevation Model (DEM)	USGS National Elevation Dataset, 1/3 arc-second	Raster	Elevation
Slope (percent)	Geosyntec	Raster	
Soils	County of Ventura	Vector (poly)	Ksat, soil hydrologic group, others
Aerial imagery	ESRI Imagery	Raster	
Precipitation (85th percentile 24-hr isohyets)	Geosyntec	Vector (poly)	Isohyet value
Precipitation (85th percentile)	Geosyntec	Raster	Rainfall depth
Parcels	County of Ventura	Vector (poly)	Ownership (public or private), site address
Roads	County of Ventura	Vector (line)	
Municipal Boundary	County of Ventura	Vector (poly)	Jurisdiction
Storm drains	Santa Paula, Fillmore, Oxnard, Ventura, County of Ventura	Vector (line)	MS4 Layer
Streams	County of Ventura	Vector (line)	
Coastal Boundary	County of Ventura	Vector (line)	
Liquefaction Hazard	County of Ventura	Vector (poly)	
Depth to Groundwater	City of Ventura	Vector (line)	Depth to groundwater contours
Precipitation gages	County of Ventura	Vector (point)	Name, location, elevation, start date
Precipitation gage influence zones	Geosyntec	Vector (poly);	Representative hourly precipitation record (one each zone)
Soils/Ksat, Soil Suction Head, Soil Moisture Deficit	Modified by Geosyntec	Vector (poly)	
Evapotranspiration	DWR CIMIS	Vector (poly)	Monthly Normal ET values for each month

2 LAND USE EMCS

The land use EMCs used for modeling of the LSCR IP Area were taken from a combination of Los Angeles Region SBPAT values that have been used for several Enhanced Watershed Management Plans (EWMPs) (see for example, Beach Cities Watershed Management Group 2014) and Ventura County-specific EMCs that were developed based on data provided by the Participating Agencies. The SBPAT User's Guide (Geosyntec 2012) contains additional detail on the datasets from which the default values were derived. Land use grouping, for the purposes of assigning EMCs, are included in Section 4. Land use EMC statistics are shown in Table 2.

Table 2. LSCR Fecal Coliform Land Use EMCs: Arithmetic Estimates of the Log Mean and Log Standard Deviation[1]

Land use type	Fecal Coliform Arithmetic Mean (MPN/100 mL)[2]	Fecal Coliform Arithmetic Standard Deviation (MPN/100 mL)[2]
Agriculture	***24,800***	***125,000***
Commercial	***5,510***	***18,100***
Education	11,800	23,700
Industrial	***18,700***	***253,000***
Multi-Family Residential	11,800	23,700
Single Family Residential	***15,600***	***31,000***
Transportation	1,680	456
Vacant	484	806

[1] SBPAT's Monte Carlo analysis is performed in log space and distributions are assumed to be log-normal, but arithmetic estimates of the log statistics are shown here.

[2] Bold, italicized values are based on site-specific data provided by the Participating Agencies. Los Angeles region values for these land use types are as follows: Agriculture – 60,300 MPN/100 mL; Commercial – 51,600 MPN/100 mL; Industrial – 3,760 MPN/100 mL; Single Family Residential – 31,100 MPN/100 mL

3 BMP EFFLUENT CONCENTRATIONS

BMP effluent concentrations were used to estimate load reductions for each BMP. BMP effluent concentrations from the SBPAT User's manual (Geosyntec, 2012) were updated with the new BMP performance data from the International Stormwater BMP Database (downloaded 2012), to ensure that water quality modeling efforts utilize the most current BMP performance summary statistics.

The SBPAT BMP effluent concentrations used this analysis are provided in Table 3.

Table 3. LSCR IP BMP Effluent Concentrations for Fecal Coliform: Arithmetic Estimates of the Log Mean and Log Standard Deviation[1]

BMP type	*Fecal Coliform Arithmetic Mean (#/100 mL)2*	*Fecal Coliform Arithmetic Standard Deviation (#/100 mL)2*
Bioswale	8.00E+04	1.19E+06
Cistern	Volume reduction only	Volume reduction only
Bioretention	5.89E+03	1.27E+04
Porous Pavement	Volume reduction only	Volume reduction only
Green Roof	Volume reduction only	Volume reduction only
Media filter	5.89E+03	1.27E+04
Distributed hydrodynamic Separator	2.68E+04	2.16E+05
SSF Wetland	% Removal = 90%	
Constructed Wetland/Wetpond (without extended detention)	9.89E+03	3.08E+04
Dry Extended Detention Basin	1.41E+04	4.15E+04
Hydrodynamic separator	2.68E+04	2.16E+05
Infiltration basin	**Volume reduction only**	**Volume reduction only**
Construction Wetland/Wetpond (with extended detention)	1.01E+04	3.23E+04

[1] SBPAT's Monte Carlo analysis is performed in log space and distributions are assumed to be log-normal, but arithmetic estimates of the log statistics are shown here.

[2] Bold values are most frequently used BMP types for the LSCR IP.

4 IMPERVIOUSNESS AND EMC GROUPING

For the purposes of assigning EMCs to the numerous land uses, the land uses were grouped based on their description, as well as on the load anticipated to stem from them based on their imperviousness. Imperviousness percentages for each land use and their EMC groups (Geosyntec, 2012) are summarized in Table 4.

Table 4. LSCR Land Use Imperviousness and EMC LU Grouping

LU Code	Detailed Land Use	Impervious Estimate (%)	EMC LU Group
1000	Agricultural - Urban Reserve	2%	Agriculture
1001	Agriculture	2%	Agriculture
1002	AIRPORT COMPATIBLE	91%	Transportation
1003	Airports	91%	Transportation
1004	Base (Built-up Area)	65%	Commercial
1005	Beach Parks	10%	Education
1006	Bus Terminals and Yards	91%	Transportation
1007	Business Park	10%	Commercial
1008	BUSINESS RESEARCH PARK	10%	Commercial
1009	Cemeteries	10%	Education
1010	Central Business District	91%	Commercial
1011	CENTRAL INDUSTRIAL AREA	91%	Industrial
1012	Colleges and Universities	47%	Education
1013	COMMERCIAL GENERAL	91%	Commercial
1014	Commercial Highway	80%	Commercial
1015	Commercial Neighborhood	91%	Commercial
1016	Commercial Office	91%	Commercial
1017	Commercial Recreation	90%	Commercial
1018	Commercial Storage	90%	Commercial
1019	COMMERCIAL COMMUNITY	91%	Commercial
1020	COMMERCIAL CONVENIENCE	91%	Commercial
1021	COMMERCIAL REGIONAL	91%	Commercial
1022	Communication Facilities	82%	Industrial
1023	Developed Local Parks and Recreation	10%	Education
1024	Developed Regional Parks and Recreation	2%	Education
1025	Duplexes Triplexes and multi unit condo	55%	MF Residential
1026	EASEMENT	91%	Transportation
1027	Electrical Power Facilities	47%	Industrial
1028	Elementary Schools	82%	Education
1029	Existing Community	80%	Industrial
1030	Existing Community - Urban Reserve	91%	Transportation
1031	Fire Stations	91%	Commercial
1032	Freeways and Major Roads	91%	Transportation
1033	Golf Courses	3%	Vacant
1034	Government Offices	91%	Commercial
1035	HARBOR CHANNEL ISLANDS	91%	Transportation
1036	Harbor Facilities	91%	Transportation
1037	High-Density Single Family Residential	42%	SF Residential
1038	High-Rise Apartments and Condominiums	90%	MF Residential
1039	Horse Ranches	42%	Agriculture
1040	Hotels and Motels	96%	MF Residential
1041	HUENEME	74%	MF Residential
1042	Improved Flood Waterways and Structures	100%	Water

LU Code	Detailed Land Use	Impervious Estimate (%)	EMC LU Group
1043	INDUSTRIAL HEAVY	90%	Industrial
1044	INDUSTRIAL LIGHT	80%	Industrial
1045	INDUSTRIAL LIMITED	60%	Industrial
1046	INDUSTRY PRIORITY TO COASTAL DEPENDENT	91%	Industrial
1047	Irrigated Cropland and Improved Pasture Land	2%	Agriculture
1048	Junior or Intermediate High Schools	82%	Education
1049	Liquid Waste Disposal Facilities	96%	Industrial
1050	Low- and Medium-Rise Major Office Use	91%	Commercial
1051	Low-Density Single Family Residential	21%	SF Residential
1052	Low-Rise Apartments Condominiums and Townhouses	86%	MF Residential
1053	Maintenance Yards	91%	Industrial
1054	Major Medical Health Care Facilities	74%	Commercial
1055	Manufacturing Assembly and Industrial Services	91%	Industrial
1056	Manufacturing - Industrial	91%	Industrial
1057	Marina Water Facilities	100%	Commercial
1058	Medium-Rise Apartments and Condominiums	86%	MF Residential
1059	Mineral Extraction - Oil and Gas	10%	Industrial
1060	Mineral Extraction - Other Than Oil and Gas	10%	Industrial
1061	Mixed Commercial and Industrial	91%	Industrial
1062	Mixed Multi-Family Residential	74%	MF Residential
1063	Mixed Residential	59%	MF Residential
1064	Mixed Transportation	90%	Transportation
1065	Mixed Urban	89%	Commercial
1066	MOBILE HOME PARK	74%	MF Residential
1067	Modern Strip Development	96%	Commercial
1068	Natural Gas and Petroleum Facilities	91%	Industrial
1069	Non-Attended Public Parking Facilities	91%	Commercial
1070	Non-Irrigated Cropland and Improved Pasture Land	2%	Agriculture
1071	North Fillmore Specific Plan	40%	Industrial
1072	Nurseries	15%	Agriculture
1073	Older Strip Development	97%	Commercial
1074	Open Space	1%	Vacant
1075	Open Space - Urban Reserve	1%	Vacant
1076	Open Storage	66%	Industrial
1077	Orchards and Vineyards	2%	Agriculture
1078	Other Agriculture	42%	Agriculture
1079	Other Open Space and Recreation	10%	Education
1080	Other Public Facilities	91%	Commercial
1081	Other Special Use Facilities	86%	Commercial
1082	Packing Houses and Grain Elevators	96%	Industrial
1083	PARK	10%	Education
1084	Petroleum Refining and Processing	91%	Industrial
1085	PLANNED UNIT DEVELOPMENT RESIDENTIAL	42%	SF Residential

LU Code	Detailed Land Use	Impervious Estimate (%)	EMC LU Group
1086	PLANNING RESERVE	1%	Vacant
1087	Police and Sheriff Stations	91%	Commercial
1088	Pre-Schools - Day Care Centers	68%	Education
1089	Public Facilities	40%	Commercial
1090	PUBLIC SEMI PUBLIC	40%	Commercial
1091	PUBLIC UTILITY ENERGY FACILITY	91%	Industrial
1092	Railroads	15%	Transportation
1093	RECREATION AREA	10%	Education
1094	Regional Shopping Center	95%	Commercial
1095	Religious Facilities	82%	Education
1096	RESDIENTIAL HIGH DENSITY	74%	MF Residential
1097	Research and Development	91%	Industrial
1098	Residential - High	74%	MF Residential
1099	Residential - Low	21%	SF Residential
1100	Residential - Low Medium	42%	SF Residential
1101	Residential - Medium	42%	SF Residential
1102	Residential - Medium High	74%	MF Residential
1103	Residential - Rural	12%	SF Residential
1104	RESIDENTIAL EXISTING	42%	SF Residential
1105	RESOURCE PROTECTION	1%	Vacant
1106	Retail Centers (Non-strip)	96%	Commercial
1107	Rural	12%	SF Residential
1108	Rural - Urban Reserve	12%	SF Residential
1109	Rural 5 Acre Minimum	12%	SF Residential
1110	Rural Residential Low-Density	10%	SF Residential
1111	SCHOOL	82%	Education
1112	Senior High Schools	82%	Education
1113	Southeast Specific Plan (HVP)	1%	Vacant
1114	Special Care Facilities	74%	Commercial
1115	State or Federal Facility	91%	Commercial
1116	Trailer Parks and Mobile Home Courts High-Density	91%	MF Residential
1117	Truck Terminals	91%	Transportation
1118	Under Construction	91%	Commercial
1119	Urban	91%	Transportation
1120	Vacant Undifferentiated	1%	Vacant
1121	Vacant With Limited Improvements	42%	Vacant
1122	Ventura Harbor	91%	Transportation
1123	VISITOR SERVING COMMERCIAL	91%	Commercial
1124	Water Storage Facilities	91%	Industrial
1125	Water Transfer Facilities	96%	Vacant
1126	Water Undifferentiated	100%	Water
1127	Wholesaling and Warehousing	91%	Industrial
1130	Vac Ind	5%	Industrial

LU Code	Detailed Land Use	Impervious Estimate (%)	EMC LU Group
1131	Rural Residential High Density	20%	SF Residential
1132	Chemical Processing	91%	Industrial
1133	High-Rise Major Office Use	91%	Commercial
1134	SFR	42%	SF Residential
1135	Com	80%	Commercial
1136	MFR	74%	MF Residential

5 RAINFALL DATA

The critical water year for this analysis was determined to be the 1995 WY (October 1, 1994 through September 30, 1995). This year was selected by investigating the total number of wet days, defined as days with at least 0.1 inches of precipitation and the following three days, at the Santa Paula Canyon – Ferndale Ranch rainfall station (173A) from 1977 to 2014. This station was selected based on its available Period of Record (POR), its geographic and orographic representativeness of the LSCR Watershed overall, as well as because it was a rain gage that was referenced in the Bacteria TMDL. Table 5 shows annual rainfall totals and total number of wet days during each water year at the Santa Paula Canyon – Ferndale Ranch station (shown in Figure 1). The source of this rainfall data is the Ventura County Watershed Protection District (VCWPD) Hydrologic Data Server.

This dataset was used to determine the 90th percentile WY over the POR. The 1995 WY is slightly more conservative (i.e., there are more wet days) than the 90th percentile year. However, 1995 was selected as the critical year for consistency with the Staff Report (LARWQCB, 2010). The 1995 WY hourly rainfall dataset (VCWPD) was also used for modeling BMPs in this analysis.

Table 5. Annual Rainfall Total and Number of Wet Days by Water Year at the Santa Paula Canyon – Ferndale Ranch Station

Water Year	Number of Wet Days[1]	Rainfall Total (in)
2014	29	9.7
1977	42	13.1
1981	42	13.6
1990	44	11.2
1991	44	19.1
2007	44	7.1
1987	45	8.8
2004	49	15.1
1984	50	12.4
2002	51	7.6
2008	51	23.6
1997	52	23.9
2012	54	12.6
1989	58	11.2
2000	59	18.4
2003	61	23.0
2009	62	14.6
1985	64	12.3
1988	64	19.8
2013	67	8.3
1999	69	12.7
2001	69	28.5
1996	71	18.1
1994	73	13.7
1980	74	30.5
1986	75	28.3
1979	76	24.9
2010	76	27.1
1992	77	31.2
2006	79	25.6
1993	80	39.1
1982	83	22.4
2005	85	61.0
1978	89	49.3
2011	92	31.8
1995	93	45.1
1983	111	49.7
1998	122	53.3

[1] Defined as days with at least 0.1 inches of precipitation and the following three days

The IP area was divided into polygons covered by three rainfall stations, listed in Table 6 and shown in Figure 1. The baseline FC load was estimated for the IP area located in each of the three rainfall station regions using rainfall data from the corresponding rain gages and then summed for an approximate baseline load for the entire IP area. Station 173A, which was used to determine the water year to be modeled, was not included since it was not as representative of the MS4 areas as the three stations that were used. In order to reduce SBPAT runs, the rainfall station that most closely predicted the total baseline load was used for the remainder of the analysis. Station ID 245A was selected, and a correction factor was applied to the baseline load estimates to reflect variation in rainfall data from the three rainfall stations.

Table 6. Rainfall Stations

Site ID	*Station Name*	*Hourly Rainfall Data*	*Elevation (ft)*
171	Fillmore – Fish Hatchery	1956 - 2013	465
175	Saticoy Fire Station	1956 - 2008	185
245A	Santa Paula - UWCD	1986 - 2010	300

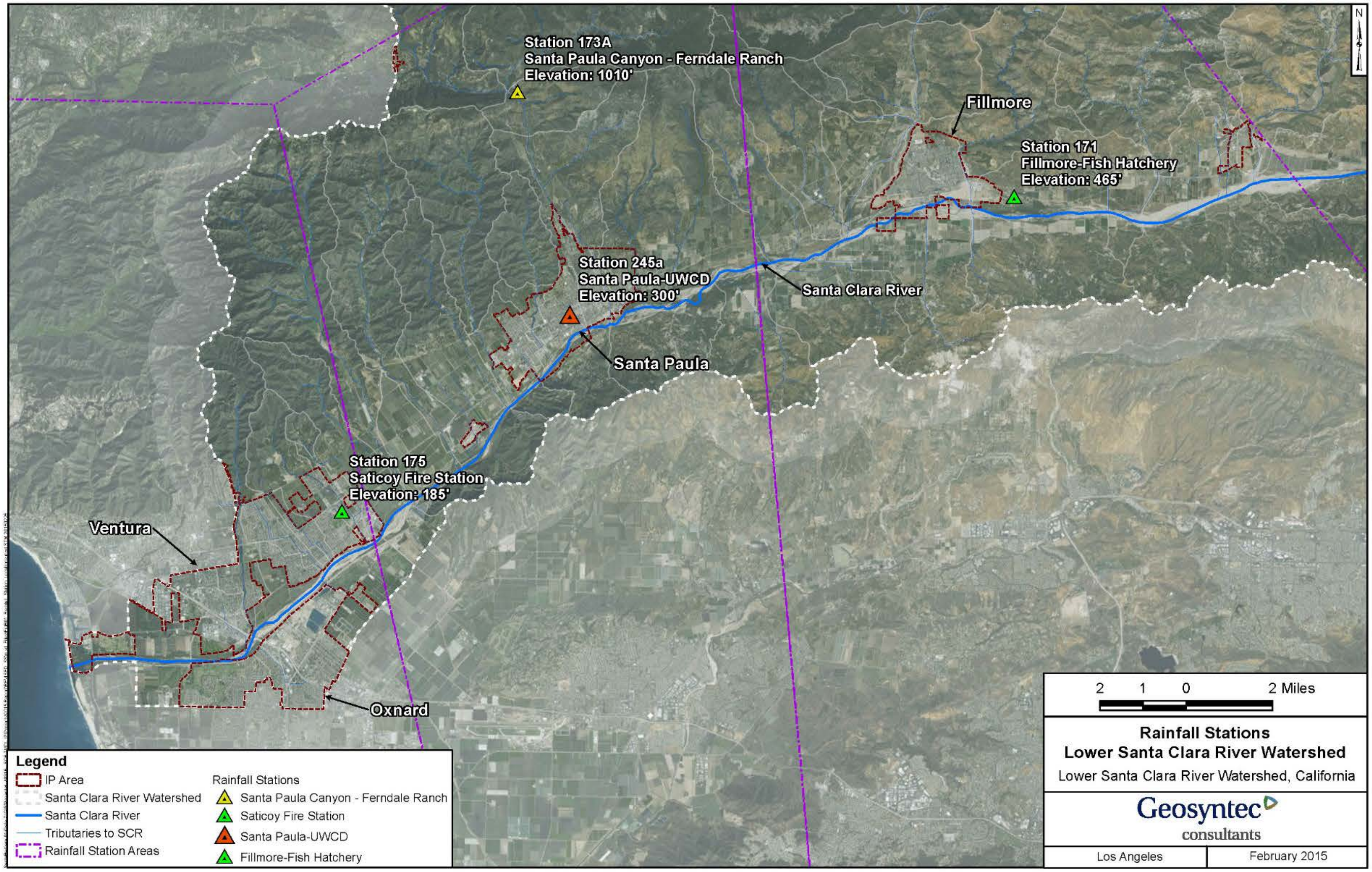

Figure 1. Rainfall Stations

The rainfall dataset from the 245A rainfall gage during the 1995 WY is used with average monthly evapotranspiration values, catchment imperviousness, and soil properties to estimate runoff volumes, which is used with BMP information to estimate the runoff volume captured by BMPs. Daily rainfall totals from Station 245A during the 1995 WY are shown in Table 7.

Table 7. Daily Rainfall Data at Station 245A (1995 WY)

Date	Sum of Rainfall (in)
10/1/1994	0
10/2/1994	0
10/3/1994	0
10/4/1994	0.383
10/5/1994	0.466
10/6/1994	0
10/7/1994	0
10/8/1994	0
10/9/1994	0
10/10/1994	0
10/11/1994	0
10/12/1994	0
10/13/1994	0
10/14/1994	0
10/15/1994	0
10/16/1994	0
10/17/1994	0
10/18/1994	0
10/19/1994	0
10/20/1994	0
10/21/1994	0
10/22/1994	0
10/23/1994	0
10/24/1994	0
10/25/1994	0
10/26/1994	0
10/27/1994	0
10/28/1994	0
10/29/1994	0
10/30/1994	0
10/31/1994	0
11/1/1994	0
11/2/1994	0
11/3/1994	0
11/4/1994	0
11/5/1994	0
11/6/1994	0
11/7/1994	0.113
11/8/1994	0.187
11/9/1994	0
11/10/1994	0.48
11/11/1994	0.06
11/12/1994	0

Date	Sum of Rainfall (in)
11/13/1994	0
11/14/1994	0
11/15/1994	0
11/16/1994	0
11/17/1994	0
11/18/1994	0
11/19/1994	0
11/20/1994	0
11/21/1994	0
11/22/1994	0
11/23/1994	0
11/24/1994	0
11/25/1994	0
11/26/1994	0.16
11/27/1994	0
11/28/1994	0
11/29/1994	0
11/30/1994	0
12/1/1994	0
12/2/1994	0
12/3/1994	0
12/4/1994	0
12/5/1994	0
12/6/1994	0
12/7/1994	0
12/8/1994	0
12/9/1994	0
12/10/1994	0
12/11/1994	0
12/12/1994	0.23
12/13/1994	0
12/14/1994	0
12/15/1994	0
12/16/1994	0
12/17/1994	0
12/18/1994	0
12/19/1994	0
12/20/1994	0
12/21/1994	0
12/22/1994	0
12/23/1994	0
12/24/1994	0.841
12/25/1994	0.109

Date	Sum of Rainfall (in)
12/26/1994	0
12/27/1994	0
12/28/1994	0
12/29/1994	0
12/30/1994	0
12/31/1994	0
1/1/1995	0
1/2/1995	0
1/3/1995	0.848
1/4/1995	3.331
1/5/1995	0
1/6/1995	0
1/7/1995	0.608
1/8/1995	0.834
1/9/1995	0.623
1/10/1995	7.353
1/11/1995	0.111
1/12/1995	0.7
1/13/1995	0
1/14/1995	0.39
1/15/1995	0
1/16/1995	0
1/17/1995	0
1/18/1995	0
1/19/1995	0
1/20/1995	0.3
1/21/1995	0
1/22/1995	0
1/23/1995	0.839
1/24/1995	2.813
1/25/1995	0.852
1/26/1995	0
1/27/1995	0
1/28/1995	0
1/29/1995	0
1/30/1995	0
1/31/1995	0
2/1/1995	0
2/2/1995	0
2/3/1995	0
2/4/1995	0
2/5/1995	0
2/6/1995	0

Date	Sum of Rainfall (in)
2/7/1995	0
2/8/1995	0.17
2/9/1995	0.08
2/10/1995	0
2/11/1995	0
2/12/1995	0
2/13/1995	0.379
2/14/1995	0.698
2/15/1995	0.01
2/16/1995	0
2/17/1995	0
2/18/1995	0
2/19/1995	0
2/20/1995	0
2/21/1995	0
2/22/1995	0
2/23/1995	0
2/24/1995	0
2/25/1995	0
2/26/1995	0
2/27/1995	0
2/28/1995	0
3/1/1995	0
3/2/1995	0.819
3/3/1995	0.179
3/4/1995	0.185
3/5/1995	1.676
3/6/1995	0
3/7/1995	0
3/8/1995	0
3/9/1995	0.069
3/10/1995	3.974
3/11/1995	0.575
3/12/1995	0
3/13/1995	0
3/14/1995	0
3/15/1995	0
3/16/1995	0
3/17/1995	0
3/18/1995	0
3/19/1995	0
3/20/1995	0
3/21/1995	0.649

Date	*Sum of Rainfall (in)*
3/22/1995	0.05
3/23/1995	0.78
3/24/1995	0
3/25/1995	0
3/26/1995	0
3/27/1995	0
3/28/1995	0
3/29/1995	0
3/30/1995	0
3/31/1995	0
4/1/1995	0
4/2/1995	0
4/3/1995	0
4/4/1995	0
4/5/1995	0
4/6/1995	0
4/7/1995	0
4/8/1995	0
4/9/1995	0
4/10/1995	0
4/11/1995	0
4/12/1995	0
4/13/1995	0
4/14/1995	0
4/15/1995	0
4/16/1995	0.459
4/17/1995	0
4/18/1995	0
4/19/1995	0
4/20/1995	0
4/21/1995	0
4/22/1995	0
4/23/1995	0
4/24/1995	0
4/25/1995	0
4/26/1995	0
4/27/1995	0
4/28/1995	0
4/29/1995	0
4/30/1995	0
5/1/1995	0
5/2/1995	0
5/3/1995	0

Date	Sum of Rainfall (in)
5/4/1995	0
5/5/1995	0
5/6/1995	0
5/7/1995	0
5/8/1995	0
5/9/1995	0
5/10/1995	0
5/11/1995	0
5/12/1995	0
5/13/1995	0
5/14/1995	0
5/15/1995	1.041
5/16/1995	0
5/17/1995	0
5/18/1995	0
5/19/1995	0
5/20/1995	0
5/21/1995	0
5/22/1995	0
5/23/1995	0
5/24/1995	0
5/25/1995	0
5/26/1995	0
5/27/1995	0
5/28/1995	0
5/29/1995	0
5/30/1995	0
5/31/1995	0
6/1/1995	0
6/2/1995	0
6/3/1995	0
6/4/1995	0
6/5/1995	0
6/6/1995	0
6/7/1995	0
6/8/1995	0
6/9/1995	0
6/10/1995	0
6/11/1995	0
6/12/1995	0
6/13/1995	0
6/14/1995	0
6/15/1995	0

Date	Sum of Rainfall (in)
6/16/1995	0.35
6/17/1995	0
6/18/1995	0
6/19/1995	0
6/20/1995	0
6/21/1995	0
6/22/1995	0
6/23/1995	0
6/24/1995	0
6/25/1995	0
6/26/1995	0
6/27/1995	0
6/28/1995	0
6/29/1995	0
6/30/1995	0
7/1/1995	0
7/2/1995	0
7/3/1995	0
7/4/1995	0
7/5/1995	0
7/6/1995	0
7/7/1995	0
7/8/1995	0
7/9/1995	0
7/10/1995	0
7/11/1995	0
7/12/1995	0
7/13/1995	0
7/14/1995	0
7/15/1995	0
7/16/1995	0
7/17/1995	0.02
7/18/1995	0
7/19/1995	0
7/20/1995	0
7/21/1995	0
7/22/1995	0
7/23/1995	0
7/24/1995	0
7/25/1995	0
7/26/1995	0
7/27/1995	0
7/28/1995	0

Date	Sum of Rainfall (in)
7/29/1995	0
7/30/1995	0
7/31/1995	0
8/1/1995	0
8/2/1995	0
8/3/1995	0
8/4/1995	0
8/5/1995	0
8/6/1995	0
8/7/1995	0
8/8/1995	0
8/9/1995	0
8/10/1995	0
8/11/1995	0
8/12/1995	0
8/13/1995	0
8/14/1995	0
8/15/1995	0
8/16/1995	0
8/17/1995	0
8/18/1995	0
8/19/1995	0
8/20/1995	0
8/21/1995	0
8/22/1995	0
8/23/1995	0
8/24/1995	0
8/25/1995	0
8/26/1995	0
8/27/1995	0
8/28/1995	0
8/29/1995	0
8/30/1995	0
8/31/1995	0
9/1/1995	0
9/2/1995	0
9/3/1995	0
9/4/1995	0
9/5/1995	0
9/6/1995	0
9/7/1995	0
9/8/1995	0
9/9/1995	0

Date	Sum of Rainfall (in)
9/10/1995	0
9/11/1995	0
9/12/1995	0
9/13/1995	0
9/14/1995	0
9/15/1995	0
9/16/1995	0
9/17/1995	0
9/18/1995	0
9/19/1995	0
9/20/1995	0
9/21/1995	0
9/22/1995	0
9/23/1995	0
9/24/1995	0
9/25/1995	0
9/26/1995	0
9/27/1995	0
9/28/1995	0
9/29/1995	0
9/30/1995	0
10/1/1995	0
Total	***34.79***

The 85th percentile rainfall depth grid developed for Ventura County (2011) by Geosyntec Consultants and Larry Walker Associates, as part of the Ventura County Technical Guidance Manual for Stormwater Quality Control Measures, was used in this analysis for sizing planned BMPs. The area weighted average 85th percentile rainfall depth for the IP Area was determined to be approximately 1.4 inches.

6 SOIL PARAMETERS

Soil Survey Geographic database (SSURGO) spatial soils data was provided by the County of Ventura. The soil dataset contained area polygons specifying percentages of each of the Hydrologic Soil Groups (A-D). Soil parameters were determined for each of the soil groups, and the specified parameters were then area weighted based on the percentage of each soil group in the particular area.

Table 8 provides the Green-Ampt soil parameters attributed to each Soil Number, and corresponding Hydrologic Soil Group, for this analysis. Saturated hydraulic conductivity, soil suction head and initial moisture deficit were taken from the SBPAT User's Manual (Geosyntec, 2012). The default values of saturated hydraulic conductivity were adjusted in order to match predicted SBPAT volumes. Stream flow data was analyzed to calculate the base flow using the USGS 11113500 Santa Paula Creek Near Santa Paula gage. Runoff from the model was then compared to the measured base flow to determine an appropriate K_{sat} adjustment factor of 0.25.

Table 8. Soil Parameter Assumptions.

Hydrologic Soil Group	*Adjusted Saturated Hydraulic Conductivity (in/hr)*	*Soil Suction Head (in)*	*Initial Moisture Deficit (in)*
A	0.25	2.9	0.32
A	0.25	2.9	0.32
B	0.125	5.04	0.36
B	0.125	5.04	0.36
C	0.0375	8.6	0.24
C	0.0375	8.6	0.24
D	0.0125	10.47	0.29

REFERENCES

Beach Cities Watershed Management Group (WMG), 2014. Enhanced Watershed Management Program (EWMP) Work Plan for the Beach Cities Watershed Management Group. June.

Geosyntec Consultants, 2012. A User's Guide for the Structural BMP Prioritization and Analysis Tool (SBPAT v1.0): Technical Appendices. November.

Los Angeles Regional Water Quality Control Board (Regional Board), 2010. Santa Clara River Estuary and Reaches 3, 5, 6, and 7 Total Maximum Daily Loads for Indicator Bacteria. July 8, 2010.

Ventura County, Ventura County Technical Guidance Manual for Stormwater Quality Control Measures. 2011. Prepared by Geosyntec Consultants and Larry Walker Associates, July.

Appendix C
IGP Sites & Modeled Existing/Planned BMPs

1 IGP Locations

Industrial General Permit (IGP) locations modeled using SBPAT are shown in Table 1 and Figure 1.

Table 1. Industrial General Permit Locations

Jurisdiction	*Name*	*Area (acres)*
City of Ventura	Barnett Tool & Engineering	1.9
City of Ventura	BCI Coca Cola Co.	3.0
City of Ventura	C&R Molds	0.46
City of Ventura	City of Ventura	12
City of Ventura	Edwards Label	2.4
City of Ventura	FedEX	11
City of Ventura	General Magnaplate	1.6
City of Ventura	Gold Coast Recycling	3.0
City of Ventura	GW Surfaces	1.3
City of Ventura	JH Biotech	1.2
City of Ventura	Rolling Frito Lay	2.5
City of Ventura	Saticoy Lemon Association	6.9
City of Ventura	United Parcel Service	2.1
City of Ventura	Valex	4.1
City of Ventura	YRC Inc	4.7
County of Ventura	734 Mission Rock Road	1.2
County of Ventura	Acme Auto Wreckers	1.6
County of Ventura	Angelus Block Co	17
County of Ventura	Anterra Energy Services	2.0
County of Ventura	E J Harrison & Sons Maint Yard	2.7
County of Ventura	Fillmore Piru Citrus Assoc	12
County of Ventura	Granite Construction Ventura Plant	20
County of Ventura	Grimes Rock Inc.[1]	-
County of Ventura	Luna Trans Inc	1.0
County of Ventura	Maintenance and Transportation - Rio School District	0.43
County of Ventura	Pegasus Transit Inc.	0.83
County of Ventura	Pick the Part	7.9
County of Ventura	Pick the Part, Inc.	4.0
County of Ventura	Santa Clara Waste Water	7.8
County of Ventura	Southern Counties Oil Co LP	3.0
County of Ventura	State Ready Mix[1]	-
County of Ventura	Toland Road Landfill[1]	-
County of Ventura	Tri Cnty Auto Dismantlers	7.9
County of Ventura	Tri County Truck Co	4.1
County of Ventura	United Chemical Corp	3.5
County of Ventura	Ventura Truck Only Dismantlers	7.4
County of Ventura	Vintage Shiells Canyon[1]	-
County of Ventura	Vintage South Mountain[1]	-
County of Ventura	Vulcan Materials Co.[1]	-
County of Ventura	Western Oil Spreading Services	2.0
County of Ventura	Wiggins Lift Co	0.86
Santa Paula	Petroleum Construction Inc	3.4

Jurisdiction	*Name*	*Area (acres)*
Santa Paula	Saticoy Lemon Plant No 3	2.8
Santa Paula	Ward Corp	1.5

[1] BMPs not modeled, located outside of MS4 area (within SCR watershed)

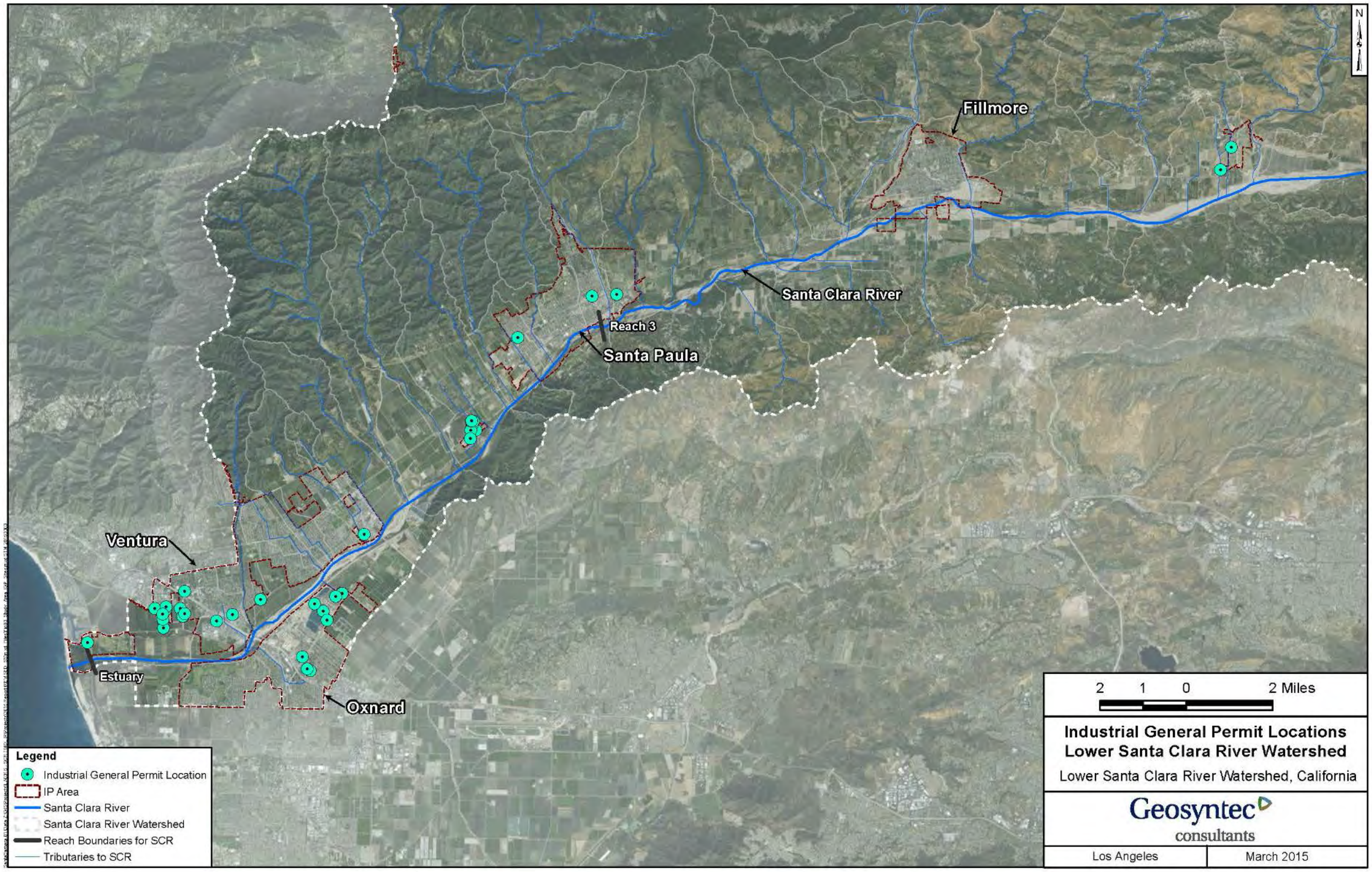

Figure 1. LSCR IGP Locations.

2 EXISTING/PLANNED BMPS

Existing/planned BMPs modeled using SBPAT are shown in Table 2 and Figure 2.

Table 2. LSCR Existing/Planned BMPs

Jurisdiction	BMP ID or Location	BMP Type for Modeling	Drainage Area (ac)	Drainage Area Land Uses
City of Ventura	458 N Hayworth APT LLC	Bioswale	1.3	Vacant
City of Ventura	458 N Hayworth APT LLC	Bioswale	1.3	Vacant
City of Ventura	Adams Gordon C-Tracy TR	Grassy/Vegetated Swale	0.99	Commercial
City of Ventura	Archstone Vanoni	Media Filter	19	MF Residential
City of Ventura	Bill Kendall Las Palmas Industrial	Bioswale	1.1	Industrial
City of Ventura	Billups-Dobbins Development	Grassy/Vegetated Swale	2.0	Industrial
City of Ventura	Boppell-Wintringham Properties Attn. Al Wintringham	Bioswale	2.2	Commercial
City of Ventura	Byrd James H-Laura F	Grassy/Vegetated Swale	0.52	Industrial
City of Ventura	Cabrollo Economic Development Corp	Media Filter	3.4	Vacant
City of Ventura	Cappelen John R-Susan J	Grassy/Vegetated Swale	0.74	Industrial
City of Ventura	CH Ventura Baptist	None	4.2	Education
City of Ventura	Chick-Fil-A	Bioswale	0.80	Commercial
City of Ventura	Citrus North Ventures LLC	Grassy/Vegetated Swale	1.7	Vacant
City of Ventura	Continental Ventura LLC	Bioswale	0.90	Industrial
City of Ventura	County Center LTD	None	3.5	Vacant
City of Ventura	Cromer Michael I-Jody D	Bioswale	0.90	SF Residential
City of Ventura	Crown and Crown	Grassy/Vegetated Swale	10.9	Commercial
City of Ventura	David Staples	Bioswale	0.51	Industrial
City of Ventura	DJL Investments LLC	Grassy/Vegetated Swale	0.78	Industrial
City of Ventura	Eddie Atoian	Grassy/Vegetated Swale	2.4	Vacant
City of Ventura	Ekam Inc.	Bioswale	0.64	MF Residential
City of Ventura	Gospel Light Pub Inc	Grassy/Vegetated Swale	1.5	Industrial
City of Ventura	Gregory Robert C-Nancy C TR	Grassy/Vegetated Swale	2.4	Industrial
City of Ventura	Hamilton John FAM LP ET AL	Bioswale	1.8	Commercial
City of Ventura	Harrison Brothers ENT LLC	Media Filter	8.0	Industrial
City of Ventura	Ivy Lawn Cemetery Assn	Bioswale	0.98	Education
City of Ventura	JTR Properties INC	Grassy/Vegetated Swale	1.1	Vacant
City of Ventura	Karl Harer	Bioswale	1.5	Industrial
City of Ventura	Kort Shirlee ET AL	Bioswale	2.2	Industrial
City of Ventura	Lake Sessa Sessa Michael J-Jonette W TR	Bioswale	0.78	Industrial
City of Ventura	Loan Oak-Ventura LLC	Bioswale	12	Agriculture
City of Ventura	MAD 10B	Media Filter	24	Commercial
City of Ventura	MAD 14	Media Filter	10	SF Residential
City of Ventura	MAD 15	Dry Extended Detention Basin	29	Vacant
City of Ventura	MAD 16	Dry Extended Detention Basin	7.0	SF Residential
City of Ventura	MAD 17	Media Filter	40	SF Residential

Jurisdiction	*BMP ID or Location*	*BMP Type for Modeling*	*Drainage Area (ac)*	*Drainage Area Land Uses*
City of Ventura	MAD 18	Dry Extended Detention Basin	23	Agriculture
City of Ventura	MAD 6	Grassy/Vegetated Swale	37	Vacant
City of Ventura	MBL Olivas LLC	Grassy/Vegetated Swale	6.5	Industrial
City of Ventura	Mendez Edmundo	Bioswale	1.1	Industrial
City of Ventura	Montalvo Shopping Center	Media Filter	25	Commercial
City of Ventura	NNN CA Auto SVC LLC	Bioswale	1.1	Commercial
City of Ventura	Petite Enterprises LLC	Grassy/Vegetated Swale	0.61	Commercial
City of Ventura	Rebel Penguin LLC	Grassy/Vegetated Swale	0.57	SF Residential
City of Ventura	Sandefer James P-Dori A TR	Dry Extended Detention Basin	1.7	Transportation
City of Ventura	Southern California Edison	Bioswale	13	SF Residential
City of Ventura	Van Dallin Prop LTD Part	Grassy/Vegetated Swale	0.73	Industrial
City of Ventura	Ventura Assisted Living	Grassy/Vegetated Swale	3.0	MF Residential
City of Ventura	Ventura Heritage Corp.	Media Filters	3.8	Vacant
City of Ventura	Ventura Retirement Res Partnership[1]	None (filter fabric inserts)	3.5	MF Residential
City of Ventura	MAD 11[1]	None (filter inserts)	-	-
City of Ventura	MAD 12[1]	None (inlet screens)	-	-
City of Ventura	Halle Properties LLC[2]	Bioswale	-	-
City of Ventura	F Squared Development LLC[2]	Bioswale	-	-
City of Ventura	Robin Oil LLC[2]	Bioswale	-	-
City of Ventura	Express Lube[2]	Bioswale	-	-
City of Ventura	County Square L P[1,2]	None (filter fabrics)	-	-
City of Ventura	Good As Gold LLC[2]	Grassy/Vegetated Swale	-	-
City of Ventura	Ventura Assisted Living LP[1]	None (filter fabric inserts)	-	-
City of Ventura	Ventura Gateway LLC[1,2]	None (filter fabrics)	-	-
County of Ventura	El Rio[5]	Infiltration trench	64	SF Residential
County of Ventura	FS 20	Bioretention	0.46	SF Residential
County of Ventura	FS 27	Bioretention	0.71	SF Residential
County of Ventura	FS-28 Retrofit	Bioretention	0.41	Commercial
County of Ventura	GSA Riverbank Drive	Infiltration Basin	24	Industrial
County of Ventura	GSA Vineyard Ave	Infiltration basin	38	Commercial
County of Ventura	Infiltration Trench (1)	Infiltration Basin	3.6	Industrial
County of Ventura	Infiltration Trench (2)	Infiltration Basin	2.2	Industrial
County of Ventura	Infiltration Trench (3)	Infiltration basin	2.2	Industrial
County of Ventura	Pervious Asphalt	Porous Pavement	2.0	SF Residential
County of Ventura	Piru Skate Park	Infiltration Basin	4.2	SF Residential
County of Ventura	FS-26 Retrofit[1,3]	None (filter inserts)	-	-
Fillmore	5th St, 1000-1100, NS	Porous Pavement	0.15	SF Residential
Fillmore	5th St, 1000-1100, SS	Porous Pavement	0.13	SF Residential
Fillmore	Blue Jay Basin	Infiltration Basin	1.5	SF Residential
Fillmore	Cabrillo/Railroad Promade	Grassy/Vegetated Swale	1.7	Transportation

Jurisdiction	BMP ID or Location	BMP Type for Modeling	Drainage Area (ac)	Drainage Area Land Uses
Fillmore	E Street Parkway, East Side	Grassy/Vegetated Swale	18	Commercial
Fillmore	E Street Parkway, West Side	Grassy/Vegetated Swale	5.0	Commercial
Fillmore	Goodenough Road, 700-750, ES	Porous Pavement	0.05	SF Residential
Fillmore	Goodenough Road, 700-750, WS	Porous Pavement	0.11	SF Residential
Fillmore	Goodenough Road, 750-799, ES	Porous Pavement	0.03	SF Residential
Fillmore	Goodenough Road, 750-799, WS	Porous Pavement	0.05	SF Residential
Fillmore	Goodenough Road, 800-829, WS	Porous Pavement	0.79	SF Residential
Fillmore	Goodenough Road, 800-899, ES	Porous Pavement	2.5	SF Residential
Fillmore	Goodenough Road, 800-899, WS	Porous Pavement	1.1	SF Residential
Fillmore	Goodenough Road, 830-899, WS	Porous Pavement	0.37	SF Residential
Fillmore	Goodenough Road, 840-849, NS	Porous Pavement	0.60	SF Residential
Fillmore	Oriole Basin	Infiltration Basin	1.9	SF Residential
Fillmore	Public Works Yard	Bioretention	1.8	Industrial
Fillmore	River St Parkway	Grassy/Vegetated Swale	24	Commercial
Fillmore	Two Rivers Park / WWTP[4]	Dry Extended Detention Basin		
Oxnard	Former Target/ Food 4 Less	Infiltration Basin	7.0	Commercial
Oxnard	Infiltration trench	Infiltration Basin	2.2	Industrial
Oxnard	McDonalds	Infiltration Basin	0.62	SF Residential
Oxnard	Rivello Greenfield Project	Infiltration Basin	14	SF Residential
Oxnard	River Park	Dry Extended Detention Basin	581	Agriculture (60%), Industrial (21%), and Residential (19%)
		Media Filter	221	Residential (73%) and Commercial (27%)
		Grassy/Vegetated Swale	36	Residential (58%), Industrial (22%), and Commercial (20%)
Oxnard	Vallarta Market Redevelopment/Former Home Depot	Infiltration Basin	12	Commercial
Oxnard	Victoria and Gum Tree	Hydrodynamic separator	3.5	SF Residential
Oxnard	Victoria Estates (Harlyn Homes)	Media Filter	0.26	SF Residential
Oxnard	Wagon Wheel Redevelopment Project (Oxnard Village)	Infiltration Basin	62	Education
Santa Paula	14th Street	Infiltration Basin; bioswale	0.45	SF Residential
Santa Paula	Acacia	Infiltration basin	0.25	SF Residential

Jurisdiction	*BMP ID or Location*	*BMP Type for Modeling*	*Drainage Area (ac)*	*Drainage Area Land Uses*
Santa Paula	Airport	Infiltration Basin	6.7	Vacant (85%), Transportation (15%)
Santa Paula	ARP	Infiltration basin; Bioswale	2.0	Industrial
Santa Paula	Cabrillo	Infiltration Basin; Porous Pavement; Bioswale	3.6	MF Residential
Santa Paula	Calavo Street Industrial Park	Bioretention; Dry Extended Detention Basin	1.5	Commercial
Santa Paula	CalPipe 1	Infiltration basin	13	Agriculture
Santa Paula	CATS	Infiltration Basin	14	Industrial
Santa Paula	Cemetery Road	Cistern	22	Vacant
Santa Paula	Chase Bank	Bioretention; Infiltration basin	17	Commercial
Santa Paula	East Area 1	Infiltration Basin; detention basin	400	SFR (60%), Commercial (15%), and Vacant (25%)
		Land Use Change	400	Agriculture to SFR (60%), Commercial (15%), and Vacant (25%)
Santa Paula	Harding Park	Infiltration trench	1.2	Education
Santa Paula	Senior Housing	Infiltration Basin; Bioswale	0.45	SF Residential
Santa Paula	Senior Housing on Main Street	Infiltration Basin; Bioswale	1.3	Education
Santa Paula	Starbucks	Bioretention; Porous Pavement	17	Commercial
Santa Paula	Williams Housing	Dry Extended Detention Basin; Infiltration Basin	19	Vacant (50%), Agriculture (38%), and SF Residential (12%)

[1] BMPs not modeled, bacteria BMP performance data unavailable for filter fabric and filter inserts

[2] BMPs not modeled, located outside of SCR watershed

[3] BMPs not modeled, located outside of IP Area (within SCR watershed)

[4] BMPs not modeled, located in drainage area of a regional BMP

[5] Grant funded retrofit project, not a private development BMP

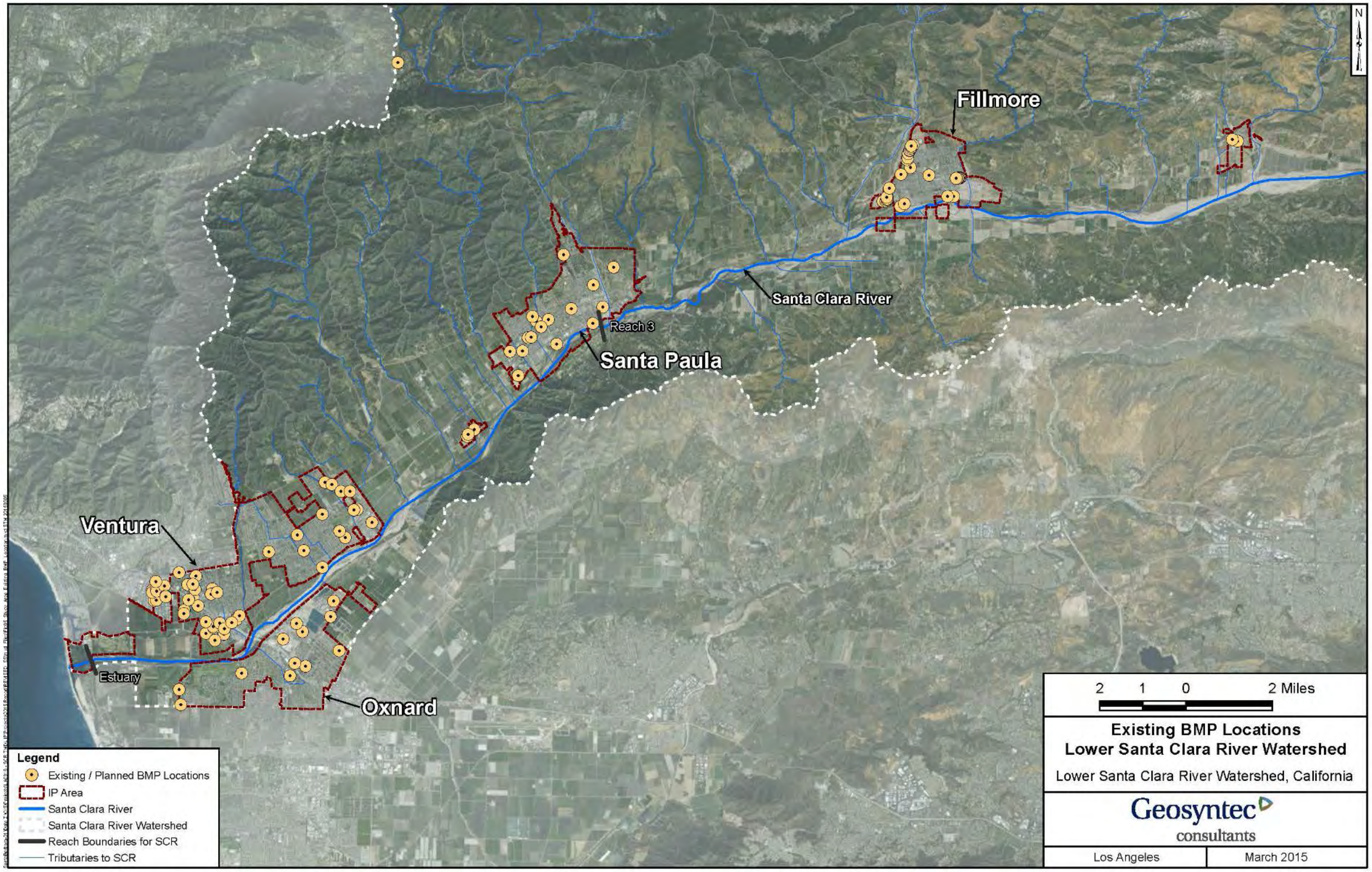

Figure 2. LSCR Existing and Planned BMPs

APPENDIX D
JURISDICTION-SPECIFIC ANALYSIS

1 INTRODUCTION

The IP includes target load reductions (TLRs) required for the Participating Agencies to meet TMDL requirements for the 90th percentile wet year, proposed suites of nonstructural and structural Best Management Practices BMPs to meet these TLRs at the receiving water Compliance Monitoring Locations (CML), the load reductions expected from these measures, and the implementation costs for the proposed structural controls. This memo presents results of these same analyses broken down by Participating Agency jurisdictions, and establishes the necessary green streets BMP area in order to meet the TLRs individually by jurisdiction. In addition, as requested by the Participating agencies, a cost-benefit comparison is provided for the proposed structural BMPs.

2 BASELINE LOADS AND TARGET LOAD REDUCTIONS

The baseline load was determined for each jurisdiction independently using the Structural BMP Prioritization and Analysis Tool (SBPAT), as described in Section 3.1.1 of the LSCR IP. The average TLR calculated for areas draining to the Estuary CML (i.e., the entire IP Area, or MS4 urban area), or 36 percent (as described in Section 3.1.2 of the IP), was applied to the baseline load for each Participating Agency to compute jurisdiction-specific TLRs for areas draining to the Estuary. These results are shown in Table 1. Similarly, the average TLR calculated for areas draining to the Reach 3 CML[1], or 31 percent, was applied to baseline loads in that area. Jurisdiction-specific TLRs for Reach 3 are shown in Table 2. Locations of CMLs are shown in Figure 2 of the SCR IP.

Table 1. LSCR Participating Agencies Baseline Loads and TLRs for Entire LSCR Watershed for Water Year 1995[1]

	County of Ventura	*City of Ventura*	*Oxnard*	*Santa Paula*	*Fillmore*	*Total*
Baseline Load (1012 MPN)	397	1,327	501	695	315	3,235
Absolute TLR (1012 MPN, based on 36 percent of baseline)	143	478	180	250	113	1,165

[1] November 1 through October 31

[1] The Cities of Ventura and Oxnard do not drain to Reach 3.

Table 2. LSCR Participating Agencies Baseline Loads and TLRs for Area Draining Only to Reach 3 CML for Water Year 1995[1]

	County of Ventura[2]	Santa Paula[2]	Fillmore	Total
Baseline Load (10^{12} MPN)	87	285	315	687
Absolute TLR (10^{12} MPN, based on 31 percent of baseline)	27	89	98	213

[1] November 1 through October 31

[2] 1,143 of the 2,940 acres in Santa Paula (39 percent) drain to the Reach 3 CML. 351 of the 1,520 acres of unincorporated urban area in the County of Ventura (23 percent) drain to the Reach 3 CML.

3 BMP LOAD REDUCTIONS BY JURISDICTION

BMPs included in the LSCR IP included non-structural BMPs, existing or planned structural BMPs, distributed green streets BMPs, and proposed regional BMPs. The methodology for estimating load reductions for these different BMP types is described in Section 3 of the LSCR IP.

For the purposes of determining jurisdiction-specific BMP load reductions, for those BMPs where the location of the BMP was known (i.e., regional, existing/planned, and IGP parcels), the calculated load reduction for each BMP was credited to that jurisdiction. LID incentives and LID redevelopment, however, were modeled in the IP based on specified percentages of certain land uses over the entire IP Area. In order to apportion load reductions from these BMPs to each Participating Agency, the entire BMP load reduction was split based on the land use area ratios among the jurisdictions. As described in the LSCR IP, load reductions from ‘other non-structural BMPs’ were assumed to be 5 percent of the baseline load.

These jurisdiction-specific BMP load reductions are shown in Table 3 and Table 4 for areas draining to the Estuary and Reach 3, respectively. Estimated load reductions based on BMP type are also illustrated for each Participating Agency in Figure 1 for areas draining to the Estuary CML, which includes the entire IP Area, and Figure 2 for areas draining only to Reach 3. The relative areas of these circles are proportional to their relative load reduction magnitudes.

As noted in Section 3.1.4 of the LSCR IP, the load reduction for the IP Area draining to the Reach 3 CML (236 x 10^{12} MPN) met the absolute TLR (213 x 10^{12} MPN) without requiring additional distributed BMP (“green streets”) implementation. However, for the entire IP Area (i.e. the LSCR MS4 urban area tributary to the Estuary CML), load reductions from BMPs other than distributed green streets BMPs (739 x 10^{12} MPN) were not sufficient to meet the absolute TLR (1,165 x 10^{12} MPN), so further jurisdictional analysis was done. BMP load reductions excluding distributed green streets BMPs were compared to each Participating Agencies’ TLR to determine additional load reduction required. For Oxnard, this was zero, so no distributed green streets were needed here. Each jurisdiction’s additional required load reduction was used to establish the amount of distributed green streets BMPs needed by jurisdiction (proposed for implementation on SFR and industrial land uses). These results are shown in Table 5.

Further analysis was conducted to determine whether the required level of distributed BMP implementation is feasible. The right-of-way (ROW) area was estimated for each jurisdiction and it was assumed (based on Geosyntec's experience analyzing ROW areas for other Southern California urban areas) that five percent of the ROW area is available for distributed BMP implementation. This was compared to the area needed for implementation of distributed BMPs to meet TLRs, shown in Table 5.

Table 3. Average Load Reduction by BMP Type and Jurisdiction for Entire LSCR Watershed for Water Year 1995

BMP	*City of Ventura*	*Oxnard*	*County of Ventura*	*Santa Paula*	*Fillmore*	*Total*
Proposed Regional Projects[1]	63	7.7	12	29	67	178
Existing/Planned	27	144	22	81	1.9	276
Redevelopment	22	8.3	10	13	5.3	59
LID Incentives	3.4	1.8	0.96	2.0	1.4	9.5
Inspection of IGP Sites	18	0	34	2.4	0	54
Other NS BMPs[2]	66	25	20	35	16	162
Total Load Reduction (10^{12} MPN, excluding distributed BMPs)	200	187	100	161	91	739
Additional LR Required to Meet Juris.-Specific TLR (10^{12} MPN) (excluding distributed BMPs)[3]	274	None	43	87	22	425
Distributed BMP Implementation Needed (% of SFR and Industrial area)[4]	65%	0%	30%	45%	40%	

[1] The proposed regional BMP located on a County owned parcel near Ventura was credited to the City of Ventura because the drainage area is in the City's jurisdiction.

[2] This is the net load reduction estimated to result from implementing the following enhanced non-structural programs: identification and control of sewage discharge to MS4s; trash cleanups; onsite wastewater treatment source reduction; good landscaping practices; commercial/industrial good housekeeping; pet waste controls; animal facilities management; street and median sweeping; homeless programs; MS4 cleaning; and education and outreach.

[3] Oxnard's "excess" load reduction was redistributed to other agencies in proportion to their baseline load.

[4] SFR and industrial area excludes area being treated by regional BMPs

Table 4. Load Reduction by BMP Type and Jurisdiction for Area Draining Only to the Reach 3 CML for Water Year 1995

BMP	*County of Ventura (area draining to Reach 3 CML)*	*Santa Paula (area draining to Reach 3 CML)*	*Fillmore*	*Total*
Proposed Regional Projects	12	29	67	107
Existing/Planned	0.35	72	1.9	74
Redevelopment	1.1	5.0	4.4	11
LID Incentives	0.25	0.74	1.3	2.3
Inspection of IGP Sites	5.1	1.8	0	6.9
Other NS BMPs[1]	4.3	14	16	34
Total Load Reduction (10^{12} MPN, excluding distributed BMPs)	23	122	90	236
Additional LR Required to Meet Juris.-Specific TLR (10^{12} MPN)(excluding distributed BMPs)	None	None	None	None

[1] This is the net load reduction estimated to result from implementing the following enhanced non-structural programs: identification and control of sewage discharge to MS4s; trash cleanups; onsite wastewater treatment source reduction; good landscaping practices; commercial/industrial good housekeeping; pet waste controls; animal facilities management; street and median sweeping; homeless programs; MS4 cleaning; and education and outreach.

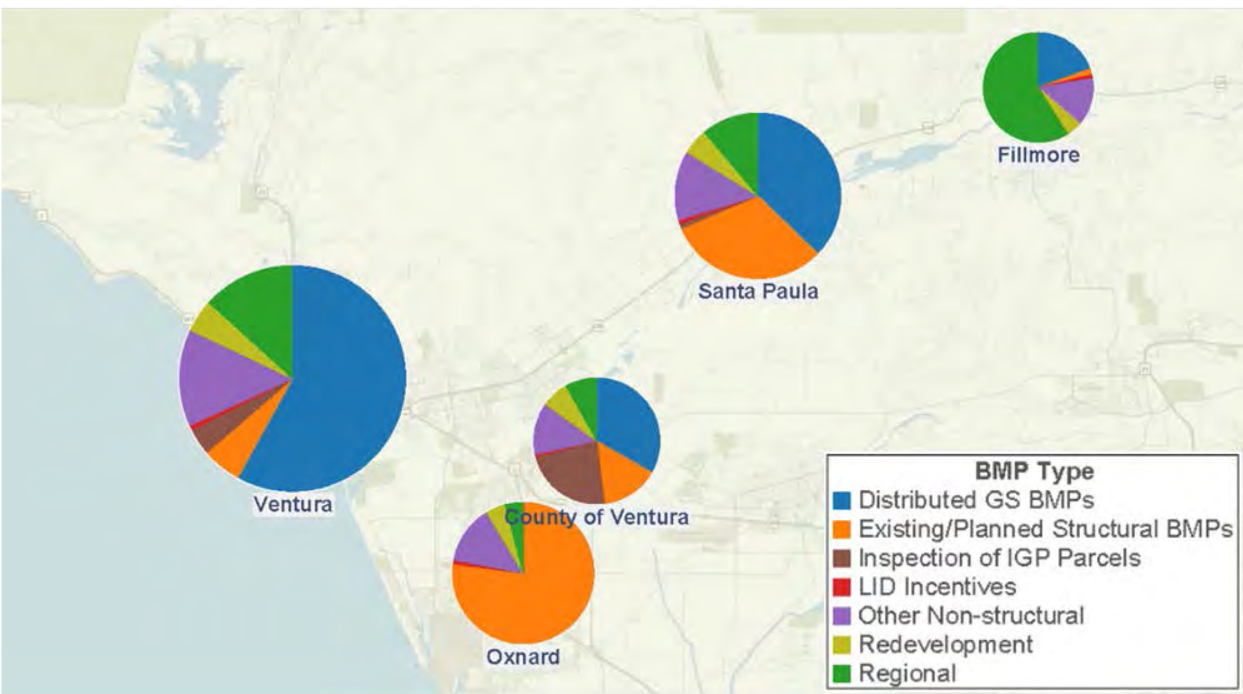

Figure 1. Load Reduction by BMP Type and Jurisdiction for Entire LSCR Watershed

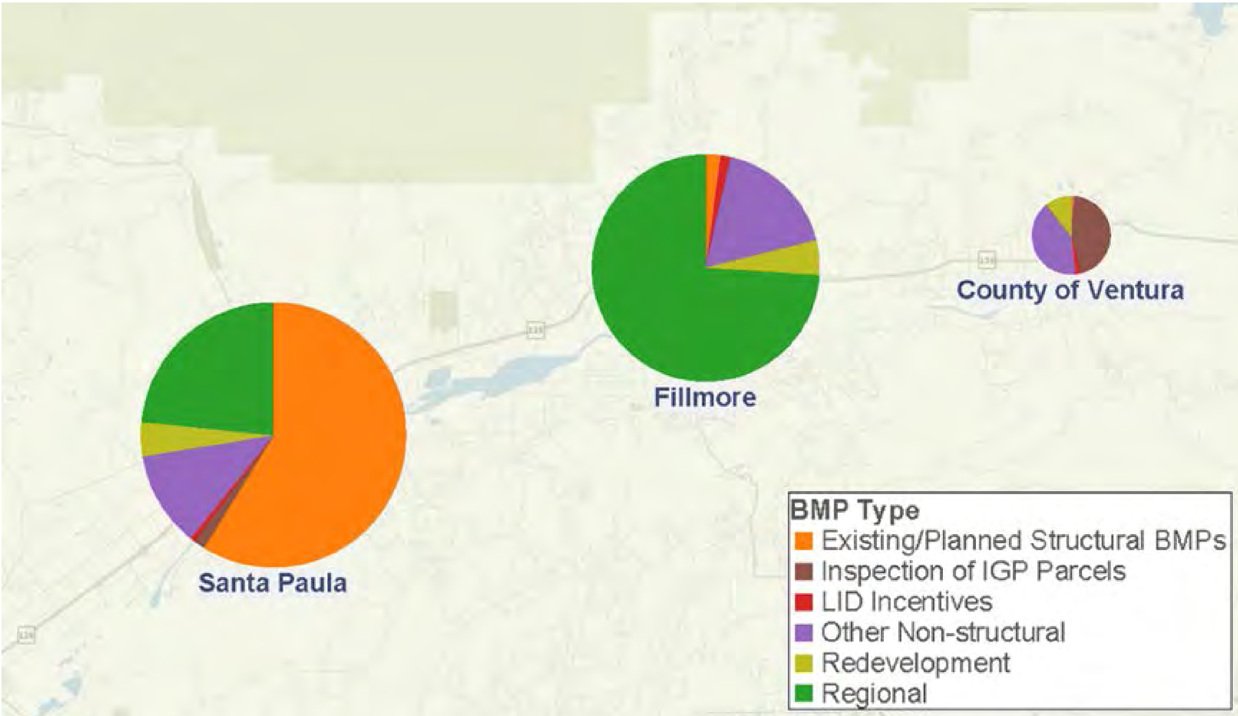

Figure 2. Load Reduction by BMP Type and Jurisdiction for Area Draining to Reach 3 CML

Table 5. Assessment of Area Available for Distributed Green Streets BMPs by Jurisdiction

	City of Ventura	*Oxnard*	*County of Ventura*	*Santa Paula*	*Fillmore*
Total SFR and Industrial Area (acres)[1]	2,029	1,264	959	1,251	431
SFR and industrial area proposed for treatment by distributed BMPs (acres)	1,319	0	288	563	173
Area needed for Distributed BMPs (acre)[2]	69	0	17	26	7.2
Total SFR and industrial ROW area (acres)[3]	476	323	149	254	78
Estimated ROW available for Distributed BMPs (acres)[4]	24	16	7.4	13	3.9

[1] Does not include area draining to regional BMPs

[2] Volume needed to treat 85th percentile design storm based on the SFR and industrial area modeled with distributed BMPs, weighted C coefficient, and 85th percentile design storm depth of 1.4 inches. Area needed for distributed BMPs based on a 12 inch retention depth

[3] Right-of-way (ROW) area based on sidewalk to sidewalk area if applicable or area located within easement lines

[4] Based on assumption that 5 percent of ROW is available for distributed BMP implementation

The right-of-way area available for distributed BMP implementation falls short of the total area needed in order to meet jurisdictional TLRs for the County of Ventura, City of Ventura, Santa Paula, and Fillmore. Therefore it is recommended that, during the implementation period, these agencies reevaluate this finding, and/or investigate additional regional BMP opportunities to meet their individual TLRs.

4 COST BENEFIT COMPARISON OF PROPOSED STRUCTURAL BMPS

Participating Agencies also requested information on the relative cost-benefit ratio for the various proposed structural BMPs (Figure 3). Regional BMPs typically have favorable economies of scale in comparison to distributed BMPs, resulting in lower cost per water quality benefit. For example, the six infiltration basin regional BMPs achieve the same load reduction as distributed green streets at an average of 21 percent of their cost. The subsurface infiltration basin proposed for the City of Ventura is approximately 37 percent of the cost for the same load reduction achieved by green streets. This analysis demonstrates that infiltration-type regional BMPs are more cost effective than distributed green streets for achieving the bacteria load reductions needed to meet the TLRs. Therefore, Participating Agencies may wish to seek additional regional BMP opportunities in the future as a cheaper alternative to some of their green streets needs.

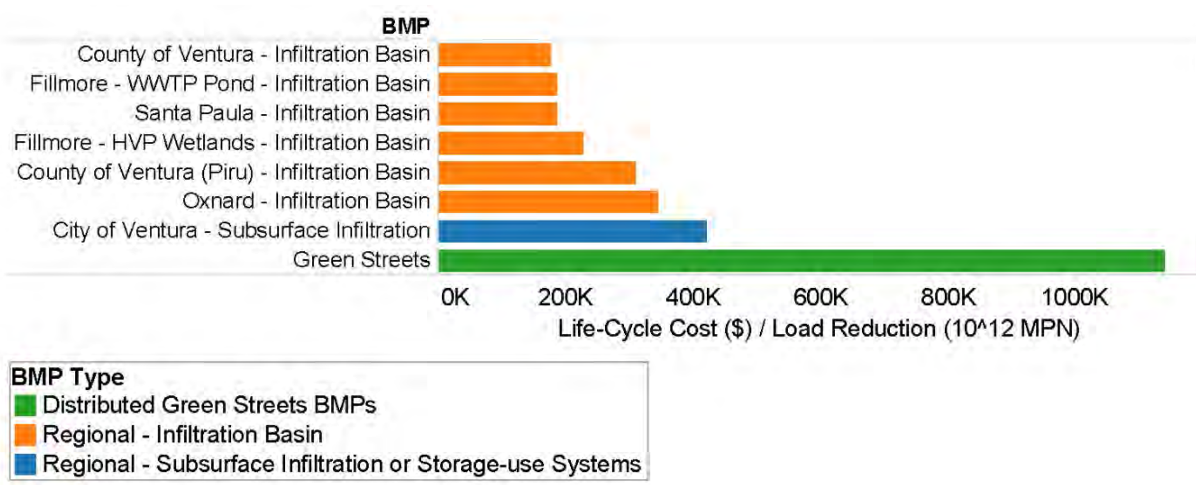

Figure 3. Cost per Load Reduction (10^{12} MPN) achieved for regional vs. distributed BMPs